



Corrective Action Plan
Petroleum-Impacted Soil
and Groundwater
121-123 Reynolds Street
Rochester, New York
NYSDEC Spill No. 1103833

April 2020

Prepared for:

New York State Department of
Environmental Conservation
6274 East Avon-Lima Road
Avon, NY 14414-9519

Prepared by:

Stantec Consulting Services Inc.
61 Commercial Street, Suite 100
Rochester NY 14614-1009
Tel: (585) 475-1440
Fax: (585) 272-1814

Prepared on Behalf of:

City of Rochester
Division of Environmental Quality
30 Church Street, Room 300B
Rochester, NY 14614

Executive Summary

This Corrective Action Plan (CAP) provides the details of proposed environmental remediation of petroleum-impacted soil and groundwater at the City of Rochester (City)-owned property located at 121-123 Reynolds Street (referred to herein as “the Site”). Previous investigations at the Site have identified soil and groundwater impacted with petroleum-related contamination at levels in excess of applicable regulatory cleanup standards. The remediation is being performed as part of the City’s Brownfield Cleanup Grant from the United States Environmental Protection Agency (EPA), and the work is being jointly funded by the EPA and the City.

The Site has been assigned Spill File No. 1103833 by the New York State Department of Environmental Conservation (NYSDEC) based on the presence of the petroleum impacts found. The City has entered into a Stipulation Agreement with the NYSDEC for cleanup at the Site. NYSDEC will provide review and approval of this CAP and oversight of the project.

The goal of the project is to remediate subsurface petroleum impacts sufficiently to facilitate closure of the NYSDEC Spill File for the Site, and to facilitate future sale and development of the property. This CAP provides details on a proposed cleanup program that will include:

- A Community Involvement/Public Outreach Program;
- Urban Fill and Petroleum-impacted soil excavation;
- Offsite landfill disposal of excavated soils;
- Source-area groundwater management and disposal;
- *In-situ* bioremediation of remaining impacts in groundwater;
- Excavation backfill, Site restoration and related activities;
- Follow up groundwater monitoring; and
- Documentation and reporting.

In addition, an Environmental Management Plan and other institutional controls will be developed and assigned to the property, related to potential minor soil and/or groundwater impacts that may remain after completion of the remedial program.

It should be noted that implementation of the activities detailed in this CAP, and the currently-anticipated schedule, are subject to modification as needed, based on current or future government-mandated restrictions, prohibitions or other requirements arising in response to the current COVID-19 pandemic. The safety and health of the public and workers involved in this project will be paramount at all times.



Table of Contents

1.0	INTRODUCTION.....	1
2.0	SITE BACKGROUND AND PREVIOUS INVESTIGATIONS.....	2
3.0	PUBLIC PARTICIPATION	4
4.0	CORRECTIVE ACTION PLAN.....	5
4.1	REMEDIAL OBJECTIVES	5
4.2	RELATED PLANS.....	6
4.3	PROPOSED REMEDIAL ACTIVITIES.....	6
4.3.1	Planning, Mobilization and Security	6
4.3.2	Impacted Soil Pre-characterization	6
4.3.3	Excavation and Backfill Plan	7
4.3.4	Groundwater and Stormwater Management	9
4.3.5	<i>In-situ</i> Groundwater Remediation Hardware Installation.....	9
4.3.6	Excavation Backfill.....	10
4.3.7	Waste Recycling and Disposal.....	10
4.3.8	Monitoring Well Decommissioning and Replacement.....	10
4.3.9	<i>In-situ</i> Groundwater Treatment and Monitoring	11
4.4	DOCUMENTATION AND REPORTING	11
4.4.1	Remedial Construction/Closure Report.....	11
4.4.2	Environmental Management Plan	12
5.0	SCHEDULE.....	12

FIGURES

Figure 1	Site Location Map
Figure 2	Remedial Site Plan
Figure 3	Estimated Project Schedule

APPENDICES

Appendix A	Community Involvement Plan
Appendix B	Health and Safety Plan
Appendix C	Community Air Monitoring Plan
Appendix D	Quality Assurance Project Plan
Appendix E	Standard Operating Procedures - Soil and Groundwater Sampling



1.0 INTRODUCTION

On behalf of the City of Rochester (the City), Stantec Consulting Services Inc. (Stantec) has prepared this Corrective Action Plan (CAP) to perform environmental remediation of petroleum-impacted soil at the property located at 121-123 Reynolds Street (referred to herein as “the Site”). The location of the Site is shown on the attached Site Location Map (Figure 1).

The environmental remediation project is being performed as part of the City of Rochester’s (City’s) Brownfield Cleanup Grant (Cooperative Agreement No. BF-96261018) from the United States Environmental Protection Agency (EPA). The work is being jointly funded by the EPA and the City. Activities eligible for EPA Cleanup Grant funding generally include remedial planning and work plan development, remedial measures and cleanup activities, restoration, performance monitoring, reports, documentation, and community involvement.

The remedial activities are subject to the conditions in the EPA Brownfield Assessment Cooperative Agreement Administrative Conditions. In addition, the Site has been assigned Spill File No. 1103833 by the New York State Department of Environmental Conservation (NYSDEC) based on the presence of the petroleum impacts found. The City has entered into a Stipulation Agreement with the NYSDEC for cleanup at the Site.

The goal of the project is to remediate subsurface petroleum impacts sufficiently to facilitate closure of the NYSDEC Spill File for the Site, and to facilitate future sale and development of the property for residential purposes. This CAP provides details on a proposed cleanup program including impacted soil excavation and offsite disposal, groundwater management and bioremediation, excavation backfill, Site restoration, follow-up monitoring and related activities.

It should be noted that implementation of the activities detailed in this CAP, and the currently-anticipated schedule, are subject to modification as needed, based on current or future government-mandated restrictions, prohibitions or other requirements arising in response to the current COVID-19 pandemic. The safety and health of the public and workers involved in this project will be paramount at all times.



2.0 SITE BACKGROUND AND PREVIOUS INVESTIGATIONS

The Site, which is owned by the City (Monroe County Tax ID No. 12.52-3-18.001) is located in a low-density residential area. The Site is generally level, and the parcel is approximately 0.19 acres in size. Several phases of investigation and partial remediation have previously been completed at the site, as detailed in the following reports:

- Subsurface Evaluation Data Package, Environmental Assessment and Remediation Services, Day Environmental (Day), December 2011;
- Phase I Environmental Site Assessment (ESA), Day, April 2015;
- Phase II ESA, Day, January 2016; and
- Supplemental Phase II ESA, Day, January 2017.

In June 2011, apparent petroleum contamination was observed in soil encountered during excavation of the basement foundation of a new residential house on the 125 Reynolds Street parcel that abuts the Site on the south. Subsequent historical research by the City revealed the former presence of a gas station, and an auto repair facility that included a paint spraying operation on the northern portion of the Site (Former 121 Reynolds Street).

Historical records indicate that up to four petroleum underground storage tanks (USTs) containing gasoline and kerosene had been documented on the Site. In addition, a single-family house had previously been located on the southern portion of the site (former 123 Reynolds Street). The City and its consultant then removed the four USTs in August 2011. A limited amount of impacted soil was also excavated and disposed offsite at that time; confirmatory sampling indicated residual petroleum impacts remained in soil at levels above regulatory cleanup criteria.

The City then commissioned a Phase I ESA in early 2015, followed by a Phase II ESA in the fall of 2015. The Phase II investigation provided the following findings:

- Twenty locations were drilled and sampled across the site, using either Geoprobe direct-push or rotary drilling methods. Four interface monitoring wells were installed; one in the northern half of the site and three in the southern half.
- Bedrock was encountered at depths ranging from approximately 8 to 10 feet below ground surface (bgs).
- Photoionization detector (PID) readings from soil screening were detected in 8 of the 20 borings. Peak PID readings ranged up to 1,659 parts per million (ppm).
- Four of nineteen soil samples contained petroleum volatile organic compounds (VOCs) at levels above applicable Part 375 soil cleanup objectives (SCOs) and CP-51 soil cleanup levels (SCLs).
- Only one sample obtained from one of several Site perimeter boring (some of which were in the rights-of-way) exceeded applicable SCOs for VOCs.
- Urban fill was encountered in 12 of the 20 test boring locations, to depths ranging up to 6 feet bgs. Two samples of urban fill were analyzed; one sample (located in the southeast portion of the site) contained lead at a level above the Restricted Residential (RR) SCO but a TCLP analysis did not indicate a hazardous level.



**CORRECTIVE ACTION PLAN
PETROLEUM-IMPACTED SOIL AND GROUNDWATER
121-123 REYNOLDS STREET
ROCHESTER, NY**

- All four groundwater samples exhibited petroleum VOCs at levels above TOGS 1.1.1 groundwater standards and/or guidance values.
- Based on readings in the four monitoring wells, groundwater flows toward the south.

A supplemental Phase II ESA was then performed in the fall of 2016, consisting of an additional nine soil test borings and field PID screening; nine soil samples were submitted for analysis for VOCs. The results of this investigation were combined with the findings of the initial Phase II ESA to further refine the apparent limits of impacts to soil. Based on the cumulative results, recommendations were provided in the Phase II ESA report that included:

- Additional excavation of impacted soil (beyond that excavated at the time of tank removal) and the upper, fractured portion of bedrock in the source area in the northeast portion of the Site;
- Excavation of deeper, wet/saturated soils in the “plume area” in the southern portion of the Site;
- Excavation of urban fill materials in the northern portion of the site;
- Post-excavation, in-situ bioremediation in the saturated zone in petroleum-impacted areas;
- Implementation of a Soil and Groundwater Management Plan (SGMP) for future development; and
- Installation of a sub-slab depressurization system (SSDS) for any future structures on the Site.

As a result of the findings of these investigations and the City's desire to return the Site to productive residential use, a Brownfields Cleanup Grant was awarded by the USEPA to the City for the remediation of soil and groundwater impacts at the Site. Details of the proposed remedial program are provided below.



3.0 PUBLIC PARTICIPATION

A public participation program will be implemented by the City for the proposed remediation, to provide the public with project-specific information regarding the benefits and potential community impacts resulting from the corrective actions. This program will include:

- Preparation and distribution of a written Community Involvement Plan (CIP) to be provided to project stakeholders including area residents, community groups and businesses (see copy, Appendix A);
- Preparation and distribution of one or more newsletters to provide surrounding community members and stakeholders with information about project activities;
- Providing project updates through the City's Project Web Site:
<https://www.cityofrochester.gov/121-123reynoldscleanup/>

Distributing hard copies of reports and other project documents to the project's official document repository (Phyllis Wheatly Branch Library; 33 Dr Samuel McCree Way, Rochester, NY 14608).
Note: At the time this CAP was prepared, due to the COVID-19 pandemic many public facilities, including City libraries, are closed to the public. Once public facilities are reopened, hard copies of relevant project-related documents will be placed in the repository.

A repository will also be established at the NYSDEC Region 8 office located at 6274 East Avon-Lima Road, Avon, New York 14414.

- Addressing or responding to public comments; and
- Holding public meetings, if appropriate to present and discuss the proposed project with adjacent property owners, community groups, and other stakeholders. *Note:* Due to restrictions related to the current COVID-19 pandemic, public gatherings are not permitted. As such, no public meetings are currently scheduled. An informational newsletter will be developed and distributed to project stakeholders.



4.0 CORRECTIVE ACTION PLAN

This section provides a detailed description of the corrective actions to be taken at the Site. The remedial program will include the development and submittal of documents, public outreach activities and implementation of the proposed actions to complete the work in accordance with City, NYSDEC and USEPA requirements.

4.1 REMEDIAL OBJECTIVES

The primary objectives of this remediation project are as follows:

- Implement corrective actions to address petroleum-impacted soil and groundwater in three primary remedial areas of concern, generally referred to herein (and in previous site-related documents) as the Urban Fill Area, UST Source Area, and the Plume Area (see Figure 2).
- Excavate source-area soils and other media that are impacted with urban-fill related materials (e.g. ash, cinders, etc.), and metals or petroleum-related contaminants in excess of applicable SCOs and transport and dispose these materials offsite;
- Remove (if encountered), treat, and discharge to the combined Monroe County sewer impacted groundwater from the excavations;
- Facilitate *in-situ* bioremediation of groundwater by adding Oxygen Releasing Compound (ORC-A™) to the excavation. In addition, prior to backfilling, install contingent remedial hardware (horizontal well screens at the base of the excavations, and vertical risers) to facilitate future additional ORC-A™ solution injection, if needed;
- Perform post-remedial groundwater monitoring; and
- Obtain NYSDEC spill file closure and a “No Further Action” letter.

Other related objectives and tasks include:

- Removal of shallow, accessible, subsurface utilities or sub-slab structures associated with previous Site structures, if present;
- Removal of existing monitoring wells MW-1, -2 and -3 during excavation work, and installation of three new replacement overburden/bedrock interface monitoring wells for follow-up monitoring;
- Follow-up groundwater monitoring (minimum of four quarters, with additional as needed based on the first-year results); and
- Development of a Remedial Construction/Closure Report and an Environmental Management Plan (EMP).



4.2 RELATED PLANS

Supporting documents have been prepared to accompany this CAP, as listed below. These are contained in the referenced appendices:

- Health and Safety Plan (Appendix B) - A project-specific Health and Safety Plan (HASP) has been prepared in accordance with OSHA regulations. The remedial contractor will prepare a HASP for its own employees. All personnel involved directly in Site work, monitoring or sampling will have the proper OSHA HAZWOPER training commensurate with their project duties.
- Community Air Monitoring Program (Appendix C) - A Community Air Monitoring Plan (CAMP) has been prepared in accordance with the NYSDEC CAMP guidance and template.
- Quality Assurance Project Plan (Appendix D) - A Quality Assurance Project Plan (QAPP) has been prepared in general accordance with USEPA guidance.

4.3 PROPOSED REMEDIAL ACTIVITIES

This section provides a detailed description of each of the proposed remedial activities to be performed as part of the corrective action for the Site. The work will be performed by TREC Environmental Inc. of Spencerport, New York (Contractor) under the observation of Stantec and the City. Laboratory analyses will be performed by Eurofins TestAmerica Laboratories in Amherst, NY.

4.3.1 Planning, Mobilization and Security

Applicable clearances and permits will be obtained by the Contractor prior to mobilizing equipment to the Site. These include:

- Underground utility clearance obtained through DigSafelyNY;
- A hydrant use permit from the City of Rochester Bureau of Water to obtain potable water for equipment decontamination and dust control; and
- A temporary Discharge Permit from the Monroe County Department of Environmental Services (MCDSE) to discharge the water to the combined sewer.

As necessary, some existing wooden bollards previously installed by the city will be temporarily removed to facilitate access for equipment and vehicles; these will be reinstalled at completion of the work. During the remedial work, Site security will include installation of temporary 6-ft. chain-link fence around the perimeter of the Site. A locking gate will be installed on Tremont Street near the northwest corner of the Site. The City also now owns, and will make available for project usage (vehicle, equipment and clean materials storage, etc.), two parcels located immediately adjacent to the 121-123 Reynolds St. parcel: 409-411 Tremont St (west of the Site) and 20 Jefferson Terrace (southwest of the Site).

It is possible that, at times, one or more parking spaces on Reynolds Street and/or Tremont Street may need to be temporarily blocked off to facilitate safe work vehicle entry and exit.

4.3.2 Impacted Soil Pre-characterization

The Site has limited space for stockpiling non-impacted and impacted materials during excavation. To facilitate direct loading of excavated material into trucks, the impacted soils will be pre-



**CORRECTIVE ACTION PLAN
PETROLEUM-IMPACTED SOIL AND GROUNDWATER
121-123 REYNOLDS STREET
ROCHESTER, NY**

characterized, a waste profile will be developed, and advanced disposal approval will be obtained from the disposal facility. The attached Figure 2 indicates potential locations for a frac tank and temporary soil stockpile; however, these feature locations are subject to field modification based on Site conditions and constraints, and the possible use of the two City-owned parcels discussed above.

Prior to implementing excavation-related activities, samples of impacted soil will be obtained from each remedial work area for laboratory analysis. The samples will be obtained by advancing a soil boring in each proposed excavation area to obtain representative samples. Underground utility clearance will be obtained through DigSafelyNY prior to performing the drilling.

Further details on disposal of the anticipated waste streams are provided in Section 4.3.7 below.

4.3.3 Excavation and Backfill Plan

The Urban Fill, UST Source, and Plume Areas will be excavated in general accordance with the recommendations of the ABCA. Figure 2 depicts the estimated limits of excavation for all excavation areas. Actual dimensions of the excavations may vary from that shown based on conditions encountered.

Stormwater Measures: Prior to excavation, measures will be taken to prevent stormwater runoff from transporting sediment beyond the Site property limits. This will consist of silt fence installed inside the security fence around essentially the entire perimeter of the Site. If the 409-411 Tremont parcel is utilized, the silt fence will be extended along the north and west sides of this parcel to prevent potential stormwater impact to the adjacent property.

Excavation: Details on the demolition methods used for the former gas station and residential structure are not well-documented. It is possible that sections of foundation walls or basement floor slabs were left in place and buried. If such structures are encountered during excavation, they will be removed to the extent practicable. Any such materials (assumed to be mostly concrete and brick, with some possible abandoned utility piping) will be included with non-hazardous impacted waste soils for offsite disposal.

Shallow, non-impacted soil and fill material in each remedial excavation will be removed and stockpiled temporarily for potential reuse as backfill (pending laboratory analyses to demonstrate acceptability). This material will be placed on, and under secured poly sheeting. Some of this material may be stored on the 409-411 Tremont parcel, if that property is included in the project working area.

The limits of the excavations will be established using visual observations and olfactory indications and PID screening. It is anticipated that gray bleaching, black staining and petroleum odors will be indicative of the presence of contamination; however, given the variation of petroleum types that have been identified on-site, in the absence of any of these, a PID reading exceeding 25 ppm will also be used initially as a screening criterion for segregating impacted versus non-impacted soils. The PID screening level may be adjusted as necessary and appropriate, with City and NYSDEC concurrence.

The UST Source Area and Plume Area excavations may also be extended below the top of bedrock if conditions allow. The actual excavation depth below top of rock will be determined in the field and will depend on the rock hardness, degree of weathering and fracturing. The general intent is to pursue excavation of those locations in bedrock that can be penetrated with conventional excavation equipment (i.e. excavator bucket) and that show indications of significant petroleum impacts. As such, this may result in an inconsistent maximum excavation depth as possible "hot spots" (if present) are



**CORRECTIVE ACTION PLAN
PETROLEUM-IMPACTED SOIL AND GROUNDWATER
121-123 REYNOLDS STREET
ROCHESTER, NY**

encountered and amenable to removal. This will be a field judgement based on conditions encountered.

The actual vertical and lateral dimensions of the excavations will depend on the conditions encountered in the field. The table below summarizes volumes for impacted soil and overlying non-impacted materials, based on laboratory results, field PID screening and observations such as staining and odors, as summarized in the Phase II ESA reports:

Area	Estimated Volume of Impacted Soil and Bedrock for Disposal (cy)	Estimated Volume of Non-Impacted Soil for Reuse (cy)
Urban Fill Area	456	N/A
UST Source Area	254	127
Plume Area	309	400

Note: "cy" – cubic yards.

If significant nuisance odors are present during excavation and soil handling, Biosolve® or a similar vapor suppressant will be utilized in the excavation and on stockpiled material as needed.

Based on the depth to bedrock (approximately 9.5 feet bgs), and the desire to limit the use of benches to maximize the amount of impacted soil removed, trench boxes will be used along the northern and eastern sidewalls to prevent potential sidewall collapse and undermining of the adjacent sidewalk/utilities. The Contractor will employ trench boxes and excavate these portions of the site in smaller "cells." Trench boxes are not proposed to be utilized on the Site's "interior" sidewalls, depending on the behavior of the soils in these areas.

Non-impacted soils will be segregated and stockpiled onsite for future use as excavation backfill. This material will be placed on and covered with polyethylene sheeting. The sheeting will be secured to prevent disturbance or erosion by wind and water and bermed such that runoff will not carry sediment from the piles.

The final approximate geometry of the excavations will be documented with GPS equipment with sub-meter accuracy for incorporation into GIS-based Site mapping.

Confirmatory Sampling: Samples will be collected for laboratory analysis from excavation sidewalls and bottoms to confirm that sufficient removal of impacted soil has been achieved. It may be necessary to place some backfill in the base of an excavation prior to receiving confirmatory sample results to stabilize sidewalls and prevent caving, especially along the north and east sides of the sites where excavations will be in close proximity to sidewalks. Sample locations and frequency will be determined in accordance with DER-10 guidance, and sampling will be done in accordance with the soil sampling Standard Operating Procedure in Appendix E. Confirmation samples will be analyzed for the analyte classes listed below:



**CORRECTIVE ACTION PLAN
PETROLEUM-IMPACTED SOIL AND GROUNDWATER
121-123 REYNOLDS STREET
ROCHESTER, NY**

- Part 375 and NYSDEC CP-51 List volatile organic compounds (VOCs) plus Tentatively Identified Compounds (TICs), USEPA Method 8260C; and
- PART 375 and NYSDEC CP-51 List Semivolatile Organic Compounds (SVOCs) plus TICs, USEPA Method 8270D.

Reporting of results for final confirmation samples will be performed using ASP Category B deliverables. A data usability summary report (DUSR) will be generated by a data validator independent of the laboratory for the confirmatory sample results.

Confirmation sample results will be compared to NYSDEC's SCOs for Restricted Residential usage and Protection of Groundwater, as contained in 6 NYCRR Part 375, and supplemental SCOs contained in NYSDEC's CP-51 Soil Cleanup Guidance document, prior to backfilling the excavation. In the event that the results of a confirmation sample do not meet SCOs, NYSDEC and the City will be consulted regarding potentially extending excavation limits; however, this may not be possible depending on proximity to property lines, adjacent structures, sidewalks, etc.

4.3.4 Groundwater and Stormwater Management

Excavation in the UST Source and Plume Areas is intended to extend down to, and potential below the top of bedrock provided the rock is weathered enough to allow removal with conventional excavation equipment. This may result in excavating below the water table depending on groundwater levels at the time of construction. Accordingly, it may be necessary to manage and contain groundwater, and potentially rainwater, accumulating in the excavation, due to the potential for contaminant presence. The Contractor will be equipped with the necessary pumps, hoses, drums and a storage tank to pump and contain water. If the work is performed during freezing weather (which is unlikely), the Contractor will have the necessary heating equipment for the storage tank to prevent freezing of the water.

Based on previous groundwater sampling results it is anticipated that the contaminant concentrations will be low enough (to be demonstrated through sampling and analysis) to allow discharge of the water to the combined sewer under a Temporary Discharge Permit from the Monroe County Department of Environmental Services (MCDES). It is also assumed that no separate-phase product will be present. A sample of the containerized water will be obtained and analyzed on a rapid turnaround basis (estimated 48 hours) to facilitate tank discharge and demobilization while the Contractor is still onsite. The results will be submitted to MCDES for approval and Stantec will coordinate with MCDES relative to its preferred discharge point. If contaminant levels are such that pre-treatment is required to achieve the contaminant discharge limits in the permit, a treatment system (e.g. granular activated carbon for VOCs) will be proposed to NYSDEC/MCDES for approval.

4.3.5 In-situ Groundwater Remediation Hardware Installation

Section 4.3.9 below discusses the application of ORC-A™ in the completed excavations to facilitate bioremediation of impacted groundwater. In the event that this application proves insufficient to reduce the petroleum contaminant levels over time, the City intends to install *in-situ* remediation hardware at the base of the excavation areas prior to backfill that could be used for future injections of ORC-A™ solution, if needed. This will consist of eight horizontal runs of 2-in. diameter, 0.02-in. slot PVC well screen, installed along the base of the excavation in the configuration shown on Figure 2. Each run of piping will be approximately 30 ft in length, oriented east-west. The screen will be capped



on the west end and connected on the east end to sufficient vertical solid PVC riser pipe to reach the surface, where a flush-mounted protective roadway box surface completion will be installed. The screen sections will be covered with at least 6 inches of #2 crushed stone.

4.3.6 Excavation Backfill

Backfill materials will consist of both reused onsite material (pending chemical testing and NYSDEC approval) and imported offsite granular fill materials from a permitted quarry. The stockpiled onsite material will be sampled in accordance with DER-10 guidance. Crushed stone will be used as the imported backfill material. As such, the sampling and analysis required by DER-10 and the recent DER policy document requiring Emerging Contaminant testing of imported materials will not apply. An estimated 800 cubic yards of imported crushed stone material will be required to make up for the amount of materials disposed offsite; this material will consist of a crushed stone product from a permitted quarry that contains less than 10% by weight passing through a #80 sieve, in accordance with DER-10 Section 5.4 (e) 5 i.

Upon completion of backfilling, approximately 445 cy of topsoil will be used across the surface of the Site. This will consist of approximately a 1.5-ft.-thick layer of clean, unscreened topsoil, followed by an overlying 6-in-thick layer of screened topsoil. The imported topsoil will be sampled and analyzed before it is delivered to the site to demonstrate that it meets NYSDEC Part 375 residential SCOs.

4.3.7 Waste Recycling and Disposal

Waste streams are anticipated to include:

- Petroleum-impacted soil and bedrock;
- Urban fill soil (there is a potential this material may include some remnant subsurface structure or demolition materials (concrete, brick, wood, etc.); and
- Wastewater.

It is currently anticipated that the petroleum-impacted soil and bedrock and urban fill waste streams will be disposed at Waste Management's High Acres Landfill in Perinton, New York, pending approval of the pre-characterization sampling and analysis discussed above in Section 4.3.2. It should be noted that other permitted disposal facilities could potentially be used if approval is not obtained from High Acres.

The wastewater will be temporarily containerized, sampled and analyzed and, if acceptable to MCDES, disposed under a temporary discharge permit as described in Section 4.3.4 above.

4.3.8 Monitoring Well Decommissioning and Replacement

The Site currently has four existing monitoring wells: MW-1, -2, -3 and -4, each located within the limits of the Site (see Figure 2). Wells MW-1, -2 and -3 will each be removed during the excavation activities. Well MW-4 is currently anticipated to remain. Accordingly, three replacement wells will be installed at approximately the same locations after backfilling is complete, using a Geoprobe® rig. Each overburden well will consist of 1-in diameter PVC casing and approximately 10-ft of well screen. New flush-mounted surface completions will be installed for each new well. The wells will be developed upon completion. All new and existing well casings will be surveyed for accurate elevations.



4.3.9 In-situ Groundwater Treatment and Monitoring

Although some source-area groundwater is anticipated to be removed and disposed as part of the excavation activities, residual groundwater contamination may remain after excavation and backfill are complete. In accordance with the ABCA recommendations, *in-situ* remediation will be performed to facilitate further reduction of contaminant levels in groundwater. To accomplish this, Oxygen Releasing Compound–Advanced™ (ORC-A™; manufactured by Regenesis) will be added to the excavation prior to backfill. Approximately 440 pounds of ORC-A™ will be placed in dry form on the bottom of the source area excavation, and 720 pounds will be placed on the bottom of the plume area excavation before backfill soils are placed.

Groundwater sampling will be performed subsequent to the ORC-A™ application and replacement well installations. At this time, it is anticipated that a groundwater monitoring program consisting of four quarterly rounds of sampling in each of the four wells will be performed. The first round of sampling will be performed approximately three months after excavation and backfill are complete.

Groundwater sampling will be performed using disposable bailers, as detailed in the Standard Operating Procedure in Appendix E. The field parameters dissolved oxygen (DO) and oxidation-reduction potential (ORP) will be measured and recorded during sampling to help assess groundwater geochemical conditions and bioremediation effectiveness. Samples will be submitted to an ELAP-certified laboratory for the following analyses:

- Part 375 and CP-51 List VOCs plus TICs, USEPA Method 8260C; and
- Part 375 and CP-51 List SVOCs plus TICs, USEPA Method 8270D.

The data and findings will be included in the Remedial Construction/Closure Report (see Section 4.4 below). A DUSR will only be generated for the final round of groundwater sampling.

4.4 DOCUMENTATION AND REPORTING

This section provides a summary of reporting to be performed after Corrective Actions are performed. The reporting will provide documentation of remediation performed, residual contamination presence, engineering and institutional controls and other aspects of the project.

4.4.1 Remedial Construction/Closure Report

A Remedial Construction/Closure Report (RCCR) will be developed that will summarize the remedial program details, including the first quarterly round of follow-up groundwater sampling performed.

The remedial activities will be documented in a Remedial Construction/Closure Report (RCCR). A draft RCCR will be submitted to NYSDEC and NYSDOH for review within 90 days of the completion of remedial activities. The primary elements of the report will include:

- A description of remedial activities, including excavation, groundwater management, soil disposal, ORC-A™ placement backfill and Site restoration;
- Waste disposal documentation;
- Data usability summary reports (DUSRs) for final soil confirmation samples and samples of imported soils (note: DUSRs will not be generated for waste characterization analyses);



**CORRECTIVE ACTION PLAN
PETROLEUM-IMPACTED SOIL AND GROUNDWATER
121-123 REYNOLDS STREET
ROCHESTER, NY**

- GIS-based drawings showing the final limits of excavation, sample locations, well locations, *in-situ* remediation piping system, areas of remaining contamination (if present) etc.;
- Photographs; and
- New York State Professional Engineer Certification.

4.4.2 Environmental Management Plan

After the remedial actions have been completed, relatively minor amounts of low-level residual contamination may remain in soil and groundwater beneath the Site. Accordingly, Institutional Controls will be implemented for the Site. These will consist of:

- The property will be flagged in the City's Building Information System (BIS) database relative to potential residual environmental impacts. This BIS flag will require that any new permit applications for the Site property will automatically trigger a project review by the City DEQ.
- In conjunction with the BIS flag, a written EMP will be developed that will provide guidance for future Site activities that may result in subsurface disturbance, including all redevelopment activities. This would include excavation, Site grading drilling, etc. The EMP will be developed in general accordance with applicable portions of NYSDEC's Site Management Plan development guidance, and will provide:
 - A summary of the environmental investigations performed;
 - A description of Site conditions at the time of completion of the remedial actions, including areas and concentrations of known residual soil impacts;
 - Site plan(s) showing remediation-related features, monitoring wells, *in-situ* remediation piping system, etc.;
 - A summary of groundwater flow conditions, contaminant levels and the ongoing groundwater monitoring program requirements;
 - The appropriate precautions and procedures to be followed in the event that impacted soil or groundwater are encountered during Site development activities, including field screening, and soil/groundwater testing, handling and disposal; and
 - Engineering controls. This is anticipated to include a generic description of a vapor intrusion mitigation system (i.e. SSDS) and a requirement for installation of such a system in any future occupied Site structures.

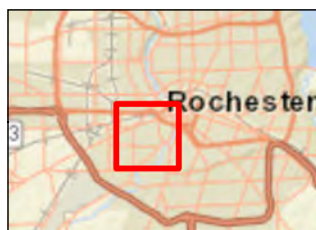
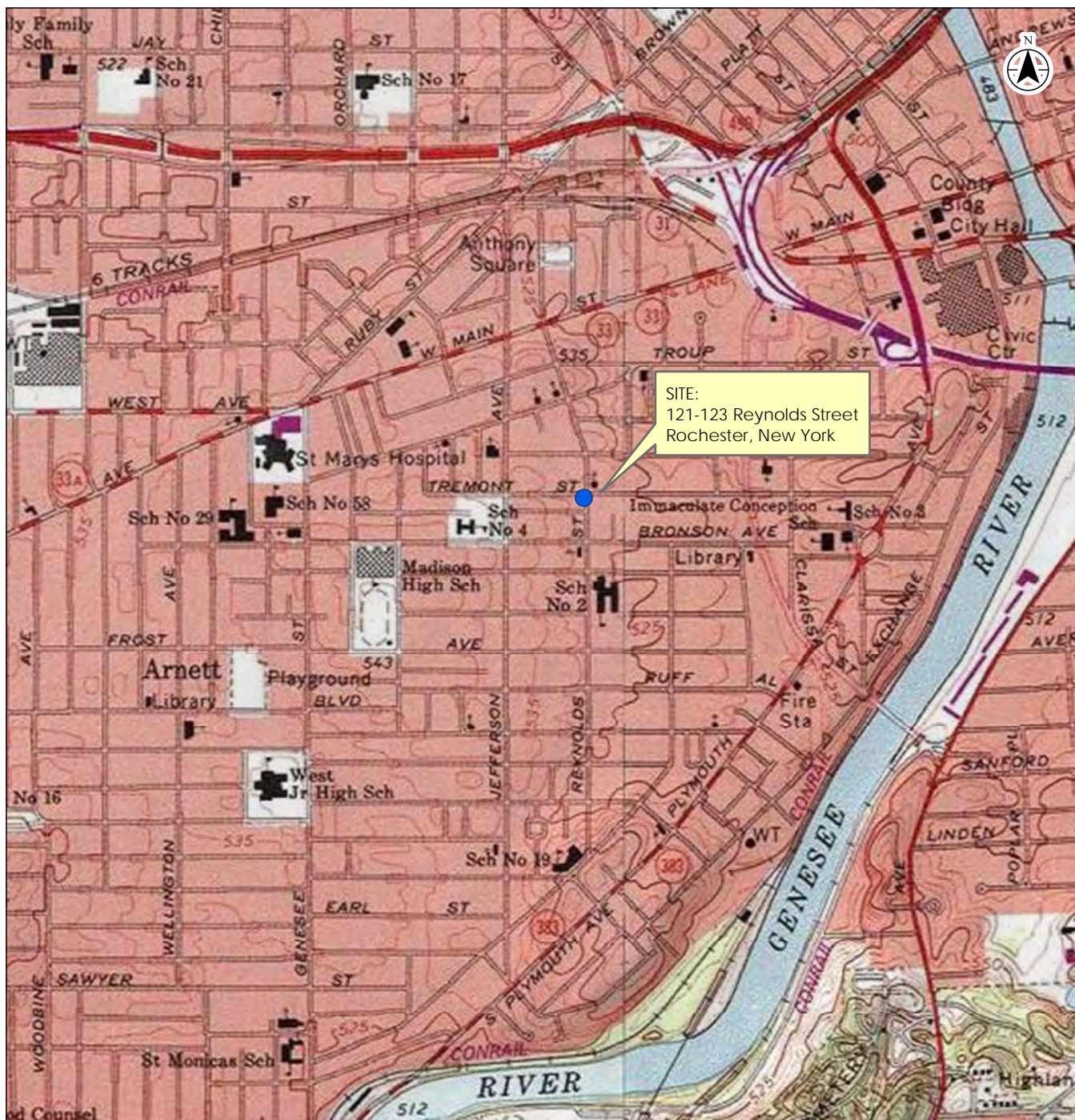
5.0 SCHEDULE

The attached Figure 3 provides the approximate anticipated schedule for each major element of the project.



**CORRECTIVE ACTION PLAN
PETROLEUM-IMPACTED SOIL AND GROUNDWATER
121-123 REYNOLDS STREET
ROCHESTER, NY**

FIGURES



Legend:

- Site Location



Project Location: 121-123 Reynolds Street
Rochester, New York
Site Location Map: REVA
Prepared by: AJK on 2017-10-12
Technical Review by: KI on 2017-10-13
Independent Review by: MPS on 2017-10-13

Client/Project: City of Rochester
Corrective Action Plan
Petroleum Impacted Soil and Groundwater

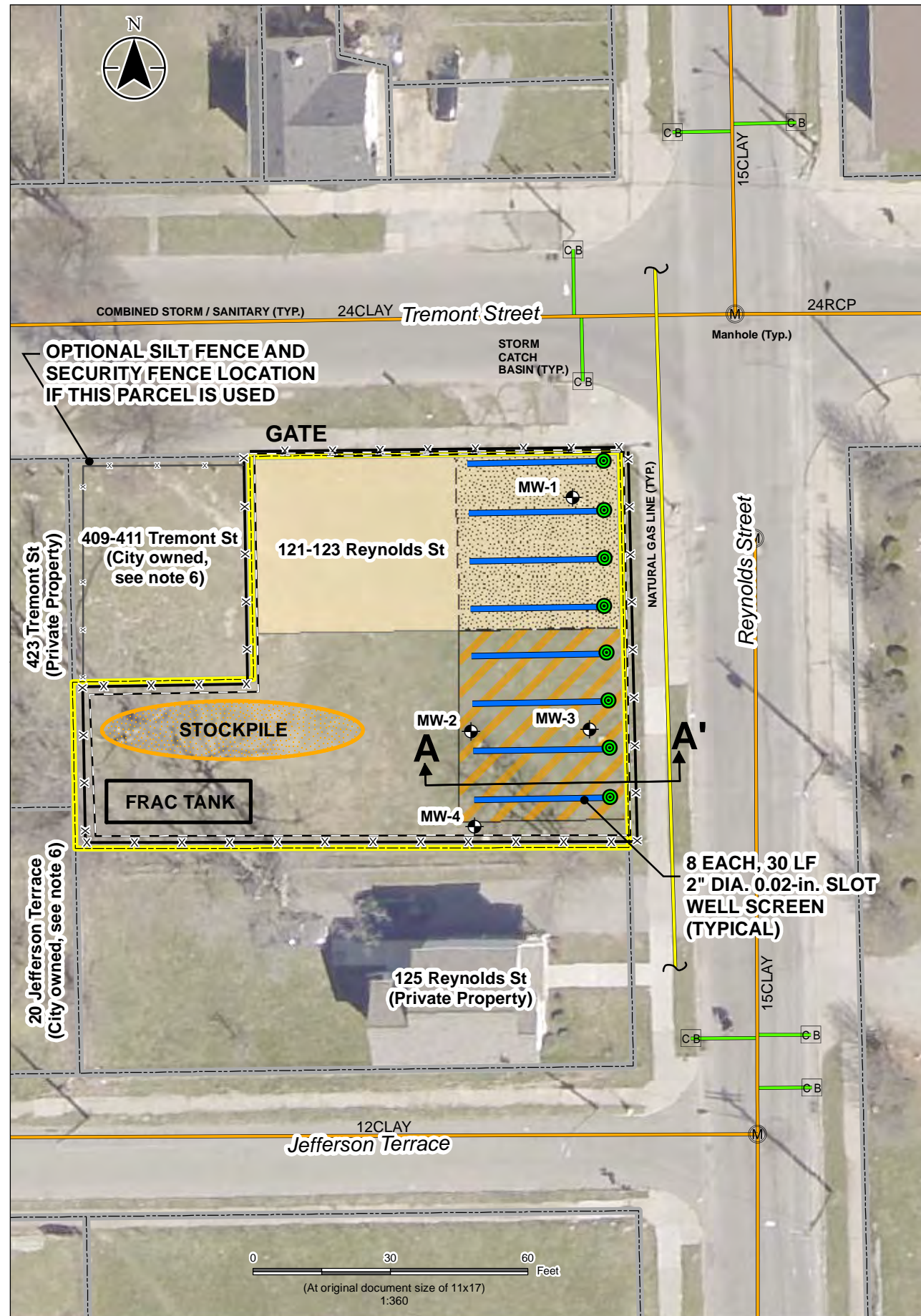
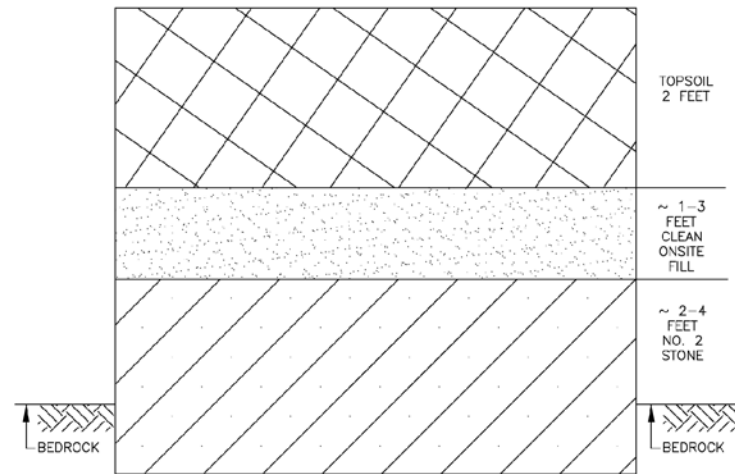
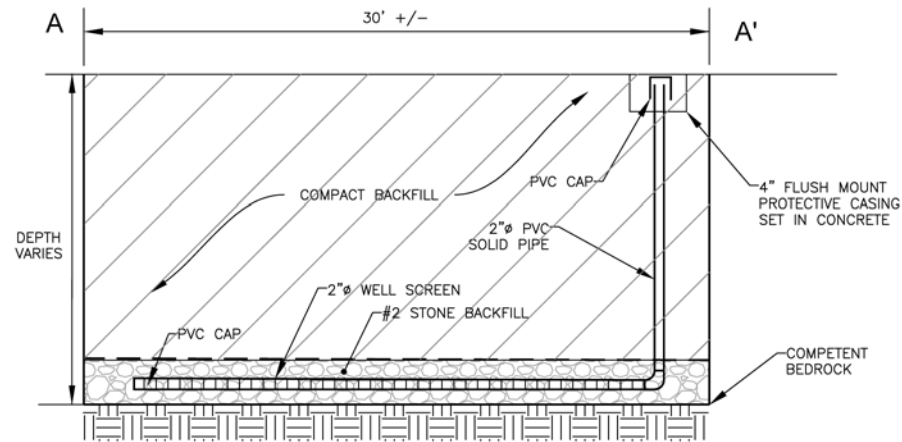
Figure No.
1

Title
Site Location Map

Notes
1. Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2013.
3. Topo Imagery provided by ESRI Online Services and USGS 7.5 Minute Quad of Rochester West, NY, dated 1995.
4. Key Map Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community
Copyright © 2013 National Geographic Society, i-cubed

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.

V:\1996\business_development\Proposal\Active 2019\Environmental\Rochester, City of\121-123 Reynolds Street\Figures\mxd\Figure 1 - Remedial Site Plan & Profile.mxd Revised: 2020-05-01 By: ibest



Legend

- Existing Monitoring Wells
- Proposed Injection Riser Piping / Port
- Proposed Injection Screen
- Security Fence
- Silt Fence
- Security Gate
- Excavation Areas
- Site Property Boundary (Approx.)
- Urban Fill Excavation (0-4' bgs)
- UST Area Excavation
- Plume Area Excavation

A A' Location of Cross-Section Drawing

Notes

- Coordinate System: NAD 1983 StatePlane New York West FIPS 3103 Feet
- Data Sources:
- Background: Sources: Esri, HERE, Garmin, Intermap, increment P Corp., GEBCO, USGS, FAO, NPS, NRCAN, GeoBase, IGN, Kadaster NL, Ordnance Survey, Esri Japan, METI, Esri China (Hong Kong), swisstopo, © OpenStreetMap contributors, and the GIS User Community
- Aerial Imagery Sourced from Eagleview dated 04-23-2018.
- All locations are Approximate.
- 409-411 Tremont St. and 20 Jefferson Terrace may be used by the contractor for equipment storage and/or stockpiling of reusable soils. See CAP text for details.
- Some remedial site feature locations (e.g. frac tanks, soil stockpiles, etc) are subject to modification in the field based on site conditions and constraints.



Project Location
121-123 Reynolds St.
Rochester, NY

Prepared by APL on 2019-03-27
TR by BM on 2019-03-27
IR Review by MPS on 2019-03-27

Client/Project
City of Rochester
121-123 Reynolds St. Remediation

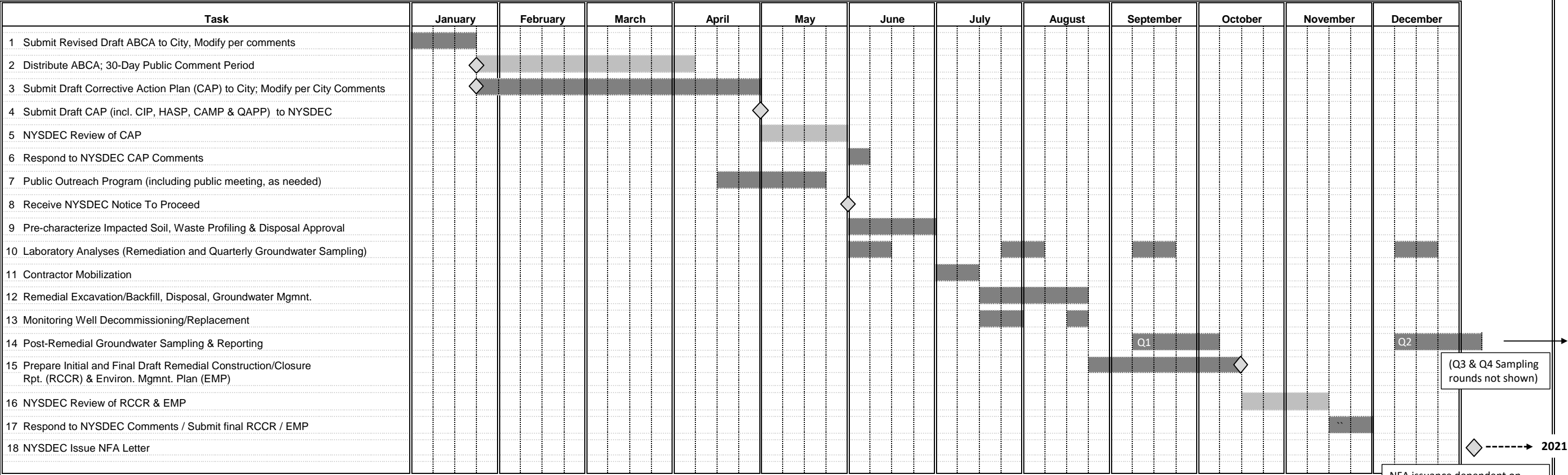
190502014

Figure No.

