Alternatives Analysis Report and Remedial Action Work Plan
Canal Street Site
Brownfield Cleanup Program Site #C828206

67 & 89 Canal Street
Rochester, Monroe County, New York

June 2020

Prepared for:

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

Prepared on Behalf of:

East House Canal Street, LLC
259 Monroe Avenue, Suite 200
Rochester, New York 14607

Prepared by:

Stantec Consulting Services Inc.
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Rochester, New York 14614

June 5, 2020
File: 190500965

Mr. Todd Caffoe
New York State Department of Environmental Conservation
6247 East Avon-Lima Road
Avon, New York 14414-2466

RE: Alternatives Analysis Report and Remedial Action Work Plan
Brownfield Cleanup Program Site # C828206
Canal Street Site
67 & 89 Canal Street, Rochester, NY

Dear Todd:

On behalf of East House Canal Street, LLC, Stantec Consulting Services Inc., has prepared this Remedial Alternatives Analysis Report and Remedial Action Work Plan for the Canal Street Site, located at 67 & 89 Canal Street in the City of Rochester, Monroe County, New York. The report presents the results of Stantec's evaluation of potential remedial actions for soil and groundwater impacts at the Site identified in the Remedial Investigation.

Please contact us at any time with questions.

Sincerely,

STANTEC CONSULTING SERVICES INC.

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Cc: D. Tucholski (NYSDOH)
K. Brumber (East House)
L. Shaw (Knauf Shaw)

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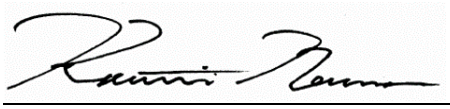
This document entitled Alternatives Analysis Report and Remedial Action Work Plan was prepared by Stantec Consulting Services Inc. (“Stantec”) for the account of East House Canal Street, LLC (the “Client”). Any reliance on this document by any third party is strictly prohibited. The material in it reflects Stantec’s professional judgment in light of the scope, schedule and other limitations stated in the document and in the contract between Stantec and the Client. The opinions in the document are based on conditions and information existing at the time the document was published and do not take into account any subsequent changes. In preparing the document, Stantec did not verify information supplied to it by others. Any use which a third party makes of this document is the responsibility of such third party. Such third party agrees that Stantec shall not be responsible for costs or damages of any kind, if any, suffered by it or any other third party as a result of decisions made or actions taken based on this document.

Prepared by 
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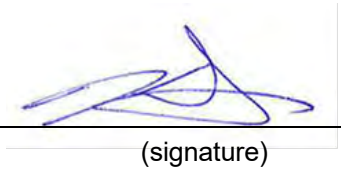
KATIE NELSON

Reviewed by 
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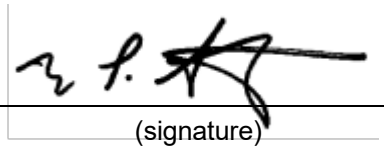
Approved by 
(signature)

MICHAEL STORONSKY

Certification

Remedial Alternatives Analysis Report

I, Kevin Ignaszak, of Stantec Consulting Services Inc., certify that I am currently a New York State-registered professional engineer and that this Alternatives Analysis Report was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10) and that all activities were performed in full accordance with the DER-approved work plan and any DER-approved modifications."

_____ 6/5/2020

Signature Date

- **Remedial Action Work Plan**

I, Kevin Ignaszak, of Stantec Consulting Services Inc., certify that I am currently a New York State-registered professional engineer and that this Remedial Action Work Plan was prepared in accordance with applicable statutes and regulations and in substantial conformance with the NYSDEC Division of Environmental Remediation (DER) Technical Guidance for Site Investigation and Remediation (DER-10).

_____ 6/5/2020

Signature Date

Executive Summary

The purpose of this Alternative Analysis Report and Remedial Action Work Plan is to present a plan for the remediation of environmentally impacted soil, groundwater, and other materials at the Canal Street Site (Site) located at the 1.7 acre Canal Street Manufacturing Site located at 67 & 89 Canal Street in the City of Rochester, Monroe County, New York. East House Canal Street, LLC, which is not yet the owner of the Site but a prospective purchaser under contract, has entered into a Brownfield Cleanup Agreement (BCA) as a Volunteer for the Site with the New York State Department of Environmental Conservation (NYSDEC) under the Brownfield Cleanup Program (BCP). The Brownfield Cleanup Agreement between East House Canal Street, LLC and NYSDEC was executed on July 26, 2018. The NYSDEC BCP Site Number is C828206.

Due to the long history of manufacturing on the Site and adjacent properties, petroleum and chlorinated solvent impacts are present on-Site and urban fill impacted with metals and polycyclic aromatic hydrocarbons was identified across the Site. Remediation for the proposed reuse of the existing building into a residential facility for East House clients is required. The proposed remediation will involve removal of the existing floor slab to access petroleum impacted hot spot areas under the existing building since this will be the most economical remedial approach and will enable achievement of a Track 4 restricted residential remediation in the shortest amount of time. The proposed remedy also includes management of urban fill, installation of sub-slab depressurization system, installation of a cover system, *In Situ* groundwater remediation and management/abatement of hazardous building materials.

Investigations completed at the Site have identified the following contamination areas to be remediated:

- *Floor Drains and Piping*: Of the drain lines that could be accessed with the video equipment, the piping was found to be intact with no obvious evidence of piping breaches. One exception to this is the north-south oriented pipe connecting the floor drain in the northern section of the main building's interior loading dock to the sump located adjacent to the dock. This approximately 10 ft.-long section of piping was found to have cracked with broken portions near the floor drain; however, water was observed flowing freely to the sump in the video. This drain and sump were documented to contain apparent gasoline in 1993 per the NYSDEC spill report (#9300522) for the Site. The plan is to remove the drain and sump and associated impacted soil when the floor slab is removed.
- *Petroleum Impacts*: Petroleum impacts in soil and/or groundwater were identified in the following four areas of the Site:
    - Northeastern