2

Title

Generalized Remedial Site Plan



Note: Dates and durations estimated only and subject to revision.

◇

Milestone/Submittal

█

City/Stantec task

█

NYSDEC task

NFA issuance dependent on groundwater monitoring results

-----> 2021



Corrective Action Plan
Petroleum Impacted Soil and Groundwater
121-123 Reynolds Street, Rochester, NY

Estimated Project Schedule

Figure 3

**CORRECTIVE ACTION PLAN
PETROLEUM-IMPACTED SOIL AND GROUNDWATER
121-123 REYNOLDS STREET
ROCHESTER, NY**

Appendix A
Community Involvement Plan

COMMUNITY INVOLVEMENT PLAN

for Proposed Environmental Cleanup

121-123 Reynolds Street
Rochester, NY

City of Rochester,
Monroe County, New York

NYSDEC Spill #1103833

April 2020



City of Rochester, NY

Prepared By:

City of Rochester
Department of Environmental Services
Division of Environmental Quality
30 Church Street
Rochester, New York 14614-1278

PREFACE

This Community Involvement Plan has been developed for the proposed environmental remediation of petroleum-impacted soil and groundwater at the City of Rochester (City)-owned property located at 121-123 Reynolds Street (referred to herein as "the Site"). This work will be completed in part with funding from the United States Environmental Protection Agency's (USEPA) Brownfield Cleanup Program. The New York State Department of Environmental Conservation's (NYSDEC) Spills Program will provide technical oversight of the cleanup project.

Brownfields are abandoned, idled, or under-used properties where expansion or redevelopment is complicated by real or perceived environmental contamination. They typically are former industrial or commercial properties where operations may have resulted in environmental contamination. They often pose not only environmental, but legal and financial burdens on communities. Left vacant, contaminated sites can diminish the property value of surrounding sites and potentially threaten the economic viability of adjoining properties.

Under the Brownfield Cleanup Program, the USEPA provides grants to municipalities to reimburse up to 80 percent of eligible costs for site investigation and remediation activities. The City of Rochester was awarded \$200,000 in funding from the United States Environmental Protection Agency's (USEPA) Brownfield Program to complete an Environmental Cleanup project at the Site. The Site consists of one parcel of vacant land covering approximately 0.19 acres. The Site was occupied by a wagon repair from the early 1910s through the mid-1930s, a gasoline station and blacksmith shop from the mid-1930s through the early 1950s, and an auto repair shop from the early 1950s through the late 1980s. The City obtained the property through tax foreclosure in 2010. Future residential redevelopment on the Site will align with the City of Rochester Revitalization Plans.

The City has completed both Phase I and Phase II Environmental Site Assessments at the Site which have identified several Recognized Environmental Conditions (RECs), including the presence of Volatile Organic Compound (VOC) impacts to on-Site soil and groundwater which appear to be associated with four former leaking petroleum underground storage tanks (USTs) on-Site. The environmental cleanup will consist of initiating a targeted soil removal excavation program to remove shallow urban fill-impacted soils and deeper petroleum-impacted soil primarily from the northern and eastern portions of the property. Some groundwater, if encountered during the program, will also be removed and disposed, and an amendment material (an oxygen releasing compound) will also be applied to the excavations before backfilling to facilitate natural biodegradation of residual impacts in groundwater.

Impacted soils that are removed will be transported off-Site to a permitted landfill for disposal. If nuisance odors are present during the excavation, a vapor suppressant will be utilized. A groundwater monitoring well network will be installed and post-cleanup groundwater monitoring will be conducted to evaluate the effectiveness of the cleanup. Institutional Controls will consist of an Environmental Management Plan and flagging the Site in the City's Building Information Permit system. A final report will be prepared and submitted to the NYSDEC summarizing the cleanup project.

SECTION 1: Introduction

The City of Rochester, in cooperation with the USEPA and the NYSDEC, are committed to informing and involving the public during the process to develop the Site Corrective Action Plan (CAP) for the Site. The Site is located at 121-123 Reynolds Street in the City of Rochester, New York (Tax ID No. 120.52-3-18.001). The Site consists of one parcel owned by the City of Rochester with an area of approximately 0.19 acres, located in a residential area on the northeast corner of Reynolds Street and Tremont Street in Mayor's Heights (see attached site location map, Figure 1).

Previous environmental studies revealed that former uses of the Site included the used of petroleum products and apparent placement of urban fill soils at the surface (a common historic practice). Further detail on the historic Site use is described in Section 3 below. This vacant Site is anticipated to be used for a single duplex home after completion of the cleanup project. Future residential redevelopment on the Site will align with the City of Rochester Revitalization Plans.

This Community Involvement Plan (CIP) has been prepared by the City of Rochester's Department of Environmental Services, Division of Environmental Quality specifically for this Site. Definitions of some common terms used during the cleanup process are included in Appendix 1.

The CIP seeks to assure an open process for the interested and possibly affected public. This includes public officials at all levels, citizen interest groups, commercial interests, individuals in the area of the Site, and the media. These parties can be a part of the decision-making process for this Site and need to be informed about on-site activities. It also identifies locations where these parties can obtain additional information about the remedial program for this Site. Specific opportunities for public and community input into the decision-making process are indicated.

The CIP is a working document. It can be enhanced to accommodate major changes in either public attitude, or in the nature and scope of technical activities at the Site. The activities listed below are not intended to be an all-inclusive list, but an outline of possible activities which may be conducted in coordination with the site investigation and remedial process.

This CIP includes the following information:

- A description of the Site history, indicating possible types of contamination, any past studies, and any previous remedial measures that may have occurred at the Site;
- A description of the proposed Corrective Action activities to be conducted at the Site;
- Listing of contacts representing the affected and interested public agencies associated with this project;
- Identification of a local repository for information and reports generated during the course of the investigation activities; and
- Description of planned citizen participation activities.

SECTION 2: Site Location

The Site is located at 121-123 Reynolds Street in the City of Rochester, New York (Tax ID No. 120.52-3-18.001). The Site consists of one parcel owned by the City of Rochester with an area of approximately 0.19 acres. The location of the Site is shown on the attached Site Location Map (Figure 1).

SECTION 3: Site History

The Site has been developed for residential and commercial uses since the 1870's. The Site was formerly used as a wagon repair from the early 1910s through the mid-1930s, a gasoline station and blacksmith shop from the mid-1930s through the early 1950s, and an auto repair shop from the early 1950s through the late 1980s. The City acquired ownership through involuntary take due to tax delinquency in 2010.

The following investigations have previously been completed at the site:

- Subsurface Investigation Data Package, Day Environmental Assessment and Remediation Services (Day), December 2011
- Phase I Environmental Site Assessment (ESA), Day, April 2015
- Phase II ESA, Day, January 2016
- Supplemental Phase II ESA, Day, January 2017

Previous environmental studies performed at the site indicate that several Recognized Environmental Conditions (RECs) existed and currently exist at the Site, including four former leaking petroleum underground storage tanks (USTs) and the presence of contaminants in urban fill soils on the Site. Soil samples were collected and analyzed from nine different test pits. These samples exhibited higher than acceptable concentrations of petroleum-related contaminants. The City had the USTs and a limited amount of the petroleum-impacted soil excavated and removed. Further testing during the Phase II ESA revealed urban fill materials that had elevated concentrations of the heavy metal lead.

SECTION 4: Planned Future Use of the Site

Detailed development plans for the Site have not been prepared yet. The proposed redevelopment of the site will be undertaken by Voters Block Associates, LLC to service the surrounding neighborhood and businesses. After the environmental remediation is complete, the Site will be subject to appropriate environmental engineering controls (e.g., placement of a clean soil cover, installation of a sub-slab depressurization system in future buildings, etc.). An Environmental Management Plan (EMP) will be developed for the Site that is to be implemented when work at the Site has the potential to disturb soil/fill and/or groundwater at areas of potential low-level residual contamination. An Activities and Use Limitation permit restriction will also be entered into the City's Building Information System (BIS) institutional control system which initiates an environmental review of all new permit applications for the Site.

SECTION 5: Recommended Remedial Alternative

The Draft CAP document, dated April, 2020, specifies the scope and details of the proposed environmental cleanup at the Site, and also contains a revised version of the Analysis of Brownfield Cleanup Alternatives (ABCA). The ABCA was completed by Stantec, which evaluated three different remedial alternatives for the cleanup of the Site. Based on the remediation criteria evaluated, the following remedial alternative has been selected for the cleanup of the Site:

- Excavation and off-Site disposal of shallow Lead and Semi-Volatile Organic Compound (SVOC) impacted soils (urban fill) in the northern portion of the Site;
- Excavation and off-Site disposal of Volatile Organic Compound (VOC) impacted soil and bedrock from the area in proximity to the location of former underground storage tanks (USTs);
- Excavation and off-Site disposal of soil and bedrock located within the downgradient petroleum impacted plume, located approximately 7.5 feet below ground surface (bgs). The overlying 7.5 feet of clean fill/soil would be used as backfill material;
- Installation of remediation infrastructure for possible future delivery of a bioremediation amendment within the petroleum source area and the downgradient plume area excavation for potential additional treatment of residual contamination;
- Application of an in-situ, bioremediation amendment to the open excavation of the petroleum source area and downgradient petroleum plume to promote enhanced natural attenuation of residual petroleum related VOC impacted groundwater;
- Conducting one year of post excavation groundwater monitoring for VOCs, with the potential for conducting a second year of monitoring contingent on the first year's results;
- Preparation of a site management plan (SMP) for future site use and re-development;
- Potential installation of a vapor sub-slab depressurization system (SSDS) for the future home; and
- Implementation of Institutional Controls incorporating the Site into the City of Rochester (City) BIS flagging system to ensure residual impacts are properly managed in the future, as necessary.

Hard copies of the ABCA, CAP and related documents will be made available for public review at the official document repository (Phyllis Wheatly Branch Library, 33 Dr Samuel McCree Way, Rochester, NY 14608). Electronic copies of these documents are also available for public review and comment and can be opened or downloaded at <https://www.cityofrochester.gov/121-123reynoldscleanup/>. *Note:* Due to the COVID-19 pandemic many public facilities, including City libraries, are closed to the public. Once public facilities are reopened, hard copies of the draft CAP and ABCA will be placed in the repository. The names of the documents are as follows:

- *Analysis of Brownfields Cleanup Alternatives*, Stantec, February 28, 2020
- *Corrective Action Plan*, Stantec, April 2020 (includes this CIP as an Appendix)
- *Cleanup Action Memorandum*, City of Rochester, pending
- *Community Involvement Plan*, Stantec, April 2020

A 30-day public comment period for the draft CAP and the draft ABCA will begin on March 5, 2020 and end April 5, 2020. If you have questions or comments regarding the draft CAP or the draft ABCA, please contact the City's project manager: Dennis Peck, Environmental Technician, Division of Environmental Quality at (585) 428-6884, or email him at peckd@cityofrochester.gov.

5.1 Project Schedule

After receiving and addressing public comments, the City will finalize the ABCA and the CAP and submit the plans to NYSDEC Region 8 for review and approval. After addressing any NYSDEC comments, the City will obtain CAP approval from the NYSDEC. Once CAP approval has been obtained, the City will coordinate with Stantec and other stakeholders regarding the schedule to initiate the cleanup of the Site, anticipated to begin in summer 2020.

SECTION 6: Citizen Participation Activities

It is the intent of the City of Rochester to provide information to the public in a timely, complete, and accurate manner. To this end, the City of Rochester has compiled a list of individuals to whom the public can address specific requests for information. The contacts are both local and state public officials and are knowledgeable of the proposed project activities. Table 1 provides the contact information for Public Agency representatives for this project.

Table 1: Public Agency Contacts

City of Rochester		
Dennis Peck Environmental Technician/ Project Manager	Division of Environmental Quality City of Rochester City Hall, Room 3008 Rochester NY 14614	585-428-6884
NYS Department of Environmental Conservation		
Michael Zamiarski NYSDEC Project Manager (Technical Assistance)	NYSDEC Region 8 Office 6274 East Avon-Lima Road Avon, NY 14414-9519	585-226-5438

A local repository will be established at the Phyllis Wheatly Branch Library, 33 Dr Samuel McCree Way, Rochester, NY 14608. *Note:* Due to the COVID-19 pandemic many public facilities, including City libraries, are closed to the public. Once public facilities are reopened, hard copies of the draft CAP and ABCA will be placed in the repository. A repository is also located at the NYSDEC Region 8 offices at 6274 East Avon-Lima Road, Avon, New York 14414. Copies of documents relevant to the project are also available on-line, at the City's website at <https://www.cityofrochester.gov/121-123reynoldscleanup/>.

A Newsletter detailing the availability of the ABCA Report, Community Involvement Plan and the draft Corrective Action Plan will be sent out to the local residents and other interested parties. Additional activities such as project status presentations at neighborhood association or public meetings and/or distribution of additional Fact Sheets will be added as appropriate.

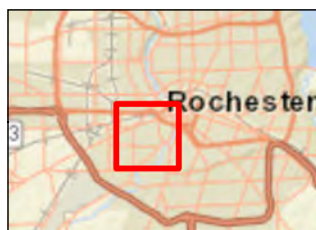
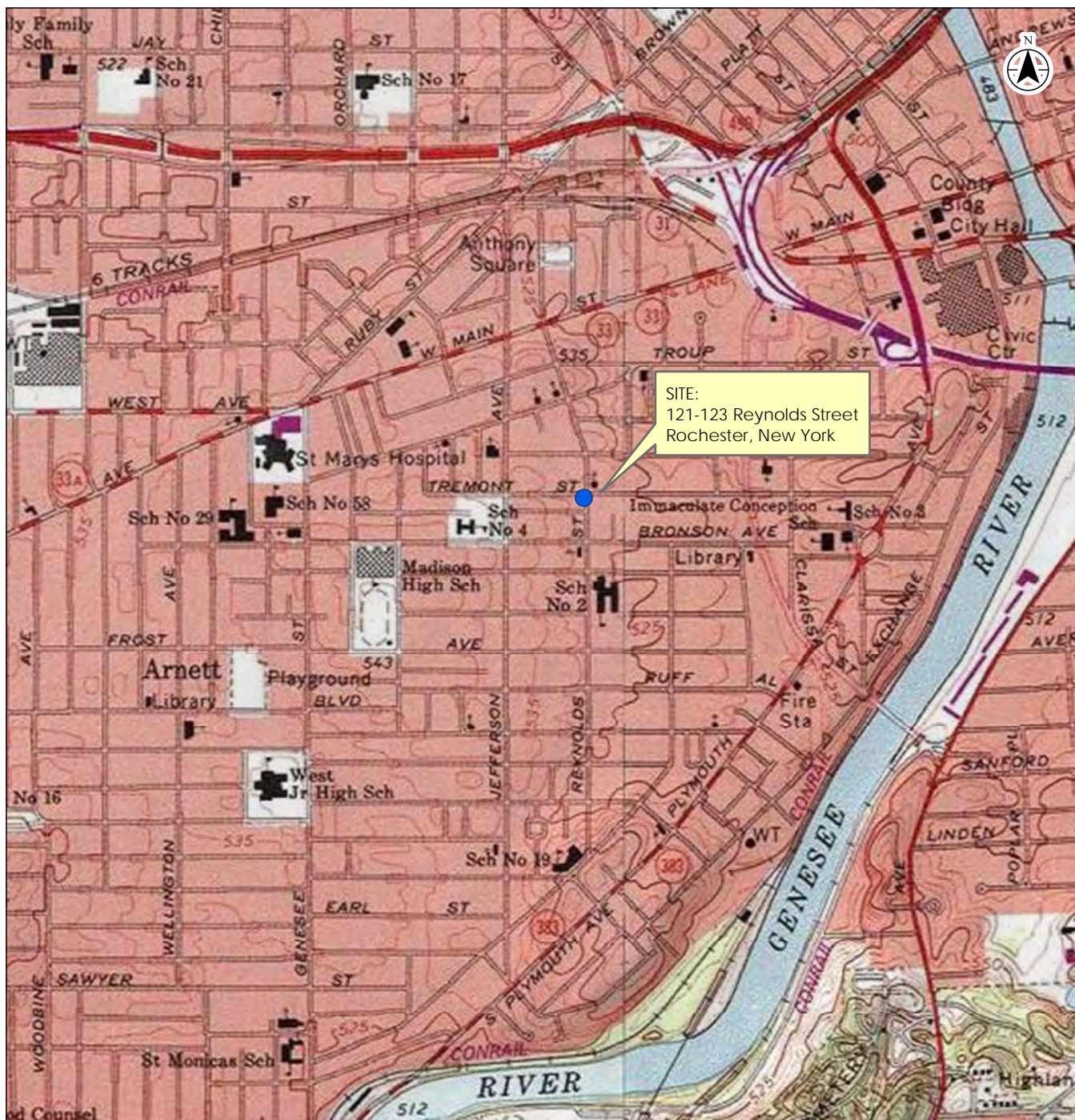
6.1 Mailing List

A mailing list including local and State elected officials and owners of properties located within the immediate vicinity of the site is included as Appendix 2. (Property owners' addresses are not provided to the public but are maintained confidentially by the City of Rochester and NYSDEC Project Managers). The City of Rochester will distribute Fact Sheets providing residents and other stakeholders with timely information on project status, including notifications of upcoming activities on-site (e.g., fieldwork) or off-site (e.g., public availability sessions). Included in all Fact Sheets will be the list of individuals to be contacted by the public for additional information (see Table 1). In addition to property owners, Fact Sheets will be mailed to the elected officials/ representatives, environmental groups, and the media as listed in Tables 2 and 3.

Table 2: Elected Officials/Representatives and Environmental Groups

Elected Officials / Public Agency Representatives		
THE HONORABLE KIRSTEN GILLIBRAND KEATING FEDERAL BLDG 100 STATE ST ROOM 4195 ROCHESTER NY 14614	THE HONORABLE CHARLES SCHUMER KEATING FEDERAL BLDG 100 STATE ST ROOM 3040 ROCHESTER NY 14614	THE HONORABLE JOSEPH MORELLE US HOUSE OF REPRESENTATIVES 3120 FEDERAL BLDG 100 STATE ST ROCHESTER NY 14614
DAVID GANTT NYS ASSEMBLY 107 LIBERTY POLE WAY ROCHESTER NY 14604	JOSEPH E. ROBACH NYS SENATE 2300 WEST RIDGE ROAD ROCHESTER NY 14626	MAYOR LOVELY A. WARREN ROCHESTER CITY HALL 30 CHURCH STREET #205A ROCHESTER NY 14614
ADAM BELLO MONROE COUNTY EXECUTIVE COUNTY OFFICE BLDG RM 110 39 W MAIN ST ROCHESTER NY 14614-1476	WILL JACKSON ROCHESTER FIRE CHIEF ROCHESTER FIRE AND RESCUE DEPT 185 EXCHANGE BLVD SUITE 665 ROCHESTER NY 14614-2277	ROCHESTER POLICE CHIEF LA'RON SINGLETARY CIVIC CENTER PLAZA 185 EXCHANGE BLVD ROCHESTER NY 14614
TODD BAXTER MONROE COUNTY SHERIFF MONROE COUNTY PUBLIC SAFETY BLDG CIVIV CTR PLAZA 130 S PLYMOUTH AVE ROCHESTER NY 14614	LORETTA SCOTT CITY COUNCIL OFFICE CITY HALL 30 CHURCH ST ROOM 301A ROCHESTER NY 14614-1265	HAZEL WASHINGTON CITY CLERK – CITY HALL 30 CHURCH ST ROOM 300A ROCHESTER NY 14614-1265
NORMAN JONES, COMMISSIONER DEPARTMENT OF ENVIRONMENTAL SERVICES CITY HALL ROOM 300B 30 CHURCH STREET ROCHESTER NY 14614	LASHAY HARRIS CITY COUNCIL OFFICE, CITY HALL 30 CHURCH STREET ROOM 301A ROCHESTER NY 14614-1265	DAISY ALGARIN DIRECTOR NEIGHTBORHOOD SERVICE CENTERS CITY HALL 30 CHURCH STREET ROCHESTER NY 14614
ANNE SPAULDING MANAGER, DIVISION OF ENVIRONMENTAL QUALITY CITY HALL ROOM 300B 30 CHURCH STREET ROCHESTER NY 14614	CITIZEN PARTICIPATION SPECIALIST NYSDEC REGION 8 OFFICE 6274 EAST AVON-LIMA RD AVON NY 14414-9519	SOUTHWEST COMMON COUNCIL JOHN BOUTET, CO-CHAIR JOHN LIGHTFOOT, CO-CHAIR 275 DR SAMUEL MCCREE WAY ROCHESTER NY 14611
JAMES DEMPS III, ADMINISTRATOR SOUTHWEST QUADRANT NSC 923 GENESEE STREET ROCHESTER NY 14611		

FIGURE 1
Site Location Map



Legend:

- Site Location



Project Location
121-123 Reynolds Street
Rochester, New York

Client/Project
City of Rochester
Petroleum Impacted Soil and Groundwater Remediation
Community Involvement Plan

Figure No.
1

Title
Site Location Map

Notes

1. Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2013.
3. Topo Imagery provided by ESRI Online Services and USGS 7.5 Minute Quad of Rochester West, NY, dated 1995.
4. Key Map Service Layer Credits: Sources Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community

Copyright © 2013 National Geographic Society, I-cubed
Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.

APPENDIX 1

Glossary and Acronyms

This glossary defines terms associated with New York's citizen participation program, and important elements of the Brownfield program. Words in **bold** in the definitions are defined elsewhere in the glossary.

+ + +

Administrative Record Part of a site's **Record of Decision** which lists and defines documents used in the development of NYSDEC's decision about selection of a remedial action.

Availability Session A scheduled gathering of program staff and members of the public in a casual setting, without a formal presentation or agenda but usually focusing on a specific aspect of a site's remedial process.

Citizen Participation A program of planning and activities to encourage communication among people affected by or interested in Brownfield sites and the government agencies responsible for investigating and remediating them.

Community Involvement Plan (CIP) A document that provides project information and describes the citizen participation activities that will be conducted during a site's remedial process. This is also sometimes referred to as a Citizen Participation Plan.

Citizen Participation Specialist A staff member from an NYSDEC central office or regional office who has specialized training and experience to assist a **project manager** and other staff to plan, conduct and evaluate a site-specific citizen participation program.

Comment Period A time period for the public to review and comment about various documents and DER actions. For example, a 45-day comment period is provided when DER issues a **Proposed Remedial Action Plan (PRAP)**.

Contact List Names, addresses and/or telephone numbers of individuals, groups, organizations, government officials and media affected by or interested in a particular Brownfield site. The size of a contact list and the categories included are influenced by population density, degree of interest in a site, the stage of the remedial process and other factors. It is an important tool needed to conduct outreach activities.

Division of Environmental Remediation A major program unit within the New York State Department of Environmental Conservation created to manage the hazardous waste site remedial program, the Brownfield program, and the Voluntary Cleanup program. Staff include: engineers,

geologists, chemists, attorneys, citizen participation specialists, environmental program specialists and support staff.

Document Repository A file of documents pertaining to a site's remedial and citizen participation programs which is made available for public review. The file generally is maintained in a public building near the Brownfield site to provide access at times and a location convenient to the public.

Fact Sheet A written discussion about part or all of a site's remedial process, prepared and provided by DER to the public. A fact sheet may focus on: a particular element of the site's remedial program; opportunities for public involvement; availability of a report or other information, or announcement of a **public meeting** or **comment period**. A fact sheet may be mailed to all or part of a site's **contact list**, distributed at meetings, placed in a **document repository** and/or sent on an "as requested" basis.

Interim Remedial Measure (IRM) A discrete action which can be conducted at a site relatively quickly to reduce the risk to people's health and the environment from a well-defined contamination problem. An IRM can involve removing contaminated soil and drums, providing alternative water supplies or securing a site to prevent access.

New York State Department of Health Agency within the executive branch of New York State government which: performs health-related inspections at suspected contaminated sites; conducts health assessments to determine potential risk from environmental exposure; reviews Exposure Assessments prepared during the **Site Investigation/Remedial Alternatives Report**; conducts health-related community outreach around sites; and reviews remedial actions to assure that public health concerns are adequately addressed.

Operable Unit A discrete part of an entire site that produces a release, threat of release, or pathway of exposure. An Operable Unit can receive specific investigation, and a particular remedy may be proposed. A **Record of Decision** is prepared for each Operable Unit.

Operation and Maintenance A period in which remedial action may be conducted following construction at a site (for example, operation of a "pump and treat" system), or which is performed after a remedial action to assure its continued effectiveness and protection of people's health and the environment. Activities can include site inspections, well monitoring and other sampling.

Project Manager A NYSDEC staff member within the **Division of Environmental Remediation** (usually an engineer, geologist or hydro geologist) responsible for the day-to-day administration of remedial activities at, and ultimate disposition of, an Environmental Restoration site. The Project Manager works with legal, health, **citizen participation** and other staff to accomplish site-related goals and objectives.

Proposed Remedial Action Plan (PRAP) An analysis by DER of each alternative considered for the remediation of an Environmental Restoration site and a rationale for selection of the alternative it recommends. The PRAP is created based on information

developed during the **Site Investigation/Remedial Alternatives Report**. The PRAP is reviewed by the public and other state agencies.

Public Meeting A scheduled gathering of **Division of Environmental Remediation** staff with the affected/interested public to give and receive information, ask questions and discuss concerns about a site's remedial program. Staff from other NYSDEC divisions, legal and health staff, and staff from consultants and a responsible party often also attend. A public meeting, unlike an **availability session**, generally features a formal presentation and a detailed agenda.

Record of Decision (ROD) A document which provides definitive record of the cleanup alternative that will be used to remediate an Environmental Restoration site. The ROD is based on information and analyses developed during the **Site Investigation/Remedial Alternatives Report** and public comment.

Remedial Construction The physical development, assembly and implementation of the remedial alternative selected to remediate a site. Construction follows the **Remedial Design** stage of a site's remedial program.

Remedial Design The process following finalization of a **Record of Decision** in which plans and specifications are developed for the **Remedial Construction** of the alternative selected to remediate a site.

Site Investigation/Remedial Alternatives Report (SI/RAR) The SI fully defines and characterizes the type and extent of contamination at the site. The RAR, which may be conducted during or after the SI, uses information developed during the SI to develop alternative remedial actions to eliminate or reduce the threat of contamination to public health and the environment.

Responsiveness Summary A written summary of major oral and written comments received by DER during a **comment period** about key elements of a site's remedial program, such as a **Proposed Remedial Action Plan**, and DER's response to those comments.

APPENDIX 2

PROJECT MAILING LIST

**ADJACENT AND NEARBY PROPERTY OWNERS ARE INCLUDED IN
MAILINGS BUT HAVE BEEN EXCLUDED FROM THE LISTING IN THIS
DOCUMENT AS CONFIDENTIAL INFORMATION**

Table 3: Nearby Property Owners/ Operators/ Residents/Tenants

***Note: Confidential Information -
Not to be included in public versions of this CIP***

Nearby Property Owners		
125 REYNOLDS ST <u>ROCHESTER, NY 14608</u> VOTERS BLOCK HOUSING DEVELOPMENT FUND CORP c/o HOME LEASING LLC 700 CLINTON SQUARE ROCHESTER NY 14608	OCCUPANT 125 REYNOLDS ST ROCHESTER NY 14608	135 AND 144 REYNOLDS ST <u>ROCHESTER, NY 14608</u> c/o LIBERTY TEMPLE CHURCH OF GOD 144 REYNOLDS STREET ROCHESTER NY 14608
ROCHESTER FAMILY MISSION 378-388 TREMONT ST ROCHESTER NY 14608	406 TREMONT ST <u>ROCHESTER NY 14608</u> c/o JAMES MCCLARY 105 EDINBURGH ST ROCHESTER NY 14608	OCCUPANT 406 TREMONT ST ROCHESTER NY 14608
420-422 TREMONT ST <u>ROCHESTER, NY 14608</u> c/o BERNADETTE PRESTON 21 JEFFERSON TERRACE ROCHESTER NY 14608	OCCUPANT 420 TREMONT ST ROCHESTER NY 14608	OCCUPANT 422 TREMONT ST ROCHESTER NY 14608
423-425 TREMONT ST <u>ROCHESTER NY</u> c/o HOUSING OPPORTUNITIES HSG 6 PRINCE ST ROCHESTER NY 14607	OCCUPANT 423 TREMONT ST ROCHESTER NY 14608	OCCUPANT 425 TREMONT ST ROCHESTER NY 14608
17 JEFFERSON TERRACE <u>ROCHESTER NY 14608</u> c/o WILLIE AND HILDA MOORE 340 CHESTNUT RIDGE RD ROCHESTER NY 14624	25 JEFFERSON TERRACE <u>ROCHESTER NY 14608</u> c/o CAROL GIBSON 18 DOVER CT ROCHESTER NY 14624	OCCUPANT 25 JEFFERSON TERRACE ROCHESTER, NY 14608
BERNADETTE PRESTON 21 JEFFERSON TERRACE ROCHESTER NY 14608		

**CORRECTIVE ACTION PLAN
PETROLEUM-IMPACTED SOIL AND GROUNDWATER
121-123 REYNOLDS STREET
ROCHESTER, NY**

Appendix B
Health and Safety Plan

Appendix B

**Health and Safety Plan
Petroleum-Impacted Soil Remediation
121-123 Reynolds Street
Rochester, NY
NYSDEC Spill No. 1103833**

Prepared by:

Stantec Consulting Services Inc.
61 Commercial Street Suite 100
Rochester, New York 14614-1009



April 2020



Emergency Contact List

Ambulance: 911
Hospital: Strong Memorial Hospital, Rochester, NY:
585-275-2100
Fire Department: 911
Police: 911
Poison Control Center: 585-222-1222
RG&E Utility Emergency: 911 or (800) 743-1702

Project Contacts:

Project Title	Name	Telephone Number	General Responsibilities
COR Project Manager	Dennis Peck	Office: 585-428-6884 Cell: 585-469-6372	Oversight of all project work
Stantec Principal-in-Charge	Mike Storonsky	Office: 585-413-5266 Cell: 585-298-2386	Direction of all Stantec project activities
Stantec Project Manager	Bob Mahoney	Office: 585-413-5301 Cell: 585-645-2567	Planning and oversight of all field activities; subcontractor coordination
TREC Project Manager	Keith Hambley	Office: 585-594-5545 Cell: 585-314-6189	Subcontracted Services

TABLE OF CONTENTS

1.0	INTRODUCTION.....	1
1.1	BACKGROUND	1
1.2	SITE-SPECIFIC CHEMICALS OF CONCERN	2
2.0	STANTEC PERSONNEL ORGANIZATION.....	5
2.1	PROJECT MANAGER	5
2.2	SITE SAFETY OFFICER	5
2.3	HEALTH AND SAFETY COORDINATOR	5
2.4	DAILY MEETINGS	5
3.0	MEDICAL SURVEILLANCE REQUIREMENTS.....	6
3.1	INTRODUCTION.....	6
3.2	MEDICAL EXAMINATIONS.....	6
4.0	ONSITE HAZARDS	6
4.1	CHEMICAL HAZARDS	6
4.2	PHYSICAL HAZARDS	8
4.2.1	Test Borings	9
4.2.2	Remedial Excavation.....	9
4.2.3	Noise.....	9
4.2.4	Heat and Cold Stress Exposure	10
4.2.5	Roadway Hazards	11
4.2.6	Electrical Work.....	11
4.2.7	Lock-Out/Tag-Out.....	12
4.2.8	Ladders.....	13
4.2.9	Hand and Power Tools	14
4.2.10	Manual Lifting	15
4.2.11	Weather-Related Hazards	16
5.0	SITE WORK ZONES	17
5.1	CONTROL ZONES	17
5.2	EXCLUSION ZONE	17
5.3	DECONTAMINATION ZONE.....	17
6.0	SITE MONITORING AND ACTION LEVELS.....	18
6.1	SITE MONITORING.....	18
6.2	ACTION LEVELS	18
7.0	PERSONAL PROTECTIVE EQUIPMENT.....	19
7.1	PROTECTIVE CLOTHING/RESPIRATORY PROTECTION.....	19

8.0	DECONTAMINATION.....	20
8.1	PERSONAL DECONTAMINATION	20
8.2	EQUIPMENT DECONTAMINATION	20
9.0	EMERGENCY PROCEDURES	21
9.1	LIST OF EMERGENCY CONTACTS	21
9.2	DIRECTIONS TO HOSPITAL	21
9.3	ACCIDENT INVESTIGATION AND REPORTING.....	21

LIST OF FIGURES

Figure 1	Site Location Map
Figure 2	Directions and Map from the Site to Hospital

LIST OF TABLES

Table 1	Health and Safety Data for Contaminants of Concern
Table 2	Exposure Pathways and First Aid Response for Contaminants of Concern
Table 3	Exposure Symptoms and First Aid for Heat Exposure
Table 4	Accident Report

LIST OF APPENDICES

Appendix A	Safety Data Sheets
Appendix B	Onsite Safety Forms
Appendix C	Job Safety Analysis Sheets

1.0 INTRODUCTION

This Health and Safety Plan (HASP) describes personal safety protection standards and procedures to be followed by Stantec staff during Corrective Action activities at 121-123 Reynolds Street, Rochester, New York (Figure 1). The field activities are described in detail in the Corrective Action Plan (CAP) to which this HASP is appended.

This HASP establishes mandatory safety procedures and personal protection standards pursuant to the Occupational Safety and Health Administration (OSHA) regulations 29 Code of Federal Regulations (CFR) 1910.120. The HASP applies to all Stantec personnel conducting any Site work, as defined in 29 CFR 1910.120(a). All personnel involved in the mentioned activities must familiarize themselves with this HASP, comply with its requirements and have completed the required health and safety training and medical surveillance program participation pursuant to 29 CFR 1910.120 prior to beginning any work onsite.

THIS HASP IS FOR THE EXPRESS USE OF STANTEC EMPLOYEES. ALL OTHER CONTRACTORS TO BE WORKING IN THE EXCLUSION AREAS ARE REQUIRED BY LAW TO DEVELOP THEIR OWN HASP, AS WELL AS TO MEET ALL PERTINENT ASPECTS OF OSHA REGULATIONS. STANTEC RESERVES THE RIGHT TO STOP ANY SITE WORK WHICH IS DEEMED TO POSE A HEALTH AND SAFETY THREAT TO ITS STAFF.

1.1 BACKGROUND

The Corrective Action Plan (CAP) is being submitted to the NYSDEC on behalf of the City of Rochester for activities at the 121-123 Reynolds Street property located in the City of Rochester, Monroe County, New York (the "Site"). The objectives of the proposed project include the following:

- Implement corrective actions to address petroleum-impacted soil and groundwater in two primary remedial areas of concern, RAOC 1, RAOC 2 and RAOC 3;
- Excavate source-area soils and other media that are impacted with petroleum-related contaminants in excess of applicable SCOs and/or soils which exhibit nuisance characteristics, and transport and dispose these materials offsite;
- Remove (if encountered), treat, and discharge to the combined sewer impacted groundwater from the excavations;
- Perform *in-situ* bioremediation of groundwater by adding Oxygen Releasing Compound (ORC-A™) to the excavation prior to backfilling to further reduce contaminant concentrations to acceptable levels; and
- Obtain NYSDEC spill file closure and a "No Further Action" letter.

Other related objectives and tasks include:

- Removal of shallow, accessible, subsurface utilities and sub-slab structures associated with Site drainage and sewer systems;

Health and Safety Plan
Petroleum-Impacted Soil & Groundwater Remediation
121-123 Reynolds Street
Rochester, NY

- Removal of some existing monitoring wells as needed for excavation work, and installation of new monitoring wells as needed for followup monitoring;
- Followup groundwater monitoring (minimum of four quarters, with additional as needed based on the first year results);
- Development of a Remedial Construction/Closure Report and an Environmental Management Plan; and
- Input of project data into USEPA's Assessment, Cleanup and Redevelopment Exchange System (ACRES) database.

The Site, which is owned by the City (Monroe County Tax ID No. 12.52-3-18.001) is located in a low-density residential area. The Site is generally level, and the parcel is approximately 0.19 acres in size.

Previous investigations by Day Environmental have identified petroleum impacts in soil at the Site. No chlorinated VOCs were identified at the Site. As more analytical data is generated during and/or following the remedial activities, this HASP should be updated to reflect any new information regarding Site contaminants of concern (COCs).

1.2 SITE-SPECIFIC CHEMICALS OF CONCERN

The primary contaminants of concern (COCs) include petroleum constituents typical of diesel fuel, kerosene, lubricating oil, and/or mineral spirits or Stoddard solvent (a known dry-cleaning agent). Other potential COCs include PCBs from potential waste oil and heavy metals from possible urban fill soils that may have been placed on the Site.

The air monitoring action levels will be based on one-half of the current Threshold Limit Value (TLV) or Permissible Exposure Limit (PEL) for benzene with a margin of safety built into the action levels to account for the non-specificity of the field monitoring instruments. Exposure limits for less hazardous compounds will be satisfied by meeting the more stringent exposure limits for benzene. Table 1 summarizes health and safety data for the volatile compounds of primary concern.

Health and Safety Plan
 Petroleum-Impacted Soil & Groundwater Remediation
 121-123 Reynolds Street
 Rochester, NY

Table 1
Health and Safety Data for Contaminants of Concern

Compound	PEL/ TWA	Physical Description	Odor Threshold in Air	Route of Exposure	Symptoms	Target Organs
Benzene	10 ppm	Colorless to light yellow liquid with a characteristic sweet aromatic odor	8.65 ppm	Inhalation, skin absorption, ingestion, skin/eye contact	Irritation to eyes, skin, nose, respiratory system; dizziness; headache, nausea, staggered gait; anorexia, lassitude (weakness, exhaustion); dermatitis; bone marrow depression; [potential occupational carcinogen]	Eyes, skin, respiratory system, blood, central nervous system, bone marrow
Butylbenzene, n-	NA	Colorless liquid	NA	Skin/eye contact, inhalation, ingestion	Irritation to skin and/or eyes, respiratory tract, digestive tract; nausea, vomiting, diarrhea; dizziness; suffocation	Liver, nervous system
Ethylbenzene	100 ppm	Colorless liquid with an aromatic odor.	2.3 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation to eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma	Eyes, skin, respiratory system, central nervous system
Isopropylbenzene	50 ppm	Clear, colorless liquid, sharp penetrating aromatic odor	NA	Inhalation, ingestion, skin and/or eye contact	Irritation to eyes, skin, mucous membrane; dermatitis; headache, narcosis, coma	Eyes, skin, respiratory system, central nervous system
Naphthalene	10 ppm	White crystalline or colorless to brown solid with a distinct aromatic odor	0.003 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	irritation eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage	Eyes, skin, blood, liver, kidneys, central nervous system
Propylbenzene, n-	NA	Colorless or light yellow liquid	NA	Inhalation, ingestion, skin/eye contact	Irritate or burn skin and eyes; respiratory tract irritation, suffocation, aspiration hazard if swallowed	Lungs, eyes, kidney

Health and Safety Plan
 Petroleum-Impacted Soil & Groundwater Remediation
 121-123 Reynolds Street
 Rochester, NY

Compound	PEL/ TWA	Physical Description	Odor Threshold in Air	Route of Exposure	Symptoms	Target Organs
Toluene	100 ppm	Colorless liquid with a sweet, pungent, benzene-like odor	0.16 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation to eyes, nose; lassitude (weakness, exhaustion), confusion, euphoria, dizziness, headache; dilated pupils, lacrimation (discharge of tears); anxiety, muscle fatigue, insomnia; paresthesia; dermatitis; liver, kidney damage	Eyes, skin, respiratory system, central nervous system, liver, kidneys
Trimethylbenzene, 1,2,4- (1,2,4-TMB)	25 ppm	Clear, colorless liquid with a distinctive, aromatic odor	2.4 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation to eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)	Eyes, skin, respiratory system, central nervous system, blood
Trimethylbenzene, 1,3,5- (1,3,5-TMB)	25 ppm	Clear, colorless liquid with a distinctive, aromatic odor	2.4 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation to eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)	Eyes, skin, respiratory system, central nervous system, blood
Xylenes	100 ppm	Colorless liquid with a sweet aromatic odor	0.851 ppm, 0.324 ppm, 0.49 ppm	Inhalation, skin absorption, ingestion, skin/eye contact	Irritation to eyes, skin, nose, throat; dizziness, excitement, drowsiness, incoordination, staggering gait; corneal vacuolization; anorexia, nausea, vomiting, abdominal pain; dermatitis	Eyes, skin, respiratory system, central nervous system, gastrointestinal tract, blood, liver, kidneys

Notes:

- NA - not available
- PEL - permissible exposure limits
- TWA - time weighted average, 8-hour workday
- mg/m³ - milligrams per cubic meter
- ppm - parts per million

Health and Safety Plan
Petroleum-Impacted Soil & Groundwater Remediation
121-123 Reynolds Street
Rochester, NY

2.0 STANTEC PERSONNEL ORGANIZATION

The following Stantec personnel will be involved in health and safety operations at the 121-123 Reynolds Street site.

2.1 PROJECT MANAGER

The Project Manager is responsible for ensuring that all Stantec procedures and methods are carried out, and that all Stantec personnel abide by the provisions of this Health and Safety Plan.

2.2 SITE SAFETY OFFICER

The Site Safety Officer (SSO) will report directly to the Project Manager and will be responsible for the implementation of this HASP as well as daily calibration of Stantec's safety monitoring instruments. The SSO will keep a log book of all calibration data and instrument readings for the Site.

2.3 HEALTH AND SAFETY COORDINATOR

The Health and Safety Coordinator will be responsible for overall coordination of health and safety issues on the project.

2.4 DAILY MEETINGS

All Stantec personnel and contractors working within the exclusion zone will be required to read this document and sign off on the daily safety meeting form presented in HASP Appendix B.

3.0 MEDICAL SURVEILLANCE REQUIREMENTS

3.1 INTRODUCTION

Hazardous waste site workers may be subjected to elevated levels of physical and chemical stress. Their daily tasks may expose them to toxic chemicals, physical hazards, biologic hazards, or radiation. They may develop heat stress while wearing protective equipment or working under temperature extremes, or face life-threatening emergencies such as explosions and fires. Therefore, a medical program is essential to: assess and monitor worker's health and fitness both prior to employment and during the course of the work; provide emergency and other treatment as needed; and keep accurate records for future reference. In addition, OSHA requires a medical evaluation for employees that may be required to work on hazardous waste sites and/or wear a respirator (29 CFR Part 1910.120 and 1910.134), and certain OSHA standards include specific medical surveillance requirements (e.g., 29 CFR Part 1926.62, Part 1910.95 and Parts 1910.1001 through 1910.1045).

3.2 MEDICAL EXAMINATIONS

All Stantec personnel working in areas of the Site where Site-related contaminants may be present shall have been examined by a licensed physician as prescribed in 29 CFR Part 1910.120, and determined to be medically fit to perform their duties for work conditions which require respirators. Employees will be provided with medical examinations as outlined below:

- Pre-job physical examination
- Annually thereafter if contract duration exceeds 1 year;
- Termination of employment;
- Upon reassignment in accordance with CFR 29 Part 1910.120(e)(3)(i)(C);
- If the employee develops signs or symptoms of illness related to workplace exposures;
- If the physician determines examinations need to be conducted more often than once a year; and
- When an employee develops a lost time injury or illness during the contract period.

Examinations will be performed by, or under the supervision of a licensed physician, preferably one knowledgeable in occupational medicine, and will be provided without cost to the employee, without loss of pay and at a reasonable time and place. Medical surveillance protocols and examination and test results shall be reviewed by the Occupational Physician.

4.0 ONSITE HAZARDS

4.1 CHEMICAL HAZARDS

The primary potential chemical hazards onsite are expected to be exposure to the VOCs detailed in Table 1. Safety data sheets for the anticipated chemicals are presented in Appendix A.

Health and Safety Plan
Petroleum-Impacted Soil & Groundwater Remediation
121-123 Reynolds Street
Rochester, NY

The COCs are volatile; therefore, any activity at the Site which causes physical disturbance of the soil can potentially allow the release of contaminants into the air. For volatiles, this can include release of organic vapors into the air. Such an occurrence may be recognized by noticeable chemical odors. Field personnel should be aware of the odor threshold for these chemicals and their relation to the action levels and Permissible Exposure Limits.

Symptoms of overexposure to primary COCs are detailed in Table 1. To prevent exposure to these chemicals, dermal contact will be minimized by using disposable surgical gloves (such as nitrile gloves) with work gloves (as appropriate) when handling soil, groundwater equipment or samples. Breathing zone levels of total VOCs will be monitored in real time using a portable photoionization detector (PID). If ambient levels exceed action levels, all Site activities will be performed using Level C PPE until ambient concentrations dissipate. Where levels exceed 50 ppm, work will cease and the project manager will be notified immediately.

In addition, depending on seasonal conditions, disturbance of the Site soils may cause the particulate contaminants to become airborne as dust. Therefore, if visible particulate dust is noted, dust-suppression methods will be used where appropriate. Particulate monitoring will be performed using Dust Track instruments in accordance with the Community Air Monitoring Plan (CAMP). A copy of the CAMP is included in the CAP.

Finally, aeration of the groundwater may cause volatilization of chemicals into the air, particularly VOCs. Table 2 below summarizes first aid instructions for exposure pathways for the COCs.

Table 2
Exposure Pathways and First Aid Response for Contaminants of Concern

Substance	Exposure Pathways	First-Aid Instructions
VOCs listed in Table 1	Eye	Irrigate immediately
	Dermal	Soap wash promptly; or Soap wash immediately (benzene, xylenes); or Soap wash (ethylbenzene, 1,3,5-TMB, 1,2,4-TMB, n-propylbenzene, naphthalene); or Water wash immediately (n-butylbenzene, isopropylbenzene, toluene) For thermal burns (naphthalene), cool affected areas by drenching or immersing in water
	Inhalation	Respiratory support; or Fresh air (n-butylbenzene, n-propylbenzene, isopropylbenzene, toluene, xylenes) Note – do not use mouth-to-mouth if victim inhaled toluene
	Ingestion	Medical attention immediately If victim is conscious and alert, give two to four cups milk/water (ethylbenzene) Rinse mouth (toluene) Note – never give anything by mouth to an unconscious person

4.2 PHYSICAL HAZARDS

Hazards typically encountered at sites with drilling and excavation activities will be a concern at this site. These hazards include slippery ground surfaces, soil stockpiles, uneven ground and holes, and operation of heavy machinery and equipment. Field team members will wear the basic safety apparel such as steel-toed shoes, hard hat and safety glasses during all appropriate activities.

During active drilling activities, Stantec personnel will not approach the borehole. Field personnel working around the rig will be shown the location and operation of kill switches, which are to be tested daily.

Multi-purpose fire extinguishers, functional and within annual inspection period, will be staged and readily accessible for use.

The use of electrical equipment in any established exclusion zones will be limited to areas verified as containing non-explosive atmospheres (<10% LEL) prior to operation, unless the equipment has been previously demonstrated or designed to be FM or UL rated as intrinsically safe. Care will be taken to avoid an ignition source while working in the presence of vapors.

The driller shall make all necessary contacts with utilities and/or underground utility locator hotlines prior to drilling and shall meet OSHA requirements for distances between the drilling rig and overhead utilities. No drilling work will be carried out where the drill rig chassis has not been stabilized and the rig is not to be moved between locations with its boom in a vertical position.

4.2.1 Test Borings

The drilling of test borings presents hazards related to exposure to chemicals and working around heavy equipment. As with any soil disturbance, monitoring for VOCs with a photoionization detector will be performed continuously during drilling activities. Work will be stopped, and the area vacated if sustained PID readings are observed at concentrations in excess of the Action Levels specified in Section 6.

4.2.2 Remedial Excavation

The remedial excavation presents hazards related to open excavations, working around heavy equipment and exposure to chemicals.

The potential exists for falling into the excavation due to a slip or trip and also due to potential caving of the excavation sidewalls. During the excavation, field personnel will generally perform observation from the end of the excavation opposite the excavation equipment and will avoid standing along the long sidewalls of the excavation. If it is necessary to make observations from a point along the sidewall of the excavation adjacent to the excavation equipment, they will maintain adequate distance between themselves and the excavation walls and be mindful of signs that caving may be likely. These could include raveling of sidewall material into the excavation, or the development of cracks in the ground surface.

If it becomes necessary to leave an excavation open overnight, construction fencing will be placed around the entire perimeter of the site.

In the event of excessive petroleum vapor emanating from the excavation, vapor suppression methods will be employed, including the use of a liquid spray surfactant such as Biosolve™ or equivalent.

As with any soil disturbance, monitoring for VOCs with a photoionization detector will be performed continuously during test pit excavation and logging activities. Work will be stopped and the area vacated if sustained PID readings are observed at concentrations in excess of the Action Levels specified in Section 6.

4.2.3 Noise

The use of heavy machinery/equipment and operation may result in noise exposures, which require hearing protection. Exposure to noise can result in temporary hearing losses, interference with speech communication, interference with complicated tasks or permanent hearing loss due to repeated exposure to noise.

During the investigative activities, Stantec field team members will use hearing protection when sound levels are in excess of 90 dB TWA.

4.2.4 Heat and Cold Stress Exposure

Heat is a potential threat to the health and safety of Site personnel. The Site Safety Officer under the direction of the Project Manager will determine the schedule of work and rest. These schedules will be employed as necessary so that personnel do not suffer adverse effects from heat. Table 3 summarizes exposure symptoms and first aid instructions for heat stress. Non-caffeinated, thirst replenishment liquids will be available onsite.

Cold stress is also a potential threat to the health and safety of Site personnel. Symptoms of cold stress include the following: shivering, blanching of the extremities, numbness or burning sensations, blue, purple or gray discoloration of hands and feet, frostbite, hypothermia, and loss of consciousness. Cold stress can be prevented by acclimatizing one's self to the cold, increasing fluid intake, avoiding caffeine and alcohol, maintaining proper salt and electrolyte intake, eating a well-balanced diet, wearing proper clothing, building heated enclosures to work in, and taking regular breaks to warm up. If any of the above symptoms are encountered the person should be removed from the cold area. Depending on the severity of the cold stress, 911 should be contacted and first aid administered. No fluids should be given to an unconscious person.

Table 3
Exposure Symptoms and First Aid for Heat Exposure

Hazard	Exposure Symptoms	First-Aid Instructions
Heat Stress	Fatigue, sweating, irritability	Rest; take fluids
	Dizziness, disorientation, perspiration ceases, loss of consciousness	Remove from hot area, activate 911, administer first aid, no fluids to be administered to unconscious victim.

4.2.5 Roadway Hazards

Field activities may take place near active roadways. Where such work zones are established, personnel shall assure that protective measures including signage, cones, and shielding through use of vehicles parked at workmen perimeter, are in place. All contractors shall be responsible for meeting signage requirements of DOT. Fluorescent safety vests shall be worn by all personnel during activities in or adjacent to roadways and driveways.

4.2.6 Electrical Work

Site work involving electrical installation or energized equipment must be performed by a qualified electrician. All electrical work will be performed in accordance with the OSHA electrical safety requirements found in 29 CFR 1926.400 through 1926.449. Workers are not permitted to work near electrical power circuits unless the worker is protected against electric shock by de-energizing and grounding the circuit or by guarding or barricading the circuit and providing proper personal protective equipment. All electrical installations must comply with NEC regulations. All electrical wiring and equipment used must be listed by a nationally recognized testing laboratory.

All electrical circuits and equipment must be grounded in accordance with the NEC regulations. The path to ground from circuits, equipment, and enclosures will be permanent and continuous. Ground fault circuit interrupters (GFCIs) are required on all 120-volt, single phase, 15- and 20-amp outlets in work areas that are not part of the permanent wiring of the building or structure. A GFCI is required when using an extension cord. GFCIs must be tested regularly with a GFCI tester.

Heavy-duty extension cords will be used; flat-type extension cords are not allowed. All extension cords must be the three-wire type, and designed for hard/extra hard usage. Electrical wire or cords passing through work areas must be protected from water and damage. Worn, frayed, or damaged cords and cables will not be used. Walkways and work spaces will be kept clear of cords and cables to prevent a tripping hazard. Extension cords and cables may not be secured with staples, hung from nails, or otherwise temporarily secured. Cords or cables passing through holes in covers, outlet boxes, etc., will be protected by bushings or fittings.

All lamps used in temporary lighting will be protected from accidental contact and breakage. Metal shell and paper-lined lamp holders are not permitted. Fixtures, lamp holders, lamps, receptacles, etc. are not permitted to have live parts. Workers must not have wet hands while plugging/unplugging energized equipment. Plugs and receptacles will be kept out of water (unless they are approved for submersion).

4.2.7 Lock-Out/Tag-Out

Before a worker sets up, services, or repairs a system where unexpected energizing (or release of stored energy) could occur and cause injury or electrocution, the circuits energizing the parts must be locked-out and tagged. Only authorized personnel will perform lock-out/tag-out procedures. All workers affected by the lock-out/tag-out will be notified prior to, and upon completion of, the lock-out/tag-out procedure.

Lock-out/tag-out devices must be capable of withstanding the environment to which they are exposed. Locks will be attached in such a way as to prevent other personnel from operating the equipment, circuit, or control, or from removing the lock unless they resort to excessive force. Tags will identify the worker who attached the device, and contain information, which warns against the hazardous condition that will result from the system's unauthorized start-up. Tags must be legible and understood by all affected workers and incidental personnel. The procedures for attaching and removing lock-out/tag-out devices include the steps outlined in the following table.

STEP	LOCK-OUT/TAG-OUT PROCEDURES
1	Disconnect the circuits and/or equipment to be worked on from all electrical energy sources.
2	Ensure that the system is completely isolated so that it cannot be operated at that shut-off point or at any other location.
3	Release stored electrical energy.
4	Block or relieve stored non-electrical energy.
5	Place a lock on each shut-off or disconnect point necessary to isolate all potential energy sources. Place the lock in such a manner that it will maintain the shut-off/disconnect in the off position.
6	Place a tag on each shut-off or disconnect point. The tag must contain a statement prohibiting the unauthorized re-start or re-connect of the energy source and the removal of the tag, and the identity of the individual performing the tag and lock-out.

7	Workers who will be working on the system must place their own lock and tag on <u>each</u> lock-out point.
8	A qualified person must verify the system cannot be re-started or re-connected, and de-energization of the system has been accomplished.

Once the service or repairs have been made on the system:	
1	A qualified person will conduct an inspection of the work area, to verify that all tools, jumpers, shorts, grounds, etc., have been removed so that the system can then be safely re-energized.
2	All workers stand clear of the system.
3	Each lock and tag will be removed by the worker who attached it. If the worker has left the site, then the lock and tag may be removed by a qualified person under the following circumstances:
	a. The qualified person ensures the worker who placed the lock and tag has left the site; and
	b. The qualified person ensures the worker is aware the lock and tag has been removed before the worker resumes work on-site.

If maintenance work is required, the electrical supply to the equipment must be disconnected. Turning off the MAIN breaker using the disconnect switch will disconnect all power to the system. Once the disconnect switch has been turned off, the switch will be locked-out using the steps outlined below.

4.2.8 Ladders

One-third of worker deaths in construction result from falls. Many falls occur because ladders are not placed or used safely. Ladder use will comply with OSHA 1926.1053 through 1926.1060, including the following safety requirements.

STEP	PROPER LADDER USE PROCEDURE
1	Choose the right ladder for the task--the proper type and size, with a sufficient rating for the task.
2	Check the condition of the ladder before climbing. Do not use a ladder with broken, loose, or cracked rails or rungs. Do not use a ladder with oil, grease, or dirt on its rungs. The ladder should have safety feet.
3	Place the ladder on firm footing, with a four-to-one pitch.

STEP	PROPER LADDER USE PROCEDURE
4	Support the ladder by: <ul style="list-style-type: none"> • Tying it off; • Using ladder outrigger stabilizers; or • Have another worker hold the ladder at the bottom. • If another worker holds the ladder, they must: <ul style="list-style-type: none"> • Wear a hard hat; • Hold the ladder with both hands; • Brace the ladder with their feet; and • Not look up.
5	Keep the areas around the top and bottom of the ladder clear.
6	Extend the top of the ladder at least 36 inches (3 feet) above the landing.
7	Climb the ladder carefully - facing it - and use both hands. Use a tool belt and hand-line to carry material to the top or bottom of the ladder. Wear shoes in good repair with clean soles.
8	Inspect the ladder every day, prior to use, for the following problems: <ul style="list-style-type: none"> • Rail or rung damage • Broken feet • Rope or pulley damage • Rung lock defects or damage • Excessive dirt, oil, or grease • If the ladder fails inspection, it must be removed from service and tagged with a "Do Not Use" sign.

4.2.9 Hand and Power Tools

All hand and power tools will be maintained in a safe condition and in good repair. Hand and power tools will be used in accordance with 29 CFR 1926, Subpart I (1926.300 through 1926.307). Neither Stantec nor its subcontractors will issue unsafe tools, and workers are not permitted to bring unsafe tools on-site. All tools will be used, inspected, and maintained in accordance with the manufacturer's instructions. Throwing tools or dropping tools to lower levels is prohibited. Hand and power tools will be inspected, tested, and determined to be in safe operating condition prior to each use. Periodic safety inspections of all tools will be conducted to assure that the tools are in good condition, all guards are in place, and the tools are being properly maintained. Any tool that fails an inspection will be immediately removed from service and tagged with a "Do Not Use" sign.

Workers using hand and power tools, who are exposed to falling, flying, abrasive, or splashing hazards will be required to wear personal protective equipment (PPE). Eye protection must always be worn when working on-site. Additional eye and face protection, such as safety goggles or face shields, may also be required when working with specific hand and power tools. Workers, when on-site, will wear hard hats. Additional hearing protection may be required when working with certain power tools. Workers using

tools, which may subject their hands to an injury, such as cuts, abrasions, punctures, or burns, will wear protective gloves. Loose or frayed clothing, dangling jewelry, or loose long hair will not be worn when working with power tools.

Electric power-operated tools will be double insulated or grounded, and equipped with an on/off switch. Guards must be provided to protect the operator and other nearby workers from hazards such as in-going nip points, rotating parts, flying chips, and sparks. All reciprocating, rotating and moving parts of tools will be guarded if contact is possible. Removing machine guards is prohibited.

Abrasive wheels will only be used on equipment provided with safety guards. Safety guards must be strong enough to withstand the effect of a bursting wheel. Abrasive wheels will not be operated in excess of their rated speed. Work or tool rests will not be adjusted while the wheel is in motion. All abrasive wheels will be closely inspected, and ring-tested before each use, and any cracked or damaged wheels will be removed immediately and destroyed.

Circular saws must be equipped with guards that completely enclose the cutting edges and have anti-kickback devices. All planer and joiner blades must be fully guarded. The use of cracked, bent, or otherwise defective parts is prohibited. Chain saws must have an automatic chain brake or kickback device. The worker operating the chain saw will hold it with both hands during cutting operations. A chain saw must never be used to cut above the operator's shoulder height. Chain saws will not be re-fueled while running or hot. Power saws will not be left unattended.

Only qualified workers will operate pneumatic tools, powder-actuated tools, and abrasive blasting tools.

4.2.10 Manual Lifting

Back injuries are among the leading occupational injuries reported by industrial workers. Back injuries such as pulls and disc impairments can be reduced by using proper manual lifting techniques. Leg muscles are stronger than back muscles, so workers should lift with their legs and not with their back. Proper manual lifting techniques include the following steps:

STEP	PROPER MANUAL LIFTING PROCEDURE
1	Plan the lift before lifting the load. Take into consideration the weight, size, and shape of the load.
2	Preview the intended path of travel and the destination to ensure there are no tripping hazards along the path.
3	Wear heavy-duty work gloves to protect hands and fingers from rough edges, sharp corners, and metal straps. Also, keep hands away from potential pinch points between the load and other objects.
4	Get the load close to your ankles and spread your feet apart. Keep your back straight and do not bend your back too far; instead bend at your knees.
5	Feel the weight; test it.

6	Lift the load smoothly, and let your legs do the lifting. If you must pivot, do not swing just the load; instead, move your feet and body with the load.
---	--

If the load is too heavy, then do not lift it alone. Lifting is always easier when performed with another person. Assistance should always be used when it is available.

4.2.11 Weather-Related Hazards

Weather-related hazards include the potential for heat or cold stress, electrical storms, treacherous weather-related working conditions, or limited visibility. These hazards correlate with the season in which Site activities occur. Outside work will be suspended during electrical storms. In the event of other adverse weather conditions, the Site Safety Officer will determine if work can continue without endangering the health and safety of site personnel.

5.0 SITE WORK ZONES

The following work zones will be delineated by Stantec during the investigation activities.

5.1 CONTROL ZONES

Control boundaries will be established within the areas of Site activities. Examples of boundary zones include the exclusion and decontamination zone. All boundaries will be dynamic and will be determined by the planned activities for the day. The Stantec representative will record the names of any visitors to the Site.

5.2 EXCLUSION ZONE

The controlled portion of the Site will be delineated to identify the exclusion zone, wherein a higher level of personal protective equipment may be required for entry during intrusive activities. The limits of the exclusion zone will be designated at each work location appropriately. A decontamination zone will be located immediately outside the entrance to the exclusion zone. All personnel leaving the exclusion zone will be required to adhere to proper decontamination procedures.

During drilling, a "super exclusion" zone will be established around the borehole which will not be entered by Stantec personnel at any time during any active drilling, slambor, cathead, silica sand dumping, or other related activities. The drilling contractor will be directed to stop such activity when Stantec site team members have a need to enter this zone.

5.3 DECONTAMINATION ZONE

The decontamination zone will be located immediately outside the entrance to the exclusion zone on its apparent upwind side, if feasible, and will be delineated with caution tape and traffic cones as needed. This zone will contain the necessary decontamination materials for personnel decontamination. Decontamination procedures are outlined in Section 8.0 of this plan.

6.0 SITE MONITORING AND ACTION LEVELS

6.1 SITE MONITORING

Field activities associated with drilling, excavation, and soil and groundwater sampling may create potentially hazardous conditions due to the migration of contaminants into the breathing zone. These substances may be in the form of mists, vapors, dusts, or fumes that can enter the body through ingestion, inhalation, absorption, and direct dermal contact. Monitoring for VOCs will be performed as needed to ensure appropriate personal protective measures are employed during site activities.

The following describes the conditions that will be monitored for during the investigation activities. All background and Site readings will be logged, and all instrument calibrations, etc., will be logged.

Organic Vapor Concentrations – During drilling, organic vapors will be monitored continuously in the breathing zone in the work area with a portable photoionization detector (PID), such as a miniRAE Model 3000 with a 10.2 eV lamp. The instrument will be calibrated daily or as per the manufacturer's recommendations. PID readings will be used as the criteria for upgrading or downgrading protective equipment and for implementing additional precautions or procedures.

Split spoons or other soil sampling devices will be monitored using the PID at the time they are opened, with appropriate PPE to be used where soils exhibit measurable volatile organic compound levels.

Particulates - Should subsurface conditions result in visible particulate dust during the course of intrusive activities (as indicated by CAMP monitoring equipment), the Contractor will be instructed to implement dust suppression measures.

6.2 ACTION LEVELS

During the course of any activity, as long as PID readings in the breathing zone are less than 5 ppm above background, Level D protection will be considered adequate. Level C protection will be required when VOC concentrations in ambient air in the work zone are sustained above 5 ppm total VOCs above background but remain below 50 ppm total VOCs.

If concentrations in the work zone exceed 50 ppm for a period of 5 minutes or longer, work will immediately be terminated by the Site Safety Officer. Options to allow continued drilling would then be discussed amongst all parties. Supplied-air respiratory protection is generally required for drilling to resume under these conditions. If Level B protection is not used, work may resume in Level C once monitoring concentrations have decreased below 50 ppm and conditions outlined in the CAMP are met.

If the monitoring of fugitive particulate levels within the work area exceeds 0.15 mg/m³ above background, then the drilling Contractor will be directed to implement fugitive dust control measures which may include use of engineering controls such as water spray at the borehole.

7.0 PERSONAL PROTECTIVE EQUIPMENT

Based on an evaluation of the hazards at the Site, personal protective equipment (PPE) will be required for all personnel and visitors entering the drilling exclusion zone(s). It is anticipated that all Stantec oversight work will be performed in Level D. All contractors will be responsible for selection and implementation of PPE for their personnel.

7.1 PROTECTIVE CLOTHING/RESPIRATORY PROTECTION

Protective equipment for each level of protection is as follows:

If PID readings are above 50 ppm, requiring an upgrade to Level B, Site work will be halted pending review of conditions and options by Stantec and other involved parties.

When PID readings range between 5 and 50 ppm, upgrade to Level C:

Level C

- Full face, air purifying respirator with organic/HEPA cartridge;
- Disposable chemical resistant one-piece suit (Tyvek or Saranex, as appropriate);
- Inner and outer chemical resistant gloves;
- Hard hat;
- Steel-toed boots; and
- Disposable booties.

When PID readings range between background and 5 ppm use Level D:

Level D

- Safety glasses;
- Steel-toed boots;
- Protective cotton, latex or leather gloves depending on Site duties;
- Hard hat; and
- Tyvek coverall (optional).

8.0 DECONTAMINATION

8.1 PERSONAL DECONTAMINATION

For complete decontamination, all personnel will observe the following procedures upon leaving the exclusion zone:

1. Remove disposable outer boots and outer gloves and place in disposal drum.
2. If using a respirator, remove respirator, dispose of cartridges if necessary, and set aside for later cleaning.
3. Remove disposable chemical resistant suits and dispose of articles in drum.
4. Remove and dispose of inner gloves.

Decontamination solutions shall be supplied at the decontamination zone. The wash solution will consist of water and detergent such as Alconox or trisodium phosphate (TSP), and the rinse solution will consist of clean water.

Contaminated wash solutions shall be collected in drums for disposal. All other disposable health and safety equipment will be decontaminated and disposed of as non-hazardous waste.

8.2 EQUIPMENT DECONTAMINATION

If equipment is used during field activities, it will be properly washed or steam-cleaned prior to exiting the decontamination zone. Pre- or post-use rinsing using solvents will be done wearing appropriate PPE.

When feasible, monitoring instruments will be either wrapped in plastic or carried by personnel not involved in handling contaminated materials, to reduce the need for decontamination. All instruments will be wet-wiped prior to removal from the work zone.

9.0 EMERGENCY PROCEDURES

The Site Safety Officer will coordinate emergency procedures and will be responsible for initiating emergency response activities. Emergency communications at the Site will be conducted verbally and by means of an air or vehicle horn. All personnel will be informed of the location of the cellular telephone and horn. Three blasts on the air or vehicle horn will be used to signal distress.

9.1 LIST OF EMERGENCY CONTACTS

Ambulance: 911
Hospital: **Strong Memorial Hospital: (585) 275-2100**
Fire Department: 911
Police: 911
Poison Control Center: 1-800-222-1222
Utility Emergency: 911

9.2 DIRECTIONS TO HOSPITAL

A map presenting directions to the hospital is provided in Figure 2. The route shall be reviewed at the initial site safety meeting onsite.

9.3 ACCIDENT INVESTIGATION AND REPORTING

All accidents requiring first aid, which occur incidental to activities onsite, will be investigated. The investigation format will be as follows:

- interviews with witnesses;
- pictures, if applicable; and
- necessary actions to alleviate the problem.

In the event that an accident or some other incident such as an explosion or exposure to toxic chemicals occurs during the course of the project, the Project Health and Safety Officer will be telephoned as soon as possible and receive a written notification within 24 hours. The report will include the following items:

- Name of injured;
- Name and title of person(s) reporting;
- Date and time of accident/incident;
- Location of accident/incident, building number, facility name;
- Brief summary of accident/incident giving pertinent details including type of operation ongoing at the time of the accident/incident;
- Cause of accident/incident;
- Casualties (fatalities, disabling injuries), hospitalizations;
- Details of any existing chemical hazard or contamination;

Health and Safety Plan
Petroleum-Impacted Soil & Groundwater Remediation
121-123 Reynolds Street
Rochester, NY

- Estimated property damage, if applicable;
- Nature of damage; effect on contract schedule;
- Action taken to ensure safety and security; and
- Other damage or injuries sustained (public or private).

Where reportable injuries, hospitalizations or fatalities occur amongst Stantec personnel, the necessary document required by OSHA will be submitted within timeframes allowed by law.

The accident report form is illustrated in Table 4.

TABLE 4
ACCIDENT REPORT

Project Corrective Action Plan Date of Occurrence _____

Location 121 Reynolds Street

Type of Occurrence: (check all that Apply)

- | | |
|--|---|
| <input type="checkbox"/> Disabling Injury | <input type="checkbox"/> Other Injury |
| <input type="checkbox"/> Property Damage | <input type="checkbox"/> Equip. Failure |
| <input type="checkbox"/> Chemical Exposure | <input type="checkbox"/> Fire |
| <input type="checkbox"/> Explosion | <input type="checkbox"/> Vehicle Accident |
| <input type="checkbox"/> Other (explain) _____ | |
-

Witnesses to Accident/Injury:

_____	_____
_____	_____
_____	_____

Injuries:

Name of Injured _____

What was being done at the time of the accident/injury?

What corrective actions will be taken to prevent recurrence? _____

SIGNATURES

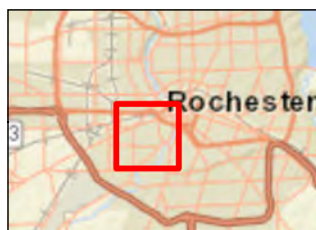
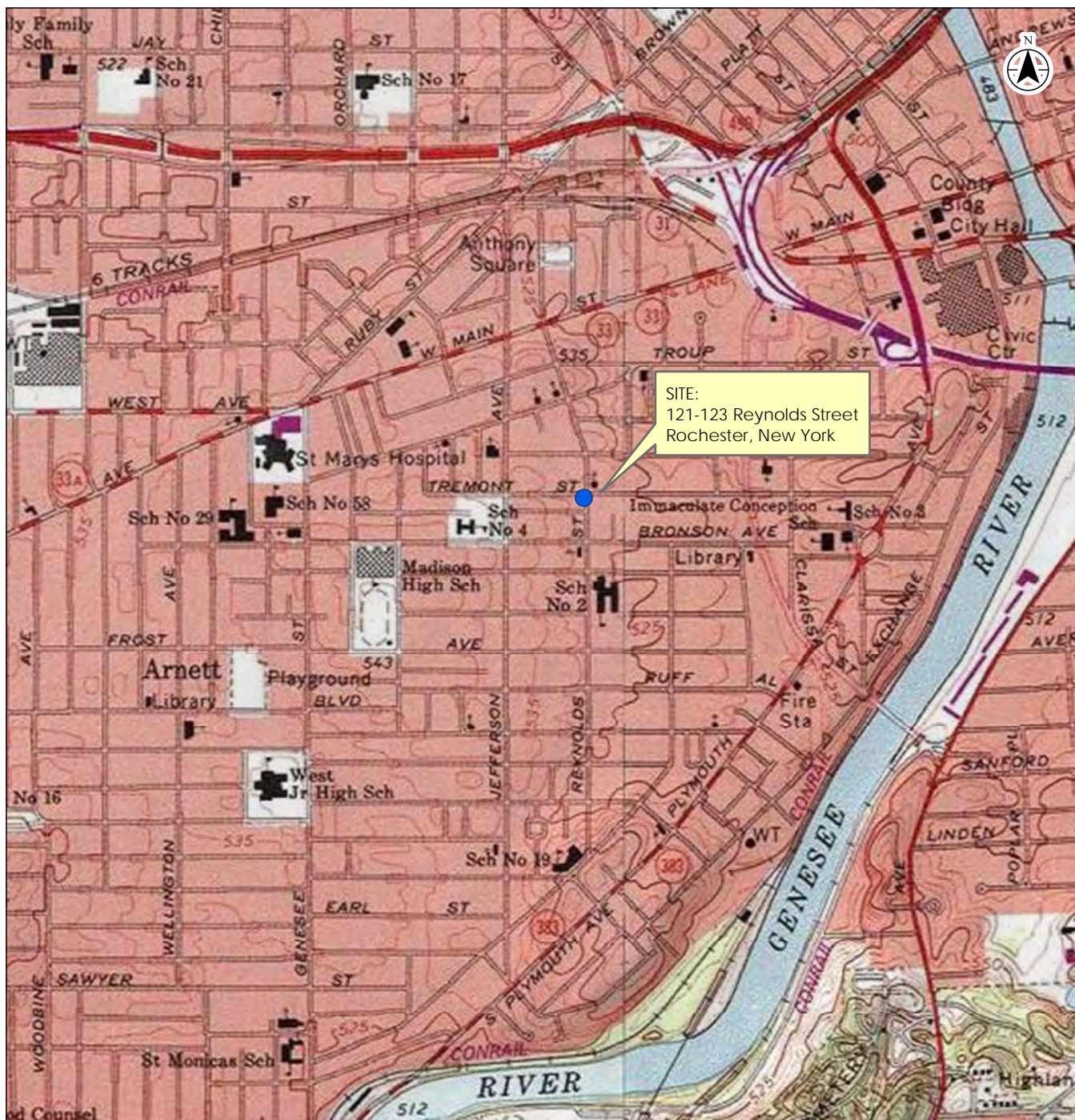
Health and Safety Officer _____ Date _____

Project Manager _____ Date _____

Reviewer _____ Date _____

Comments by reviewer _____

FIGURES



Legend:

- Site Location



Project Location: 121-123 Reynolds Street
Rochester, New York
Site Location Map: REVA
Prepared by: AJK on 2017-10-12
Technical Review by: KI on 2017-10-13
Independent Review by: MFS on 2017-10-13

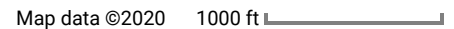
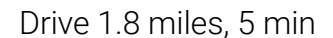
Client/Project:
City of Rochester
Petroleum-Impacted Soil and Groundwater
Corrective Action Plan

Figure No.
1

Title
Site Location Map

Notes
1. Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2013.
3. Topo Imagery provided by ESRI Online Services and USGS 7.5 Minute Quad of Rochester West, NY, dated 1995.
4. Key Map Service Layer Credits: Sources: Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community
Copyright © 2013 National Geographic Society, i-cubed

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.







Rochester, NY 14608

1 min (0.3 mi)

- 3 min (1.1 mi)

3. Turn right onto Ford St
0.3 mi
4. At the traffic circle, continue straight to stay on Ford St
0.1 mi
5. Continue straight to stay on Ford St
0.2 mi
6. Turn right toward Mt Hope Ave
187 ft

FIGURE 2
MAP TO HOSPITAL

-  7. Turn right onto Mt Hope Ave
0.4 mi
-  8. Turn left onto Robinson Dr
1 min (0.3 mi)
-  9. Turn left onto South Ave
27 s (0.1 mi)
-  10. Turn right onto Bellevue Dr
5 s (26 ft)

Highland Hospital

1000 South Ave, Rochester, NY 14620

These directions are for planning purposes only. You may find that construction projects, traffic, weather, or other events may cause conditions to differ from the map results, and you should plan your route accordingly. You must obey all signs or notices regarding your route.

HEALTH & SAFETY PLAN

APPENDIX A

SAFETY DATA SHEETS

SAFETY DATA SHEET

Version 4.12
Revision Date 03/23/2017
Print Date 05/16/2017

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : 1,1-Dichloroethene

Product Number : 48526

Brand : Supelco

Index-No. : 602-025-00-8

CAS-No. : 75-35-4

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

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

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

Flammable liquids (Category 1), H224

Acute toxicity, Oral (Category 3), H301

Skin irritation (Category 2), H315

Eye irritation (Category 2A), H319

Carcinogenicity (Category 2), H351

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H224 : Extremely flammable liquid and vapour.

H301 : Toxic if swallowed.

H315 : Causes skin irritation.

H319 : Causes serious eye irritation.

H351 : Suspected of causing cancer.

Precautionary statement(s)

P201 : Obtain special instructions before use.

P202 : Do not handle until all safety precautions have been read and understood.

P210	Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233	Keep container tightly closed.
P240	Ground/bond container and receiving equipment.
P241	Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242	Use only non-sparking tools.
P243	Take precautionary measures against static discharge.
P264	Wash skin thoroughly after handling.
P270	Do not eat, drink or smoke when using this product.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P301 + P310 + P330	IF SWALLOWED: Immediately call a POISON CENTER/doctor. Rinse mouth.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P305 + P351 + P338	IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
P308 + P313	IF exposed or concerned: Get medical advice/ attention.
P332 + P313	If skin irritation occurs: Get medical advice/ attention.
P337 + P313	If eye irritation persists: Get medical advice/ attention.
P362	Take off contaminated clothing and wash before reuse.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

2.3 Hazards not otherwise classified (HNOC) or not covered by GHS

May form explosive peroxides.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms	: 1,1-Dichloroethylene Vinylidene chloride
Formula	: C ₂ H ₂ Cl ₂
Molecular weight	: 96.94 g/mol
CAS-No.	: 75-35-4
EC-No.	: 200-864-0
Index-No.	: 602-025-00-8

Hazardous components

Component	Classification	Concentration
Vinylidene chloride		
	Flam. Liq. 1; Acute Tox. 3; Skin Irrit. 2; Eye Irrit. 2A; Carc. 2; H224, H301, H315, H319, H351	90 - 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Take victim immediately to hospital. Consult a physician.

In case of eye contact

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

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES**5.1 Extinguishing media****Suitable extinguishing media**

Dry powder Dry sand

Unsuitable extinguishing media

Do NOT use water jet.

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES**6.1 Personal precautions, protective equipment and emergency procedures**

Wear respiratory protection. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

For personal protection see section 8.

6.2 Environmental precautions

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

Contain spillage, and then collect with non-combustible absorbent material, (e.g. sand, earth, diatomaceous earth, vermiculite) and place in container for disposal according to local / national regulations (see section 13).

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE**7.1 Precautions for safe handling**

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Air and moisture sensitive. Store under inert gas.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Vinylidene chloride	75-35-4	TWA	5.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Liver damage Kidney damage Not classifiable as a human carcinogen		
		Potential Occupational Carcinogen See Appendix A		
		PEL	1 ppm 4 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

8.2 Exposure controls

Appropriate engineering controls

Avoid contact with skin, eyes and clothing. Wash hands before breaks and immediately after handling the product.

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact

Material: butyl-rubber

Minimum layer thickness: 0.3 mm

Break through time: 30 min

Material tested: Butoject® (KCL 897 / Aldrich Z677647, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

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

Control of environmental exposure

Prevent further leakage or spillage if safe to do so. Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance	Form: liquid, clear Colour: colourless
b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	Melting point/range: -122 °C (-188 °F) - lit.
f) Initial boiling point and boiling range	30 - 32 °C (86 - 90 °F) - lit.
g) Flash point	-19 °C (-2 °F) - closed cup
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	Upper explosion limit: 15.5 %(V) Lower explosion limit: 6.5 %(V)
k) Vapour pressure	658.6 hPa (494.0 mmHg) 667.3 hPa (500.5 mmHg) at 20.0 °C (68.0 °F) 2,137.4 hPa (1,603.2 mmHg) at 55.0 °C (131.0 °F)
l) Vapour density	No data available
m) Relative density	1.213 g/cm ³ at 20 °C (68 °F)
n) Water solubility	0.2 g/l at 20 °C (68 °F)
o) Partition coefficient: n-octanol/water	No data available
p) Auto-ignition temperature	520.0 °C (968.0 °F) 580.0 °C (1,076.0 °F)
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

9.2 Other safety information

No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

Vapours may form explosive mixture with air.

10.4 Conditions to avoid

Heat, flames and sparks.

10.5 Incompatible materials

Oxidizing agents, Copper, Aluminum, and its alloys, Peroxides, Strong bases, Oxygen

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 200.0 mg/kg

Inhalation: Lung irritation

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

Laboratory experiments have shown mutagenic effects.

Carcinogenicity

This product is or contains a component that has been reported to be possibly carcinogenic based on its IARC, ACGIH, NTP, or EPA classification.

Limited evidence of carcinogenicity in animal studies

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: KV9275000

Nausea, Headache, Vomiting, Dizziness, Drowsiness, Confusion., Incoordination., Central nervous system depression, To the best of our knowledge, the chemical, physical, and toxicological properties have not been thoroughly investigated.

Stomach - Irregularities - Based on Human Evidence

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Daphnia magna (Water flea) - 11.60 - 11.79 mg/l
	LC50 - Pimephales promelas (fathead minnow) - 108.00 - 169.00 mg/l
	LC50 - Lepomis macrochirus (Bluegill) - 74.00 - 220.00 mg/l
	LC50 - Cyprinodon variegatus (sheepshead minnow) - 249.00 mg/l
	LC50 - other fish - 250.00 mg/l
	LC50 - other fish - 224.00 mg/l
	LC50 - Pimephales promelas (fathead minnow) - 108 mg/l - 96 h
	NOEC - Cyprinodon variegatus (sheepshead minnow) - 80 mg/l - 96 h
Toxicity to daphnia and other aquatic invertebrates	LC50 - Daphnia magna (Water flea) - 11.6 mg/l - 48 h

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

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

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

Offer surplus and non-recyclable solutions to a licensed disposal company. Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 1303 Class: 3 Packing group: I
Proper shipping name: Vinylidene chloride, stabilized
Reportable Quantity (RQ): 100 lbsReportable Quantity (RQ): 100 lbsMarine pollutant:yes
Poison Inhalation Hazard: No

IMDG

UN number: 1303 Class: 3 Packing group: I EMS-No: F-E, S-D
Proper shipping name: VINYLIDENE CHLORIDE, STABILIZED
Marine pollutant:yes Marine pollutant: yes

IATA

UN number: 1303 Class: 3 Packing group: I
Proper shipping name: Vinylidene chloride, stabilized

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
Vinylidene chloride	75-35-4	2007-07-01

SARA 311/312 Hazards

Fire Hazard, Acute Health Hazard, Chronic Health Hazard

Reportable Quantity : D029 lbs

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Vinylidene chloride	75-35-4	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Vinylidene chloride	75-35-4	2007-07-01

	CAS-No.	Revision Date
Vinylidene chloride	75-35-4	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
Vinylidene chloride	75-35-4	2007-07-01

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Carc.	Carcinogenicity
Eye Irrit.	Eye irritation
Flam. Liq.	Flammable liquids
H224	Extremely flammable liquid and vapour.
H301	Toxic if swallowed.
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H351	Suspected of causing cancer.
Skin Irrit.	Skin irritation

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	*
Flammability:	4
Physical Hazard	2

NFPA Rating

Health hazard:	2
Fire Hazard:	4
Reactivity Hazard:	2

Further information

Copyright 2017 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only. The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.12

Revision Date: 03/23/2017

Print Date: 05/16/2017

SAFETY DATA SHEET

Version 4.10
Revision Date 09/23/2016
Print Date 07/13/2017

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : 1,1,1-Trichloroethane

Product Number : 402877

Brand : Sigma-Aldrich

Index-No. : 602-013-00-2

CAS-No. : 71-55-6

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

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832

Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

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

Acute toxicity, Inhalation (Category 4), H332

Skin irritation (Category 2), H315

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Warning

Hazard statement(s)

H315

Causes skin irritation.

H332

Harmful if inhaled.

Precautionary statement(s)

P261

Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.

P264

Wash skin thoroughly after handling.

P271

Use only outdoors or in a well-ventilated area.

P280

Wear protective gloves.

P302 + P352

IF ON SKIN: Wash with plenty of soap and water.

P304 + P340

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

P312

Call a POISON CENTER/doctor if you feel unwell.

P321 Specific treatment (see supplemental first aid instructions on this label).
P332 + P313 If skin irritation occurs: Get medical advice/ attention.
P362 Take off contaminated clothing and wash before reuse.

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

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : 'Chloroethene'
Methylchloroform

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

Hazardous components

Component	Classification	Concentration
1,1,1-Trichloroethane		
	Acute Tox. 4; Skin Irrit. 2; Eye Irrit. 2A; Ozone 1; H315, H319, H332	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

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

If swallowed

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

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

No data available

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation.
For personal protection see section 8.

6.2 Environmental precautions

Do not let product enter drains.

6.3 Methods and materials for containment and cleaning up

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

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
1,1,1-Trichloroethane	71-55-6	TWA	350.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Liver damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		STEL	450.000000 ppm	USA. ACGIH Threshold Limit Values (TLV)
		Central Nervous System impairment Liver damage Substances for which there is a Biological Exposure Index or Indices (see BEI® section) Not classifiable as a human carcinogen		
		C	350.000000 ppm 1,900.000000 mg/m3	USA. NIOSH Recommended Exposure Limits
		See Appendix C 15 minute ceiling value		
		TWA	350.000000 ppm 1,900.000000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		The value in mg/m3 is approximate.		

		PEL	350 ppm 1,900 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		STEL	450 ppm 2,450 mg/m ³	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
		C	800 ppm	California permissible exposure limits for chemical contaminants (Title 8, Article 107)

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
1,1,1-Trichloroethane	71-55-6	Methyl chloroform	40ppm	In end-exhaled air	ACGIH - Biological Exposure Indices (BEI)
	Remarks	Prior to last shift of workweek			
		Trichloroacetic acid	10.0000 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of the workweek (After four or five consecutive working days with exposure)			
		Total trichloroethanol	30.0000 mg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			
		Total trichloroethanol	1.0000 mg/l	In blood	ACGIH - Biological Exposure Indices (BEI)
		End of shift at end of workweek			

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

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

Skin protection

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

Full contact

Material: Fluorinated rubber

Minimum layer thickness: 0.7 mm

Break through time: 480 min

Material tested: Vitoject® (KCL 890 / Aldrich Z677698, Size M)

Splash contact

Material: Nitrile rubber

Minimum layer thickness: 0.4 mm

Break through time: 60 min

Material tested: Camatril® (KCL 730 / Aldrich Z677442, Size M)

data source: KCL GmbH, D-36124 Eichenzell, phone +49 (0)6659 87300, e-mail sales@kcl.de, test method: EN374

If used in solution, or mixed with other substances, and under conditions which differ from EN 374, contact the supplier of the CE approved gloves. This recommendation is advisory only and must be evaluated by an

industrial hygienist and safety officer familiar with the specific situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

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

Respiratory protection

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

Control of environmental exposure

Do not let product enter drains.

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

a) Appearance	Form: liquid, clear Colour: colourless
b) Odour	No data available
c) Odour Threshold	No data available
d) pH	No data available
e) Melting point/freezing point	-35.0 °C (-31.0 °F)
f) Initial boiling point and boiling range	72.0 - 75.0 °C (161.6 - 167.0 °F)
g) Flash point	No data available
h) Evaporation rate	No data available
i) Flammability (solid, gas)	No data available
j) Upper/lower flammability or explosive limits	Upper explosion limit: 15 %(V) Lower explosion limit: 7.5 %(V)
k) Vapour pressure	133.3 hPa (100.0 mmHg) at 20.0 °C (68.0 °F)
l) Vapour density	No data available
m) Relative density	1.34 g/cm ³
n) Water solubility	1.25 g/l at 23 °C (73 °F)
o) Partition coefficient: n-octanol/water	log Pow: 2.49
p) Auto-ignition temperature	537.0 °C (998.6 °F)
q) Decomposition temperature	No data available
r) Viscosity	No data available
s) Explosive properties	No data available
t) Oxidizing properties	No data available

9.2 Other safety information

No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.

Contains the following stabiliser(s):

Low alkyl epoxide ($\leq 0.05\%$)

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

No data available

10.5 Incompatible materials

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

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides, Hydrogen chloride gas

Other decomposition products - No data available

In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LD50 Oral - Rat - 9,600 mg/kg

Remarks: Cardiac:Pulse rate. Nutritional and Gross Metabolic:Weight loss or decreased weight gain.

LD50 Oral - Mouse - 6,000 mg/kg

Remarks: Cardiac:Pulse rate. Nutritional and Gross Metabolic:Weight loss or decreased weight gain.

LC50 Inhalation - Mouse - 2 h - 3911 ppm

Remarks: Behavioral:Excitement.

Dermal: No data available

LD50 Intraperitoneal - Rat - 3,593 mg/kg

LD50 Intraperitoneal - Mouse - 2,568 mg/kg

LD50 Subcutaneous - Mouse - 16.0 mg/kg

Remarks: Drowsiness Behavioral:Ataxia.

LD50 Intraperitoneal - Dog - 3,100 mg/kg

Remarks: Liver:Liver function tests impaired.

Skin corrosion/irritation

Skin - Rabbit

Result: Skin irritation - 24 h

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

IARC: 3 - Group 3: Not classifiable as to its carcinogenicity to humans (1,1,1-Trichloroethane)

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a

carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: Not available

burning sensation, Cough, wheezing, laryngitis, Shortness of breath, Headache, Nausea, Vomiting, Exposure to and/or consumption of alcohol may increase toxic effects., prolonged or repeated exposure can cause:, narcosis, Liver injury may occur., Kidney injury may occur.

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish LC50 - Pimephales promelas (fathead minnow) - 42.3 mg/l - 96 h

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

Bioaccumulation Lepomis macrochirus (Bluegill) - 28 d
- 0.0734 mg/l

Bioconcentration factor (BCF): 9

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

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

12.6 Other adverse effects

No data available

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product

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

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)

UN number: 2831 Class: 6.1 Packing group: III
Proper shipping name: 1,1,1-Trichloroethane
Reportable Quantity (RQ): 1000 lbs

Poison Inhalation Hazard: No

IMDG

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

IATA

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

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

	CAS-No.	Revision Date
1,1,1-Trichloroethane	71-55-6	2007-07-01

SARA 311/312 Hazards

Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloroethane	71-55-6	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloroethane	71-55-6	2007-07-01

New Jersey Right To Know Components

	CAS-No.	Revision Date
1,1,1-Trichloroethane	71-55-6	2007-07-01

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Eye Irrit.	Eye irritation
H315	Causes skin irritation.
H319	Causes serious eye irritation.
H332	Harmful if inhaled.
Ozone	Hazardous to the ozone layer
Skin Irrit.	Skin irritation

HMIS Rating

Health hazard:	2
Chronic Health Hazard:	
Flammability:	0
Physical Hazard	0

NFPA Rating

Health hazard:	2
Fire Hazard:	0
Reactivity Hazard:	0

Further information

Copyright 2016 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only.
The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the

product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.10

Revision Date: 09/23/2016

Print Date: 07/13/2017

SAFETY DATA SHEET

Creation Date 28-Apr-2009

Revision Date 24-May-2017

Revision Number 3

1. Identification

Product Name Acetone

Cat No. : AC177170000; AC177170010; AC177170025; AC177170050;
AC177170100; AC177170250

Synonyms 2-Propanone

Recommended Use Laboratory chemicals.

Uses advised against Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company

Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number

For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11
Emergency Number **US**:001-201-796-7100 / **Europe**: +32 14 57 52 99
CHEMTREC Tel. No.**US**:001-800-424-9300 / **Europe**:001-703-527-3887

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable liquids	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Central nervous system (CNS).	
Specific target organ toxicity - (repeated exposure)	Category 2
Target Organs - Kidney, Liver, spleen, Blood.	

Label Elements

Signal Word

Danger

Hazard Statements

Highly flammable liquid and vapor
Causes serious eye irritation
May cause drowsiness or dizziness
May cause damage to organs through prolonged or repeated exposure

**Precautionary Statements****Prevention**

Wash face, hands and any exposed skin thoroughly after handling
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Wear protective gloves/protective clothing/eye protection/face protection
Keep cool

Response

Get medical attention/advice if you feel unwell

Inhalation

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician if you feel unwell

Skin

IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower

Eyes

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention

Fire

In case of fire: Use CO₂, dry chemical, or foam for extinction

Storage

Store in a well-ventilated place. Keep container tightly closed
Store locked up

Disposal

Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)

Repeated exposure may cause skin dryness or cracking

3. Composition / information on ingredients

Component	CAS-No	Weight %
Acetone	67-64-1	>95

4. First-aid measures

Eye Contact

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
Obtain medical attention.

Skin Contact

Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.

Inhalation

Move to fresh air. If breathing is difficult, give oxygen. Get medical attention immediately if symptoms occur.

Ingestion

Do not induce vomiting. Obtain medical attention.

Most important symptoms/effects	Breathing difficulties. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting: May cause pulmonary edema
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	CO ₂ , dry chemical, dry sand, alcohol-resistant foam. Water spray. Cool closed containers exposed to fire with water spray.
Unsuitable Extinguishing Media	Water may be ineffective
Flash Point	-20 °C / -4 °F
Method -	Closed cup
Autoignition Temperature	465 °C / 869 °F
Explosion Limits	
Upper	12.8 vol %
Lower	2.5 vol %
Oxidizing Properties	Not oxidising
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical

Flammable. Risk of ignition. Containers may explode when heated. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back.

Hazardous Combustion Products

Carbon monoxide (CO) Carbon dioxide (CO₂) Formaldehyde Methanol

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
1	3	0	N/A

6. Accidental release measures

Personal Precautions	Use personal protective equipment. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges. Keep people away from and upwind of spill/leak. Avoid contact with skin, eyes and inhalation of vapors.
Environmental Precautions	Should not be released into the environment.
Methods for Containment and Clean Up	Remove all sources of ignition. Take precautionary measures against static discharges. Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Use spark-proof tools and explosion-proof equipment.

7. Handling and storage

Handling	Do not breathe vapors or spray mist. Do not get in eyes, on skin, or on clothing. Wear personal protective equipment. Ensure adequate ventilation. Keep away from open flames, hot surfaces and sources of ignition. Take precautionary measures against static discharges. Use only non-sparking tools. Use explosion-proof equipment. To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded.
Storage	Flammables area. Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Acetone	TWA: 250 ppm STEL: 500 ppm	(Vacated) TWA: 750 ppm (Vacated) TWA: 1800 mg/m ³ (Vacated) STEL: 2400 mg/m ³ (Vacated) STEL: 1000 ppm TWA: 1000 ppm TWA: 2400 mg/m ³	IDLH: 2500 ppm TWA: 250 ppm TWA: 590 mg/m ³	TWA: 1000 ppm TWA: 2400 mg/m ³ STEL: 1260 ppm STEL: 3000 mg/m ³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures

Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location. Use explosion-proof electrical/ventilating/lighting/equipment.

Personal Protective Equipment

Eye/face Protection

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection

Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection

Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	sweet
Odor Threshold	19.8 ppm
pH	7
Melting Point/Range	-95 °C / -139 °F
Boiling Point/Range	56 °C / 132.8 °F
Flash Point	-20 °C / -4 °F
Method -	Closed cup
Evaporation Rate	5.6 (Butyl Acetate = 1.0)
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	12.8 vol %
Lower	2.5 vol %
Vapor Pressure	247 mbar @ 20 °C
Vapor Density	2.0
Specific Gravity	0.790
Solubility	Soluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	465 °C / 869 °F
Decomposition Temperature	> 4°C
Viscosity	0.32 mPa.s @ 20 °C

Molecular Formula	C3 H6 O
Molecular Weight	58.08
Refractive index	1.358 - 1.359

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Stable under normal conditions.
Conditions to Avoid	Heat, flames and sparks. Incompatible products. Keep away from open flames, hot surfaces and sources of ignition.
Incompatible Materials	Strong oxidizing agents, Strong reducing agents, Strong bases, Peroxides, Halogenated compounds, Alkali metals, Amines
Hazardous Decomposition Products	Carbon monoxide (CO), Carbon dioxide (CO ₂), Formaldehyde, Methanol
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Acetone	5800 mg/kg (Rat)	> 15800 mg/kg (rabbit) > 7400 mg/kg (rat)	76 mg/l, 4 h, (rat)

Toxicologically Synergistic Products Carbon tetrachloride; Chloroform; Trichloroethylene; Bromodichloromethane; Dibromochloromethane; N-nitrosodimethylamine; 1,1,2-Trichloroethane; Styrene; Acetonitrile, 2,5-Hexanedione; Ethanol; 1,2-Dichlorobenzene

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation	Irritating to eyes and skin
Sensitization	No information available
Carcinogenicity	The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Acetone	67-64-1	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Central nervous system (CNS)
STOT - repeated exposure Kidney Liver spleen Blood

Aspiration hazard No information available

Symptoms / effects, both acute and delayed Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting: May cause pulmonary edema

Endocrine Disruptor Information No information available

Other Adverse Effects

The toxicological properties have not been fully investigated.

12. Ecological information**Ecotoxicity**

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Acetone	NOEC = 430 mg/l (algae; 96 h)	Oncorhynchus mykiss: LC50 = 5540 mg/l 96h Alburnus alburnus: LC50 = 11000 mg/l 96h Leuciscus idus: LC50 = 11300 mg/L/48h Salmo gairdneri: LC50 = 6100 mg/L/24h	EC50 = 14500 mg/L/15 min	EC50 = 8800 mg/L/48h EC50 = 12700 mg/L/48h EC50 = 12600 mg/L/48h

Persistence and Degradability

Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation

No information available.

Mobility

Will likely be mobile in the environment due to its volatility.

Component	log Pow
Acetone	-0.24

13. Disposal considerations**Waste Disposal Methods**

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Acetone - 67-64-1	U002	-

14. Transport information**DOT**

UN-No UN1090
 Proper Shipping Name ACETONE
 Hazard Class 3
 Packing Group II

TDG

UN-No UN1090
 Proper Shipping Name ACETONE
 Hazard Class 3
 Packing Group II

IATA

UN-No UN1090
 Proper Shipping Name ACETONE
 Hazard Class 3
 Packing Group II

IMDG/IMO

UN-No UN1090
 Proper Shipping Name ACETONE
 Hazard Class 3
 Packing Group II

15. Regulatory information**International Inventories**

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
-----------	------	-----	------	--------	--------	-----	-------	------	------	-------	------

Acetone	X	X	-	200-662-2	-		X	X	X	X	X
---------	---	---	---	-----------	---	--	---	---	---	---	---

Legend:

X - Listed

E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.

F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.

N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.

P - Indicates a commenced PMN substance

R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

S - Indicates a substance that is identified in a proposed or final Significant New Use Rule

T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.

XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B)).

Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.

Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313 Not applicable

SARA 311/312 Hazard Categories

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	Yes
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

CWA (Clean Water Act) Not applicable

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration
Not applicable**CERCLA**

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Acetone	5000 lb	-

California Proposition 65 This product does not contain any Proposition 65 chemicals**U.S. State Right-to-Know Regulations**

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Acetone	X	X	X	-	X

U.S. Department of Transportation

Reportable Quantity (RQ):	Y
DOT Marine Pollutant	N
DOT Severe Marine Pollutant	N

U.S. Department of Homeland Security

This product contains the following DHS chemicals:

Component	DHS Chemical Facility Anti-Terrorism Standard
Acetone	2000 lb STQ

Other International Regulations

Mexico - Grade

Serious risk, Grade 3

16. Other information**Prepared By**Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com**Creation Date**

28-Apr-2009

Revision Date

24-May-2017

Print Date

24-May-2017

Revision Summary

This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SAFETY DATA SHEET

Version 4.4
Revision Date 12/01/2015
Print Date 07/13/2017

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : cis-Dichloroethylene

Product Number : 48597
Brand : Supelco
Index-No. : 602-026-00-3

CAS-No. : 156-59-2

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

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

Company : Sigma-Aldrich
3050 Spruce Street
SAINT LOUIS MO 63103
USA

Telephone : +1 800-325-5832
Fax : +1 800-325-5052

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887 (CHEMTREC)

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

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

Flammable liquids (Category 2), H225
Acute toxicity, Inhalation (Category 4), H332
Acute aquatic toxicity (Category 3), H402
Chronic aquatic toxicity (Category 3), H412

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

2.2 GHS Label elements, including precautionary statements

Pictogram



Signal word

Danger

Hazard statement(s)

H225 Highly flammable liquid and vapour.
H332 Harmful if inhaled.
H412 Harmful to aquatic life with long lasting effects.

Precautionary statement(s)

P210 Keep away from heat/sparks/open flames/hot surfaces. No smoking.
P233 Keep container tightly closed.
P240 Ground/bond container and receiving equipment.
P241 Use explosion-proof electrical/ ventilating/ lighting/ equipment.
P242 Use only non-sparking tools.

P243	Take precautionary measures against static discharge.
P261	Avoid breathing dust/ fume/ gas/ mist/ vapours/ spray.
P271	Use only outdoors or in a well-ventilated area.
P273	Avoid release to the environment.
P280	Wear protective gloves/ protective clothing/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Remove/ Take off immediately all contaminated clothing. Rinse skin with water/ shower.
P304 + P340	IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
P312	Call a POISON CENTER or doctor/ physician if you feel unwell.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P403 + P235	Store in a well-ventilated place. Keep cool.
P501	Dispose of contents/ container to an approved waste disposal plant.

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

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Formula	: C ₂ H ₂ Cl ₂
Molecular weight	: 96.94 g/mol
CAS-No.	: 156-59-2
EC-No.	: 205-859-7
Index-No.	: 602-026-00-3

Hazardous components

Component	Classification	Concentration
cis-Dichloroethylene		
	Flam. Liq. 2; Acute Tox. 4; Aquatic Acute 3; Aquatic Chronic 3; H225, H332, H412	<= 100 %

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

4. FIRST AID MEASURES

4.1 Description of first aid measures

General advice

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

If inhaled

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

In case of skin contact

Wash off with soap and plenty of water. Consult a physician.

In case of eye contact

Flush eyes with water as a precaution.

If swallowed

Do NOT induce vomiting. Never give anything by mouth to an unconscious person. Rinse mouth with water. Consult a physician.

4.2 Most important symptoms and effects, both acute and delayed

The most important known symptoms and effects are described in the labelling (see section 2.2) and/or in section 11

4.3 Indication of any immediate medical attention and special treatment needed

No data available

5. FIREFIGHTING MEASURES

5.1 Extinguishing media

Suitable extinguishing media

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

5.2 Special hazards arising from the substance or mixture

Carbon oxides, Hydrogen chloride gas

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

Use water spray to cool unopened containers.

6. ACCIDENTAL RELEASE MEASURES

6.1 Personal precautions, protective equipment and emergency procedures

Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. Evacuate personnel to safe areas. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.

For personal protection see section 8.

6.2 Environmental precautions

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

6.3 Methods and materials for containment and cleaning up

Contain spillage, and then collect with an electrically protected vacuum cleaner or by wet-brushing and place in container for disposal according to local regulations (see section 13).

6.4 Reference to other sections

For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling

Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.

Use explosion-proof equipment. Keep away from sources of ignition - No smoking. Take measures to prevent the build up of electrostatic charge.

For precautions see section 2.2.

7.2 Conditions for safe storage, including any incompatibilities

Keep container tightly closed in a dry and well-ventilated place. Containers which are opened must be carefully resealed and kept upright to prevent leakage.

Recommended storage temperature 2 - 8 °C

Handle and store under inert gas. Air and moisture sensitive. Light sensitive.

7.3 Specific end use(s)

Apart from the uses mentioned in section 1.2 no other specific uses are stipulated

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
cis-Dichloroethylene	156-59-2	TWA	200 ppm	USA. ACGIH Threshold Limit Values (TLV)
	Remarks	Central Nervous System impairment Eye irritation		

8.2 Exposure controls

Appropriate engineering controls

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

Personal protective equipment

Eye/face protection

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

Skin protection

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

Body Protection

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

Respiratory protection

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

Control of environmental exposure

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

9. PHYSICAL AND CHEMICAL PROPERTIES

9.1 Information on basic physical and chemical properties

- | | |
|---|--------------------------------------|
| a) Appearance | Form: liquid
Colour: light yellow |
| b) Odour | No data available |
| c) Odour Threshold | No data available |
| d) pH | No data available |
| e) Melting point/freezing point | -80.0 °C (-112.0 °F) |
| f) Initial boiling point and boiling range | 60.0 - 61.0 °C (140.0 - 141.8 °F) |
| g) Flash point | 6.0 °C (42.8 °F) - closed cup |
| h) Evaporation rate | No data available |
| i) Flammability (solid, gas) | No data available |
| j) Upper/lower flammability or explosive limits | No data available |
| k) Vapour pressure | No data available |
| l) Vapour density | No data available |
| m) Relative density | 1.28 g/cm ³ |
| n) Water solubility | No data available |
| o) Partition coefficient: n-octanol/water | No data available |

- | | |
|------------------------------|-------------------|
| p) Auto-ignition temperature | No data available |
| q) Decomposition temperature | No data available |
| r) Viscosity | No data available |
| s) Explosive properties | No data available |
| t) Oxidizing properties | No data available |

9.2 Other safety information

No data available

10. STABILITY AND REACTIVITY

10.1 Reactivity

No data available

10.2 Chemical stability

Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions

Vapours may form explosive mixture with air.

10.4 Conditions to avoid

Heat, flames and sparks. Extremes of temperature and direct sunlight.

10.5 Incompatible materials

Oxidizing agents

10.6 Hazardous decomposition products

Other decomposition products - No data available
In the event of fire: see section 5

11. TOXICOLOGICAL INFORMATION

11.1 Information on toxicological effects

Acute toxicity

LC50 Inhalation - Rat - 13700 ppm

Remarks: Behavioral: Somnolence (general depressed activity). Liver: Fatty liver degeneration.

Dermal: No data available

No data available

Skin corrosion/irritation

No data available

Serious eye damage/eye irritation

No data available

Respiratory or skin sensitisation

No data available

Germ cell mutagenicity

No data available

Carcinogenicity

IARC: No component of this product present at levels greater than or equal to 0.1% is identified as probable, possible or confirmed human carcinogen by IARC.

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

OSHA: No component of this product present at levels greater than or equal to 0.1% is identified as a carcinogen or potential carcinogen by OSHA.

Reproductive toxicity

No data available

No data available

Specific target organ toxicity - single exposure

No data available

Specific target organ toxicity - repeated exposure

No data available

Aspiration hazard

No data available

Additional Information

RTECS: KV9420000

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

12. ECOLOGICAL INFORMATION**12.1 Toxicity**

No data available

12.2 Persistence and degradability

No data available

12.3 Bioaccumulative potential

No data available

12.4 Mobility in soil

No data available

12.5 Results of PBT and vPvB assessment

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

12.6 Other adverse effects

An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Harmful to aquatic life.

13. DISPOSAL CONSIDERATIONS**13.1 Waste treatment methods****Product**

Burn in a chemical incinerator equipped with an afterburner and scrubber but exert extra care in igniting as this material is highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company. Contact a licensed professional waste disposal service to dispose of this material.

Contaminated packaging

Dispose of as unused product.

14. TRANSPORT INFORMATION**DOT (US)**

UN number: 1150 Class: 3 Packing group: II

Proper shipping name: 1,2-Dichloroethylene

Poison Inhalation Hazard: No

IMDG

UN number: 1150 Class: 3 Packing group: II EMS-No: F-E, S-D

Proper shipping name: 1,2-DICHLOROETHYLENE

IATA

UN number: 1150 Class: 3 Packing group: II

Proper shipping name: 1,2-Dichloroethylene

15. REGULATORY INFORMATION

SARA 302 Components

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

SARA 313 Components

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

SARA 311/312 Hazards

Fire Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
cis-Dichloroethylene	156-59-2	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
cis-Dichloroethylene	156-59-2	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
cis-Dichloroethylene	156-59-2	1993-04-24

California Prop. 65 Components

This product does not contain any chemicals known to State of California to cause cancer, birth defects, or any other reproductive harm.

16. OTHER INFORMATION

Full text of H-Statements referred to under sections 2 and 3.

Acute Tox.	Acute toxicity
Aquatic Acute	Acute aquatic toxicity
Aquatic Chronic	Chronic aquatic toxicity
Flam. Liq.	Flammable liquids
H225	Highly flammable liquid and vapour.
H332	Harmful if inhaled.
H402	Harmful to aquatic life.

HMIS Rating

Health hazard:	1
Chronic Health Hazard:	*
Flammability:	3
Physical Hazard	1

NFPA Rating

Health hazard:	2
Fire Hazard:	3
Reactivity Hazard:	0

Further information

Copyright 2015 Sigma-Aldrich Co. LLC. License granted to make unlimited paper copies for internal use only. The above information is believed to be correct but does not purport to be all inclusive and shall be used only as a guide. The information in this document is based on the present state of our knowledge and is applicable to the product with regard to appropriate safety precautions. It does not represent any guarantee of the properties of the product. Sigma-Aldrich Corporation and its Affiliates shall not be held liable for any damage resulting from handling or from contact with the above product. See www.sigma-aldrich.com and/or the reverse side of invoice or packing slip for additional terms and conditions of sale.

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956

Version: 4.4

Revision Date: 12/01/2015

Print Date: 07/13/2017

LEAD METAL SAFETY DATA SHEET

SECTION 1. IDENTIFICATION

Product Identity: Lead Metal

Trade Names and Synonyms: Lead; Pb; Plumbum; Metallic Lead; Inorganic Lead; ASTM B29; TADANAC Lead, Low-Alpha Lead.

Manufacturer:

Teck Metals Ltd.
Trail Operations
Trail, British Columbia
V1R 4L8
Emergency Telephone: 250-364-4214

Supplier:

In U.S.:
Teck American Metal Sales
Incorporated
501 North Riverpoint Blvd, Suite 300
Spokane, WA
USA, 99202

Other than U.S.:

Teck Metals Ltd.
#1700 – 11 King Street West
Toronto, Ontario
M5H 4C7

Preparer:

Teck Metals Ltd.
Suite 3300 – 550 Burrard Street
Vancouver, British Columbia
V6C 0B3

Date of Last Review: June 29, 2015.

Date of Last Edit: June 29, 2015.


Product Use: Used as a construction material for tank linings, piping, and equipment used in the manufacture of sulphuric acid and the refining and processing of petroleum; used in x-ray and atomic radiation shielding; used in the manufacture of paint pigments, organic and inorganic lead compounds, lead shot, lead wire for bullets, ballast, and lead solders; used as a bearing metal or alloy; used in the manufacture of storage batteries, ceramics, plastics, and electronic devices; used in the metallurgy of steel and other metals; and used in the form of lead oxide for batteries.

SECTION 2. HAZARDS IDENTIFICATION

CLASSIFICATION:

Health	Physical	Environmental
Acute Toxicity (Oral, Inhalation) – Does not meet criteria Skin Corrosion/Irritation – Does not meet criteria Eye Damage/Eye Irritation – Does not meet criteria Respiratory or Skin Sensitization – Does not meet criteria Mutagenicity – Does not meet criteria Carcinogenicity – Category 2 Reproductive Toxicity – Category 1A Specific Target Organ Toxicity Chronic Exposure – Category 1	Does not meet criteria for any Physical Hazard	Aquatic Toxicity – Short Term (Acute) Category 3

LABEL:

Symbols: 	Signal Word: DANGER
Hazard Statements DANGER! Causes damage to kidneys, blood-forming systems, central nervous system and digestive tract through prolonged or repeated exposure. May damage the unborn child. May cause harm to breast-fed children. Suspected of damaging fertility. Suspected of causing cancer. Harmful to aquatic life.	Precautionary Statements: Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves/protective clothing/eye protection. Do not breathe dust or fumes. Wash hands thoroughly after handling. Do not eat, drink or smoke when using this product. If exposed or concerned or you feel unwell: Get medical advice/attention. Avoid release to the environment.

Emergency Overview: A bluish-white to silvery-grey, heavy, soft metal that does not burn in bulk. Finely-divided lead dust clouds are a moderate fire and explosion hazard, however. When heated strongly in air, highly toxic lead oxide fumes can be generated. Inhalation or ingestion of lead may produce both acute and chronic health effects. Possible cancer and reproductive hazard. SCBA and full protective clothing are required for fire emergency response personnel.

Potential Health Effects: Inhalation or ingestion of lead may result in headache, nausea, vomiting, abdominal spasms, fatigue, sleep disturbances, weight loss, anemia and leg, arm, and joint pain. Prolonged exposure may also cause central nervous system damage, hypertension, gastrointestinal disturbances, anemia, kidney dysfunction and possible reproductive effects. Pregnant women should be protected from excessive exposure in order to prevent lead crossing the placental barrier and causing infant neurological disorders. Lead and inorganic lead compounds are listed as an *A3 Carcinogen (Confirmed Animal Carcinogen with Unknown Relevance to Humans)* by the ACGIH. IARC has listed lead compounds as *Group 2A Carcinogens (Probably Carcinogenic to Humans)* while lead metal is listed as *Group 2B (Possibly Carcinogenic to Humans)*. The NTP lists lead and lead compounds as *Reasonably Anticipated to be a Human Carcinogen*. OSHA and the EU does not currently list lead as a human carcinogen (see Toxicological Information, Section 11).

Potential Environmental Effects: Lead metal has relatively low bioavailability; however, compounds which it forms with other elements can be toxic to both aquatic and terrestrial organisms at low concentrations. These compounds can be particularly toxic in the aquatic environment. Lead bioaccumulates in plants and animals in both aquatic and terrestrial environments (see Ecological Information, Section 12).

SECTION 3. COMPOSITION / INFORMATION ON INGREDIENTS

HAZARDOUS COMPONENT	CAS Registry No.	CONCENTRATION (% wgt/wgt)
Lead	7439-92-1	99+%

Note: See Section 8 for Occupational Exposure Guidelines.

SECTION 4. FIRST AID MEASURES

Eye Contact: *Symptoms:* Eye irritation, redness. Gently brush product off face if necessary. Do not rub eye(s). Let the eye(s) water naturally for a few minutes. Look right and left, then up and down. If particle/dust does not dislodge, cautiously rinse eye(s) with lukewarm, gently flowing water for 5 minutes or until particle/dust is removed, while holding eyelid(s) open. If irritation persists, get medical advice/attention. DO NOT attempt to manually remove anything stuck to the eye.

Skin Contact: *Symptoms:* Skin soiling, mild irritation. Gently brush away excess dust. Wash gently and thoroughly with lukewarm, gently flowing water and non-abrasive soap for 5 minutes, or until product is removed. If skin irritation occurs or you feel unwell, get medical advice/attention. *Molten Metal:* Flush contact area to solidify and cool but do not attempt to remove encrusted material or clothing. Cover burns and seek medical attention immediately.

Inhalation: *Symptoms:* Respiratory irritation. Remove source of exposure or move person to fresh air and keep comfortable for breathing. Seek medical attention if you feel unwell.

Ingestion: *Symptoms:* Stomach upset. If you feel unwell or are concerned, get medical advice/attention.

SECTION 5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Massive metal is not flammable or combustible. Finely-divided lead dust or powder is a moderate fire hazard and moderate explosion hazard when dispersed in the air at high concentrations and exposed to heat, flame, or other ignition sources. Explosions may also occur upon contact with certain incompatible materials (see Stability and Reactivity, Section 10).

Extinguishing Media: Use any means of extinction appropriate for surrounding fire conditions such as water spray, carbon dioxide, dry chemical, or foam.

Fire Fighting: Do not use direct water streams on fires where molten metal is present, due to the risk of a steam explosion that could potentially eject molten metal uncontrollably. Use a fine water mist on the front-running edge of the spill and on the top of the molten metal to cool and solidify it. If possible, move solid material from fire area or cool material exposed to flame to prevent melting of the metal ingots. Highly toxic lead oxide fumes may evolve in fires. Fire fighters must be fully trained and wear full protective clothing including an approved, self-contained breathing apparatus which supplies a positive air pressure within a full face-piece mask.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Procedures for Cleanup: Control source of spillage if possible to do so safely. Restrict access to the area until completion of clean-up. Clean up spilled material immediately, observing precautions outlined below. Molten metal should be allowed to solidify before cleanup. If solid metal, wear gloves, pick up and return to process. If dust, wear recommended personal protective equipment (see below) and use methods which will minimize dust generation (e.g., vacuum solids). Return uncontaminated spilled material to the process if possible. Place contaminated material in suitable labelled containers for later recovery or disposal. Treat or dispose of waste material in accordance with all local, regional, and national requirements.

Personal Precautions: Persons responding to an accidental release should wear protective clothing, gloves and a respirator (see also Section 8). Close-fitting safety goggles may be necessary in some circumstances to prevent eye contact with dust and fume. Where molten metal is involved, wear heat-resistant gloves and suitable clothing for protection from hot-metal splash as well as a respirator to protect against inhalation of lead fume. Workers should wash and change clothing following cleanup of a lead spill to prevent personal contamination with lead dust.

Environmental Precautions: Lead metal has low bioavailability; however, compounds which it forms with other elements can be toxic to aquatic and terrestrial organisms. Releases of the product to water and soil should be prevented.

SECTION 7. HANDLING AND STORAGE

Store in a DRY, covered area, separate from strong acids, other incompatible materials, active metals and food or feedstuffs. Solid metal suspected of containing moisture should be THOROUGHLY DRIED before being added to a molten bath. Otherwise, entrained moisture could expand explosively and spatter molten metal out of the bath. No special packaging materials are required. Lead metal, in contact with wood or other surfaces, may leave traces of lead particulate that can accumulate over time. Cleaning or disposal of these surfaces requires review to ensure that any effluent or solid waste disposal meets the requirements of regulations in the applicable jurisdiction.

SECTION 8. EXPOSURE CONTROLS / PERSONAL PROTECTION

Occupational Exposure Guidelines:

<u>Component</u>	<u>ACGIH TLV</u>	<u>OSHA PEL</u>	<u>NIOSH REL</u>
Lead	0.05 mg/m ³	0.05 mg/m ³	0.05 mg/m ³

NOTE: OEGs for individual jurisdictions may differ from those given above. Check with local authorities for the applicable OEGs in your jurisdiction.

ACGIH - American Conference of Governmental Industrial Hygienists; OSHA - Occupational Safety and Health Administration; NIOSH - National Institute for Occupational Safety and Health. TLV – Threshold Limit Value, PEL – Permissible Exposure Limit, REL – Recommended Exposure Limit.

NOTE: The selection of the necessary level of engineering controls and personal protective equipment will vary depending upon the conditions of use and the potential for exposure. The following are therefore only general guidelines that may not fit all circumstances. Control measures to consider include:

Ventilation: Use adequate local or general ventilation to maintain the concentration of lead fumes in the working environment well below recommended occupational exposure limits. Supply sufficient replacement air to make up for air removed by the exhaust system. Local exhaust is recommended for melting, casting, welding, grinding, flame cutting or burning, and use of lead powders.

Protective Clothing: Gloves and coveralls or other work clothing are recommended to prevent prolonged or repeated direct skin contact when lead is processed. Appropriate eye protection should be worn where fume or dust is generated. Where hot or molten metal is handled, heat resistant gloves, goggles or face shield, and clothing to protect from radiant heat and hot metal splash should be worn. Safety type boots are recommended.

Respirators: Where lead dust or fumes are generated and cannot be controlled to within acceptable levels by engineering means, use appropriate NIOSH-approved respiratory protection equipment (a 42CFR84 Class N, R or P-100 particulate filter cartridge). When exposure levels are obviously high but the actual concentration is unknown, a self-contained breathing apparatus which supplies a positive air pressure within a full face-piece mask should be worn.

General Hygiene Considerations: Do not eat, drink or smoke in work areas. Thoroughly wash hands before eating, drinking, or smoking in appropriate, designated areas as well as at the end of the workday. A double locker-shower system with separate clean and dirty sides is usually required for lead handling operations to avoid cross-contamination of street clothes. Contaminated clothing should be changed frequently and laundered before each reuse. Inform laundry personnel of contaminants' hazards. Workers should not take dirty work clothes home and launder them with other personal clothing.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance: Malleable, bluish-white to silvery-grey solid metal	Odour: None	Odour Threshold: Not Applicable	pH: Not Applicable
Vapour Pressure: (negligible @ 20°C)	Vapour Density: Not Applicable	Melting Point/Range: 328°C	Boiling Point/Range: 1,740°C
Relative Density (Water = 1): 11.34	Evaporation Rate: Not Applicable	Coefficient of Water/Oil Distribution: Not Applicable	Solubility: Insoluble in water
Flash Point: None	Flammable Limits (LEL/UEL): Not Flammable	Auto-ignition Temperature: None	Decomposition Temperature: None

SECTION 10. STABILITY AND REACTIVITY

Stability & Reactivity: Massive metal is stable and not considered reactive under normal temperatures and pressures. Hazardous polymerization or runaway reactions will not occur. Freshly cut or cast lead surfaces tarnish rapidly due to the formation of an insoluble protective layer of basic lead carbonate.

Incompatibilities: Lead reacts vigorously with strong acids (e.g., hot concentrated nitric acid, boiling concentrated hydrochloric acid, etc.), strong oxidizers such as peroxides, chlorates, nitrates and halogen or interhalogen compounds such as chlorine trifluoride. Powdered lead metal in contact with disodium acetylide, chlorine trifluoride, sodium carbide or fused ammonium nitrate poses a risk of explosion. Solutions of sodium azide in contact with lead metal can form lead azide, which is a detonating compound. Vigorous reactions can also occur between molten lead and active metals, such as sodium, potassium, lithium and calcium. A lead-zirconium alloy (10-70% Zr) will ignite when struck with a hammer.

Hazardous Decomposition Products: High temperature operations such as oxy-acetylene cutting or burning, electric arc welding or overheating a molten bath will generate highly toxic lead oxide fume. Lead oxide is highly soluble in body fluids and the particle size of the metal fumes is largely within the respirable size range, which increases the likelihood of inhalation and deposition of the fume within the body.

SECTION 11. TOXICOLOGICAL INFORMATION

General: Lead accumulates in bone and body organs once it enters the body. Elimination from the body is slow. Initial and periodic medical examinations are advised for persons repeatedly exposed to levels at or above the exposure limits of lead dust or fumes. Once lead enters the body, it can affect a variety of organ systems, including the nervous system, kidneys, reproductive system, blood formation, and gastrointestinal system. The primary routes of exposure to lead are inhalation or ingestion of dust and fumes.

Acute:

Skin/Eye: Contact with dust or fume may cause local irritation but would not cause tissue damage.

Inhalation: Exposure to lead dust or fume may cause headache, nausea, vomiting, abdominal spasms, fatigue, sleep disturbances, weight loss, anemia, and pain in legs, arms, and joints. An intense, short-term exposure to lead could cause acute encephalopathy with seizures, coma, and death. However, short-term exposures of this magnitude are unlikely in industry today. Kidney damage, as well as anemia, can occur from acute exposure.

Ingestion: Symptoms due to ingestion of lead dust or fume would be similar to those from inhalation. Other health effects such as metallic taste in the mouth and constipation or bloody diarrhea might also occur.

Chronic:

Prolonged exposure to lead dust and fume may produce many of the symptoms of short-term exposure and may also cause central nervous system damage, gastrointestinal disturbances, anemia, and, rarely, wrist drop. Reduced hemoglobin production has been associated with low lead exposures. Symptoms of central nervous system damage due to moderate lead exposure include fatigue, headaches, tremors and hypertension. Very high lead exposure can result in lead encephalopathy with symptoms of hallucinations, convulsions, and delirium. Kidney dysfunction and possible injury has also been associated with chronic lead poisoning. Chronic over-exposure to lead has been implicated as a causative agent for the impairment of male and female reproductive capacity. Pregnant women should be protected from excessive exposure as lead can cross the placental barrier and unborn children may suffer neurological damage or developmental problems due to excessive lead exposure. Teratogenic and mutagenic effects from exposure to lead have been reported in some studies but not in others. The literature is inconsistent and no firm conclusions can be drawn at this time. Lead and lead compounds are listed as an *A3 Carcinogen (Confirmed Animal Carcinogen with Unknown Relevance to Humans)* by the ACGIH. IARC has listed lead compounds as *Group 2A Carcinogens (Probably Carcinogenic to Humans)* while lead metal is listed as *Group 2B (Possibly Carcinogenic to Humans)*. The NTP lists lead and lead compounds as *Reasonably Anticipated to be a Human Carcinogen*. OSHA and the EU do not currently list lead as a human carcinogen.

Animal Toxicity:

<u>Hazardous Ingredient:</u>	<u>Acute Oral Toxicity:</u>	<u>Acute Dermal Toxicity:</u>	<u>Acute Inhalation Toxicity:</u>
Lead	No Data	No Data	No Data

SECTION 12. ECOLOGICAL INFORMATION

While lead metal is relatively insoluble, its processing or extended exposure in aquatic and terrestrial environments may lead to the release of lead compounds in more bioavailable forms. While lead compounds are not particularly mobile in the aquatic environment, they can be toxic to aquatic organisms, especially fish, at low concentrations. Water hardness, pH and dissolved organic carbon content are three major factors which regulate the degree of lead toxicity. Lead in soil is generally neither very mobile nor bioavailable, as it can become strongly sorbed onto soil particles, increasingly so over time, to a degree related to physical properties of the soil. Lead bioaccumulates in plants and animals in both aquatic and terrestrial environments.

SECTION 13. DISPOSAL CONSIDERATIONS

If material cannot be returned to process or salvage, dispose of in accordance with applicable regulations.

SECTION 14. TRANSPORT INFORMATION

PROPER SHIPPING NAME Not a regulated product in ingot form.
TRANSPORT CANADA AND U.S. DOT CLASSIFICATION Not Applicable

TRANSPORT CANADA AND U.S. DOT PIN Not Applicable
MARINE POLLUTANT No
IMO CLASSIFICATION Not Regulated

SECTION 15. REGULATORY INFORMATION

U.S.

Ingredient Listed on TSCA Inventory Yes

Hazardous Under Hazard Communication Standard Yes

CERCLA Section 103 Hazardous Substances Lead RQ: 10 lbs. (4.54 kg.)*
*reporting not required when diameter of the pieces of solid metal released is equal to or exceeds 100 micrometers (0.004 inches).

EPCRA Section 302 Extremely Hazardous Substance No

EPCRA Section 311/312 Hazard Categories Delayed (chronic) health hazard - Carcinogen
Delayed (chronic) health hazard – Reproductive toxin

EPCRA Section 313 Toxic Release Inventory Lead CAS No. 7439-92-1
Percent by Weight - At least 99%

SECTION 16. OTHER INFORMATION

Date of Original Issue: July 23, 1997 **Version:** 01 (*First edition*)

Date of Latest Revision: June 29, 2015 **Version:** 13

The information in this Safety Data Sheet is based on the following references:

- American Conference of Governmental Industrial Hygienists, 2004, Documentation of the Threshold Limit Values and Biological Exposure Indices, Seventh Edition plus updates.
- American Conference of Governmental Industrial Hygienists, 2015, Threshold Limit Values for Chemical Substances and Physical Agents and Biological Exposure Indices.
- American Conference of Governmental Industrial Hygienists, Guide to Occupational Exposure Values – 2015.
- Bretherick's Handbook of Reactive Chemical Hazards, 20th Anniversary Edition. (P. G. Urben, Ed), 1995.
- Canadian Centre for Occupational Health and Safety, Hamilton, ON, CHEMINFO Record No. 608 - Lead (Rev. 2009-05).
- European Regulation (EC) No. 1272/2008 on classification, labelling and packaging of substances and mixtures, amending and repealing directives 67/548/EEC and 1999/45/EC, and amending Regulation (EC) No 1907/2006 (REACH).
- Health Canada, SOR/2015-17, Hazardous Products Regulations, 30 January 2015.
- International Agency for Research on Cancer (IARC), Monographs on the Evaluation of the Carcinogenic Risk of Chemicals to Man, 1972 – present, (multi-volume work), World Health Organization, Geneva.
- International Chemical Safety Cards (WHO/IPCS/ILO), ICSC:0052 - Lead.
- Merck & Co., Inc., 2001, The Merck Index, An Encyclopedia of Chemicals, Drugs, and Biologicals, Thirteenth Edition.
- National Library of Medicine, National Toxicology Information Program, Hazardous Substance Data Bank (online version).
- Patty's Toxicology, Fifth Edition, 2001: E. Bingham, B. Cohrssen & C.H. Powell, Ed.
- U.S. Dept. of Health and Human Services, National Institute of Environmental Health Sciences, National Toxicology Program (NTP), 13th Report on Carcinogens, October 2014.
- U.S. Dept. of Health and Human Services, National Institute for Occupational Safety and Health, NIOSH Pocket Guide to Chemical Hazards, on-line edition.
- U.S. Dept. of Health and Human Services, Public Health Service, Agency for Toxic Substances and Disease Registry, Toxicological Profile for Lead, September 2005.
- U.S. Occupational Safety and Health Administration, 1989, Code of Federal Regulations, Title 29, Part 1910.

Notice to Reader

Although reasonable precautions have been taken in the preparation of the data contained herein, it is offered solely for your information, consideration and investigation. Teck American Metal Sales Incorporated and Teck Metals Ltd. extend no warranty and assume no responsibility for the accuracy of the content and expressly disclaim all liability for reliance thereon. This safety data sheet provides guidelines for the safe handling and processing of this product; it does not and cannot advise on all possible situations. Therefore, your specific use of this product should be evaluated to determine if additional precautions are required. Individuals exposed to this product should read and understand this information and be provided pertinent training prior to working with this product.

SAFETY DATA SHEET

Creation Date 27-Jan-2010

Revision Date 24-May-2017

Revision Number 5

1. Identification

Product Name	Methylene chloride
Cat No. :	D37-1; D37-4; D37-20; D37-200; D37-200LC; D37-500; D37FB-19; D37FB-50; D37FB-115; D37FB-200; D37POP-19; D37POPB-50; D37POPB-200; D37RB-19; D37RB-50; D37RB-115; D37RB-200; D37RS-19; D37RS-28; D37RS-50; D37RS-115; D37RS-200; D37SK-4; D37SK-4LC; D37SS-28; D37SS-50; D37SS-115; D37SS-200; D37SS-1350
Synonyms	Dichloromethane; DCM
Recommended Use	Laboratory chemicals.
Uses advised against	Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company

Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number

CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Carcinogenicity	Category 1B
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Central nervous system (CNS).	

Label Elements

Signal Word

Danger

Hazard Statements

Causes skin irritation
Causes serious eye irritation
May cause drowsiness or dizziness
May cause cancer

**Precautionary Statements****Prevention**

Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Wear eye/face protection
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area

Response

IF exposed or concerned: Get medical attention/advice

Inhalation

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

Skin

IF ON SKIN: Wash with plenty of soap and water
If skin irritation occurs: Get medical advice/attention
Take off contaminated clothing and wash before reuse

Eyes

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention

Storage

Store locked up
Store in a well-ventilated place. Keep container tightly closed

Disposal

Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)

WARNING! This product contains a chemical known in the State of California to cause cancer.

3. Composition / information on ingredients

Component	CAS-No	Weight %
Methylene chloride	75-09-2	>99.5

4. First-aid measures

General Advice	If symptoms persist, call a physician.
Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.
Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.
Inhalation	Move to fresh air. If breathing is difficult, give oxygen. Obtain medical attention.
Ingestion	Do not induce vomiting. Call a physician or Poison Control Center immediately.
Most important symptoms/effects	Breathing difficulties. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Unsuitable Extinguishing Media No information available

Flash Point No information available

Method - No information available

Autoignition Temperature 556 °C / 1032.8 °F

Explosion Limits

Upper 23 vol %

Lower 13 vol %

Sensitivity to Mechanical Impact No information available

Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical

Thermal decomposition can lead to release of irritating gases and vapors. Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products

Carbon monoxide (CO) Carbon dioxide (CO₂) Hydrogen chloride gas Phosgene

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health
2

Flammability
1

Instability
0

Physical hazards
N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment. Ensure adequate ventilation. Avoid contact with skin, eyes and clothing. Keep people away from and upwind of spill/leak.

Environmental Precautions Should not be released into the environment. See Section 12 for additional ecological information.

Methods for Containment and Clean Up Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

7. Handling and storage

Handling Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Use only under a chemical fume hood.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Methylene chloride	TWA: 50 ppm	(Vacated) TWA: 500 ppm (Vacated) STEL: 2000 ppm (Vacated) Ceiling: 1000 ppm TWA: 25 ppm STEL: 125 ppm	IDLH: 2300 ppm	TWA: 100 ppm TWA: 330 mg/m ³ STEL: 500 ppm STEL: 1740 mg/m ³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Use only under a chemical fume hood. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Wear appropriate protective gloves and clothing to prevent skin exposure.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	sweet
Odor Threshold	No information available
pH	Not applicable
Melting Point/Range	-97 °C / -142.6 °F
Boiling Point/Range	39 °C / 102.2 °F
Flash Point	No information available
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	23 vol %
Lower	13 vol %
Vapor Pressure	350 mbar @ 20°C
Vapor Density	2.93 (Air = 1.0)
Specific Gravity	1.33
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	556 °C / 1032.8 °F
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	C H ₂ Cl ₂
Molecular Weight	84.93

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat.

Incompatible Materials Strong oxidizing agents, Strong acids, Amines

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO₂), Hydrogen chloride gas, Phosgene

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Methylene chloride	> 2000 mg/kg (Rat)	> 2000 mg/kg (Rat)	53 mg/L (Rat) 6 h 76000 mg/m ³ (Rat) 4 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Irritating to eyes and skin

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Methylene chloride	75-09-2	Group 2A	Reasonably Anticipated	A3	X	A3

IARC: (International Agency for Research on Cancer)

NTP: (National Toxicity Program)

ACGIH: (American Conference of Governmental Industrial Hygienists)

Mexico - Occupational Exposure Limits - Carcinogens

IARC: (International Agency for Research on Cancer)

Group 1 - Carcinogenic to Humans

Group 2A - Probably Carcinogenic to Humans

Group 2B - Possibly Carcinogenic to Humans

NTP: (National Toxicity Program)

Known - Known Carcinogen

Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen

A1 - Known Human Carcinogen

A2 - Suspected Human Carcinogen

A3 - Animal Carcinogen

ACGIH: (American Conference of Governmental Industrial Hygienists)

Mexico - Occupational Exposure Limits - Carcinogens

A1 - Confirmed Human Carcinogen

A2 - Suspected Human Carcinogen

A3 - Confirmed Animal Carcinogen

A4 - Not Classifiable as a Human Carcinogen

A5 - Not Suspected as a Human Carcinogen

Mutagenic Effects Mutagenic effects have occurred in microorganisms.

Reproductive Effects Experiments have shown reproductive toxicity effects on laboratory animals.

Developmental Effects Developmental effects have occurred in experimental animals.

Teratogenicity No information available.

STOT - single exposure Central nervous system (CNS)

STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects, both acute and delayed Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information No information available

Other Adverse Effects Tumorigenic effects have been reported in experimental animals. See actual entry in RTECS for complete information.

12. Ecological information

Ecotoxicity

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Methylene chloride	EC50:>660 mg/L/96h	Pimephales promelas: LC50:193 mg/L/96h	EC50: 1 mg/L/24 h EC50: 2.88 mg/L/15 min	EC50: 140 mg/L/48h

Persistence and Degradability Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its volatility.

Component	log Pow
Methylene chloride	1.25

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Methylene chloride - 75-09-2	U080	-

14. Transport information

DOT

UN-No UN1593
 Proper Shipping Name DICHLOROMETHANE
 Hazard Class 6.1
 Packing Group III

TDG

UN-No UN1593
 Proper Shipping Name DICHLOROMETHANE
 Hazard Class 6.1
 Packing Group III

IATA

UN-No UN1593
 Proper Shipping Name Dichloromethane
 Hazard Class 6.1
 Packing Group III

IMDG/IMO

UN-No UN1593
 Proper Shipping Name Dichloromethane
 Hazard Class 6.1
 Packing Group III

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Methylene chloride	X	X	-	200-838-9	-		X	X	X	X	X

Legend:

X - Listed

E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.

F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.

N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated

polymer made with any free-radical initiator regardless of the amount used.

P - Indicates a commenced PMN substance

R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

S - Indicates a substance that is identified in a proposed or final Significant New Use Rule

T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.

XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B)).

Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.

Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b)

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Methylene chloride	75-09-2	>99.5	0.1

SARA 311/312 Hazard Categories

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Methylene chloride	-	-	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Methylene chloride	X		-

OSHA Occupational Safety and Health Administration

Component	Specifically Regulated Chemicals	Highly Hazardous Chemicals
Methylene chloride	125 ppm STEL 12.5 ppm Action Level 25 ppm TWA	-

CERCLA

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Methylene chloride	1000 lb 1 lb	-

California Proposition 65

This product contains the following proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Methylene chloride	75-09-2	Carcinogen	200 µg/day 50 µg/day	Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Methylene chloride	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ):	Y
DOT Marine Pollutant	N
DOT Severe Marine Pollutant	N

U.S. Department of Homeland Security

This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 27-Jan-2010

Revision Date 24-May-2017

Print Date 24-May-2017

Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SAFETY DATA SHEET

Creation Date 10-Dec-2009

Revision Date 26-May-2017

Revision Number 4

1. Identification

Product Name Tetrachloroethylene

Cat No. : AC445690000; ACR445690010; AC445690025; AC445691000

Synonyms Perchloroethylene

Recommended Use Laboratory chemicals.

Uses advised against Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet**Company**

Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Acros Organics
One Reagent Lane
Fair Lawn, NJ 07410

Emergency Telephone Number

For information **US** call: 001-800-ACROS-01 / **Europe** call: +32 14 57 52 11

Emergency Number **US**:001-201-796-7100 / **Europe**: +32 14 57 52 99

CHEMTREC Tel. No.**US**:001-800-424-9300 / **Europe**:001-703-527-3887

2. Hazard(s) identification**Classification**

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Skin Corrosion/irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Skin Sensitization	Category 1
Carcinogenicity	Category 1B
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Central nervous system (CNS).	
Specific target organ toxicity - (repeated exposure)	Category 2
Target Organs - Kidney, Liver, Blood.	

Label Elements**Signal Word**

Danger

Hazard Statements

Causes skin irritation
Causes serious eye irritation
May cause an allergic skin reaction
May cause drowsiness or dizziness
May cause cancer
May cause damage to organs through prolonged or repeated exposure

**Precautionary Statements****Prevention**

Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Contaminated work clothing should not be allowed out of the workplace
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear protective gloves/protective clothing/eye protection/face protection

Response

IF exposed or concerned: Get medical attention/advice

Inhalation

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

Skin

IF ON SKIN: Wash with plenty of soap and water
Take off contaminated clothing and wash before reuse
If skin irritation or rash occurs: Get medical advice/attention

Eyes

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention

Storage

Store locked up
Store in a well-ventilated place. Keep container tightly closed

Disposal

Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)

Toxic to aquatic life with long lasting effects

WARNING! This product contains a chemical known in the State of California to cause cancer.

3. Composition / information on ingredients

Component	CAS-No	Weight %
Tetrachloroethylene	127-18-4	>95

4. First-aid measures

General Advice

If symptoms persist, call a physician.

Eye Contact

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes.
Obtain medical attention.

Skin Contact

Wash off immediately with plenty of water for at least 15 minutes. If skin irritation persists, call a physician.

Inhalation

Move to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur.

Ingestion

Clean mouth with water and drink afterwards plenty of water.

Most important symptoms/effects	None reasonably foreseeable. May cause allergic skin reaction. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.
Unsuitable Extinguishing Media	No information available
Flash Point	No information available
Method -	No information available
Autoignition Temperature	No information available
Explosion Limits	
Upper	No data available
Lower	No data available
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical

Thermal decomposition can lead to release of irritating gases and vapors. Containers may explode when heated.

Hazardous Combustion Products

Chlorine Hydrogen chloride gas Phosgene

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health
2

Flammability
0

Instability
0

Physical hazards
N/A

6. Accidental release measures

Personal Precautions	Use personal protective equipment. Ensure adequate ventilation.
Environmental Precautions	Do not flush into surface water or sanitary sewer system.

Methods for Containment and Clean Up Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

7. Handling and storage

Handling Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Ensure adequate ventilation. Avoid ingestion and inhalation.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from sunlight.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Tetrachloroethylene	TWA: 25 ppm STEL: 100 ppm	(Vacated) TWA: 25 ppm (Vacated) TWA: 170 mg/m ³ Ceiling: 200 ppm TWA: 100 ppm	IDLH: 150 ppm	TWA: 100 ppm TWA: 670 mg/m ³ TWA: 200 ppm TWA: 1250 mg/m ³ STEL: 200 ppm STEL: 1340 mg/m ³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Use only under a chemical fume hood. Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Long sleeved clothing.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	Characteristic, sweet
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-22 °C / -7.6 °F
Boiling Point/Range	120 - 122 °C / 248 - 251.6 °F @ 760 mmHg
Flash Point	No information available
Evaporation Rate	6.0 (Ether = 1.0)
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	18 mbar @ 20 °C
Vapor Density	No information available
Density	1.619
Specific Gravity	1.625
Solubility	0.15 g/L water (20°C)
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	> 150°C
Viscosity	0.89 mPa s at 20 °C
Molecular Formula	C2 Cl4
Molecular Weight	165.83

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat. Exposure to moist air or water.

Incompatible Materials Strong acids, Strong oxidizing agents, Strong bases, Metals, Zinc, Amines, Aluminium

Hazardous Decomposition Products Chlorine, Hydrogen chloride gas, Phosgene

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Tetrachloroethylene	LD50 = 2629 mg/kg (Rat)	LD50 > 10000 mg/kg (Rat)	LC50 = 27.8 mg/L (Rat) 4 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Irritating to eyes and skin

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Tetrachloroethylene	127-18-4	Group 2A	Reasonably Anticipated	A3	X	A3

IARC: (International Agency for Research on Cancer)

NTP: (National Toxicity Program)

ACGIH: (American Conference of Governmental Industrial Hygienists)

Mexico - Occupational Exposure Limits - Carcinogens

IARC: (International Agency for Research on Cancer)

Group 1 - Carcinogenic to Humans

Group 2A - Probably Carcinogenic to Humans

Group 2B - Possibly Carcinogenic to Humans

NTP: (National Toxicity Program)

Known - Known Carcinogen

Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen

A1 - Known Human Carcinogen

A2 - Suspected Human Carcinogen

A3 - Animal Carcinogen

ACGIH: (American Conference of Governmental Industrial Hygienists)

Mexico - Occupational Exposure Limits - Carcinogens

A1 - Confirmed Human Carcinogen

A2 - Suspected Human Carcinogen

A3 - Confirmed Animal Carcinogen

A4 - Not Classifiable as a Human Carcinogen

A5 - Not Suspected as a Human Carcinogen

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Central nervous system (CNS)

STOT - repeated exposure Kidney Liver Blood

Aspiration hazard No information available

Symptoms / effects, both acute and delayed Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest

pain, muscle pain or flushing

Endocrine Disruptor Information

Component	EU - Endocrine Disruptors Candidate List	EU - Endocrine Disruptors - Evaluated Substances	Japan - Endocrine Disruptor Information
Tetrachloroethylene	Group II Chemical	Not applicable	Not applicable

Other Adverse Effects Tumorigenic effects have been reported in experimental animals.

12. Ecological information

Ecotoxicity

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. The product contains following substances which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Tetrachloroethylene	EC50: > 500 mg/L, 96h (Pseudokirchneriella subcapitata)	LC50: 4.73 - 5.27 mg/L, 96h flow-through (Oncorhynchus mykiss) LC50: 11.0 - 15.0 mg/L, 96h static (Lepomis macrochirus) LC50: 8.6 - 13.5 mg/L, 96h static (Pimephales promelas) LC50: 12.4 - 14.4 mg/L, 96h flow-through (Pimephales promelas)	EC50 = 100 mg/L 24 h EC50 = 112 mg/L 24 h EC50 = 120.0 mg/L 30 min	EC50: 6.1 - 9.0 mg/L, 48h Static (Daphnia magna)

Persistence and Degradability Insoluble in water Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility . Is not likely mobile in the environment due its low water solubility. Will likely be mobile in the environment due to its volatility.

Component	log Pow
Tetrachloroethylene	2.88

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Tetrachloroethylene - 127-18-4	U210	-

14. Transport information

DOT

UN-No UN1897
 Proper Shipping Name TETRACHLOROETHYLENE
 Hazard Class 6.1
 Packing Group III

TDG

UN-No UN1897
 Proper Shipping Name TETRACHLOROETHYLENE
 Hazard Class 6.1
 Packing Group III

IATA

UN-No UN1897
 Proper Shipping Name TETRACHLOROETHYLENE
 Hazard Class 6.1

Packing Group	III
IMDG/IMO	
UN-No	UN1897
Proper Shipping Name	TETRACHLOROETHYLENE
Hazard Class	6.1
Subsidiary Hazard Class	P
Packing Group	III

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Tetrachloroethylene	X	X	-	204-825-9	-		X	X	X	X	X

Legend:

X - Listed

E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.

F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.

N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.

P - Indicates a commenced PMN substance

R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

S - Indicates a substance that is identified in a proposed or final Significant New Use Rule

T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.

XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B)).

Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.

Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Tetrachloroethylene	127-18-4	>95	0.1

SARA 311/312 Hazard Categories

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Tetrachloroethylene	-	-	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Tetrachloroethylene	X		-

OSHA Occupational Safety and Health Administration

Not applicable

CERCLA

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive

Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Tetrachloroethylene	100 lb 1 lb	-

California Proposition 65 This product contains the following proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Tetrachloroethylene	127-18-4	Carcinogen	14 µg/day	Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Tetrachloroethylene	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant Y
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security

This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 10-Dec-2009
Revision Date 26-May-2017
Print Date 26-May-2017

Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SAFETY DATA SHEET

Creation Date 03-Feb-2010

Revision Date 14-Jul-2016

Revision Number 2

1. Identification

Product Name Trichloroethylene

Cat No. : T340-4; T341-4; T341-20; T341-500; T403-4

Synonyms Trichloroethene (Stabilized/Technical/Electronic/Certified ACS)

Recommended Use Laboratory chemicals.

Uses advised against

Details of the supplier of the safety data sheet

Company

Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number

CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Skin Corrosion/irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Skin Sensitization	Category 1
Germ Cell Mutagenicity	Category 2
Carcinogenicity	Category 1A
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Central nervous system (CNS).	
Specific target organ toxicity - (repeated exposure)	Category 2
Target Organs - Kidney, Liver, Heart, spleen, Blood.	

Label Elements**Signal Word**

Danger

Hazard Statements

Causes skin irritation
Causes serious eye irritation
May cause an allergic skin reaction
May cause drowsiness or dizziness
Suspected of causing genetic defects
May cause cancer
May cause damage to organs through prolonged or repeated exposure

**Precautionary Statements****Prevention**

Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Contaminated work clothing should not be allowed out of the workplace
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear protective gloves/protective clothing/eye protection/face protection

Response

IF exposed or concerned: Get medical attention/advice

Inhalation

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

Skin

IF ON SKIN: Wash with plenty of soap and water
Take off contaminated clothing and wash before reuse
If skin irritation or rash occurs: Get medical advice/attention

Eyes

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention

Storage

Store locked up
Store in a well-ventilated place. Keep container tightly closed

Disposal

Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)

Harmful to aquatic life with long lasting effects
WARNING! This product contains a chemical known in the State of California to cause cancer, birth defects or other reproductive harm.

3. Composition / information on ingredients

Component	CAS-No	Weight %
Trichloroethylene	79-01-6	100

4. First-aid measures

General Advice

Show this safety data sheet to the doctor in attendance. Immediate medical attention is required.

Eye Contact

Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. In the case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

Skin Contact

Wash off immediately with plenty of water for at least 15 minutes. Immediate medical attention is required.

Inhalation

Move to fresh air. If not breathing, give artificial respiration. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a

pocket mask equipped with a one-way valve or other proper respiratory medical device. Immediate medical attention is required.

Ingestion Do not induce vomiting. Call a physician or Poison Control Center immediately.

Most important symptoms/effects None reasonably foreseeable. May cause allergic skin reaction. Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide.

Unsuitable Extinguishing Media No information available

Flash Point No information available
Method - No information available

Autoignition Temperature 410 °C / 770 °F

Explosion Limits

Upper 10.5 vol %

Lower 8 vol %

Oxidizing Properties Not oxidising

Sensitivity to Mechanical Impact No information available

Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical

Thermal decomposition can lead to release of irritating gases and vapors. Containers may explode when heated. Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products

Hydrogen chloride gas Chlorine Phosgene Carbon monoxide (CO) Carbon dioxide (CO₂)

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health
2

Flammability
1

Instability
0

Physical hazards
N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment. Keep people away from and upwind of spill/leak. Evacuate personnel to safe areas.

Environmental Precautions Should not be released into the environment. Do not flush into surface water or sanitary sewer system.

Methods for Containment and Clean Up Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

7. Handling and storage

Handling Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Use only under a chemical fume hood. Do not breathe vapors or spray mist. Do not ingest.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Protect from light. Do not store in aluminum containers.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Trichloroethylene	TWA: 10 ppm STEL: 25 ppm	(Vacated) TWA: 50 ppm (Vacated) TWA: 270 mg/m ³ Ceiling: 200 ppm (Vacated) STEL: 200 ppm (Vacated) STEL: 1080 mg/m ³ TWA: 100 ppm	IDLH: 1000 ppm	TWA: 100 ppm TWA: 535 mg/m ³ STEL: 200 ppm STEL: 1080 mg/m ³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures

Use only under a chemical fume hood. Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

Eye/face Protection

Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection

Long sleeved clothing.

Respiratory Protection

Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures

Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	Characteristic
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-85 °C / -121 °F
Boiling Point/Range	87 °C / 188.6 °F
Flash Point	No information available
Evaporation Rate	0.69 (Carbon Tetrachloride = 1.0)
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	10.5 vol %
Lower	8 vol %
Vapor Pressure	77.3 mbar @ 20 °C
Vapor Density	4.5 (Air = 1.0)
Specific Gravity	1.460
Solubility	Slightly soluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	410 °C / 770 °F
Decomposition Temperature	> 120°C
Viscosity	0.55 mPa.s (25°C)

Molecular Formula C₂ H Cl₃
Molecular Weight 131.39

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Light sensitive.

Conditions to Avoid Incompatible products. Excess heat. Exposure to light. Exposure to moist air or water.

Incompatible Materials Strong oxidizing agents, Strong bases, Amines, Alkali metals, Metals,

Hazardous Decomposition Products Hydrogen chloride gas, Chlorine, Phosgene, Carbon monoxide (CO), Carbon dioxide (CO₂)

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Trichloroethylene	LD50 = 4290 mg/kg (Rat) LD50 = 4920 mg/kg (Rat)	LD50 > 20 g/kg (Rabbit) LD50 = 29000 mg/kg (Rabbit)	LC50 = 26 mg/L (Rat) 4 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation Irritating to eyes and skin

Sensitization No information available

Carcinogenicity The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Trichloroethylene	79-01-6	Group 1	Reasonably Anticipated	A2	X	Not listed

IARC: (International Agency for Research on Cancer)

NTP: (National Toxicity Program)

ACGIH: (American Conference of Governmental Industrial Hygienists)

IARC: (International Agency for Research on Cancer)

Group 1 - Carcinogenic to Humans

Group 2A - Probably Carcinogenic to Humans

Group 2B - Possibly Carcinogenic to Humans

NTP: (National Toxicity Program)

Known - Known Carcinogen

Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen

A1 - Known Human Carcinogen

A2 - Suspected Human Carcinogen

A3 - Animal Carcinogen

ACGIH: (American Conference of Governmental Industrial Hygienists)

Mutagenic Effects Mutagenic effects have occurred in humans.

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure	Central nervous system (CNS)
STOT - repeated exposure	Kidney Liver Heart spleen Blood
Aspiration hazard	No information available
Symptoms / effects, both acute and delayed	Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: Symptoms of allergic reaction may include rash, itching, swelling, trouble breathing, tingling of the hands and feet, dizziness, lightheadedness, chest pain, muscle pain or flushing
Endocrine Disruptor Information	No information available
Other Adverse Effects	The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Harmful to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Do not empty into drains. The product contains following substances which are hazardous for the environment. Contains a substance which is: Harmful to aquatic organisms. Toxic to aquatic organisms.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Trichloroethylene	EC50: = 175 mg/L, 96h (Pseudokirchneriella subcapitata) EC50: = 450 mg/L, 96h (Desmodesmus subspicatus)	LC50: 39 - 54 mg/L, 96h static (Lepomis macrochirus) LC50: 31.4 - 71.8 mg/L, 96h flow-through (Pimephales promelas)	EC50 = 0.81 mg/L 24 h EC50 = 115 mg/L 10 min EC50 = 190 mg/L 15 min EC50 = 235 mg/L 24 h EC50 = 410 mg/L 24 h EC50 = 975 mg/L 5 min	EC50: = 2.2 mg/L, 48h (Daphnia magna)

Persistence and Degradability Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility Will likely be mobile in the environment due to its volatility.

Component	log Pow
Trichloroethylene	2.4

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Trichloroethylene - 79-01-6	U228	-

14. Transport information

DOT

UN-No	UN1710
Proper Shipping Name	TRICHLOROETHYLENE
Hazard Class	6.1
Packing Group	III

TDG

UN-No	UN1710
Proper Shipping Name	TRICHLOROETHYLENE
Hazard Class	6.1
Packing Group	III

IATA

UN-No	UN1710
Proper Shipping Name	TRICHLOROETHYLENE

Hazard Class	6.1
Packing Group	III
IMDG/IMO	
UN-No	UN1710
Proper Shipping Name	TRICHLOROETHYLENE
Hazard Class	6.1
Packing Group	III

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Trichloroethylene	X	X	-	201-167-4	-		X	X	X	X	X

Legend:

X - Listed

E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.

F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.

N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.

P - Indicates a commenced PMN substance

R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

S - Indicates a substance that is identified in a proposed or final Significant New Use Rule

T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.

XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B)).

Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.

Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

Component	TSCA 12(b)
Trichloroethylene	Section 5

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Trichloroethylene	79-01-6	100	0.1

SARA 311/312 Hazard Categories

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	No
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Trichloroethylene	X	100 lb	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Trichloroethylene	X		-

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
Trichloroethylene	100 lb 1 lb	-

California Proposition 65 This product contains the following proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Trichloroethylene	79-01-6	Carcinogen Developmental Male Reproductive	14 µg/day 50 µg/day	Developmental Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Trichloroethylene	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security

This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 03-Feb-2010

Revision Date 14-Jul-2016

Print Date 14-Jul-2016

Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

SAFETY DATA SHEET

Creation Date 11-Jun-2009

Revision Date 24-May-2017

Revision Number 3

1. Identification

Product Name Toluene

Cat No. : T326F-1GAL; T326P-4; T326S-20; T326S-20LC

Synonyms Tol; Methylbenzene

Recommended Use Laboratory chemicals.

Uses advised against Not for food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company

Fisher Scientific
One Reagent Lane
Fair Lawn, NJ 07410
Tel: (201) 796-7100

Emergency Telephone Number

CHEMTREC®, Inside the USA: 800-424-9300
CHEMTREC®, Outside the USA: 001-703-527-3887

2. Hazard(s) identification

Classification

This chemical is considered hazardous by the 2012 OSHA Hazard Communication Standard (29 CFR 1910.1200)

Flammable liquids	Category 2
Skin Corrosion/Irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Reproductive Toxicity	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system, Central nervous system (CNS).	
Specific target organ toxicity - (repeated exposure)	Category 2
Target Organs - Kidney, Liver, spleen, Blood.	
Aspiration Toxicity	Category 1

Label Elements

Signal Word

Danger

Hazard Statements

Highly flammable liquid and vapor
May be fatal if swallowed and enters airways
Causes skin irritation
Causes serious eye irritation
May cause respiratory irritation
May cause drowsiness or dizziness
Suspected of damaging the unborn child
Causes damage to organs through prolonged or repeated exposure

**Precautionary Statements****Prevention**

Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Wash face, hands and any exposed skin thoroughly after handling
Wear eye/face protection
Do not breathe dust/fume/gas/mist/vapors/spray
Do not eat, drink or smoke when using this product
Use only outdoors or in a well-ventilated area
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Keep cool

Response

IF exposed or concerned: Get medical attention/advice

Inhalation

IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing

Skin

If skin irritation occurs: Get medical advice/attention
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse

Eyes

IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention

Ingestion

IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Do NOT induce vomiting

Fire

In case of fire: Use CO₂, dry chemical, or foam for extinction

Storage

Store locked up
Store in a well-ventilated place. Keep container tightly closed

Disposal

Dispose of contents/container to an approved waste disposal plant

Hazards not otherwise classified (HNOC)

WARNING! This product contains a chemical known in the State of California to cause birth defects or other reproductive harm.

3. Composition / information on ingredients

Component	CAS-No	Weight %
Toluene	108-88-3	>95

4. First-aid measures

General Advice	If symptoms persist, call a physician.
Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Obtain medical attention.
Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. If skin irritation persists, call a physician.
Inhalation	Move to fresh air. If not breathing, give artificial respiration. Get medical attention if symptoms occur. Risk of serious damage to the lungs.
Ingestion	Clean mouth with water and drink afterwards plenty of water. Do not induce vomiting. Call a physician or Poison Control Center immediately. If vomiting occurs naturally, have victim lean forward.
Most important symptoms/effects	Breathing difficulties. Causes central nervous system depression: Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	Use water spray, alcohol-resistant foam, dry chemical or carbon dioxide. Cool closed containers exposed to fire with water spray.
Unsuitable Extinguishing Media	No information available
Flash Point	4 °C / 39.2 °F
Method -	No information available
Autoignition Temperature	535 °C / 995 °F
Explosion Limits	
Upper	7.1 vol %
Lower	1.1 vol %
Oxidizing Properties	Not oxidising
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical

Flammable. Containers may explode when heated. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back.

Hazardous Combustion Products

Carbon monoxide (CO) Carbon dioxide (CO₂)

Protective Equipment and Precautions for Firefighters

As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health
3

Flammability
3

Instability
0

Physical hazards
N/A

6. Accidental release measures

Personal Precautions	Use personal protective equipment. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges.
Environmental Precautions	Should not be released into the environment. Do not flush into surface water or sanitary sewer system.

Methods for Containment and Clean Up Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

7. Handling and storage

Handling Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Ensure adequate ventilation. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. To avoid ignition of vapors by static electricity discharge, all metal parts of the equipment must be grounded. Take precautionary measures against static discharges.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Flammables area. Keep away from heat and sources of ignition.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Toluene	TWA: 20 ppm	(Vacated) TWA: 100 ppm (Vacated) TWA: 375 mg/m ³ Ceiling: 300 ppm (Vacated) STEL: 150 ppm (Vacated) STEL: 560 mg/m ³ TWA: 200 ppm	IDLH: 500 ppm TWA: 100 ppm TWA: 375 mg/m ³ STEL: 150 ppm STEL: 560 mg/m ³	TWA: 50 ppm TWA: 188 mg/m ³

Legend

ACGIH - American Conference of Governmental Industrial Hygienists

OSHA - Occupational Safety and Health Administration

NIOSH IDLH: The National Institute for Occupational Safety and Health Immediately Dangerous to Life or Health

Engineering Measures Ensure that eyewash stations and safety showers are close to the workstation location. Use explosion-proof electrical/ventilating/lighting/equipment. Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment

Eye/face Protection Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin and body protection Long sleeved clothing.

Respiratory Protection Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Hygiene Measures Handle in accordance with good industrial hygiene and safety practice.

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	aromatic
Odor Threshold	1.74 ppm
pH	Not applicable
Melting Point/Range	-95 °C / -139 °F
Boiling Point/Range	111 °C / 231.8 °F @ 760 mmHg
Flash Point	4 °C / 39.2 °F

Evaporation Rate	2.4 (Butyl acetate = 1.0)
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	7.1 vol %
Lower	1.1 vol %
Vapor Pressure	29 mbar @ 20 °C
Vapor Density	3.1
Specific Gravity	0.866
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	535 °C / 995 °F
Decomposition Temperature	No information available
Viscosity	0.6 mPa.s @ 20 °C
Molecular Formula	C7 H8
Molecular Weight	92.14

10. Stability and reactivity

Reactive Hazard	None known, based on information available
Stability	Stable under normal conditions.
Conditions to Avoid	Incompatible products. Excess heat. Keep away from open flames, hot surfaces and sources of ignition.
Incompatible Materials	Strong oxidizing agents, Strong acids, Strong bases, Halogenated compounds
Hazardous Decomposition Products	Carbon monoxide (CO), Carbon dioxide (CO ₂)
Hazardous Polymerization	Hazardous polymerization does not occur.
Hazardous Reactions	None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Toluene	> 5000 mg/kg (Rat)	LD50 = 12000 mg/kg (Rabbit)	26700 ppm (Rat) 1 h

Toxicologically Synergistic Products No information available

Delayed and immediate effects as well as chronic effects from short and long-term exposure

Irritation	Irritating to eyes, respiratory system and skin
Sensitization	No information available
Carcinogenicity	The table below indicates whether each agency has listed any ingredient as a carcinogen.

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Toluene	108-88-3	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects Not mutagenic in AMES Test

Reproductive Effects Experiments have shown reproductive toxicity effects on laboratory animals.

Developmental Effects Developmental effects have occurred in experimental animals.

Teratogenicity Possible risk of harm to the unborn child.

STOT - single exposure Respiratory system Central nervous system (CNS)
STOT - repeated exposure Kidney Liver spleen Blood

Aspiration hazard No information available

Symptoms / effects, both acute and delayed Causes central nervous system depression: Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Contains a substance which is: The product contains following substances which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Toluene	EC50: = 12.5 mg/L, 72h static (Pseudokirchneriella subcapitata) EC50: > 433 mg/L, 96h (Pseudokirchneriella subcapitata)	50-70 mg/L LC50 96 h 5-7 mg/L LC50 96 h 15-19 mg/L LC50 96 h 28 mg/L LC50 96 h 12 mg/L LC50 96 h	EC50 = 19.7 mg/L 30 min	EC50: = 11.5 mg/L, 48h (Daphnia magna) EC50: 5.46 - 9.83 mg/L, 48h Static (Daphnia magna)

Persistence and Degradability Soluble in water Persistence is unlikely based on information available.

Bioaccumulation/ Accumulation No information available.

Mobility . Will likely be mobile in the environment due to its water solubility.

Component	log Pow
Toluene	2.7

13. Disposal considerations

Waste Disposal Methods Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations to ensure complete and accurate classification.

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Toluene - 108-88-3	U220	-

14. Transport information

DOT

UN-No UN1294
 Proper Shipping Name TOLUENE
 Hazard Class 3
 Packing Group II

TDG

UN-No UN1294
 Proper Shipping Name TOLUENE
 Hazard Class 3
 Packing Group II

IATA

UN-No UN1294
 Proper Shipping Name TOLUENE
 Hazard Class 3
 Packing Group II

IMDG/IMO

UN-No UN1294
 Proper Shipping Name TOLUENE
 Hazard Class 3
 Packing Group II

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Toluene	X	X	-	203-625-9	-		X	X	X	X	X

Legend:

X - Listed

E - Indicates a substance that is the subject of a Section 5(e) Consent order under TSCA.

F - Indicates a substance that is the subject of a Section 5(f) Rule under TSCA.

N - Indicates a polymeric substance containing no free-radical initiator in its inventory name but is considered to cover the designated polymer made with any free-radical initiator regardless of the amount used.

P - Indicates a commenced PMN substance

R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

S - Indicates a substance that is identified in a proposed or final Significant New Use Rule

T - Indicates a substance that is the subject of a Section 4 test rule under TSCA.

XU - Indicates a substance exempt from reporting under the Inventory Update Rule, i.e. Partial Updating of the TSCA Inventory Data Base Production and Site Reports (40 CFR 710(B)).

Y1 - Indicates an exempt polymer that has a number-average molecular weight of 1,000 or greater.

Y2 - Indicates an exempt polymer that is a polyester and is made only from reactants included in a specified list of low concern reactants that comprises one of the eligibility criteria for the exemption rule.

U.S. Federal Regulations

TSCA 12(b) Not applicable

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Toluene	108-88-3	>95	1.0

SARA 311/312 Hazard Categories

Acute Health Hazard	Yes
Chronic Health Hazard	Yes
Fire Hazard	Yes
Sudden Release of Pressure Hazard	No
Reactive Hazard	No

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Toluene	X	1000 lb	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Toluene	X		-

OSHA Occupational Safety and Health Administration

Not applicable

CERCLA

This material, as supplied, contains one or more substances regulated as a hazardous substance under the Comprehensive Environmental Response Compensation and Liability Act (CERCLA) (40 CFR 302)

Component	Hazardous Substances RQs	CERCLA EHS RQs
-----------	--------------------------	----------------

Toluene	1000 lb 1 lb	-
---------	--------------	---

California Proposition 65 This product contains the following proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Toluene	108-88-3	Developmental	-	Developmental

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Toluene	X	X	X	X	X

U.S. Department of Transportation

Reportable Quantity (RQ): Y
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security

This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade Serious risk, Grade 3

16. Other information

Prepared By Regulatory Affairs
Thermo Fisher Scientific
Email: EMSDS.RA@thermofisher.com

Creation Date 11-Jun-2009
Revision Date 24-May-2017
Print Date 24-May-2017
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

The information provided in this Safety Data Sheet is correct to the best of our knowledge, information and belief at the date of its publication. The information given is designed only as a guidance for safe handling, use, processing, storage, transportation, disposal and release and is not to be considered a warranty or quality specification. The information relates only to the specific material designated and may not be valid for such material used in combination with any other materials or in any process, unless specified in the text

End of SDS

HEALTH & SAFETY PLAN

APPENDIX B

ONSITE SAFETY FORMS

Project: B + L Site RI Project No: 190500898
 Client: Ridgecrest Associates
 Location: 820 Linden Avenue, Pittsford, New York
 Start Date: _____

Documentation and Procedure Review

1. Risk Management Strategy (RMS1) form and/or Site Specific Health and Safety Plan signed and reviewed? ☐ Yes ☐ **No***
2. Emergency Response Plan reviewed? ☐ Yes ☐ **No*** ☐ N/A
3. Tested two-way communications (cell phone, satellite phone) and security measures? ☐ Yes ☐ **No***
4. Attended Client Site Health and Safety meeting? ☐ Yes ☐ **No*** ☐ N/A
5. Conducted Stantec site safety meeting with all workforces? ☐ Yes ☐ **No*** ☐ N/A
6. Are there any new or unexpected hazards not identified in the RMS1/HASP?
If yes, include in the Job Safety Analysis (JSA). ☐ Yes ☐ No
7. Working alone or remote work?
If yes, complete call in/out process – Safe Work form must be completed. ☐ Yes ☐ No

Notifications and Permits

8. Are work permits required for this site?
If yes, have they been completed and submitted as required? ☐ Yes ☐ No
☐ Yes ☐ **No***
9. Are utility locates required for this site?
If yes, have they been completed and reviewed? ☐ Yes ☐ No
☐ Yes ☐ **No***
10. Does the Client require any notification prior to starting the work?
If yes, has the notification been provided? ☐ Yes ☐ No
☐ Yes ☐ **No***

***Contact your Project Manager immediately.**

Work Description Provide a general description of the work to be conducted.

Personal Protective Equipment

List specific PPE as needed. Verify type and inspect condition.

- | | | |
|--|--|---|
| <input type="checkbox"/> Head Protection Type: _____ | <input type="checkbox"/> Hearing Protection: _____ | <input type="checkbox"/> Gloves Type: _____ |
| <input type="checkbox"/> Foot Protection Type: _____ | <input type="checkbox"/> Respiratory Protection: _____ | <input type="checkbox"/> Water Safety Gear: _____ |
| <input type="checkbox"/> Eye Protection Type: _____ | <input type="checkbox"/> Fire Retardant Coveralls: _____ | <input type="checkbox"/> _____ |
| <input type="checkbox"/> High Visibility Vest: _____ | <input type="checkbox"/> Fall Protection: _____ | <input type="checkbox"/> _____ |

Tools and Equipment

List specific equipment to be used. Verify type and inspect condition.

- | | | |
|--------------------------------|--------------------------------|--------------------------------|
| <input type="checkbox"/> _____ | <input type="checkbox"/> _____ | <input type="checkbox"/> _____ |
| <input type="checkbox"/> _____ | <input type="checkbox"/> _____ | <input type="checkbox"/> _____ |

Daily Tailgate Discussions/Subcontractor Input

Date:		Time:	Weather:
Start			
Mid-Day			
Post-Day			
Date:		Time:	Weather:
Start			
Mid-Day			
Post-Day			
Date:		Time:	Weather:
Start			
Mid-Day			
Post-Day			
Date:		Time:	Weather:
Start			
Mid-Day			
Post-Day			
Date:		Time:	Weather:
Start			
Mid-Day			
Post-Day			

FIELD LEVEL RISK ASSESSMENT (FIT FOR DUTY), 5 DAY – RMS 2

I know the hazards:

By signing here, you are stating the following:

1. I have been involved in the Job Safety Analysis (JSA) and understand the hazards and risk control actions associated with each task I am about to perform.
2. I understand the permit to work requirements applicable to the work I am about to perform (if it includes permitted activities).
3. I am aware that work that has not been risk-assessed must not be performed.
4. I am aware of my ability and obligation to **Stop Work** (*See below*).

I arrived and departed fit for duty (see Fit for Duty card for further information):

5. I am physically and mentally fit for duty.
6. I am not under the influence of any type of medication, drugs or alcohol that could affect my ability to work safely.
7. I am aware of my responsibility to bring any illness, injury (regardless of where or when it occurred), symptoms of soreness or discomfort, or fatigue issue I may have to the attention of the Crew Lead or Supervisor.
8. I sign out uninjured unless I have otherwise informed the Crew Lead or Supervisor.

Insert fitness level under corresponding time column: Fit for Duty = F Alternate Plan = AP Team Lead to contact Project Manager for any personnel identified as AP															
Individual Name/Company Name/Signature	Date:			Date:			Date:			Date:			Date:		
	Time:	Time:	Time:	Time:	Time:	Time:	Time:	Time:	Time:	Time:	Time:	Time:	Time:	Time:	Time:

I will STOP WORK any time anyone is concerned or uncertain about safety. **I will STOP WORK** if anyone identifies a hazard or additional mitigation not recorded. **I will** be alert to any changes in personnel or their fitness level (AP), conditions at the work site or hazards. If it is necessary to **STOP WORK**, I will reassess the task, hazards and mitigations; and then proceed only when safe to do so.

Conclusion of day: I certify that the planned work activities are completed for the day and all injuries and first aids have been reported via RMS3.

Signature of Crew Lead:	_____	Date:	_____
Signature of Crew Lead:	_____	Date:	_____
Signature of Crew Lead:	_____	Date:	_____
Signature of Crew Lead:	_____	Date:	_____
Signature of Crew Lead:	_____	Date:	_____




FIELD LEVEL RISK ASSESSMENT (FIT FOR DUTY), 5 DAY – RMS 2

Job Safety Analysis (JSA) Must be completed for all field activities.

Basic Job Steps	Potential Hazards	Controls to Reduce or Eliminate Hazard	Person Responsible

Review the hazard categories below and check the mitigation measures applicable to the identified scope of work.

Environmental Hazards <ul style="list-style-type: none"> 1. Work area clean <input type="checkbox"/> 2. Material storage identified <input type="checkbox"/> 3. Dust/Mist/Fume <input type="checkbox"/> 4. Noise in area <input type="checkbox"/> 5. Extreme temperatures <input type="checkbox"/> 6. Spill potential <input type="checkbox"/> 7. Waste containers needed <input type="checkbox"/> 8. Waste properly disposed <input type="checkbox"/> 9. Waste plan identified <input type="checkbox"/> 10. Excavation permit required <input type="checkbox"/> 11. Other workers in area <input type="checkbox"/> 12. Weather conditions <input type="checkbox"/> 13. MSDS reviewed <input type="checkbox"/> 	Access/Egress Hazards <ul style="list-style-type: none"> 23. Aerial life/Man basket (inspected & tagged) <input type="checkbox"/> 24. Scaffold (inspected & tagged) <input type="checkbox"/> 25. Ladders (tied off) <input type="checkbox"/> 26. Slips & trips <input type="checkbox"/> 27. Hoisting (tools, equipment) <input type="checkbox"/> 28. Evacuation (alarms, routes, ph. #) <input type="checkbox"/> 29. Confined space entry permit required <input type="checkbox"/> 	Rigging & Hoisting Hazards <ul style="list-style-type: none"> 38. Lift study required <input type="checkbox"/> 39. Proper tools used <input type="checkbox"/> 40. Tools inspected <input type="checkbox"/> 41. Equipment inspected <input type="checkbox"/> 42. Slings inspected <input type="checkbox"/> 43. Others working overhead/below <input type="checkbox"/> 44. Critical lift permit <input type="checkbox"/> 	
Ergonomic Hazards <ul style="list-style-type: none"> 14. Awkward body position <input type="checkbox"/> 15. Over extension <input type="checkbox"/> 16. Prolonged twisting/bending motion <input type="checkbox"/> 17. Working in a tight area <input type="checkbox"/> 18. Lift too heavy/awkward to lift <input type="checkbox"/> 19. Parts of body in line of fire <input type="checkbox"/> 20. Repetitive motion <input type="checkbox"/> 21. Hands not in line of sight <input type="checkbox"/> 22. Working above your head <input type="checkbox"/> 			Electrical Hazards <ul style="list-style-type: none"> 45. GFI test <input type="checkbox"/> 46. Lighting levels too low <input type="checkbox"/> 47. Working on/near energized equipment <input type="checkbox"/> 48. Electrical cords condition <input type="checkbox"/> 49. Electrical tools condition <input type="checkbox"/> 50. Fire extinguisher <input type="checkbox"/> 51. Hot work or electrical permit required <input type="checkbox"/>
	Overhead Hazards <ul style="list-style-type: none"> 30. Barricades & signs in place <input type="checkbox"/> 31. Hole coverings identified <input type="checkbox"/> 32. Harness/lanyard inspected <input type="checkbox"/> 33. 100% Tie-off with harness <input type="checkbox"/> 34. Tie off points identified <input type="checkbox"/> 35. Falling items <input type="checkbox"/> 36. Foreign bodies in eyes <input type="checkbox"/> 37. Hoisting or moving loads overhead <input type="checkbox"/> 	Personal Limitations/Hazards <ul style="list-style-type: none"> 52. Procedure not available for task <input type="checkbox"/> 53. Confusing instructions <input type="checkbox"/> 54. No training for task or tools to be used <input type="checkbox"/> 55. First time performing the task <input type="checkbox"/> 56. Micro break (stretching/flexing) <input type="checkbox"/> 57. Report all injuries to your supervisor <input type="checkbox"/> 	

**It is important that all relevant hazards have plans in place to reduce risk.
Be sure that all associated permits are closed off at the end of the job.**

Remember: Stop and Think

Reviewed by Name and Signature: _____

HEALTH & SAFETY PLAN

APPENDIX C

JOB SAFETY ANALYSIS SHEETS

JOB SAFETY ANALYSIS		
PROJECT: Petroleum-Impacted Soil, 121-123 Reynolds Street, Rochester, NY		
TASK: Geoprobe Drilling Activities		
<u>Created by:</u> R, Mahoney	<u>Date:</u> February 25, 2020	<u>Revision Date:</u>
Task Element	Hazard(s)	Controls
1. Pre-Clearance Activities & Utility Locates	a. Damage to utilities or injuries arising from struck utilities	a. Utility location surveys (including GPR & RD surveys) must be conducted by a subcontractor prior to any ground-intrusive work to prevent damage to existing infrastructure and to prevent injuries which may arise from striking a utility; if any part of the crew is unsure of the mark out, work must stop until the problem is resolved; the Project Manager should be consulted if pipes or other indications of underground infrastructure are encountered; remember that all workers have Stop Work Authority if proceeding with the work places themselves, others, and/or the environment at risk.
2. Mobilization	a. Slip/Trip/Fall b. Kickoff and Tailgate Meetings	a. Assess ground conditions when accessing the work area; take measure to eliminate objects; clear walking paths in areas of vegetative growth; wear boots with proper treads; remove ice on pavement, if possible, or use salt/sand for traction. b. Conduct initial safety meeting as kickoff to the field work and review HASP. Conduct daily tailgate meetings to review tasks for the day, identify hazards/changed conditions, and reiterate "Stop Work" authority for <u>all</u> workers.
3. Work Area Control	a. Injury to others in the vicinity of the work area	a. Mark work areas with orange cones or caution tape to prevent unwanted foot traffic in close proximity to drilling areas and operating machinery; be aware of surroundings and maintain communication with personnel in the vicinity of drilling activities.

JOB SAFETY ANALYSIS		
PROJECT: Petroleum-Impacted Soil, 121-123 Reynolds Street, Rochester, NY		
TASK: Geoprobe Drilling Activities		
Created by: R, Mahoney	Date: February 25, 2020	Revision Date:
Task Element	Hazard(s)	Controls
4. Oversee Drilling Activities and Collect Soil Samples	a. Exposure to vapors b. Exposure to impacted soil/groundwater c. Struck by operating equipment/pinch points d. Noise e. Handling glass sample containers	a. Monitor breathing zone continuously with PID; be aware of action levels set forth in Section 6.2 of the HASP ; upgrade to Level C (full-face respirator with P-100 combo cartridges) if action levels of VOCs are exceeded and sustained. b. Wear nitrile gloves and safety glasses in case of dermal contact with soil boring and/or encountered groundwater; move slowly if standing water accumulates and presents splash potential; containerized water/liquids should be covered and placed on firm, solid ground. c. Maintain an observer's position where eye contact and open communication with the operator are possible; do not stand where the operator cannot see you; maintain adequate distance from the machinery when in use, particularly the moving parts; appropriate standing locations and communication should be discussed at the health and safety meeting prior to work start; be aware of other activities in the area and periodically confirm the work area is controlled. d. Use hearing protection as specified in Section 4.2.3 of the HASP . e. Use bubble wrap to cushion containers in cooler.
5. Decontamination (equipment)	a. Splash Potential	a. Perform decontamination in a controlled environment with proper containers and water supply; wear gloves and safety glasses; wear a face shield if necessary; containerize decontamination water.
6. Decontamination (personal)	a. Exposure to contaminated liquids (splash potential) and solids.	a. If necessary, perform dry decontamination on boots with stiff-bristled brush to remove soil, onto a poly-covered surface; wear gloves and safety glasses; wear a face shield if necessary; containerize wash and rinse fluids.

JOB SAFETY ANALYSIS		
PROJECT: Petroleum-Impacted Soil, 121-123 Reynolds Street, Rochester, NY		
TASK: Geoprobe Drilling Activities		
Created by: R, Mahoney	Date: February 25, 2020	Revision Date:
Task Element	Hazard(s)	Controls
Training Requirements: HAZWOPER 40-hr and 8-Hr Refresher	Personal Protective Equipment (PPE) Requirements: Wear minimum PPE level appropriate for task. Steel toed, ankle-height boots; Hard hat; Safety vest; Hand protection (chemical resistant and/or impact resistant); Safety glasses required for ALL tasks.	
Remarks: note that although drilling is likely to involve a direct-push Geoprobe rig, the hazards and controls for given task elements are likely applicable to other drilling programs.		

JOB SAFETY ANALYSIS		
PROJECT: Petroleum-Impacted Soil, 121-123 Reynolds Street, Rochester, NY		
TASK: Excavation Activities		
<u>Created by:</u> Bob Mahoney	<u>Date:</u> February 25, 2020	<u>Revision Date:</u>
Task Element	Hazard(s)	Controls
1. Pre-Clearance Activities & Utility Locates (DigSafelyNY)	a. Damage to utilities or injuries arising from struck utilities	a. Utility location surveys (including GPR & RD surveys) must be conducted by a subcontractor prior to any ground-intrusive work to prevent damage to existing infrastructure and to prevent injuries which may arise from striking a utility; if any part of the crew is unsure of the mark out, work must stop until the problem is resolved; the Project Manager should be consulted if pipes or other indications of underground infrastructure are encountered; remember that all workers have Stop Work Authority if proceeding with the work places themselves, others, and/or the environment at risk.
2. Mobilization	a. Slip/Trip/Fall b. Kickoff and Tailgate Meetings	a. Assess ground conditions when accessing the work area; take measure to eliminate objects; clear walking paths in areas of vegetative growth; wear boots with proper treads; remove ice on pavement, if possible, or use salt/sand for traction. b. Conduct initial safety meeting as kickoff to the field work and review HASP. Conduct daily tailgate meetings to review tasks for the day, identify hazards/changed conditions, and reiterate "Stop Work" authority for <u>all</u> workers.
3. Work Area Control	a. Injury to others in the vicinity of the work area	a. Mark work area with orange cones or caution tape to prevent unwanted foot traffic in close proximity to excavation area and operating machinery; be aware of surroundings and maintain communication with personnel in the excavation vicinity.

JOB SAFETY ANALYSIS		
PROJECT: Petroleum-Impacted Soil, 121-123 Reynolds Street, Rochester, NY		
TASK: Excavation Activities		
<u>Created by:</u> Bob Mahoney	<u>Date:</u> February 25, 2020	<u>Revision Date:</u>
Task Element	Hazard(s)	Controls
4. Oversee excavation	a. Exposure to vapors b. Exposure to impacted soil/groundwater c. Struck by operating equipment d. Fall in excavation (slip/trip/fall) e. Handling glass sample containers (if collecting waste characterization samples)	a. Monitor breathing zone continuously with PID; be aware of action levels set forth in Section 6.2 of the HASP ; upgrade to Level C (full-face respirator with P-100 combo cartridges) if action levels of VOCs are exceeded and sustained. b. Wear nitrile gloves and safety glasses in case of dermal contact with excavated soil and/or encountered groundwater; move slowly if standing water accumulates and presents splash potential; containerized water/liquids should be covered and placed on firm, solid ground. c. Stand on opposite side of excavation across from the operating equipment; maintain eye contact and open communication with the operator; do not stand where the operator cannot see you; maintain adequate distance from the machinery when in use, particularly the moving parts; appropriate standing locations and communication should be discussed at the health and safety meeting prior to work start; be aware of other activities in the area and periodically confirm the work area is controlled. d. Maintain an adequate distance from walls of excavation; stay alert for signs of wall collapse (sliding, toppling, bulging); do not enter excavations greater than 4 feet deep; excavations deeper than 10 feet should have fall prevention systems in place. e. Use bubble wrap to cushion containers in cooler.
5. Decontamination (equipment)	a. Splash Potential	a. Perform decontamination in a controlled environment with proper containers and water supply; wear gloves and safety glasses; wear a face shield if necessary; containerize decontamination water.

JOB SAFETY ANALYSIS		
PROJECT: Petroleum-Impacted Soil, 121-123 Reynolds Street, Rochester, NY		
TASK: Excavation Activities		
<u>Created by:</u> Bob Mahoney	<u>Date:</u> February 25, 2020	<u>Revision Date:</u>
Task Element	Hazard(s)	Controls
6. Decontamination (personal)	a. Exposure to contaminated liquids (splash potential) and solids)	a. If necessary, perform dry decontamination on boots with stiff-bristled brush to remove soil, onto a poly-covered surface; wear gloves and safety glasses; wear a face shield if necessary; containerize wash and rinse fluids.
<u>Training Requirements:</u> HAZWOPER 40-hr and 8-Hr Refresher	<u>Personal Protective Equipment (PPE) Requirements:</u> Wear minimum PPE level appropriate for task. Steel toed, ankle-height boots; Hard hat; Safety vest; Hand protection (chemical resistant and/or impact resistant); Safety glasses required for ALL tasks.	
Remarks:		

JOB SAFETY ANALYSIS		
PROJECT: Petroleum-Impacted Soil, 121-123 Reynolds Street, Rochester, NY		
TASK: Groundwater Monitoring Well Gauging and Sampling		
<u>Created by:</u> R. Mahoney	<u>Date:</u> February 25, 2020	<u>Revision Date:</u>
Task Element	Hazard(s)	Controls
1. Mobilization	<ul style="list-style-type: none"> a. Lifting hazards b. Slip/Trip/Fall 	<ul style="list-style-type: none"> a. Minimize weight of any single lift; use two people where necessary; lift with legs and not with back. b. Assess ground conditions at each well site; take measures to eliminate objects; Clear walking paths in areas of vegetative growth; Wear boots with proper treads; remove ice on pavement, if possible, or use salt/sand for traction.
2. Opening Well / Gauging	<ul style="list-style-type: none"> a. Struck by vehicle (if in traffic area) b. Pinch Point when opening well cover c. Exposure to vapors d. Splash potential for groundwater or NAPL 	<ul style="list-style-type: none"> a. Wear reflective vest; Establish work area and mark with cones and flagging; position field vehicle to block work area. b. Be aware of pinch points associated with removal and replacement of the well lid/vault cover. Be aware of body position; wear sturdy leather or impact-resistant gloves. Use appropriate tool to remove well lid cover. This includes a handle appropriately designed for the type and weight of cover to be removed, and should allow lifting the cover from an upright position. c. Monitor breathing zone continuously with PID; be aware of action levels set forth in Section 6.2 of HASP. Upgrade to Level C (Full-face respirator with P-100 combo cartridges) if action levels of VOCs are exceeded and sustained. d. Wear latex gloves (minimum protection) and neoprene gloves (preferred). Use slow and controlled motion when inserting and removing well probe from well or decontamination bucket. Place decon bucket on firm, level surface.

JOB SAFETY ANALYSIS		
PROJECT: Petroleum-Impacted Soil, 121-123 Reynolds Street, Rochester, NY		
TASK: Groundwater Monitoring Well Gauging and Sampling		
<u>Created by:</u> R. Mahoney	<u>Date:</u> February 25, 2020	<u>Revision Date:</u>
Task Element	Hazard(s)	Controls
3. Opening Well / Sampling	a. Struck by vehicle (if in traffic area) b. Pinch Point when opening well cover c. Exposure to vapors d. Splash potential for groundwater or NAPL e. Handling glass sample containers	a. Wear reflective vest; Establish work area and mark with cones and flagging; position field vehicle to block work area. b. Be aware of pinch points associated with removal and replacement of the well lid/vault cover. Be aware of body position; wear sturdy leather or impact-resistant gloves. Use appropriate tool to remove well lid cover. This includes a handle appropriately designed for the type and weight of cover to be removed, and should allow lifting the cover from an upright position. c. Monitor breathing zone continuously with PID; Be aware of action levels set forth in Section 4.1 of HASP . Upgrade to Level C (Full-face respirator with P-100 combo cartridges) if action levels of VOCs are exceeded and sustained. d. Wear latex gloves (minimum protection) and neoprene gloves (preferred). Use slow and controlled motion when inserting and removing bailer from well and when pouring contents into measuring bucket or carbon bucket. Place all buckets on firm, level surface. e. Use bubble wrap to cushion containers in cooler.
4. Decontamination (equipment)	a. Splash Potential	a. Perform decon in a controlled environment with proper containers and potable water supply; Wear gloves and safety glasses; wear a Face Shield if necessary. Containerize decon water in covered buckets for transport to GCTS treatment bldg.

JOB SAFETY ANALYSIS		
PROJECT: Petroleum-Impacted Soil, 121-123 Reynolds Street, Rochester, NY		
TASK: Groundwater Monitoring Well Gauging and Sampling		
Created by: R. Mahoney	Date: February 25, 2020	Revision Date:
Task Element	Hazard(s)	Controls
5. Decontamination (personal)	a. Exposure to contaminated liquids (splash potential) and solids.	a. If necessary, perform dry decon on boots with stiff-bristled brush to remove soil, onto a poly-covered surface; Wear gloves and safety glasses; wear a Face Shield if necessary; Contain wash and rinse fluids in appropriate containers.
Training Requirements: HAZWOPER 40-hr and 8-Hr Refresher	Personal Protective Equipment (PPE) Requirements: Wear minimum PPE level appropriate for task. Steel toed, ankle-height boots; Hard hat; Safety glasses required for <u>ALL</u> tasks.	
Remarks: For wells located in areas of heavy brush or trees – visually inspect area for poison ivy before proceeding with work. If present, take measures to eliminate threat (remove, or cover with plastic sheeting, etc). For removal, wear Tyvek suit and gloves – cover all exposed skin.		

**CORRECTIVE ACTION PLAN
PETROLEUM-IMPACTED SOIL AND GROUNDWATER
121-123 REYNOLDS STREET
ROCHESTER, NY**

Appendix C
Community Air Monitoring Plan

New York State Department of Health Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. "Periodic" monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed $150 \text{ mcg}/\text{m}^3$ above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than $150 \text{ mcg}/\text{m}^3$ above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within $150 \text{ mcg}/\text{m}^3$ of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009

Fugitive Dust and Particulate Monitoring

A program for suppressing fugitive dust and particulate matter monitoring at hazardous waste sites is a responsibility on the remedial party performing the work. These procedures must be incorporated into appropriate intrusive work plans. The following fugitive dust suppression and particulate monitoring program should be employed at sites during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.
2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.
3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM10) with the following minimum performance standards:
 - (a) Objects to be measured: Dust, mists or aerosols;
 - (b) Measurement Ranges: 0.001 to 400 mg/m³ (1 to 400,000 :ug/m³);
 - (c) Precision (2-sigma) at constant temperature: +/- 10 :g/m³ for one second averaging; and +/- 1.5 g/m³ for sixty second averaging;
 - (d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
 - (e) Resolution: 0.1% of reading or 1g/m³, whichever is larger;
 - (f) Particle Size Range of Maximum Response: 0.1-10;
 - (g) Total Number of Data Points in Memory: 10,000;
 - (h) Logged Data: Each data point with average concentration, time/date and data point number
 - (i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
 - (j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
 - (k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
 - (l) Operating Temperature: -10 to 50° C (14 to 122° F);
 - (m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.
4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.
5. The action level will be established at 150 ug/m³ (15 minutes average). While conservative,

this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m³, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m³ above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see paragraph 7). Should the action level of 150 ug/m³ continue to be exceeded work must stop and DER must be notified as provided in the site design or remedial work plan. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM₁₀ at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

- (a) Applying water on haul roads;
- (b) Wetting equipment and excavation faces;
- (c) Spraying water on buckets during excavation and dumping;
- (d) Hauling materials in properly tarped or watertight containers;
- (e) Restricting vehicle speeds to 10 mph;
- (f) Covering excavated areas and material after excavation activity ceases; and
- (g) Reducing the excavation size and/or number of excavations.

Experience has shown that the chance of exceeding the 150ug/m³ action level is remote when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

**CORRECTIVE ACTION PLAN
PETROLEUM-IMPACTED SOIL AND GROUNDWATER
121-123 REYNOLDS STREET
ROCHESTER, NY**

Appendix D
Quality Assurance Project Plan

Appendix D

USEPA Brownfield Program Site-Specific QAPP

Brownfields QAPP

Title and Approval Page

Title: Corrective Action- Petroleum-Impacted Soils
121-123 Reynolds Street, Rochester, NY
Quality Assurance Project Plan (QAPP)

Project Name/Property Name: Corrective Action – Petroleum Impacted Soils and Groundwater
Property/Site Location: 121-123 Reynolds Street, Rochester, NY

Revision Number: Rev. 0
Revision Date: April 30, 2020

Brownfields Cooperative Agreement Number: 96261018

City of Rochester, New York

Brownfields Recipient

Robert Mahoney, Stantec Consulting Services Inc., 61 Commercial Street, Suite 100, Rochester, New York 14614, 585-413-5301, Bob.Mahoney@Stantec.com

Preparer's Name and Organizational Affiliation
Preparer's Address, Telephone Number, and E-mail Address

April 30, 2020

Preparation Date (Day/Month/Year)

Brownfields Recipient Program Manager:

Signature

Joe Biondolillo / City of Rochester Div. Environ. Quality – April 30, 2020

Printed Name/Organization/Date

Environmental Consultant Quality Assurance Officer:
(QAO)

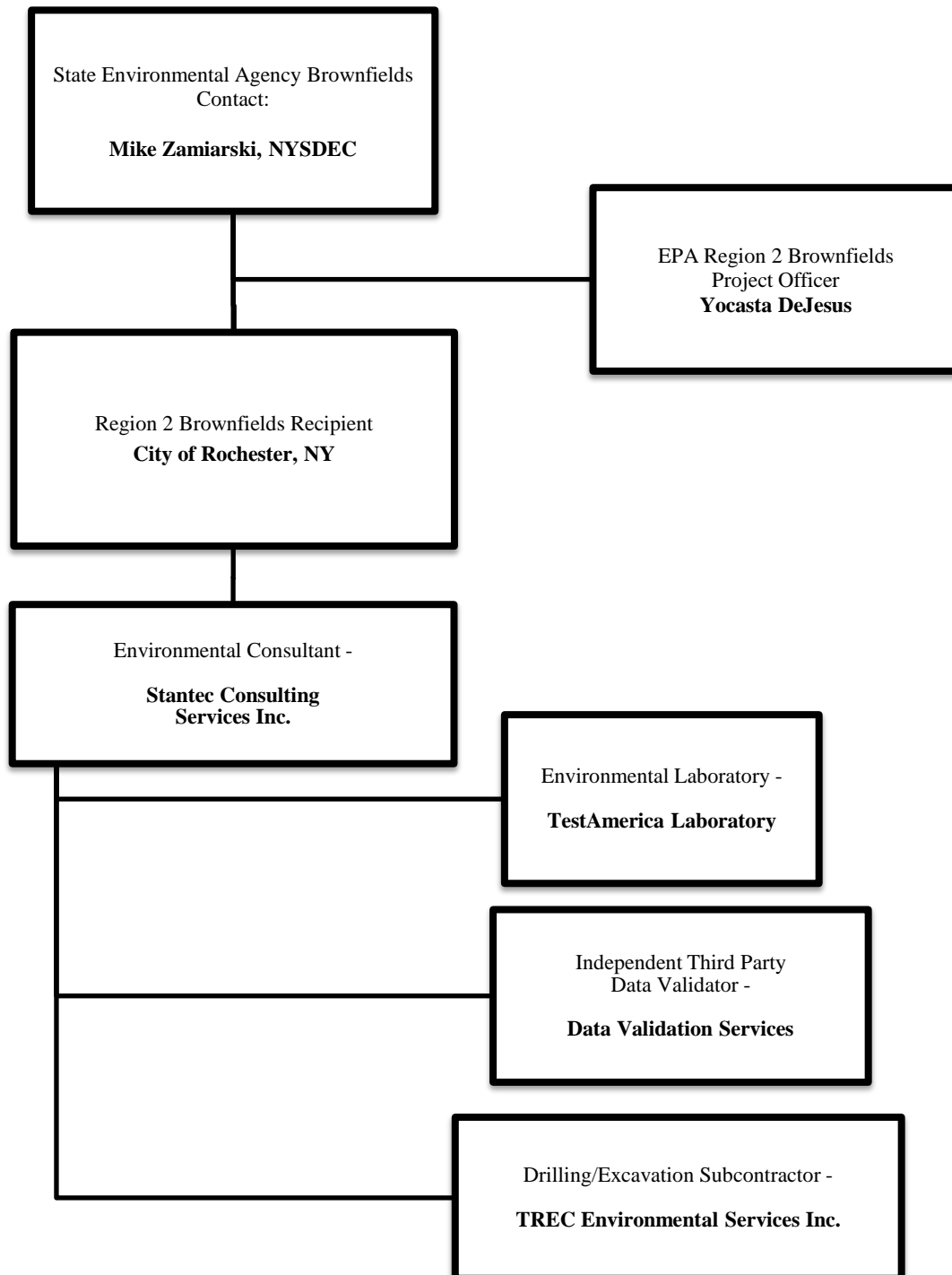
Signature

Kevin Ignaszak, P.E., Stantec Consulting Services – April 30, 2020

Printed Name/Organization/Date

Brownfields QAPP Template #2a

Project Organizational Chart



**Brownfields QAPP Template #2b
Personnel Responsibilities**

Name	Title	Telephone Number	Organizational Affiliation	Responsibilities¹
Mr. Joe Biondolillo	Brownfields Recipient Program Manager	585-428-6649	City of Rochester, NY	Administration of Brownfield Grant Projects
Mr. Dennis Peck	Environmental Technician	585-428-6649	City of Rochester, NY	Day-to-day oversight of remediation
Mr. Michael Zamiarski, P.E.	State Spills Unit Project Manager	585-226-2466	New York State Department of Environmental Conservation	Oversight of environmental investigations and remediation under Petroleum Spill Program.
Ms. Yocasta DeJesus	EPA Brownfields Project Officer (BPO)	212-637-4340	EPA Region 2	Transmission of information about the QA requirements and oversight of grants and/or contracts
Mr. Michael Storonsky	Environmental Consultant Project Manager	585-413-5266	Stantec Consulting Services	Oversight of execution of project elements and preparation of project deliverables.
Mr. Robert Mahoney, P.G.	Field Program Manager	585-413-5301	Stantec Consulting Services	Management of field program and subcontractors, data management and report preparation.
Mr. Kevin Ignaszak, P.E.	Quality Assurance Officer	585-413-5355	Stantec Consulting Services	Technical review and input; P.E. Certification
Mr. Ryan VanDette	Environmental Laboratory Contact	716-691-2600	TestAmerica Laboratory	Analytical Laboratory services coordination and reporting.
Ms. Judy Harry	Third Party Data Validator ²	518-251-4429	Data Validation Services	All data validation-related services

¹ Include resumes as an appendix to the Site-Specific QAPP

² Data validation to be performed by third party – independent to project (can be within Environmental Consulting firm or subcontracted to a data validation firm).

Brownfields QAPP Template #3a

Problem Definition/Project Description

I. PROBLEM DEFINITION

This QAPP is appended to a Corrective Action Plan (CAP) that has been developed for proposed environmental remediation of petroleum-impacted soil and groundwater at the property located at 121-123 Reynolds Street (“the Site”). Site environmental conditions were assessed through previously performed Phase I and II Environmental Site Assessment, which identified the presence of petroleum-impacted soils and urban fill soils on the Site.

The environmental remediation project is being performed as part of the City of Rochester’s (City’s) Cooperative Agreement (Agreement No. 96261018) from the United States Environmental Protection Agency (EPA). The work is being jointly funded by the EPA and the City.

The remedial activities are subject to the conditions in the EPA Brownfield Assessment Cooperative Agreement Administrative Conditions. In addition, the Site has been assigned Spill File No. 1103833 by the New York State Department of Environmental Conservation (NYSDEC) based on the presence of the petroleum impacts found. The City has entered into a Stipulation Agreement with the NYSDEC for cleanup at the Site.

The goal of the project is to remediate subsurface petroleum impacts sufficiently to facilitate closure of the NYSDEC Spill File for the Site, and to facilitate future sale and development of the property. This CAP provides details on a proposed cleanup program including impacted soil excavation and offsite disposal, groundwater management, excavation backfill, Site restoration and related activities.

II. PROJECT DESCRIPTION

A. Site Location and Description

The Site, which is owned by the City (Monroe County Tax ID No. 12.52-3-18.001) is located in a low-density residential area. The Site is generally level, and the parcel is approximately 0.19 acres in size. (see Figure 1).

The following investigations have previously been completed at the site:

- Subsurface Investigation Data Package, Day Environmental Assessment and Remediation Services (Day), December 2011.
- Phase I Environmental Site Assessment (ESA), Day, April 2015.

- Phase II ESA, Day, January 2016.
- Supplemental Phase II ESA, Day, January 2017.

In June 2011, apparent petroleum contamination was observed in soil encountered during excavation of the basement foundation of a new residential house on the 125 Reynolds Street parcel that abuts the Site on the south. Subsequent historical research by the City revealed the former presence of a gas station, and an auto repair facility that included a paint spraying operation on the northern portion of the Site (Former 121 Reynolds Street).

The City commissioned a Phase I ESA in 2015, followed by a Phase II ESA in the fall of 2016. The Phase II investigation provided the following findings:

- Twenty locations were drilled and sampled across the site, using either Geoprobe direct-push or rotary drilling methods. Four interface monitoring wells were installed: one in the northern half of the site and three in the southern half.
- Bedrock was encountered at depths ranging from approximately 8 to 10 feet below ground surface (bgs).
- Photoionization detector (PID) readings from soil screening were detected in 8 of the 20 borings. Peak PID readings ranged up to 1,659 parts per million (ppm).
- Four of nineteen soil samples contained petroleum volatile organic compounds (VOCs) at levels above applicable Part 375 soil cleanup objectives (SCOs) and CP-51 soil cleanup levels (SCLs).
- Only one sample obtained from one of several Site perimeter boring (some of which were in the rights-of-way) exceeded applicable SCOs for VOCs.
- Urban fill was encountered in 12 of the 20 test boring locations, to depths ranging up to 6 feet bgs. Two samples of urban fill were analyzed; one sample (located in the southeast portion of the site) contained lead at a level above the RR SCO but a TCLP analysis did not indicate a hazardous level.
- All four groundwater samples exhibited petroleum VOCs at levels above TOGS 1.1.1 groundwater standards and/or guidance values.
- Based on readings in the four monitoring wells, groundwater flows toward the south.

A supplemental Phase II ESA was then performed in 2016, consisting of an additional nine soil test borings and field PID screening; nine soil samples were submitted for analysis for VOCs. The results of this investigation were combined with the findings of the initial Phase II ESA to further refine the apparent limits of impacts to soil. Based on the cumulative results, recommendations were provided in the Phase II ESA report that included:

- Additional excavation of impacted soil (beyond that excavated at the time of tank removal) and the upper, fractured portion of bedrock in the source area in the northeast portion of the Site.

- Excavation of deeper, wet/saturated soils in the “plume area” in the southern portion of the Site.
- Excavation of urban fill materials in the northern portion of the site.
- Post-excavation, in-situ bioremediation in the saturated zone in petroleum-impacted areas.
- Implementation of a Soil and Groundwater Management Plan (SGMP) for future development.
- Installation of a sub-slab depressurization system (SSDS) for any future structures on the Site.

B. Proposed Corrective Action and Sampling Considerations

A corrective action program will be implemented to remediate petroleum-impacted soil and groundwater. The CAP document to which this QAPP is appended provides a detailed description of the proposed remedial activities. The primary objectives of this remediation project are as follows:

- Implement corrective actions to address petroleum-impacted soil and groundwater in three primary remedial areas of concern: Urban Fill Excavation; UST Source-Area Excavation; and Plume Area Excavation.
- Excavate source-area soils and other media that are impacted with petroleum-related contaminants in excess of applicable SCOs and/or soils which exhibit nuisance characteristics, and transport and dispose these materials offsite.
- Remove (if encountered), treat, and discharge to the combined sewer impacted groundwater from the excavations.
- Perform *in-situ* bioremediation of groundwater by adding Oxygen Releasing Compound (ORC-A™) to the excavation prior to backfilling to further reduce contaminant concentrations to acceptable levels (as demonstrated through groundwater monitoring). If needed, future injection of ORC-A™ solution will be facilitate via remediation hardware (subsurface piping) installed in the excavation prior to backfill.

Successful implementation of these project elements will result in issuance by NYSDEC of spill file closure and a “No Further Action” letter.

Soil and groundwater samples will be submitted to a laboratory accredited through the New York State Department of Health Environmental Laboratory Accreditation Program (ELAP). Specific analyses to be used are listed in the sections below.

Sampling Considerations:**1. Excavation Areas**

Impacted soil will be removed from each of the identified Excavation Areas. Prior to performing excavation a test boring will be performed in each proposed excavation area to obtain a subsurface soil sample for waste disposal characterization analyses, which will facilitate live loading of excavated impacted soil into trucks for off-Site disposal. During excavation, soil will be screened with a calibrated photoionization detector (PID). Confirmatory soil samples will be obtained from excavation sidewalls and bottoms and the samples will be submitted for laboratory analysis for:

- Part 375 and NYSDEC CP-51 List volatile organic compounds (VOCs) plus Tentatively Identified Compounds (TICs), USEPA Method 8260C (UST Source Area and Plume Area excavations only).
- Part 375 and NYSDEC CP-51 List Semivolatile Organic Compounds (SVOCs) plus TICs, USEPA Method 8270D (Urban Fill excavation area only).
- Lead, USEPA Method 6010 (Urban Fill excavation area only).

2. Monitoring Well Installation and Sampling

Three new 2-inch diameter bedrock interface groundwater monitoring wells will be installed to replace the three decommissioned wells. The replacement wells will be installed after backfilling is complete. Well construction will be essentially the same as the original wells; well screens will be installed to a depth 5 ft. below the top of bedrock, using rotary drilling methods. New flush-mounted surface completions will be installed for each new well. All new and existing well casings will be surveyed for accurate elevations. The wells will be developed upon completion. Each well will be developed after completion to reduce turbidity to the extent practicable. The wells will be allowed to equilibrate for a minimum of 48 hours before sampling is performed.

The sampling will be performed using bailers or low-flow methodology to facilitate accurate measurement of the field parameters dissolved oxygen (DO) and oxidation-reduction potential (ORP). Samples will be submitted to an ELAP-certified laboratory for the following analyses:

- CP-51 List VOCs plus TICs, USEPA Method 8260C.

In accordance with NYSDEC's DER-10 guidance document, a DUSR will only be generated for the final round of groundwater sampling.

3. Groundwater Elevation Measurement

After water levels have equilibrated, static water levels will be measured in each well with an electronic water level indicator to the nearest 0.01 ft. The potential presence of petroleum product will also be monitored with an interface probe.

4. Survey of Exploration and Sample Locations

Horizontal coordinates of excavations, test borings, monitoring wells and relevant Site features will be established with GPS equipment. The relative elevation of the top of each monitoring well casing will be established by a licensed surveyor using a temporary benchmark established on the Site.

5. Decontamination

Sampling methods and equipment have been chosen to minimize the need for decontamination. All non-dedicated or non-disposable equipment will be decontaminated prior to and following each use. Decontamination of soil sampling equipment (such as split spoons and hand-sampling tools) will consist of a wash with Alconox (or equivalent) solution and a potable water rinse. Following decontamination, direct contact between sampling equipment and the ground surface will not be permitted. Decontamination fluids will be managed as investigation-derived waste.

C. Project Decision Statements

The future use and redevelopment of the Site is anticipated to be residential use, specifically a single duplex or two-family home, which is consistent with the completed Voter's Block LLC In-fill Housing Initiative.

It is currently presumed that the cleanup criteria to be used to compare analytical results for soil samples will be soil cleanup objectives (SCOs) for Protection of Groundwater (POGW) contained in NYSDEC's 6NYCRR Part 375 regulations.

Project "If/Then" statements:

1. If confirmatory sample results indicate residual soil contamination is present at levels above applicable SCOs, then the excavation will be expanded to the extent practicable to remove the residual impacts.
2. If, after the prescribed time period for post-remedial groundwater monitoring, contaminant concentrations exceed the groundwater standards contained in NYSDEC's TOGS 1.1.1 Guidance Document, then it will be proposed to conduct groundwater monitoring until asymptotic conditions for VOCs are attained for a one-year period. At that time, it would also be proposed that the institutional and

engineering controls be used to provide conditions protective of public health and the environment for the intended and reasonably anticipated use of the Site.

Brownfields QAPP Template #3b

Project Quality Objectives/Systematic Planning Process Statements

Use this template to develop the project quality objectives (PQOs) that define the type, quantity and quality of data needed to answer specific environmental questions and support proper environmental decisions. The questions below are examples only and are neither inclusive nor appropriate for all projects.

Overall project objectives include:

The primary objectives of the soil and groundwater remediation are to:

- Excavate and dispose source-area soils and other media that are impacted with petroleum-related contaminants in excess of applicable SCOs and/or soils which exhibit nuisance characteristics.
- Remove (if encountered), treat, and discharge to the combined sewer impacted groundwater from the excavations.
- Perform *in-situ* bioremediation of groundwater and achieve groundwater quality sufficient for regulatory closure of the site.

Soil and groundwater will be analyzed for the following (not all samples will be analyzed for all analyte classes):

- Part 375 and/or NYSDEC CP-51 List volatile organic compounds (VOCs) USEPA Method 8260C.
- PART 375 and/or NYSDEC CP-51 List Semivolatile Organic Compounds (SVOCs) USEPA Method 8270D.
- Lead, USEPA Method 6010.

Who will use the data?

The data will be used by the City, which is the current owner and EPA Region 2 Brownfields Recipient, and the NYSDEC, which currently has an open Spill File for the Site.

What will the data be used for?

The data will evaluate whether site soil and/or groundwater have been remediated sufficiently to allow Spill File closure by NYSDEC.

What types of data are needed?

- Laboratory Analytical Data for both soil and groundwater will include:

- Part 375 and/or NYSDEC CP-51 List volatile organic compounds (VOCs), USEPA Method 8260C.
- Part 375 and/or NYSDEC CP-51 List Semivolatile Organic Compounds (SVOCs), USEPA Method 8270D (Urban Fill Area only).
- Lead, USEPA Method 6010 (Urban Fill Area only).
- Field Data include:
 - Geoprobe[®] direct-push drilling methods to obtain continuous soil samples in each boring with a Macrocore sampler. The sampler uses dedicated plastic sleeves for each sample interval and the sampler will be decontaminated after each sample interval. During drilling, soil samples will be visually inspected for indications of staining, sheen, etc. The soil samples will be screened with a calibrated PID for the presence of volatile organic compounds.
 - Excavation limits (X, Y, Z coordinates), measured with a Trimble Geo 7X H-Star GPS unit.
 - Monitoring well construction details.
 - For groundwater sampling, each sample will be collected using bailing methodology.
 - Field parameters to be measured during purging would include pH, temperature, specific conductance, oxidation reduction potential and dissolved oxygen.
 - Groundwater levels will be measured in monitoring wells to the nearest 0.01 ft using an electronic water level indicator.

How much data are needed?

Including the QA/QC samples, it is currently estimated that up to approximately 25 total analyses will be performed for the three analyte classes listed above for soil and up to five analyses will be performed for the same analyte classes for groundwater samples.

Where, when, and how should the data be collected/generated?

Data will be collected continually during the field program. Stantec will be the primary responsible party for data collection, management and reporting. Daily Field Reports will summarize much of the data collection efforts. The following summarizes collection of soil quality data in the form of anticipated sampling:

- Soil waste pre-characterization samples will be obtained from a Geoprobe test boring performed near the center of each proposed excavation area, prior to any soil-disturbing activities being performed.
- Confirmation soil samples will be obtained from each excavation sidewall and each excavation bottom at completion.

- Groundwater samples will be collected from each of the four replacement monitoring wells that will remain after the remedial excavations are complete.

Who will collect and generate the data?

Stantec Consulting Services Inc. will collect samples, perform field screening for soils using a calibrated PID, and measure field parameters while sampling groundwater during the final round of sampling. Subsequent rounds of groundwater sampling may be performed by City personnel. TestAmerica Laboratory in Amherst, New York will generate the laboratory data.

How will the data be reported?

- Field data will be recorded in a field book, on field diagrams, and on Groundwater Sampling Reports.
- Laboratory data for confirmatory samples will be reported by the laboratory in “Category B” deliverables. In addition, electronic data deliverables (EDDs) will be provided by the laboratory in a format compatible with NYSDEC’s requirements for EDDs. All laboratory-generated soil data will undergo independent review by an experienced data validator who will prepare Data Usability Summary Reports (DUSRs) for each sample delivery group. For groundwater, a DUSR will be generated only for the final groundwater monitoring sampling round, in accordance with NYSDEC’s DER-10 guidance document.
- Data will be included, discussed and summarized in a Remedial Construction/Closure Report (RCCR).

How will the data be archived?

- As discussed above, all data will be included in a summary report to the City of Rochester and NYSDEC. The report will be provided in electronic format to both parties, and in hard copies, if requested.
- The laboratory analytical data will also be provided in electronic data deliverable format. The EDD file will be compatible with NYSDEC EDD requirements as detailed in its Electronic Data Deliverable Manual (April 2013). Once the RCCR report has been finalized the EDD file will be uploaded to NYSDEC’s Environmental Information Management System for permanent archiving.

Brownfields QAPP Template #4

Project Schedule/Timeline

List all project activities that will be performed during the course of the project. Include the anticipated start and completion dates.

Activities	Organization	Dates (MM/DD/YY)		Deliverable	Estimated Deliverable Due Date
		Anticipated Date(s) of Initiation	Anticipated Date of Completion		
Preparation of QAPP	Stantec Consulting Services Inc.	02/13/2020	04/24/2020	QAPP	04/24/2020
Review of QAPP	City of Rochester DEQ, Joseph Biondolillo	04/23/2020	04/30/2020	Written Approval by COR DEQ	04/30/2020
	NYSDEC	05/01/2020	05/29/2020	Written Approval by NYSDEC	05/30/2020
Preparation of Health and Safety Plan	Stantec Consulting	02/26/2020	03/20/2020	HASP	03/20/2020
Procurement of Equipment	Stantec Consulting	06/01/2020	06/15/2020	N/A	N/A
Laboratory Request	Stantec Consulting	06/22/2020	06/26/2020	N/A	N/A
Field Reconnaissance/ Access	Stantec Consulting	05/14/2020	05/28/2020	N/A	N/A
Collection of Field Samples (soil)	Stantec Consulting	06/01/2020	08/20/2020	N/A	N/A
Collection of Field Samples (quarterly groundwater follow up)	Stantec Consulting	09/07/2020	06/25/2021	N/A	N/A
Laboratory Packages Received (multiple)	Stantec Consulting	06/19/2020	07/09/2021	Unvalidated data package, Preliminary EDD ²	various
Validation of Laboratory Results	Data Validation Services ¹	08/24/2020	09/30/2020	Validated data Packages, Updated EDD	10/14/2020
Data Evaluation/ Preparation of Final Report	Stantec Consulting Services Inc.	09/01/2020	12/15/2020	Final Report	12/15/2020

¹ Data validation to be performed by third party – independent to project (can be within Environmental Consulting firm or subcontracted to data validation firm).

² EDD = Electronic Data Deliverable

Brownfields QAPP Template #5a

Sampling Methods and Locations

Matrix	Sampling Location(s)	Approx. Depth (ft)	Analytical Group ¹	Est. No. of Samples ²	Sampling SOP Reference	Rationale for Sampling Location
Soil	Excavation sidewalls and bottoms	6-10	VOCs, SVOCs,	25 + Field Dup + MS/MSD	Corrective Action Plan, Petroleum-Impacted Soil and Groundwater, 121-123 Reynolds Street, Rochester, New York, NYSDEC Spill No. 1103833 by Stantec Consulting Services Inc., dated April 2020	Actual number of samples and locations to be determined based on observations, excavation limits and field screening results.
Soil	Excavation sidewalls and bottoms (Urban Fill area only)	0-4	Lead	25 + Field Dup + MS/MSD		Actual number of samples to be determined based on volume of water encountered and containerized
Groundwater	Containerized water from excavation (if encountered)	Estim. 9-12 ft	VOCs, SVOCs; RCRA Metals	1 + Field Dup		Post Remedial Monitoring
Groundwater	Wells MW-1 through MW-4 (See Figure 1)	Estim. 9-12 ft	VOCs	4 + Field Dup + MS/MSD + trip blank		

¹ Analytical Groups include: Volatiles; Semivolatiles, RCRA Metals, Pesticides, PCBs² The number of groundwater samples will vary depending on whether overburden or interface wells are installed³ PCBs and Metals to be analyzed in groundwater only if detected in soils.

Brownfields QAPP Template #5b

Analytical Methods and Requirements

Matrix	Analytical Group	Concentration Level	Analytical & Preparation Method/ SOP Reference	Sample Volume	Containers (number, size, type)	Preservation Requirements (chemical, temperature, light protected)	Maximum Holding Time (preparation/analysis)
Groundwater	VOCs	Low	SW-846 Method 8260	80 ml	(2) 40 ml VOA vials w/Teflon lined septum	1:1 HCl to pH<2; cool to 4°C	14 days
Groundwater	SVOCs	Low	SW-846 Method 8270	2000 ml	(2) 1000 ml glass bottles with w/Teflon lined cap	cool to 4°C	7 days to extraction, 40 days to analysis
Soil	VOCs	Low	SW-846 Method 8260	10 g	4oz glass jar with Teflon lined cap	cool to 4°C	14 days
Soil	SVOCs	Low	SW-846 Method 8270	30 g	8 oz glass jar w/Teflon lined cap	cool to 4°C	14 days until extraction, 40 days until analysis
Soil	PCBs	Low	SW-846 Method 8082	30 g	8 oz glass jar w/Teflon lined cap	cool to 4°C	14 days until extraction, 40 days until analysis
Soil	Metals & mercury	Low	SW-846 Method 6010/7471	5 g	4 oz glass jar w/Teflon lined cap	cool to 4°C	180 days (28 days for mercury)

¹Concentration Level refers to anticipated typical ranges in each media.

Brownfields QAPP Template #5c

Reference Limits and Evaluation Table

GROUNDWATER

Matrix <i>Aqueous</i>				
Analytical Group <i>VOCs – SW-846 8260</i>				
Concentration Level <i>Low</i>				
Analyte	CAS Number	NYSDEC TOGS 1.1.1 Groundwater Standards (µg/L)	Achievable Lab Method Detection Limit (µg/L)	Achievable Lab Reporting Limit µg/L)
1,1,1-Trichloroethane	71-55-6	5	0.5	5
1,1,2,2-Tetrachloroethane	79-34-5	5	0.42	5
1,1,2-Trichloroethane	79-00-5	1	0.38	5
1,1-Dichloroethane	75-34-3	5	0.25	5
1,1-Dichloroethene	75-35-4	5	0.39	5
1,2,3-Trichlorobenzene	87-61-6	5	0.33	5
1,2,4-Trichlorobenzene	120-82-1	5	0.26	5
1,2-Dibromo-3-chloropropane	96-12-8	0.04	0.75	5
1,2-Dibromoethane	106-93-4	ns	0.5	5
1,2-Dichlorobenzene	95-50-1	3	0.33	5
1,2-Dichloroethane	107-06-2	0.6	0.41	5
1,2-Dichloropropane	78-87-5	1	0.61	5
1,3-Dichlorobenzene	541-73-1	3	0.29	5
1,4-Dichlorobenzene	106-46-7	3	0.4	5
2-Butanone	78-93-3	50	2.1	5
2-Hexanone	591-78-6	ns	1.7	5
4-Methyl-2-pentanone	108-10-1	ns	0.82	5
Acetone	67-64-1	50	2.2	5
Benzene	71-43-2	1	0.33	5
Bromochloromethane	74-97-5	ns	0.43	5
Bromodichloromethane	75-27-4	50	0.26	5
Bromoform	75-25-2	50	0.77	5
Bromomethane	74-83-9	5	0.8	5
Carbon disulfide	75-15-0	60	0.34	5
Carbon tetrachloride	56-23-5	5	0.54	5
Chlorobenzene	108-90-7	5	0.26	5
Chloroethane	75-00-3	5	0.48	5
Chloroform	67-66-3	7	0.33	5
Chloromethane	74-87-3	5	0.26	5
cis-1,2-Dichloroethene	156-59-2	5	0.48	5
cis-1,3-Dichloropropene	10061-01-5	0.4	0.45	5
Dibromochloromethane	124-48-1	50	0.57	5
Dichlorodifluoromethane	75-71-8	5	0.66	5

Ethylbenzene	100-41-4	5	0.35	5
Isopropylbenzene	98-82-8	5	0.38	5
m,p-Xylene	179601-23-1	5	0.77	5
Methyl tert-butyl ether	1634-04-4	10	0.24	5
Methylene chloride	75-09-2	5	0.41	5
o-Xylene	95-47-6	5	0.36	5
Styrene	100-42-5	5	0.5	5
Tetrachloroethene	127-18-4	5	0.65	5
Toluene	108-88-3	5	0.32	5
trans-1,2-Dichloroethene	156-60-5	5	0.65	5
trans-1,3-Dichloropropene	10061-02-6	0.4	0.48	5
Trichloroethene	79-01-6	5	0.36	5
Trichlorofluoromethane	75-69-4	5	0.54	5
Vinyl chloride	75-01-4	2	0.5	5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ns	0.82	5
1,4-Dioxane	123-91-1	ns	34	100
Cyclohexane	110-82-7	ns	0.71	5
Methyl acetate	79-20-9	ns	0.29	5
Methylcyclohexane	108-87-2	ns	0.76	5

Matrix <i>Aqueous</i>				
Analytical Group <i>SVOCs - SW-846 8270</i>				
Concentration Level <i>Low</i>				
Analyte	CAS Number	NYSDEC TOGS 1.1.1 Groundwater Standards (µg/L)	Achievable Lab Method Detection Limit (µg/L)	Achievable Lab Reporting Limit µg/L)
2,2'-oxybis(1-Chloropropane)	108-60-1	ns	0.78	10
2,4-Dichlorophenol	120-83-2	5	0.57	10
2,4-Dimethylphenol	105-67-9	50	1.8	10
2,4-Dinitrophenol	51-28-5	10	3.5	20
2,4-Dinitrotoluene	121-14-2	5	0.41	10
2,6-Dinitrotoluene	606-20-2	5	0.52	10
2-Chloronaphthalene	91-58-7	10	0.81	10
2-Chlorophenol	95-57-8	ns	0.61	10
2-Methylnaphthalene	91-57-6	ns	0.94	10
2-Methylphenol	95-48-7	ns	0.96	10
2-Nitroaniline	88-74-4	5	0.71	20
2-Nitrophenol	88-75-5	ns	0.6	10
3,3'-Dichlorobenzidine	91-94-1	5	1.7	10
3-Nitroaniline	99-09-2	5	0.97	20
4,6-Dinitro-2-methylphenol	534-52-1	ns	0.79	20
4-Bromophenyl-phenylether	101-55-3	ns	0.54	10
4-Chloro-3-methylphenol	59-50-7	ns	0.6	10
4-Chloroaniline	106-47-8	5	2	10
4-Chlorophenyl-phenylether	7005-72-3	ns	0.41	10
4-Methylphenol	106-44-5	ns	1.4	10
4-Nitroaniline	100-01-6	5	0.96	20

4-Nitrophenol	100-02-7	ns	0.53	20
Acenaphthene	83-32-9	20	0.65	10
Acenaphthylene	208-96-8	ns	0.42	10
Anthracene	120-12-7	50	0.48	10
Benzo(a)anthracene	56-55-3	0.002	0.4	10
Benzo(a)pyrene	50-32-8	ns	1.2	10
Benzo(b)fluoranthene	205-99-2	0.002	0.94	10
Benzo(g,h,i)perylene	191-24-2	ns	0.39	10
Benzo(k)fluoranthene	207-08-9	0.002	1.2	10
Bis(2-chloroethoxy)methane	111-91-1	5	1.1	10
Bis(2-chloroethyl)ether	111-44-4	1	0.75	10
Bis(2-ethylhexyl)phthalate	117-81-7	5	1.3	10
Butylbenzylphthalate	85-68-7	50	0.32	10
Carbazole	86-74-8	ns	0.64	10
Chrysene	218-01-9	0.002	0.42	10
Di-n-butylphthalate	84-74-2	50	0.48	10
Di-n-octylphthalate	117-84-0	ns	0.47	10
Dibenzo(a,h)anthracene	53-70-3	ns	0.44	10
Dibenzofuran	132-64-9	ns	0.52	10
Diethylphthalate	84-66-2	50	0.45	10
Dimethylphthalate	131-11-3	50	0.37	10
Fluoranthene	206-44-0	50	0.33	10
Fluorene	86-73-7	0.04	0.44	10
Hexachlorobenzene	118-74-1	0.04	0.44	10
Hexachlorobutadiene	87-68-3	0.5	0.75	10
Hexachlorocyclopentadiene	77-47-4	5	1	10
Hexachloroethane	67-72-1	5	0.55	10
Indeno(1,2,3-cd)pyrene	193-39-5	0.002	0.38	10
Isophorone	78-59-1	50	0.47	10
N-Nitroso-di-n-propylamine	621-64-7	ns	0.63	10
N-Nitrosodiphenylamine	86-30-6	50	1.1	10
Naphthalene	91-20-3	10	0.96	10
Nitrobenzene	98-95-3	0.4	1.6	10
Pentachlorophenol	87-86-5	1	1.7	20
Phenanthrene	85-01-8	50	0.45	10
Phenol	108-95-2	1	0.75	10
Pyrene	129-00-0	50	0.44	10
1,1'-Biphenyl	92-52-4	5	0.65	10
2,4,5-Trichlorophenol	95-95-4	ns	0.26	20
2,4,6-Trichlorophenol	88-06-2	ns	0.53	10
1,2,4,5-Tetrachlorobenzene	95-94-3	ns	0.92	10
2,3,4,6-Tetrachlorophenol	58-90-2	ns	0.65	25
Acetophenone	98-86-2	ns	0.51	10
Atrazine	1912-24-9	ns	1.3	10
Benzaldehyde	100-52-7	ns	0.51	10
Caprolactam	105-60-2	ns	1.1	10

SOIL

Matrix Soil				
Analytical Group <i>VOCs – SW-846 8260</i>				
Concentration Level <i>Low</i>				
Analyte	CAS Number	NYSDEC Part 375 Soil Cleanup Objectives for Protection of Groundwater (µg/kg)	Achievable Lab Method Detection Limit (µg/kg)	Achievable Lab Reporting Limit (µg/kg)
1,1,1-Trichloroethane	71-55-6	680	0.53	5
1,1,2,2-Tetrachloroethane	79-34-5	1,000,000	0.68	5
1,1,2-Trichloroethane	79-00-5	1,000,000	0.48	5
1,1-Dichloroethane	75-34-3	270	0.67	5
1,1-Dichloroethene	75-35-4	330	0.95	5
1,2,3-Trichlorobenzene	87-61-6	ns	0.64	5
1,2,4-Trichlorobenzene	120-82-1	1,000,000	0.63	5
1,2-Dibromo-3-chloropropane	96-12-8	ns	1.3	5
1,2-Dibromoethane	106-93-4	ns	0.74	5
1,2-Dichlorobenzene	95-50-1	1,100	0.62	5
1,2-Dichloroethane	107-06-2	20	0.54	5
1,2-Dichloropropane	78-87-5	1,000,000	0.69	5
1,3-Dichlorobenzene	541-73-1	2,400	0.7	5
1,4-Dichlorobenzene	106-46-7	1,800	0.8	5
2-Butanone	78-93-3	120	2	5
2-Hexanone	591-78-6	1,000,000	0.83	5
4-Methyl-2-pentanone	108-10-1	ns	0.73	5
Acetone	67-64-1	50	1.6	5
Benzene	71-43-2	60	0.61	5
Bromochloromethane	74-97-5	ns	0.76	5
Bromodichloromethane	75-27-4	1,000,000	0.97	5
Bromoform	75-25-2	1,000,000	2	5
Bromomethane	74-83-9	1,000,000	1.1	5
Carbon disulfide	75-15-0	1,000,000	0.3	5
Carbon tetrachloride	56-23-5	760	0.33	5
Chlorobenzene	108-90-7	1,100	0.51	5
Chloroethane	75-00-3	1,000,000	1	5
Chloroform	67-66-3	370	0.64	5
Chloromethane	74-87-3	1,000,000	0.8	5
cis-1,2-Dichloroethene	156-59-2	250	0.75	5
cis-1,3-Dichloropropene	10061-01-5	1,000,000	0.67	5
Dibromochloromethane	124-48-1	1,000,000	0.65	5
Dichlorodifluoromethane	75-71-8	ns	0.98	5
Ethylbenzene	100-41-4	1,000	0.5	5
Isopropylbenzene	98-82-8	1,000,000	0.58	5
m,p-Xylene	179601-23-1	1,600	1.6	5
Methyl tert-butyl ether	1634-04-4	930	0.61	5
Methylene chloride	75-09-2	50	1.3	5
o-Xylene	95-47-6	1,600	0.47	5

Styrene	100-42-5	1,000,000	0.52	5
Tetrachloroethene	127-18-4	1,300	0.62	5
Toluene	108-88-3	700	0.47	5
trans-1,2-Dichloroethene	156-60-5	190	0.53	5
trans-1,3-Dichloropropene	10061-02-6	1,000,000	0.68	5
Trichloroethene	79-01-6	470	0.62	5
Trichlorofluoromethane	75-69-4	ns	0.42	5
Vinyl chloride	75-01-4	20	0.63	5
1,1,2-Trichloro-1,2,2-trifluoroethane	76-13-1	ns	3	5
1,4-Dioxane	123-91-1	100	61	100
Cyclohexane	110-82-7	ns	1.7	5
Methyl acetate	79-20-9	ns	1.4	5
Methylcyclohexane	108-87-2	ns	1.8	5

Matrix Soil				
Analytical Group SVOCs – SW-846 8270				
Concentration Level Low				
Analyte	CAS Number	NYSDEC Part 375 Soil Cleanup Objectives for Protection of Groundwater (µg/kg)	Achievable Lab Method Detection Limit (µg/kg)	Achievable Lab Reporting Limit (µg/kg)
2,2'-oxybis(1-Chloropropane)	108-60-1		51	330
2,4-Dichlorophenol	120-83-2	1,000,000	38	330
2,4-Dimethylphenol	105-67-9	1,000,000	36	330
2,4-Dinitrophenol	51-28-5	1,000,000	180	670
2,4-Dinitrotoluene	121-14-2	1,000,000	23	330
2,6-Dinitrotoluene	606-20-2	1,000,000	28	330
2-Chloronaphthalene	91-58-7	1,000,000	38	330
2-Chlorophenol	95-57-8	1,000,000	41	330
2-Methylnaphthalene	91-57-6	1,000,000	42	330
2-Methylphenol	95-48-7	1,000,000	38	330
2-Nitroaniline	88-74-4	1,000,000	21	670
2-Nitrophenol	88-75-5	1,000,000	36	330
3,3'-Dichlorobenzidine	91-94-1	1,000,000	35	330
3-Nitroaniline	99-09-2	1,000,000	24	670
4,6-Dinitro-2-methylphenol	534-52-1	ns	25	670
4-Bromophenyl-phenylether	101-55-3	ns	32	330
4-Chloro-3-methylphenol	59-50-7	1,000,000	26	330
4-Chloroaniline	106-47-8	1,000,000	24	330
4-Chlorophenyl-phenylether	7005-72-3	1,000,000	40	330
4-Methylphenol	106-44-5	ns	35	330
4-Nitroaniline	100-01-6	1,000,000	25	670
4-Nitrophenol	100-02-7	1,000,000	22	670
Acenaphthene	83-32-9	98,000	39	330
Acenaphthylene	208-96-8	107,000	37	330
Anthracene	120-12-7	1,000,000	27	330
Benzo(a)anthracene	56-55-3	1000	33	330

Benzo(a)pyrene	50-32-8	22,000	31	330
Benzo(b)fluoranthene	205-99-2	1,700	40	330
Benzo(g,h,i)perylene	191-24-2	100,000	38	330
Benzo(k)fluoranthene	207-08-9	1,700	43	330
Bis(2-chloroethoxy)methane	111-91-1	1,000,000	39	330
Bis(2-chloroethyl)ether	111-44-4	1,000,000	42	330
Bis(2-ethylhexyl)phthalate	117-81-7	1,000,000	29	330
Butylbenzylphthalate	85-68-7	1,000,000	26	330
Carbazole	86-74-8	1,000,000	28	330
Chrysene	218-01-9	1,000	29	330
Di-n-butylphthalate	84-74-2	1,000,000	28	330
Di-n-octylphthalate	117-84-0	1,000,000	28	330
Dibenzo(a,h)anthracene	53-70-3	1,000,000	35	330
Dibenzofuran	132-64-9	210,000	36	330
Diethylphthalate	84-66-2	1,000,000	24	330
Dimethylphthalate	131-11-3	1,000,000	30	330
Fluoranthene	206-44-0	1,000,000	29	330
Fluorene	86-73-7	386,000	33	330
Hexachlorobenzene	118-74-1	3,200	32	330
Hexachlorobutadiene	87-68-3	1,000,000	45	330
Hexachlorocyclopentadiene	77-47-4	1,000,000	96	330
Hexachloroethane	67-72-1	1,000,000	35	330
Indeno(1,2,3-cd)pyrene	193-39-5	8,200	37	330
Isophorone	78-59-1	1,000,000	34	330
N-Nitroso-di-n-propylamine	621-64-7	1,000,000	32	330
N-Nitrosodiphenylamine	86-30-6	1,000,000	29	330
Naphthalene	91-20-3	12,000	41	330
Nitrobenzene	98-95-3	1,000,000	38	330
Pentachlorophenol	87-86-5	800	140	670
Phenanthrene	85-01-8	1,000,000	26	330
Phenol	108-95-2	330	37	330
Pyrene	129-00-0	1,000,000	32	330
1,1'-Biphenyl	92-52-4	ns	42	330
2,4,5-Trichlorophenol	95-95-4	1,000,000	37	670
2,4,6-Trichlorophenol	88-06-2	1,000,000	39	330
1,2,4,5-Tetrachlorobenzene	95-94-3	ns	59	330
2,3,4,6-Tetrachlorophenol	58-90-2	ns	31	330
Acetophenone	98-86-2	ns	31	330
Atrazine	1912-24-9	ns	47	330
Benzaldehyde	100-52-7	ns	44	330
Caprolactam	105-60-2	ns	21	330

Brownfields QAPP Template #5d

Analytical Laboratory Sensitivity and Project Criteria

Matrix Aqueous				
Analytical Group VOCs				
Concentration Level Low				
Analytical Method/SOP	Data Quality Indicators¹	Performance Criteria (related to analytical method)	QC Sample such as Duplicate, Matrix Spike, Surrogates etc.) Used To Assess Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
8260	Precision	RPD <20	Field Duplicate	S & A
	Accuracy / Representativeness	<=10 degrees C	Cooler Temperature	S
	Accuracy / Contamination	Analytes <= QL	Field Equipment Blank	S
	Accuracy / Contamination	Analytes <= QL, or less than 1/10 sample concentration, common lab contaminants <=2X QL	Method Blank	A
	Accuracy	Laboratory In-house Limits	Laboratory Control Sample	A
	Accuracy / Precision	Laboratory In-house Limits, 40% RPD	Matrix Spike / Matrix Spike Duplicate	A
	Accuracy	Factor of two (-50% to +100%) from most recent calibration	Internal Standards	A
	Accuracy	Laboratory In-house Limits	Surrogate Standards	A

¹Defined as Precision; Accuracy/Bias; Sensitivity/Quantitation Limits, Representativeness; Comparability, Completeness

Matrix Soil				
Analytical Group VOCs				
Concentration Level Low				
Analytical Method/SOP	Data Quality Indicators¹	Performance Criteria (related to analytical method)	QC Sample such as Duplicate, Matrix Spike, Surrogates etc.) Used To Assess Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
8260	Precision	RPD <20	Field Duplicate	S & A
	Accuracy / Representativeness	<=10 degrees C	Cooler Temperature	S
	Accuracy / Contamination	Analytes <= QL	Field Equipment Blank	S
	Accuracy / Contamination	Analytes <= QL, or less than 1/10 sample concentration, common lab contaminants <=2X QL	Method Blank	A
	Accuracy	Laboratory In-house Limits	Laboratory Control Sample	A
	Accuracy / Precision	Laboratory In-house Limits, 40% RPD	Matrix Spike / Matrix Spike Duplicate	A
	Accuracy	Factor of two (-50% to +100%) from most recent calibration	Internal Standards	A
	Accuracy	Laboratory In-house Limits	Surrogate Standards	A

¹Defined as Precision; Accuracy/Bias; Sensitivity/Quantitation Limits, Representativeness; Comparability, Completeness

Matrix Aqueous				
Analytical Group SVOCs				
Concentration Level Low				
Analytical Method/SOP	Data Quality Indicators¹	Performance Criteria (related to analytical method)	QC Sample such as Duplicate, Matrix Spike, Surrogates etc.) Used To Assess Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
8270	Precision	RPD <20	Field Duplicate	S & A
	Accuracy / Representativeness	<=10 degrees C	Cooler Temperature	S
	Accuracy / Contamination	Analytes < = QL	Field Equipment Blank	S
	Accuracy / Contamination	Analytes < = QL, or less than 1/10 sample concentration, Common lab contaminants <=5X QL	Method Blank	A
	Accuracy	Laboratory In-house Limits	Laboratory Control Sample	A
	Accuracy / Precision	Laboratory In-house Limits, RPD 40%	Matrix Spike / Matrix Spike Duplicate	A
	Accuracy	Factor of two (-50% to +100%) from most recent calibration	Internal Standards	A
	Accuracy	Laboratory In-house Limits	Surrogate Standards	A

¹Defined as Precision; Accuracy/Bias; Sensitivity/Quantitation Limits, Representativeness; Comparability, Completeness

Matrix Soil				
Analytical Group SVOCs				
Concentration Level Low				
Analytical Method/SOP	Data Quality Indicators¹	Performance Criteria (related to analytical method)	QC Sample such as Duplicate, Matrix Spike, Surrogates etc.) Used To Assess Performance Criteria	QC Sample Assesses Error for Sampling (S), Analytical (A) or both (S&A)
8270	Precision	RPD <20	Field Duplicate	S & A
	Accuracy / Representativeness	<=10 degrees C	Cooler Temperature	S
	Accuracy / Contamination	Analytes <= QL	Field Equipment Blank	S
	Accuracy / Contamination	Analytes <= QL, or less than 1/10 sample concentration, Common lab contaminants <=5X QL	Method Blank	A
	Accuracy	Laboratory In-house Limits	Laboratory Control Sample	A
	Accuracy / Precision	Laboratory In-house Limits, RPD 40%	Matrix Spike / Matrix Spike Duplicate	A
	Accuracy	Factor of two (-50% to +100%) from most recent calibration	Internal Standards	A
	Accuracy	Laboratory In-house Limits	Surrogate Standards	A

¹Defined as Precision; Accuracy/Bias; Sensitivity/Quantitation Limits, Representativeness; Comparability, Completeness

Brownfields QAPP Template #5e

Secondary Data Criteria and Limitations Table

Secondary Data	Data Source (Originating Organization, Report Title, and Date)	Data Generator(s) (Originating Org., Data Types, Data Generation/ Collection Dates)	How Data Will Be Used	Limitations on Data Use
Site Environmental History	City of Rochester- Data Package, Environmental Assessment and Remediation Services December 2011	City of Rochester- Nine (9) Test Pits, Removal of four (4) USTs August 2011	Site information relative to features and locations that may be source areas of contamination.	Limited information of soil contamination
Site Environmental History	Day Environmental– Phase I Environmental Site Assessment (ESA), 121-123 Reynolds St. Rochester, NY April 2015			
Site-Specific Environmental Conditions	Day Environmental– Phase II Environmental Site Assessment (ESA), 121-123 Reynolds St. Rochester, NY January 2016	Day Environmental– Soil Screening, Soil and groundwater analytical data January 2016	Site information relative to features and locations that may be source areas of contamination.	Unvalidated data, limited data points
Site-Specific Environmental Conditions	Day Environmental – Supplemental Phase II ESA, 121-123 Reynolds Street, City of Rochester, NY January 2017	Day Environmental– Additional Soil and Groundwater analytical data January 2017	Site information relative to features and locations that may be source areas, and extent of contamination.	Unvalidated data, limited data points

Brownfields QAPP Template #6

**Project Specific Method and Standard Operating
Procedures (SOPs) Reference Table**

ANALYTICAL METHOD REFERENCE <i>(Include document title, method name/number, revision number, date)</i>
1a. SW846 Method 8260C GCMS Volatiles, August 2006
2a. SW846 Method 8270D GCMS Semivolatiles, July 2014
3a. SW846 Method 6010D, Inductively Coupled Plasma – Atomic Emission Spectrometry, July 2014
ANALYTICAL LABORATORY SOPs <i>(Include document title, date, revision number, and originator's name)</i>
1. Analytical Methods for the Analysis of GC/MS Volatiles [SW846 Method 8260C] – TestAmerica, BF-MV-013 r3, 3/1/2019
2. Analytical Methods for the Analysis of GC/MS Semivolatile Samples by SW846, 8270D – TestAmerica, BF-MB-010 r5, 2/6/2020
3. Thermo Scientific ICAP 6500 Analysis Method No(s). 6010C/CLP/200.7/6010D – TestAmerica, BF-ME-009 r10, 10/18/2017
FIELD SAMPLING SOPs¹ <i>(Include document title, date, revision number, and originator's name)</i>
1. <i>Corrective Action Plan, Petroleum-Impacted Soil and Groundwater, 121-123 Reynolds Street, Rochester, NY, NYSDEC Spill No. 1103833, by Stantec Consulting Services Inc., dated April 2020</i>

¹ Project Sampling SOPs include sample collection, sample preservation, equipment decontamination, preventive maintenance, etc.

Brownfields QAPP Template #7

Field Equipment Calibration, Maintenance, Testing, and Inspection

Field Equipment	Calibration Activity	Maintenance Activity	Testing/ Inspection Activity	Frequency	Acceptance Criteria	Corrective Action	SOP Reference
MiniRAE 2000 Photoionization Detector	Calibrate with isobutylene	Charge the monitor before use	NA	Prior to day's activities	0-2000 ppm: ± 2 ppm or 10% of reading 2000 ppm: $\pm 20\%$ of reading	Charge or replace battery, clean sensor module or lamp housing, replace water trap filter	MiniRAE 2000 Operation and Maintenance Manual

Brownfields QAPP Template #8

Analytical Laboratory Instrument and Equipment Maintenance, Testing, and Inspection

Instrument	Activity	List Maintenance, Testing and Inspection Activities	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	Method/SOP Reference
Purge & Trap/ GC/MS	VOC and SVOC Analysis	Check connections, replace disposables, perform injection port maintenance, clip column and perform leak checks.	Initial: After instrument set up and when calibration verification fails; minimum 5 points	%RSD ≤ 20 for all compounds & minimum RF for all compounds in Table 4 or 'r' ≥ 0.99	Perform necessary equipment maintenance and check calibration standards	GC/MS Analysts: TestAmerica Laboratories	SW846 8260C
			Continuing: Daily prior to samples and every 12 hours	% D ≤ 20 for all compounds	Perform necessary equipment maintenance and check calibration standards		
GCMS	SVOC Analysis	Check connections, replace disposables, perform injection port maintenance, clip column and perform leak checks.	Initial: After instrument set up and when calibration verification fails; minimum 5 points	%RSD ≤ 20 for all compounds & minimum RF for all compounds in Table 4 or 'r' ≥ 0.99	Perform necessary equipment maintenance and check calibration standards	GC/MS Analysts: TestAmerica Laboratories	SW846 8270D
			Continuing: Daily prior to samples and every 12 hours	% D ≤ 20 for all CCC compounds and $\leq 30\%$ for all other compounds.	Perform necessary equipment maintenance and check calibration standards		
GC/ECD	Pesticide Analysis	Check connections, replace disposables, perform injection port maintenance, clip column, perform leak checks, clean detector.	Initial: After instrument set up and when calibration verification fails; minimum 5 points or 6 points (non-linear)	%RSD ≤ 20 or 'r' ≥ 0.99	Perform necessary equipment maintenance and check calibration standards	GC/ECD Analysts: TestAmerica Laboratories	SW846 8081B
			Continuing: Daily prior to samples and after every 20 samples, or every 12 hours, whichever is more frequent	%D < 15 ;	Perform necessary equipment maintenance and check calibration standards		

Instrument	Activity	List Maintenance, Testing and Inspection Activities	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	Method/ SOP Reference
GC/ECD	PCB Analysis	Check connections, replace disposables, perform injection port maintenance, clip column, perform leak checks, clean detector.	Initial: Minimum 5 levels for Aroclors 1016 & 1260, single midpoint level for other Aroclors. Use 3-5 peaks for each Aroclor	$\%RSD \leq 20$ or $r' \geq 0.99$	Perform necessary equipment maintenance and check calibration standards	GC/ECD Analysts: TestAmerica Laboratories	SW846 8082A
			Continuing: Midpoint containing Aroclors 1016/1260 prior to samples and after every 20 samples, or every 12 hours, whichever is more frequent	$\%D < 205$;	Perform necessary equipment maintenance and check calibration standards		
ICP-AES	Metals Analysis	ICP: Check argon tank pressure, check tubing, nebulizer, clean plasma torch assembly, clean filters, check o-rings.	Initial Calibration: One standard and a blank; daily prior to samples	$r > 0.998$	Perform necessary equipment maintenance and check calibration standards	Metals Analyst: TestAmerica Laboratories	SW846 6010C
			Continuing Calibration Verification: Every 10 samples and at end of analytical run	90-110% recovery	Perform necessary equipment maintenance and check calibration standards		
CVAA	Mercury Analysis	CVAA: Inspect pump windings, rotate and replace if necessary, check gases.	Daily prior to samples; 5 standards and blank	$r > 0.995$	Perform necessary equipment maintenance and check calibration standards	Mercury Analyst: TestAmerica Laboratories	SW846 7471B
			Continuing Calibration Verification: Every 10 samples and at end of analytical run	80-120% recovery	Perform necessary equipment maintenance and check calibration standards		

Instrument	Activity	List Maintenance, Testing and	Frequency of Calibration	Acceptance Criteria	Corrective Action (CA)	Person Responsible for CA	Method/SOP
Lachat analyzer (colorimetric detector)	Cyanide analysis	Replace tubing as needed.. Check for leaks and replace o-rings as necessary.	Initial: (daily); five calibration levels and blank	$r \geq 0.995$	Perform necessary equipment maintenance and check calibration standards	Cyanide Analyst: TestAmerica Laboratories	SW846 9012B
			Continuing: Every 20 samples and at the end of the sequence	85-115% recovery	Perform necessary equipment maintenance and check calibration standards		

Brownfields QAPP Template #9a

Sample Handling System

SAMPLE COLLECTION, PACKAGING, AND SHIPMENT	
Sample Collection (Personnel/Organization):	Stantec Field Geologist or Environmental Technician (TBD)
Sample Packaging (Personnel/Organization):	Stantec Field Geologist or Environmental Technician (TBD)
Coordination of Shipment (Personnel/Organization):	Stantec Field Geologist or Environmental Technician (TBD) and Robert Mahoney, Project Geologist
Type of Shipment/Carrier:	Fed Ex or Private Courier, typically Priority Overnight
SAMPLE RECEIPT AND ANALYSIS	
Sample Receipt (Personnel/Organization):	Sample receiving staff/TestAmerica Laboratory, RI Division
Sample Custody and Storage (Personnel/Organization):	Sample receiving staff/TestAmerica Laboratory
Sample Preparation (Personnel/Organization):	Sample Preparation Technicians (Organics, Inorganics)/ TestAmerica Laboratory
Sample Determinative Analysis (Personnel/Organization):	Instrument Lab Staff (Organics, Inorganics)/ TestAmerica Laboratory
SAMPLE ARCHIVING	
Field Sample Storage (No. of days from sample collection):	Samples to be shipped at the end of each sampling day, and arrive at laboratory within 48 hours (2 days) of sample shipment.
Sample Extract/Digestate Storage (No. of days from extraction/digestion):	Six months from delivery of final laboratory report.
SAMPLE DISPOSAL	
Personnel/Organization:	Sample receiving staff/ TestAmerica Laboratory
Number of Days from Analysis:	30 days from delivery of final laboratory report.

Brownfields QAPP Template #9b

Sample Custody Requirements

Sample Identification Procedures:

Sample identification documents include field records, sample labels, custody seals, and chain-of-custody records. The sample labels are placed on the bottles so as not to obscure any QA/QC lot numbers on the bottles. Sample information is printed in a legible manner using waterproof ink. To minimize handling of sample containers, labels will be filled out prior to sample collection to the extent possible. The sample label will be firmly affixed to the sample containers and will include information of the name or initials of sampler, date (and time if possible) of collection, sample number, intended analysis, and preservation performed.

Each sample will have a unique ID number that will refer to the sample location, media type, and depth interval (if applicable).

Field Sample Custody/Tracking Procedures (sample collection, packaging, shipment, and delivery to laboratory):

Field quality control samples will be collected to verify reproducibility of the sampling and analytical methods. Field duplicates will be obtained at a rate of one per 20 original field samples. Trip blanks will be used to assess whether groundwater has been exposed to volatile constituents during sample storage and transport. The trip blanks will remain unopened throughout the sampling event and will only be analyzed for volatile organics. Sample bottles will be obtained pre-cleaned by the laboratory and shipped to the sampling personnel in charge of the field activities. Coolers or boxes containing cleaned bottles should be sealed with a custody tape seal during transport to the field or while in storage prior to use. Transportation and handling of samples must be accomplished in a manner that not only protects the integrity of the sample, but also prevents any detrimental effects due to the possible hazardous nature of samples.

Laboratory Sample Custody/Tracking Procedures (receipt of samples, archiving, and disposal):

Laboratory sample custody procedures (receipt of samples, archiving, and disposal) will be used according to TestAmerica Laboratory standard procedures. Coolers are received and checked for proper temperature. A sample cooler receipt form will be filled out to note conditions and any discrepancies. The chain-of-custody form will be checked against the sample containers for accuracy. Samples will be logged into the laboratory information management system and given a unique log number which can be tracked through processing. The laboratory project manager will notify the client verbally or via email immediately if any problems are identified. Discrepancies and resolutions will be documented on the sample receiving checklist. Samples will remain under custody until the completion of analysis and following analysis until sample remnants are ultimately disposed. The TestAmerica laboratory facility is a secured, limited access facility.

Chain-of-Custody Procedures:

After collection, each sample will be maintained in the sampler's custody until formally transferred to another party (e.g., Fed Ex or Private Courier). For all samples collected, chain-of-custody forms will document the date and time of sample collection, the sampler's name, and the names of all others who subsequently held custody of the sample. Specifications for chemical analyses will also be documented on the chain-of-custody form. After collection, each sample will be maintained in the sampler's custody until formally transferred to another party (e.g., FedEx).

Brownfields QAPP Template #10
Field and Analytical Laboratory Quality Control Summary

Matrix		Groundwater				
Analytical Group		VOCs				
Concentration Level		Low/Medium - mg/kg (ppm)				
Sampling SOP(s)		<i>Corrective Action Plan, Petroleum-Impacted Soil and Groundwater, 121-123 Reynolds Street, Rochester, New York, NYSDEC Spill No. 1103833 by Stantec Consulting Services Inc., dated February 2020</i>				
Analytical Method/SOP Reference		EPA Method 8260 / BF-MV-013				
Sampler's Name		Stantec Field Geologist or Environmental Technician				
Field Sampling Organization		Stantec Consulting Services Inc.				
Analytical Organization		TestAmerica Laboratory				
No. of Sample Locations		4				
Quality Control (QC) Sample:	Frequency /Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate		RPD <20			Precision	RPD <20
Cooler Temperature	1 per shipping cooler	<=10 deg. C	Note in report		Accuracy / Representativeness	<=10 deg. C
Field Equipment Blank		Analytes < = QL			Accuracy / Contamination	Analytes < = QL
Method Blank	One per batch of <=20 samples	Analytes < = QL, or less than 1/10 sample concentration, common lab contaminants <=2X QL	If sufficient holding time remains, reanalyze batch. If insufficient holding time, flag result, note in narrative	TestAmerica Analyst or Department Supervisor	Accuracy / Contamination	Analytes < = QL, or less than 1/10 sample concentration, common lab contaminants <=2X QL
Laboratory Control Sample	One per batch of <=20 samples	Laboratory In-house Limits	If sufficient holding time remains, reanalyze batch. If insufficient holding time, flag result, note in narrative	TestAmerica Analyst or Department Supervisor	Accuracy	Laboratory In-house Limits

Matrix Spike / Matrix Spike Duplicate	One set per 20 samples, as determined by sampler	Laboratory In-house Limits, 40% RPD	flag result, note in narrative	TestAmerica Analyst or Department Supervisor	Accuracy / Precision	Laboratory In-house Limits, 40% RPD
Internal Standards	Every sample, standard, QC sample	Factor of two (-50% to +100%) from most recent calibration	Reanalyze sample. If determined to be matrix interference, note in narrative.	TestAmerica Analyst or Department Supervisor	Accuracy	Factor of two (-50% to +100%) from most recent calibration
Surrogate Standards	Every sample, standard, QC sample	Laboratory in-house limits. No exceedances for MB or LCS, one exceedance allowed for field samples	Flag result, note in narrative	TestAmerica Analyst or Department Supervisor	Accuracy	Laboratory in-house limits. No exceedances for MB or LCS, one exceedance allowed for field samples

Matrix		Soil				
Analytical Group		VOCs				
Concentration Level		Low/Medium - mg/kg (ppm)				
Sampling SOP(s)		<i>Corrective Action Plan, Petroleum-Impacted Soil and Groundwater, 121-123 Reynolds Street, Rochester, NY, NYSDEC Spill No. 1103833, by Stantec Consulting Services Inc., dated November 2015</i>				
Analytical Method/SOP Reference		EPA Method 8260 / BF-MV-013				
Sampler's Name		Stantec Field Geologist or Environmental Technician				
Field Sampling Organization		Stantec Consulting Services Inc.				
Analytical Organization		TestAmerica Laboratory				
No. of Sample Locations		25				
Quality Control (QC) Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate		RPD <20			Precision	RPD <20
Cooler Temperature	1 per shipping cooler	<=10 deg. C	Note in report		Accuracy / Representativeness	<=10 deg. C

Field Equipment Blank		Analytes < = QL			Accuracy / Contamination	Analytes < = QL
Method Blank	One per batch of <=20 samples	Analytes < = QL, or less than 1/10 sample concentration, common lab contaminants <=2X QL	If sufficient holding time remains, reanalyze batch. If insufficient holding time, flag result, note in narrative	TestAmerica Analyst or Department Supervisor	Accuracy / Contamination	Analytes < = QL, or less than 1/10 sample concentration, common lab contaminants <=2X QL
Laboratory Control Sample	One per batch of <=20 samples	Laboratory In-house Limits	If sufficient holding time remains, reanalyze batch. If insufficient holding time, flag result, note in narrative	TestAmerica Analyst or Department Supervisor	Accuracy	Laboratory In-house Limits
Matrix Spike / Matrix Spike Duplicate	One set per 20 samples, as determined by sampler	Laboratory In-house Limits, 40% RPD	flag result, note in narrative	TestAmerica Department Supervisor	Accuracy / Precision	Laboratory In-house Limits, 40% RPD
Internal Standards	Every sample, standard, QC sample	Factor of two (-50% to +100%) from most recent calibration	Reanalyze sample. If determined to be matrix interference, note in narrative.	TestAmerica Analyst or Department Supervisor	Accuracy	Factor of two (-50% to +100%) from most recent calibration
Surrogate Standards	Every sample, standard, QC sample	Laboratory in-house limits. No exceedances for MB or LCS, one exceedance allowed for field samples	Flag result, note in narrative	TestAmerica Analyst or Department Supervisor	Accuracy	Laboratory in-house limits. No exceedances for MB or LCS, one exceedance allowed for field samples

Matrix		Groundwater				
Analytical Group		Semivolatile Organic Compounds				
Concentration Level		Low/Medium - mg/kg (ppm)				
Sampling SOP(s)		EPA Region 2 Low Flow Groundwater Sampling Procedure				
Analytical Method/SOP Reference		EPA Method 8270 / BF-MB-010				
Sampler's Name		Stantec Field Geologist or Environmental Technician				
Field Sampling Organization		Stantec Consulting Services Inc.				
Analytical Organization		TestAmerica Laboratory				
No. of Sample Locations		4				
Quality Control (QC) Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate		RPD <20			Precision	RPD <20
Cooler Temperature	1 per shipping cooler	<=10 deg. C	Note in report		Accuracy / Representativeness	<=10 deg. C
Field Equipment Blank		Analytes < = QL			Accuracy / Contamination	Analytes < = QL
Method Blank	One per preparation batch of <=20 samples	Analytes < = QL, or less than 1/10 sample concentration, common lab contaminants <=5X QL	If sufficient holding time remains, reprepare batch. If insufficient holding time, flag result, note in narrative	TestAmerica Analyst or Department Supervisor	Accuracy / Contamination	Analytes < = QL, or less than 1/10 sample concentration, common lab contaminants <=5X QL
Laboratory Control Sample	One per preparation batch of <=20 samples	Laboratory In-house Limits	If sufficient holding time remains, reprepare batch. If insufficient holding time, flag result, note in narrative	TestAmerica Analyst or Department Supervisor	Accuracy	Laboratory In-house Limits
Matrix Spike / Matrix Spike Duplicate	One set per 20 samples, as determined by sampler	Laboratory In-house Limits, 40% RPD	flag result, note in narrative	TestAmerica Analyst or Department Supervisor	Accuracy / Precision	Laboratory In-house Limits, 40% RPD

Internal Standards	Every sample, standard, QC sample	Factor of two (-50% to +100%) from most recent calibration, unless obvious matrix interference	Reanalyze sample. If determined to be matrix interference, note in narrative.	TestAmerica Analyst or Department Supervisor	Accuracy	Factor of two (-50% to +100%) from most recent calibration, unless obvious matrix interference
Surrogate Standards	Every sample, standard, QC sample	Laboratory in-house limits. No exceedances for MB or LCS, one acid and one base/neutral exceedance allowed for field samples, unless obvious matrix interference	Flag result, note in narrative	TestAmerica Analyst or Department Supervisor	Accuracy	Laboratory in-house limits. No exceedances for MB or LCS, one acid and one base/neutral exceedance allowed for field samples, unless obvious matrix interference

Matrix		Soil				
Analytical Group		Semivolatile Organic Compounds				
Concentration Level		Low/Medium - mg/kg (ppm)				
Sampling SOP(s)		<i>Corrective Action Plan, Petroleum-Impacted Soil and Groundwater, 121-123 Reynolds Street, Rochester, NY, NYSDEC Spill No. 1103833, by Stantec Consulting Services Inc., dated February 2020</i>				
Analytical Method/SOP Reference		EPA Method 8270 / BF-MB-010				
Sampler's Name		Stantec Field Geologist or Environmental Technician				
Field Sampling Organization		Stantec Consulting Services Inc.				
Analytical Organization		TestAmerica Laboratory				
No. of Sample Locations		25				
Quality Control (QC) Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate		RPD <20			Precision	RPD <20
Cooler Temperature	1 per shipping cooler	<=10 deg. C	Note in report		Accuracy / Representativeness	<=10 deg. C

Field Equipment Blank		Analytes < = QL			Accuracy / Contamination	Analytes < = QL
Method Blank	One per preparation batch of <=20 samples	Analytes < = QL, or less than 1/10 sample concentration, common lab contaminants <=5X QL	If sufficient holding time remains, reprepare batch. If insufficient holding time, flag result, note in narrative	TestAmerica Analyst or Department Supervisor	Accuracy / Contamination	Analytes < = QL, or less than 1/10 sample concentration, common lab contaminants <=5X QL
Laboratory Control Sample	One per preparation batch of <=20 samples	Laboratory In-house Limits	If sufficient holding time remains, reprepare batch. If insufficient holding time, flag result, note in narrative	TestAmerica Analyst or Department Supervisor	Accuracy	Laboratory In-house Limits
Matrix Spike / Matrix Spike Duplicate	One set per 20 samples, as determined by sampler	Laboratory In-house Limits, 40% RPD	flag result, note in narrative	TestAmerica Analyst or Department Supervisor	Accuracy / Precision	Laboratory In-house Limits, 40% RPD
Internal Standards	Every sample, standard, QC sample	Factor of two (-50% to +100%) from most recent calibration, unless obvious matrix interference	Reanalyze sample. If determined to be matrix interference, note in narrative.	TestAmerica Analyst or Department Supervisor	Accuracy	Factor of two (-50% to +100%) from most recent calibration, unless obvious matrix interference
Surrogate Standards	Every sample, standard, QC sample	Laboratory in-house limits. No exceedances for MB or LCS, one acid and one base/neutral exceedance allowed for field samples, unless obvious matrix interference	Flag result, note in narrative	TestAmerica Analyst or Department Supervisor	Accuracy	Laboratory in-house limits. No exceedances for MB or LCS, one acid and one base/neutral exceedance allowed for field samples, unless obvious matrix interference

Matrix			Groundwater			
Analytical Group			Metals			
Concentration Level			Low/Medium - ug/L (ppb)			
Sampling SOP(s)			EPA Region 2 Low Flow Groundwater Sampling Procedure			
Analytical Method/SOP Reference			EPA Method 6010/ BF-ME-019			
Sampler's Name			Stantec Field Geologist or Environmental Technician			
Field Sampling Organization			Stantec Consulting Services Inc.			
Analytical Organization			TestAmerica Laboratory			
No. of Sample Locations						
Quality Control (QC) Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria
Field Duplicate		RPD <20			Precision	RPD <20
Cooler Temperature	1 per shipping cooler	<=10 deg. C	Note in report		Accuracy / Representativeness	<=10 deg. C
Field Equipment Blank		Analytes < = QL			Accuracy / Contamination	Analytes < = QL
Method Blank	One per preparation batch of <=20 samples	Analytes < = QL, or less than 1/10 sample concentration, common lab contaminants <=5X QL	Reprepare batch	TestAmerica Analyst or Department Supervisor	Accuracy / Contamination	Analytes < = QL, or less than 1/10 sample concentration, common lab contaminants <=5X QL
Laboratory Control Sample	One per preparation batch of <=20 samples	80% - 120%	If LCS has high bias, and samples non-detect, report with case narrative comment. If LCS has low bias, evaluate and re-prepare and reanalyze the LCS and all samples in the associated prep batch for failed analytes, if sufficient sample material is available.	TestAmerica Analyst or Department Supervisor	Accuracy	80% - 120%

Matrix Spike / Matrix Spike Duplicate	One set per 20 samples, as determined by sampler	75%-125% RPD between MS and MSD $\leq 20\%$	Evaluate results. If analytical error reprepare/reanalyze as needed, if matrix effect, flag result, note in narrative	TestAmerica Analyst or Department Supervisor	Accuracy / Precision	75%-125% RPD between MS and MSD $\leq 20\%$
Serial Dilution Test	One per preparatory batch if MS or MSD fails. (Only applicable for samples with concentrations $> 5 \times \text{QL}$)	Five-fold dilution must agree within $\pm 10\%$ of the original determination	If dilution test fails analyze post digestion spike.	TestAmerica Analyst or Department Supervisor	Accuracy/Bias / Precision	Five-fold dilution must agree within $\pm 10\%$ of the original determination
Post Digestion Spike (PDS)	When dilution test fails or analyte concentration of samples $< 5 \times \text{QL}$	80% - 120%	If post spike fails and MS/MSD fails flag and narrate results..	TestAmerica Analyst or Department Supervisor	Accuracy/Bias	80% - 120%
Internal Standards	Every sample, standard, QC sample	Factor of two (-50% to +100%) from most recent calibration,	Reanalyze sample. If determined to be matrix interference, dilute and reanalyze sample..	TestAmerica Analyst or Department Supervisor	Accuracy	Factor of two (-50% to +100%) from most recent calibration,

Matrix		Soil				
Analytical Group		Semivolatile Organic Compounds				
Concentration Level		Low/Medium - mg/kg (ppm)				
Sampling SOP(s)		Corrective Action Plan, Petroleum-Impacted Soil and Groundwater, 121-123 Reynolds Street, Rochester, NY, NYSDEC Spill No. 1103833, by Stantec Consulting Services Inc., dated February 2020				
Analytical Method/SOP Reference		EPA Method 6010 / BF-MB-009				
Sampler's Name		Stantec Field Geologist or Environmental Technician				
Field Sampling Organization		Stantec Consulting Services Inc.				
Analytical Organization		TestAmerica Laboratory				
No. of Sample Locations		Soil				
Quality Control (QC) Sample:	Frequency/ Number	Method/SOP QC Acceptance Limits	Corrective Action	Person(s) Responsible for Corrective Action	Data Quality Indicator (DQI)	Measurement Performance Criteria

Field Duplicate		RPD <20			Precision	RPD <20
Cooler Temperature	1 per shipping cooler	<=10 deg. C	Note in report		Accuracy / Representativeness	<=10 deg. C
Field Equipment Blank		Analytes < = QL			Accuracy / Contamination	Analytes < = QL
Method Blank	One per preparation batch of <=20 samples	Analytes < = QL, or less than 1/10 sample concentration, common lab contaminants <=5X QL	Reprepare batch	TestAmerica Analyst or Department Supervisor	Accuracy / Contamination	Analytes < = QL, or less than 1/10 sample concentration, common lab contaminants <=5X QL
Laboratory Control Sample / Standard Reference Material	One per preparation batch of <=20 samples	80% - 120% or SRM Vendor Certified Limits	If LCS/SRM has high bias, and samples non-detect, report with case narrative comment. If LCS/SRM has low bias, evaluate and re-prepare and reanalyze the LCS and all samples in the associated prep batch for failed analytes, if sufficient sample material is available.	TestAmerica Analyst or Department Supervisor	Accuracy	SRM Vendor Certified Limits
Matrix Spike / Matrix Spike Duplicate	One set per 20 samples, as determined by sampler	75%-125% RPD between MS and MSD ≤ 20%	Evaluate results. If analytical error reprepare/reanalyze as needed, if matrix effect, flag result, note in narrative	TestAmerica Analyst or Department Supervisor	Accuracy / Precision	75%-125% RPD between MS and MSD ≤ 20%
Serial Dilution Test	One per preparatory batch if MS or MSD fails. (Only applicable for samples with concentrations > 5x QL)	Five-fold dilution must agree within ± 10% of the original determination	If dilution test fails analyze post digestion spike.	TestAmerica Analyst or Department Supervisor	Accuracy/Bias / Precision	Five-fold dilution must agree within ± 10% of the original determination
Post Digestion Spike (PDS)	When dilution test fails or analyte concentration of samples < 5x QL	80% - 120%	If post spike fails and MS/MSD fails flag and narrate results..	TestAmerica Analyst or Department Supervisor	Accuracy/Bias	80% - 120%

Internal Standards	Every sample, standard, QC sample	Factor of two (-50% to +100%) from most recent calibration,	Reanalyze sample. If determined to be matrix interference, dilute and reanalyze sampl..	TestAmerica Analyst or Department Supervisor	Accuracy	Factor of two (-50% to +100%) from most recent calibration,
--------------------	-----------------------------------	---	---	--	----------	---

Brownfields QAPP Template #11a

Data Management and Documentation

Field Sample Collection Documents and Records	Analytical Laboratory Documents and Records	Data Assessment Documents and Records	Project File
<ul style="list-style-type: none"> •Site and field logbooks •Boring logs •Well construction diagrams •Chain-of-Custody (COC) forms •Well Sampling Forms •Field Data Sheets •Photographs 	<ul style="list-style-type: none"> •Sample receipt logs •Internal and external COC forms •Equipment calibration logs •Sample preparation worksheets/logs •Sample analysis worksheets/run logs •Telephone/email logs •Corrective action documentation 	<ul style="list-style-type: none"> •Data Usability Summary Reports •Review forms for electronic entry of data into database •Documentation of internal technical review of report(s) •Corrective action documentation 	<ul style="list-style-type: none"> •The laboratory will maintain its project files for a minimum of 10 years •Stantec Consulting will maintain its project files for a minimum of 10 years •The City of Rochester will maintain its project files for a minimum of 10 years

Brownfields QAPP Template #11b

Project Reports

Type of Report	Frequency	Projected Delivery Date(s)	Person(s) Responsible for Report Preparation	Report Recipient(s)
Status reports	Weekly	July – August 2020	Robert Mahoney – Sr. Environ. Geologist, Stantec Consulting	Joe Biondolillo – Project Manager, City of Rochester DEQ
Data Usability Summary Report (DUSR)	One Time	October 2020	Judy Harry- Data Validation Services	Joe Biondolillo – Project Manager , City of Rochester DEQ; Yocasta DeJesus - EPA Region 2 Brownfields Project Officer
Remedial Construction/ Closure Report	One Time	December 2020	Robert Mahoney – Sr. Environ. Geologist, Stantec Consulting	Joe Biondolillo – Project Manager, City of Rochester DEQ; Michael Zamiarski, .P.E. - Engineer, NYSDEC Yocasta DeJesus - EPA Region 2 Brownfields Project Officer

Brownfields QAPP Template #12a

Planned Project Assessments Table

Assessment Type	Frequency	Internal or External	Organization Performing Assessment	Person(s) Responsible for Performing Assessment (Title and Organizational Affiliation)	Person(s) Responsible for Responding to Assessment Findings (Title and Organizational Affiliation)	Person(s) Responsible for Identifying and Implementing Corrective Actions (Title and Organizational Affiliation)	Person(s) Responsible for Monitoring Effectiveness of Corrective Actions (Title and Organizational Affiliation)
<i>Due to the short time frame for project completion, these types of assessments are not applicable.</i>							

Brownfields QAPP Template #12b

Assessment Findings and Corrective Action Responses

Assessment Type	Nature of Deficiencies Documentation	Individual(s) Notified of Findings (Name, Title, Organization)	Timeframe of Notification	Nature of Corrective Action Response Documentation	Individual(s) Receiving Corrective Action Response (Name, Title, Org.)	Timeframe for Response
<i>Due to the short time frame for project completion, these types of assessments are not applicable.</i>						

Brownfields QAPP Template #13a

Project Data Verification Process (Step I)¹

Verification Input	Description	Internal/ External²	Responsible for Verification
Site/Field Logbooks	Field notes will be prepared daily by the Environmental Consultant Field Personnel and will be complete, appropriate, legible and pertinent. Upon completion of field work, logbooks will be placed in the project files.	I	Robert Mahoney - Stantec Consulting
Chains of custody	COC forms will be reviewed against the samples packed in the specific cooler prior to shipment. The reviewer will initial the form. An original COC will be sent with the samples to the laboratory, while copies are retained for (1) the Sampling Trip Report and (2) the project files.	I	Robert Mahoney- Stantec Consulting
Laboratory analytical data package	Data packages will be reviewed/verified internally by the laboratory performing the work for completeness and technical accuracy prior to submittal.	I	TestAmerica Laboratory
Laboratory analytical data package	Data packages will be reviewed as to content and sample information upon receipt by the Environmental Consultant Project Manager and the Third Party Data Validation Personnel.	I/E	Robert Mahoney - Stantec Consulting; Judy Harry - Data Validation Services ²
Remedial Construction/ Completion Report	The project data results will be compiled in a summary report for the project. Entries will be reviewed/verified against hardcopy information.	I	Robert Mahoney - Stantec Consulting

¹Step I – Completeness Check²Internal or External is in relation to the data generator.

Brownfields QAPP Template #13b

Project Data Validation Process (Steps IIa and IIb) ¹

Step IIa/IIb¹	Validation Input	Description	Responsible for Validation (Name, Organization)
IIa	SOPs	Ensure that the sampling methods/procedures outlined in QAPP were followed, and that any deviations were noted/approved.	Robert Mahoney - Stantec Consulting
IIb	SOPs	Determine potential impacts from noted/approved deviations, in regard to PQOs.	Robert Mahoney - Stantec Consulting
IIa	Chains of custody	Examine COC forms against QAPP and laboratory contract requirements (e.g., analytical methods, sample identification, etc.).	Judy Harry - Data Validation Services
IIa	Laboratory data package	Examine packages against QAPP and laboratory contract requirements, and against COC forms (e.g., holding times, sample handling, analytical methods, sample identification, data qualifiers, QC samples, etc.).	Judy Harry - Data Validation Services
IIb	Laboratory data package	Determine potential impacts from noted/approved deviations, in regard to PQOs. Examples include PQLs and QC sample limits (precision/accuracy).	Robert Mahoney - Stantec Consulting; Judy Harry - Data Validation Services
IIb	Field duplicates	Compare results of field duplicate (or replicate) analyses with RPD criteria	Robert Mahoney - Stantec Consulting; Judy Harry - Data Validation Services

¹Step IIa – Compliance with Methods, Procedures, and Contracts¹Step IIb – Comparison with Performance Criteria in QAPP

Brownfields QAPP Template #13c

Project Matrix and Analytical Validation (Steps IIa and IIb)¹ Summary

Step IIa/IIb¹	Matrix	Analytical Group	Concentration Level	Validation Criteria	Data Validator (title and organizational affiliation)
IIa / IIb	Soil/Sediment/ Aqueous	VOCs, SVOCs, TPH	Low and Medium	USEPA Contract Laboratory Program (CLP) National Functional Guidelines for Organic Data Review (October 1999)	Judy Harry, Data Validation Services

¹Step IIa – Compliance with Methods, Procedures, and Contracts¹Step IIb – Comparison with Performance Criteria in QAPP

Brownfields QAPP Template #13d

Usability Assessment (Step III)¹

Summarize the usability assessment process and all procedures, including interim steps and any statistics, equations, and computer algorithms that will be used:

Determine if any detectable amounts of contaminant(s) are present. If no detectable amounts are indicated and all data are acceptable for the verification and validation, then the data is usable.

If verification and validation are not acceptable then take corrective action (determine cause, data impact, evaluate the impact and document the rationale for resampling).

Describe the evaluative procedures used to assess overall measurement error associated with the project:

Determine if the quality control data is within the performance criteria (precision, accuracy, etc) through validation process IIb (Validation Activities).

Identify the personnel responsible for performing the usability assessment:

Project Management Team – Consisting of the Environmental Consultant Project Manager (Mike Storonsky); Data Validator (Judy Harry - DVS); Brownfields Recipient Project Manager (Joe Biondolillo – City of Rochester).

Describe the documentation that will be generated during usability assessment and how usability assessment results will be presented so that they identify trends, relationships (correlations), and anomalies:

The Data Usability Summary Report (DUSR) will describe the rationale for the data and the presentation of any data limitations. For example, if the performance criteria are not usable to address the regulatory requirements or support the project-decision for the Brownfields Recipient, then the Phase II ESA Report will address how this problem will be resolved and discuss any alternative approaches.

¹Step III – Usability Assessment

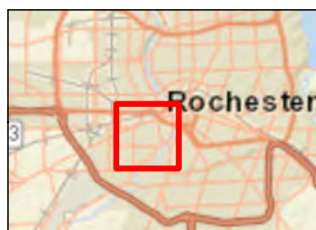
Table 13d-1**Data Elements for Data Review Process**

Item	Step I - Data Verification	Step IIa - Data Validation Compliance	Step IIb - Data Validation Comparison	Step III -Data Usability
Planning Documents				
Evidence of approval of QAPP	X			Use outputs from previous steps
Identification of personnel	X			
Laboratory name	X			
Methods (sampling & analytical)	X	X	X	
Performance requirements (including QC criteria)	X	X		
Project quality objectives	X		X	
Reporting forms	X	X		
Sampling plans – locations, maps grids, sample ID numbers	X	X		
Site identification	X			
SOPs (sampling & analytical)	X	X		
Staff training & certification	X			
List of project-specific analytes	X	X		
Analytical Data Package				
Case narrative	X	X	X	Use outputs from previous steps
Internal lab chain of custody	X	X		
Sample condition upon receipt, & storage records	X	X		
Sample chronology (time of receipt, extraction/digestion, analysis)	X	X		
Identification of QC samples (sampling /lab)	X	X		
Associated PE sample results	X	X	X	
Communication Logs	X	X		
Copies of lab notebook, records, prep sheets	X	X		
Corrective action reports	X	X		
Definition of laboratory qualifiers	X	X	X	
Documentation of corrective action results	X	X	X	
Documentation of individual QC results (e.g., spike, duplicate, LCS)	X	X	X	
Documentation of laboratory method deviations	X	X	X	
Electronic data deliverables	X	X		
Instrument calibration reports	X	X	X	
Laboratory name	X	X		
Laboratory sample identification no.	X	X		

QC sample raw data	X	X	X	
QC summary report	X	X	X	

Data Elements for Data Review Process				
Raw data	X	X	X	Use outputs from previous steps
Reporting forms, completed with actual results	X	X	X	
Signatures for laboratory sign-off (e.g., laboratory QA manager)	X	X		
Standards traceability records (to trace standard source form NIST, for example)	X	X	X	
Sampling Documents				
Chain of custody	X	X		Use outputs from previous steps
Communication logs	X	X		
Corrective action reports	X	X	X	
Documentation of corrective action results	X	X	X	
Documentation of deviation from methods	X	X	X	
Documentation of internal QA review	X	X	X	
Electronic data deliverables	X	X		
Identification of QC samples	X	X	X	
Meteorological data from field (e.g., wind, temperature)	X	X	X	
Sampling instrument decontamination records	X	X		
Sampling instrument calibration logs	X	X		
Sampling location and plan	X	X	X	
Sampling notes & drilling logs	X	X	X	
Sampling report (from field team leader to project manager describing sampling activities)	X	X	X	
External Reports				
External audit report	X	X	X	Use outputs from previous steps
External PT sample results	X	X		
Laboratory assessment	X	X		
Laboratory QA plan	X	X		
MDL study information	X	X	X	
NELAP accreditation	X	X		

FIGURE 1



Legend:

- Site Location



Project Location
121-123 Reynolds Street
Rochester, New York

Client/Project
City of Rochester
Petroleum Impacted Soil and Groundwater Remediation
Quality Assurance Project Plan

Figure No.
1

Title
Site Location Map

Notes
1. Coordinate System: WGS 1984 Web Mercator Auxiliary Sphere
2. Base features produced under license with the Ontario Ministry of Natural Resources © Queen's Printer for Ontario, 2013.
3. Topo Imagery provided by ESRI Online Services and USGS 7.5 Minute Quad of Rochester West, NY, dated 1995.
4. Key Map Service Layer Credits: Sources Esri, HERE, DeLorme, USGS, Intermap, INCREMENT P, NRCan, Esri Japan, METI, Esri China (Hong Kong), Esri Korea, Esri (Thailand), MapmyIndia, NGCC, © OpenStreetMap contributors, and the GIS User Community
Copyright © 2013 National Geographic Society, I-cubed

Disclaimer: Stantec assumes no responsibility for data supplied in electronic format. The recipient accepts full responsibility for verifying the accuracy and completeness of the data. The recipient releases Stantec, its officers, employees, consultants and agents, from any and all claims arising in any way from the content or provision of the data.

**CORRECTIVE ACTION PLAN
PETROLEUM-IMPACTED SOIL AND GROUNDWATER
121-123 REYNOLDS STREET
ROCHESTER, NY**

Appendix E

Standard Operating Procedures – Soil and Groundwater Sampling

	Soil Sampling SOP		ES-RR&IH-001
			Page 1 of 11
		Rev. 2	Jun 2016

1.0 PURPOSE & APPLICABILITY

The purpose of this document is to define the standard operating procedure (SOP) for collecting soil samples when drilling with hollow-stem augers, direct push, and hand auger methods. The ultimate goal of the sampling program is to obtain samples that meet acceptable standards of accuracy, precision, comparability, representativeness, and completeness. All steps that could affect tracking, documentation, or integrity of samples have been explained in sufficient detail to allow different sampling personnel to collect samples that are equally reliable and consistent.

This procedure provides descriptions of equipment, field procedures, sample containers, decontamination, documentation, decontamination, storage, holding times, and field quality assurance (QA) and quality control (QC) procedures necessary to collect soil samples.

While the Project Quality Assurance Project Plan (QAPP) is intended to be strictly followed, it must be recognized that field conditions may force some modifications to the SOP. Any modification to the procedure shall be approved by the Project Manager or Task Leader in advance. Where SOP modification is planned sufficiently in advance, regulatory agency concurrence will be sought prior to conducting the specific activity. When direct contact with regulatory agency staff is not possible, or unscheduled delays will result, such as during field activities, regulatory agency will be notified of deviations from the SOPs, in writing, as soon as possible after the occurrence.

2.0 DEFINITIONS

HASP	Health and Safety Plan
OSHA	Occupational Safety and Health Administration
PID	Photoionization Detector
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
QA	Quality Assurance
QC	Quality Control
QAPP	Quality Assurance Project Plan
SAP	Sampling and Analysis Plan
SOP	Standard Operating Procedure
USCS	Unified Soil Classification System
VOA	Volatile Organic Analysis
VOCs	Volatile Organic Compounds

3.0 HEALTH AND SAFETY CONSIDERATIONS

Refer to the site-specific Health and Safety Plan (HASP) for health and safety considerations applicable to soil sampling.

Many hazards should be considered during the soil sampling activities, careful consideration of these hazards by the project team is essential. Some of the hazards include the following:

	Soil Sampling SOP	ES-RR&IH-001	
		Page 2 of 11	
		Rev. 2	Jun 2016

- Proper utility clearance must be performed in accordance with the Pre-Drilling/Excavation Checklist and Utility Clearance Log. There must be a minimum clearance of five (5) feet in addition to the diameter of the drilling augers. Client-specific requirements may be more restrictive.
- Traffic control may be required depending on the proximity of soil sampling activities to the roadway. Traffic control plans should be carefully evaluated to adequately delineate the work zone and provide the necessary safety factors.
- Personal protective equipment (PPE) including hard hats, high visibility traffic vest, gloves, hip boots or chest waders and other appropriate clothing;
- Heat and cold stress;
- Biological hazards such as insects and spiders. Appropriate clothing is required such as long-sleeved shirts and long pants.
- Bloodborne pathogens. Some of our sites may have syringes and other drug paraphernalia that must be carefully avoided.
- Chemical exposure on sites with open contamination. Respiratory protection may be necessary. Proper selection of respiratory protection is essential and an understanding of its limitation (i.e., negative pressure respiratory protection does not supply oxygen in an oxygen-deficient atmosphere). Staff should familiarize themselves with exposure limits for contaminants of concern.
- Use of air monitoring instrumentation will likely be necessary. We must be careful to make sure that our instrumentation is appropriate for the airborne contaminants of interest and that our staff understands the limitations of the instrumentation. Staff must also understand and perform calibration including zeroing with zero gas cylinders and appropriate other calibration gases.
- Decontamination of equipment and personnel must be properly designed and constructed to be sure that contamination is kept within the boundaries of the exclusion zone;
- Noise and proper use of hearing protection devices such as ear plugs and muffs.
- Emergency action plan must be carefully coordinated in advance between Stantec, our subcontractors, the client, and emergency responders.

All of these risks and others must be discussed with our subcontractors and clients to be sure they are properly addressed. Once the issues have been addressed at a project management level, they must be communicated to the staff that will actually perform the work. Details of procedures, instrument measurements and calibration, and other activities must be recorded in the field log and/or on data collection forms.

4.0 QUALITY ASSURANCE PLANNING CONSIDERATIONS

Soil sampling shall be done by personnel familiar with the common sources of random and systematic error so appropriate decisions can be made in the field. Some of the

	Soil Sampling SOP	ES-RR&IH-001	
		Page 3 of 11	
		Rev. 2	Jun 2016

common phenomena which may degrade the sample quality collected from the well point are listed below.

- **Volatilization.** Volatilization occurs when the sample is in contact with air for an extended time. Typically volatilization occurs if the sample undergoes excessive disturbance during sampling or if air pockets exist at the top of the container. Limiting disturbance during sampling, filling sample containers in order of volatility, and tight capping of bottles immediately after filling will minimize these errors.
- **Adsorption/desorption.** This is the gain or loss of chemicals through exchange across surfaces. Adsorption may occur when the sample comes in contact with large surface areas such as the sampling container. Thorough decontamination of sample collection containers/monitoring equipment probes along with expedient transfer from the sample container to the laboratory container minimizes sorption effects.
- **Chemical reaction.** Dissolved chemical constituents may change due to reactions such as oxidation, hydrolysis, precipitation, etc. Proper preservation and adherence to holding times minimize these reactions.
- **Sample contamination.** Sample contamination is the most common source of errors and can result from several factors, including incomplete decontamination, contact with other samples, and contact with the atmosphere. Careful attention to decontamination, handling, and container sealing minimizes sample contamination.

5.0 RESPONSIBILITIES

The Project Manager or Task Leader will be responsible for assigning project staff to complete soil sampling activities. The Task Leader will also be responsible for assuring that this and any other appropriate procedures are followed by all project personnel.

The project staff assigned to the soil sampling will be responsible for completing their tasks according to this and other appropriate procedures. All staff will be responsible for reporting deviations from the procedure or nonconformance to the Task Leader, Project Manager or Project QA/QC Officer.

6.0 TRAINING AND QUALIFICATIONS

Only qualified personnel shall be allowed to perform this procedure. At a minimum, Stantec employees qualified to perform soil sampling will be required to have:

- Read this SOP.
- Read project-specific QAPP.
- Indicated to the Task Leader that all procedures contained in this SOP are understood.
- Completed the Occupational Safety and Health Administration (OSHA) 40-hour training course, and/or annual 8-hour refresher course, as appropriate.

	Soil Sampling SOP	ES-RR&IH-001	
		Page 4 of 11	
		Rev. 2	Jun 2016

- Coordinated any proposed sampling activities with the laboratory to ensure proper sampling procedures.
- Previously performed soil sampling activities generally consistent with those described in this SOP.

Stantec employees who do not have previous experience with soil sampling will be trained on site by a qualified Stantec employee, and will be supervised directly by that employee until they have demonstrated an ability to perform the procedures.

7.0 REQUIRED MATERIALS

The following is a typical list of equipment that may be needed to perform soil sampling:

- Auger rig or direct-push unit with appropriate equipment for sampling, or hand auger.
- Continuous soil sampler (2-½-inch x 18-inch or 2-foot split-spoon sample tube) or direct-push clear acetate or polyvinyl chloride PVC tube (typically 4-foot long).
- Photoionization detector (PID) or other air monitoring instrumentation as required by the HASP.
- 4-mil-thick plastic sheeting or aluminum foil.
- Tape measure.
- Unified Soil Classification System (USCS) based on the Visual-Manual Procedures in ASTM Standards D 2487-00 and D 2488-00.
- 5035 sample containers with lids.
- Terra-cores™ or similar coring sampling device, if required.
- Sample labels.
- Stainless steel trowels, putty knives or similar soil working tool.
- Penetrometer (if available).
- Waterproof marking pens, such as the Staedtler Lumocolor.
- Coolers (with ice) for sample storage and shipment.
- Sample data forms/clip board.
- Decontamination supplies (Alconox™ [or similar detergent], brush, bucket).
- Nitrile gloves, or other specified chemical resistant gloves.
- Work gloves.

	Soil Sampling SOP		ES-RR&IH-001
			Page 5 of 11
		Rev. 2	Jun 2016

- Camera and film or disks.
- Blank soil borehole logs or a field-logging PDA.
- Personal safety gear (hard hat, steel-toed boots, ear plugs, safety glasses, etc.).

8.0 METHODS

8.1 Hollow-Stem Auger/Direct Push Sampling

Make sure that all equipment and meters have been calibrated to the equipment specifications and the results have been recorded in the field log.

The top five (5) feet of the boreholes will be cleared via air knife, vacuum excavation, ground penetrating radar, hand auger, tile probe or some combination of these methods.

Shallow soil boreholes are typically drilled with hollow-stem augers or geoprobe and sampled at the intervals specified in the work plans. Sampling shall be done in advance of the lead auger to minimize cross-contamination. Samples for laboratory analysis shall be taken with a continuous soil sampler. Standard blow counts shall be recorded for driving the sampler 6 and 12 inches (ASTM Method D 1586-99) if sampler is hammer driven.

Upon retrieval of the sample, the sample will placed on a clean surface (or lined with disposable aluminum foil or plastic sheeting) and will be screened with a PID for locating potential elevated PID readings. If applicable, a representative grab sample will be collected along with a headspace sample and placed into the appropriately labeled sample container. The sample containers shall be placed in self-sealing plastic or bubble bags in a cooler with ice or frozen ice packs for storage until they are delivered to the analytical laboratory.

The following method is to be used for headspace screening:

- The portion (for headspace screening) should be placed into an appropriately sized re-sealable Ziploc® or equivalent bag;
- Seal and label the bag with the borehole identification and the depth of the sample;
- Allow the bag to equilibrate for approximately ten (10) minutes; and
- Insert the probe tip of the PID into the bag. Obtain a measurement using the PID.

The remainder of the sample shall be logged in accordance with the USCS and recorded on the boring logs according to the following procedure:

1. As much information as possible is to be shown in the heading of each log. This includes, but is not limited to:
 - Project name and project identification number;
 - Identification of borehole;

	Soil Sampling SOP	ES-RR&IH-001	
		Page 6 of 11	
		Rev. 2	Jun 2016

- Name of drilling company;
 - Make, model, type, and size of drilling and sampling equipment used;
 - Date and time of start and end of drilling
 - Name of geologist(s) logging boring;
 - End of boring depth; and,
 - Depth to water (if encountered).
2. Each log is to begin with a description of the surface, (i.e., native, paved with asphalt, paved with concrete, and such). If any concrete is cut to open the hole, the thickness will be noted.
 3. Every foot will be accounted for, with no gaps. If an interval is not sampled it will be noted. If an attempt is made to sample an interval, but there is no recovery, it will be noted.
 4. Complete construction details are to be detailed for each well on a standard well construction form. Construction details should include:
 - A description of the type and length of casing i.e., 20' of 2" inner diameter (ID) Schedule 40 PVC casing;
 - Length and depths of the top and bottom of the screened interval;
 - Screen slot size;
 - Depths of the top and bottom of the filter pack;
 - Filter pack materials and sand size;
 - Depths and types of bentonite seals;
 - Detail of the use of grout; and,
 - Detail of the surface completion (i.e., stick up, flush-mounted).
 5. The number of bags of sand, bentonite, and grout used will be counted. These numbers will be compared daily with the driller's daily report.

Soil cuttings will be stockpiled on 4-mil thick plastic sheeting or drummed. The cuttings and other investigation-derived waste will be managed in accordance with the work plan or client-specific directives.

When sampling for volatile organic compounds (VOCs), use USEPA Method 5035. Method 5035 requires ample preservation in the field at the point of collection. The preservative used for the low concentration soil method (0.5 to 200 µg/kg) is sodium bisulfate and the preservative used for the medium/high concentration soil method (>200 µg/kg) is methanol. This field collection and preservation procedure is intended to prevent loss of VOCs during sample transport, handling, and analysis. The holding time for VOC analysis is 14 days.

1. Use the lab provided plunger style sampler (T-handle, syringe with tool, or terra-core™ sampler) to collect a 5g soil sample.
2. Unscrew the lid of the lab provided pre-preserved sodium bisulfate volatile organic analysis (VOA) vials and inject the 5g soil sample.

	Soil Sampling SOP		ES-RR&IH-001
			Page 7 of 11
		Rev. 2	Jun 2016

3. Tightly seal the VOA vial.
4. Repeat this step with the second sodium bisulfate VOA vial.
5. Then, repeat with the methanol preserved VOA vial.
6. Collect a soil sample in the 4-ounce wide mouth glass jar provided by the lab.
7. Make sure sample containers are labeled and bagged in plastic or bubble bags.
8. Ice the samples.

8.2 Hand Auger Sampling

Shallow soil boreholes less than five (5) feet in depth can be collected using a hand auger. The auger will be advanced until the desired sampling depth is reached. The auger will be removed from the boring, the sample will be extracted from the hand auger and field screened (as appropriate), and representative grab samples will be collected and placed into the appropriate labeled sample container. Decontamination of the auger and extensions will occur after each sample.

Boreholes will be abandoned by backfilling with bentonite chips and hydrating with potable water.

8.3 Excavation

Excavations and test pits will be excavated using a backhoe provided by the subcontractor. The dimensions of individual excavations will vary depending on the strength and stability of the trench walls and the specific purpose of the trench. Excavations greater than four (4) feet deep will not be entered by any personnel unless shoring is performed or the sides are stepped back to the proper angle per OSHA requirements.

When starting an excavation, the backhoe operator will first remove the topsoil or cover (if any) and place it in a discrete mound at least five (5) feet from the edge of the excavation. The excavation will be continued in approximately 6-inch cuts with the backhoe using a horizontal scraping motion rather than a vertical scooping motion. If a visibly-stained or otherwise chemically-affected soil interval is encountered, the affected excavated soils will be placed on 4-mil thick plastic sheeting.

8.3.1 Excavation Sampling

Samples will be collected from the backhoe bucket using a stainless steel trowel or similar. The top layer of soil will be removed prior to collecting the sample. The soil will then be placed in the appropriately labeled sample container and placed inside a chilled cooler.

8.3.2 Excavation Backfilling

The soils will be replaced in the excavation at their original depths to the extent

	Soil Sampling SOP		ES-RR&IH-001
			Page 8 of 11
			Rev. 2 Jun 2016

practicable so that the soil from the bottom of the trench will be placed on the bottom, and the topsoil will be replaced on the top. The backhoe will be used to backfill and compact the excavation.

Upon completion and subsequent backfilling of each excavation, four corners will be marked with a wooden stake for surveying. If appropriate, a fifth stake will be placed above the location where a soil sample was collected. The points may be surveyed, as needed.

8.4 Decontamination Methods

8.4.1 Sampling Equipment Decontamination

The following steps will be used to decontaminate sampling equipment:

- Ensure that the decontamination process has been carefully designed to be sure that the solutions used are appropriate for the chemicals of interest.
- Ensure that the decontamination area is properly constructed to keep contamination within the contamination reduction and exclusion zones.
- Ensure that the decontamination area is properly constructed to contain the rinse solutions and solids.
- Personnel will dress in suitable safety equipment to reduce personal exposure.
- Smaller equipment that will not be damaged by water will be placed in a wash bucket containing an Alconox™ (or equivalent) solution and scrubbed with a brush or clean cloth. Smaller equipment will be rinsed in water. Change rinse and detergent waters between boreholes, as needed.
- For larger drilling equipment the soil and/or other material will be scraped off with a flat-bladed scraper, and placed within a decontamination (decon) pad. The decon pad will be constructed in a predetermined location, and equipment shall be cleaned with a pressure washer using potable water. Care will be taken to adequately clean the insides of the hollow-stem augers, and cutter heads.
- Equipment that may be damaged by water will be carefully wiped clean using a sponge and detergent water and rinsed in or wiped down with distilled water. Care will be taken to prevent any equipment damage.

Following decontamination, equipment will be placed in a clean area or on clean plastic sheeting to prevent contact with potentially contaminated soil.

Following decontamination, drilling equipment will be placed on the clean drill rig and moved to a clean area. If the equipment is not used immediately, it will be stored in the designated secure, clean area.

	Soil Sampling SOP		ES-RR&IH-001
			Page 9 of 11
		Rev. 2	Jun 2016

8.4.2 Excavation Decontamination

Decontamination protocols must be carefully designed and constructed to deal with the chemicals of interest and ensure that the rinse solutions and solids are contained within the contamination reduction zone.

The backhoe bucket will be decontaminated prior to excavating each excavation. The entire backhoe, bucket, and tires will be decontaminated at the conclusion of the trenching operation. Decontamination will involve using a steam cleaner with an Alconox™ solution or pressure washer and rinsing using a steam cleaner or pressure washer with potable water. Backhoe decontamination will take place at the decontamination area located adjacent to the maintenance building or at another appropriate location.

The sampling equipment will be decontaminated prior to collecting each sample. Decontamination will consist of washing the equipment with a scrub brush in a bucket with an Alconox™ solution (or equivalent) and rinsing the equipment in a bucket filled with tap water. The date and time of decontamination of the backhoe and sampling equipment will be recorded in the field book and/or data collection forms.

8.5 Sample Containers, Storage, and Holding Times

Refer to the Project Sampling and Analysis Plan (SAP) for project specific instructions on proper containers, storage of samples and allowable holding times.

9.0 QUALITY CONTROL CHECKS AND ACCEPTANCE CRITERIA

Refer to the QAPP and SAP for specific quality control checks and acceptance criteria.

10.0 DOCUMENTATION

A borehole log will be completed for each hollow-stem auger or direct-push borehole. The field notebook and/or data collection forms will contain the following information:

- Project name and number.
- Drilling company's name.
- Date drilling started and finished.
- Type of auger and size (ID & OD).
- Type of equipment for air monitoring (PID or FID).
- Air monitoring calibration and measurements.
- Well completion and graphic log.
- Driller's name.
- Geologist's or engineer's name.

	Soil Sampling SOP	ES-RR&IH-001	
		Page 10 of 11	
		Rev. 2	Jun 2016

- Type of drill rig.
- Borehole number.
- Surface elevation (if available).
- Stratigraphic description with depth.
- Classification of the soils according to the USCS.
- Water levels and light non-aqueous phase liquid levels, if applicable.
- Drilling observations.
- Map of borehole or monitoring well location.

In addition, proper documentation will include observance of the chain of custody procedures as described in the Project QAPP and SAP.

Additional information regarding field documentation for borehole logging for fine- and coarse-grained soils and rocks is provided in Stantec checklists ESPA-603 through ESPA-605.

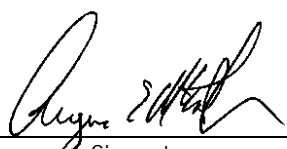
	Soil Sampling SOP	ES-RR&IH-001	
		Page 11 of 11	
		Rev. 2	Jun 2016

ACCEPTANCE


Author


James M. Kerr, Jr.		6/1/2016
Printed Name	Signature	Date

Quality/Technical Reviewer

Angus McGrath		6/1/2016
Printed Name	Signature	Date

Independent Reviewer

John W. McInnes		6/1/2016
Printed Name	Signature	Date

	Groundwater Sampling SOP		ES-RR&IH-006
			Page 1 of 12
		Rev. 2	Jun 2016

1.0 PURPOSE & APPLICABILITY

The purpose of this document is to define the standard operating procedure (SOP) for the sampling of monitoring wells. The ultimate goal of the sampling program is to obtain samples that meet acceptable standards of accuracy, precision, comparability, representativeness and completeness. All steps that could affect tracking, documentation, or integrity of samples have been explained in sufficient detail to allow different sampling personnel to collect samples that are equally reliable and consistent.

This procedure provides descriptions of equipment, field procedures, sample containers, decontamination, documentation, storage, holding times, and field quality assurance/quality control (QA/QC) procedures necessary to collect water samples from groundwater monitoring wells.

This procedure may apply to all groundwater sampling of monitoring wells by Stantec personnel or their subcontractors.

While the QAPP is intended to be strictly followed, it must be recognized that field conditions may force some modifications to the SOP. Any modification to the procedure shall be approved by the Project Manager or Task Leader in advance. Where SOP modification is planned sufficiently in advance, regulatory agency concurrence will be sought prior to conducting the specific activity. When direct contact with regulatory agency staff is not possible, or unscheduled delays will result, such as during field activities, regulatory agency will be notified of deviations from the SOPs, in writing, as soon as possible after the occurrence.


2.0 DEFINITIONS

HASP	Health and Safety Plan
HCL	Hydrochloric Acid
OSHA	Occupational Safety and Health Administration
PID	Photoionization Detector
PPE	Personal Protective Equipment
PVC	Polyvinyl Chloride
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
SOP	Standard Operating Procedure
VOC	Volatile Organic Compound

3.0 HEALTH AND SAFETY CONSIDERATIONS

Refer to the site-specific HASP for health and safety considerations applicable to groundwater sampling.

Consideration of Health and Safety risks prior to performing this work is paramount. This risk review can be performed by making our generic Job Safety Analysis site specific in our site-specific Health and Safety Plan. Of course, there are many items that need to be considered. The following is just a short list of the items. Careful consideration of these items by the project team is essential, and the ultimate responsibility of the project manager.


	Groundwater Sampling SOP	ES-RR&IH-006	
		Page 2 of 12	
		Rev. 2	Jun 2016

- Traffic guidance and control. Even plans developed by outside traffic control contractors need to be carefully evaluated to make sure they are protective of our staff and contractors.
- Personal protective equipment (PPE) including high visibility traffic vest, gloves, appropriate clothing.
- Heat and cold stress.
- Biological hazards such as insects and spiders. Therefore appropriate clothing is required such as long-sleeved shirts and long pants.
- Bloodborne pathogens. Some of our sites may have syringes and other drug paraphernalia that must be avoided.
- Chemical exposure on sites with open contamination. Proper selection of respiratory protection is essential and an understanding of its limitation (i.e., negative pressure respiratory protection does not supply oxygen in an oxygen-deficient atmosphere). Staff should familiarize themselves with exposure limits for contaminants of concern.
- Use of air monitoring instrumentation will not likely be necessary. We must be careful to make sure that our instrumentation is appropriate for the airborne contaminants of interest and that our staff understands the limitations of the instrumentation. Staff must also understand and perform calibration including zeroing with zero gas cylinders and appropriate other calibration gases.
- Decontamination of equipment and personnel must be properly designed and constructed to be sure that contamination is kept within the boundaries of the exclusion zone.
- Noise and proper use of hearing protection devices such as ear plugs and/or muffs.
- Emergency action plan must be carefully coordinated in advance between Stantec, our subcontractors, the client and emergency responders.
- Ergonomics should be considered when setting up equipment. Ensure that staff does not lift more than 50 lbs. alone.

All of these risks and others must be discussed with our subcontractors, if applicable, and clients to be sure they are properly addressed. Once the issues have been addressed at a project management level, they must be communicated to the staff actually performing the work. Details of procedures, instrument measurements, and other activities must be recorded in the field log and/or on data collection forms.

4.0 QUALITY ASSURANCE PLANNING CONSIDERATIONS

Sampling shall be done by personnel familiar with the common sources of random and systematic error so intelligent decisions can be made in the field. Some of the common phenomena which may degrade sample quality are listed below:

	Groundwater Sampling SOP	ES-RR&IH-006	
		Page 3 of 12	
		Rev. 2	Jun 2016

- **Volatilization.** This occurs when the sample is in contact with air for an extended time. It is typically a problem when water is either sitting in the well or when air pockets exist at the top of the water container. Prompt sampling after well evacuation, proper sampling order (i.e., fill VOC sample containers first), and tight capping of bottles immediately after filling will minimize these errors.
- **Adsorption/desorption.** This is the gain or loss of chemicals through exchange across surfaces. It may occur when the sample comes in contact with large surface areas such as bailers or tubing. Thorough decontamination of bailers and/or tubing, or using disposable bailers and/or tubing and probes along with expedient sampling after well purging minimizes sorption effects.
- **Chemical reaction.** Dissolved chemical constituents may change due to reactions such as oxidation, hydrolysis, precipitation, etc. Proper preservation and adherence to holding times minimize these reactions.
- **Biodegradation.** Virtually all groundwater contains bacteria, some of which may be capable of altering the composition of contaminants. Proper preservation and adherence to holding time will reduce this effect.
- **Sample contamination.** This is the most common source of errors and can result from several factors, including incomplete decontamination, contact with other samples, and contact with the atmosphere. Careful attention to decontamination, handling, and container sealing minimizes sample contamination.

5.0 RESPONSIBILITIES


The Project Manager or Task Leader will be responsible for assigning project staff to complete water sampling activities. The Task Leader will also be responsible for assuring that this and any other appropriate procedures are followed by all project personnel.

The project staff assigned to the water sampling task will be responsible for completing their tasks according to this and other appropriate procedures. All staff will be responsible for reporting deviations from the procedure or nonconformance to the Task Leader, Project Manager, or Project QA/QC Officer.

6.0 TRAINING/QUALIFICATIONS

Only qualified personnel shall be allowed to perform water sampling. At a minimum, Stantec employees qualified to perform water sampling will be required to have:

- Read this SOP.
- Indicated to the Task Leader that all procedures contained in this SOP are understood.
- Completed the OSHA 40-hour training course and/or 8-hour refresher course, as appropriate.
- Previously performed water sampling in a manner generally consistent with the procedures described in this SOP.

	Groundwater Sampling SOP	ES-RR&IH-006	
		Page 4 of 12	
		Rev. 2	Jun 2016

Stantec employees who do not have previous experience sampling ground water will be trained on site by a qualified Stantec employee and supervised directly by that employee until they have demonstrated an ability to perform the procedures.

The Project Manager shall document personnel qualifications related to this procedure in the project QA files.


7.0 REQUIRED MATERIALS

Dedicated evacuation/sampling equipment will be used whenever possible and stored at the well or a designated location on site. Sample bottles for volatile and semivolatile organic compounds, general mineral, and metals samples will be obtained from the analytical laboratory. Extra sample containers will be obtained in case of breakage or other problems. Trip blanks will also be obtained from the analytical laboratory.

A typical well evacuation equipment list:

- Water level probe or fiberglass tape.
- Bailers:
 - 2-inch-diameter well
 - 1.66-inch O.D. x 3-foot PVC bailer, or
 - 1.66-inch O.D. x 5-foot PVC bailer, or
 - 1.66-inch O.D. x 3-foot disposable polyethylene bailer.
- Pumps:
 - Grundfos, bladder, or peristaltic type submersible pump.
- Teflon-coated bailing wire rope or disposable polyethylene cord.
- Electric generator.
- YSI meter.
- Personal protective equipment, including nitrile (or other material depending upon the nature of the chemicals encountered) or powderless surgical gloves and safety glasses. Tough work gloves may also be required for moving around equipment before or after the sampling itself. Other PPE include traffic vest, steel-toed safety shoes, hearing protection devices, long-sleeved shirt and long pants, and possibly a respirator if there is volatilization of chemicals, etc.
- Groundwater sample collection data forms.
- Photoionization Detector (PID).
- Data recording sheets/electronic storage device (PDA).
- Field notebook.

A typical well sampling equipment list:

	Groundwater Sampling SOP	ES-RR&IH-006	
		Page 5 of 12	
		Rev. 2	Jun 2016


- Sampling bailers (double check valve, bottom discharge).
- Teflon-coated bailing wire rope or disposable polypropylene cord.
- Bladder pump Teflon and/or stainless steel construction equipped with Teflon and/or Teflon-lined control and discharge tubing.
- Personal protective equipment, including nitrile (or other material depending upon the nature of the chemicals we expect to encounter) or powderless surgical gloves and safety glasses. Tough work gloves may also be required for moving around equipment before or after the sampling itself. Other PPE include traffic vest, steel-toed safety shoes, hearing protection devices, long-sleeved shirt and long pants, and possibly a respirator if there is volatilization of chemicals, etc.
- Ground Water Sample Collection Data Forms.
- Chain-of-custody forms.
- Labels.
- Cooler.
- Ice or frozen ice packs.
- Field notebook.

Proposed equipment for sample filtration, if filtration is needed:

- Two clean containers, approximately one (1) liter in size
- Organic-free deionized water
- One Peristaltic filtration pump
- In-line plate filter
- Filter membranes--0.45 μ pore size
- A 1:1 nitric acid/purified water solution or 0.1 normal HCL for decontamination of filtering glassware

Equipment used during decontamination:

- Alconox™ detergent (or equivalent) or other solution that will neutralize the chemicals encountered.
- Organic-free deionized water, or distilled water.
- Containers, brushes, paper towels.

	Groundwater Sampling SOP	ES-RR&IH-006	
		Page 6 of 12	
		Rev. 2	Jun 2016

- Personal protective equipment, including nitrile (or other material depending upon the nature of the chemicals we expect to encounter) or powderless surgical gloves and safety glasses. Tough work gloves may also be required for moving around equipment before or after the sampling itself. Other PPE include traffic vest, steel-toed safety shoes, hearing protection devices, long-sleeved shirt and long pants, and possibly a respirator if there is volatilization of chemicals, etc.

8.0 METHODS

This section describes the sequence of events to follow for sample collection in the field.

8.1 Equipment Decontamination Method

The decontamination protocol is essential to the quality of the sampling procedure as well as essential to ensuring that chemicals stay at the project site and are not tracked or carried elsewhere. The decontamination procedure should be designed and constructed to work on the chemicals of interest and contain the rinsate and solids within the contamination reduction zone.


Before sampling begins any non-dedicated or non-disposable equipment, well probes, pumps, and pump hoses shall be decontaminated.

Decontamination will be performed on all non-dedicated sampling equipment that may contact potentially contaminated water, including water level probes, fiberglass tapes, Teflon bailers, and non-dedicated pump hoses. Clean nitrile gloves (or other appropriate material depending upon the chemicals involved) or powderless surgical gloves are to be worn during decontamination.

Each piece of sampling equipment will also be decontaminated between each well. The decontamination procedure for most equipment will be as follows:

- Disassemble equipment (i.e., bladder pump).
- Wash equipment in an Alconox™ (or equivalent) and water solution using a brush or clean cloth to ensure removal of all contaminants.
- Rinse equipment in fresh tap water. Re-rinse with de-ionized water or distilled water.
- Dry equipment with paper towel and place in clean place, if appropriate.

The effectiveness of these decontamination procedures will be verified by vigorous QA/QC protocols, including blanks, duplicates, and spikes.

	Groundwater Sampling SOP	ES-RR&IH-006	
		Page 7 of 12	
		Rev. 2	Jun 2016

The rinsate water will be sufficient to prevent the Alconox™ solution (or equivalent) from entering the well. If a submersible pump is used to evacuate wells, the pump shall be decontaminated prior to use in each well. The procedure consists of immersing the pump, discharge tubing, and drop wire in an Alconox™ solution (or equivalent) and circulating the solution through the system. After washing, the circulating procedure will be repeated three (3) times with clean tap water. Samples of the tap water used as rinsate for the jet pump and/or submersible pump will be submitted for analysis. The analyses will be the same test methods used as water samples collected from the wells on site.

In addition to the above procedures for the jet and submersible pumps and other pieces of equipment, each of the decontamination solutions will be replaced with clean solution between each decontamination operation (i.e., between each well).

8.2 Well Evacuation Method

The purpose of well purging is to remove stagnant water from the well and obtain fresh water from the geologic material screened by the well.

Static water levels shall be measured for each well immediately before evacuating the well for sampling. This procedure shall be accomplished with a measuring probe or by the use of a chalked fiberglass tape. Water levels will be measured from the elevation reference point marked on the PVC inner casing. Regardless of the tools used, the measuring process will be repeated until consecutive water level measurements agree to within ± 0.01 foot. If floating product is historically known to occur in a well or if there is reason to believe there will be floating product in a new well, an interface probe will be used to measure the depth to water and the thickness of the floating material.


For wells that have been sampled previously, the purging method will be determined by the historic yield of the well. For new wells, the purging method will be based on past experience with wells screened in similar geologic materials.

If a pump is used, the type will be dependent upon the depth of the well. Typically, shallow high yield wells will be purged with a jet pump, and deep high yield wells will be purged with a submersible pump.

Purge water will be containerized and labeled for appropriate disposal.

The following sampling procedure is performed at each well:

- Note well condition, and any unusual conditions of the area immediately surrounding the well.
- Remove well cover and unlock cap.
- If necessary, evacuate any standing water within well box prior to removing inner well caps.
- When inner well caps are removed, perform head space analysis using a PID (as required).
- Measure and record depth to static water level from measuring point on PVC

	Groundwater Sampling SOP	ES-RR&IH-006	
		Page 8 of 12	
		Rev. 2	Jun 2016

inner well casing. Repeat the measurement process until values agree within \pm 0.01 feet. Indicate time of measurement.

- Record total depth of well (measured during water level measurement process) and use this depth to calculate volume of water in well (casing volume) in feet (of water) and gallons.
- When using a pump for evacuation, the pump intake will be initially placed in the center of the well screen.


8.3 Obtaining Water Samples

Groundwater samples shall be collected as soon as the water parameters have stabilized.

Sampling shall be accomplished with either a dedicated PVC bailer, a Teflon sampling bailer, a disposable bailer, or other sampling equipment. Bailers will be lowered into the well using either a Teflon-coated wire rope or disposable (one time use) polypropylene cord. Clean nitrile or powderless surgical gloves shall be worn by sampling personnel and changed often during all sampling procedures. Gloves shall be changed between purging and sampling

The following sampling procedure is to be used at each well:

- Assemble decontaminated sampling equipment.
- Don clean nitrile or powderless surgical gloves immediately before obtaining sample.
- Label sample containers.
- Obtain sample from well using a Teflon bailer, a disposable bailer, a dedicated PVC bailer, or directly from the pump tubing or permanent sampling apparatus. Care will be taken when using a bailer to minimize degassing or contamination of the sample, therefore the bailer will be submerged and withdrawn slowly to avoid splashing. The bailer will not be placed on the ground. The bailer will be lowered to the screened interval before sampling unless a nonaqueous floating layer is present, in which case the bailer will be submerged to just below the water table. Similar procedures apply for the use of a bladder pump.
- Transfer sample water directly into pre-preserved sample bottles provided by the laboratory, maintaining a slow linear flow with as little aeration as possible. The individual sample bottles will be filled and immediately capped in the order given below or as required by the analytical protocol:
 - ◆ Volatile organic compounds (VOCs)
 - ◆ Semivolatile organic compounds
 - ◆ Priority Pollutant Metals
 - ◆ General Minerals
- After each sample is collected, place the bottles in self-sealing plastic or bubble

	Groundwater Sampling SOP	ES-RR&IH-006	
		Page 9 of 12	
		Rev. 2	Jun 2016

bags, seal the bags, and immediately place the bags in a chilled cooler with ice or frozen ice packs.

- Water samples collected with a bladder pump for metal and general mineral analyses will be filtered in the field with an in-line filter attached to the pump discharge hose if needed. These samples can be analyzed for dissolved metal content. Samples collected with a sampling bailer for metal analysis will be analyzed for total metal content. The turbidity of such samples will be recorded in the field notebook and/or data collection form to allow a qualitative evaluation of the degree to which metal concentrations could be associated with suspended matter.
- Record sample number, time of sampling, location, and sampler on the Ground Water Sample Collection Data Form.
- Replace well cap, close well cover, and lock well.
- Complete chain-of-custody form for transportation of samples to lab.
- Hand deliver or ship samples to the lab on the same day they are collected, or as soon afterwards as possible.


8.4 Sample Filtration Method

The following filtering procedures shall be used on samples collected for filtered metal and general mineral analyses using a bladder pump. Clean nitrile or powderless surgical gloves will be worn during this procedure.

- Connect in-line filter capsule (0.45 micron pore size) to bladder pump tubing.
- Pre-rinse the filter (2 to 3 gallons for filters with a 750 cm² effective filtration area), with organic-free deionized water.
- Fill sample bottle containing necessary preservatives.
- Store filtered samples in a chilled cooler with ice or frozen ice packs.
- Discard filter.

If, for some reason, filtration of bailer-collected samples is desired or appropriate, the following filtration procedure will be followed. Clean nitrile or powderless surgical gloves will be worn during this procedure.

- Place a new 0.45 filter membrane on the filter plate and assemble the (decontaminated) filter holder.
- Transfer information from sample label on the sample collected in the field (these samples will have been collected in sample bottles without preservatives) to new sample bottle (containing preservative, if appropriate).
- Place filtration tube in the sample bottle containing the unfiltered solution.

	Groundwater Sampling SOP	ES-RR&IH-006	
		Page 10 of 12	
		Rev. 2	Jun 2016

- Place new sample bottle (containing necessary preservatives) under filtering unit.
- Turn on pump and filter sample at less than 25 psi.
- Store filtered samples in chilled cooler with ice or frozen ice packs.
- Remove and dispose of used filter membrane.
- Rinse filtration plate and all parts of filtering apparatus that contacted the water sample with deionized water.
- Decontaminate any filtering glassware in an Alconox™ (or equivalent) solution, followed by rinses with tap water, a 1:1 nitric acid/purified water solution or 0.1 normal HCl, and finally organic-free deionized water.

8.5 Decontamination Methods

The following steps will be used to decontaminate sampling equipment:

- Ensure that the decontamination process has been carefully designed so that the solutions used are appropriate for the chemicals of concern.
- Personnel will don appropriate safety equipment to reduce personal exposure.
- Equipment that will not be damaged by water will be placed in a wash tub containing an Alconox™ (or equivalent) solution and scrubbed with a brush or clean cloth. Equipment will then be rinsed in a second wash tub.
- Equipment that may be damaged by water will be carefully wiped clean using a sponge and detergent water and wiped with organic-free deionized water. Care will be taken to prevent any equipment damage.

Following decontamination, equipment will be placed in a clean area or on clean plastic sheeting to prevent possible contamination. Single use equipment and consumables will be discarded in an appropriate manner.


8.6 Sample Containers, Storage, and Holding Times

Refer to the Project SAP for project specific instructions on proper containers, storage of samples and allowable holding times.

9.0 QUALITY CONTROL CHECKS AND ACCEPTANCE CRITERIA

Refer to the Quality Assurance Project Plan for specific quality control checks and acceptance criteria.

Outline quality control checking procedures, including frequency requirements and acceptance criteria. Acceptance criteria may take the form of an illustration such as a chart of acceptable results with tolerances, or other appropriate forms.

	Groundwater Sampling SOP	ES-RR&IH-006	
		Page 11 of 12	
		Rev. 2	Jun 2016

10.0 DOCUMENTATION

A record will be maintained during the purging procedure that will contain, at a minimum:


- Initial depth to water
- Volume of water removed
- Purging method
- Physical parameters of the purged water
- How purge water was contained (drum, tank, bucket, etc.)

The data shall be recorded on a Ground Water Sample Collection Data Form for each well that is evacuated and sampled.

Sampling information in the field book should contain, at a minimum, the following:

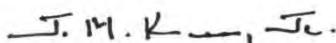
- Sample name, location, time, sampler, analysis
- Blind duplicates shall be noted on field notes (not chain-of-custody)
- Volume of water evacuated
- Time of sample collection
- Number of samples collected
- Sample identification numbers
- Preservation and storage of samples
- Filtration performed, if any
- Record of any QC samples from site
- Any irregularities or problems that may have a bearing on sampling quality
- Type of sampling equipment

In addition, proper documentation will include observance of the chain of custody procedures as described in the Project QAPP and SAP.


	Groundwater Sampling SOP		ES-RR&IH-006	
			Page 12 of 12	
			Rev. 2	Jun 2016

ACCEPTANCE

Author

James M. Kerr, Jr. _____ Printed Name	 _____ Signature	6/1/2016 _____ Date
---	--	---------------------------

Quality/Technical Reviewer

Angus McGrath _____ Printed Name	 _____ Signature	6/1/2016 _____ Date
--	--	---------------------------

Independent Reviewer

John W. McInnes _____ Printed Name	 _____ Signature	6/1/2016 _____ Date
--	---	---------------------------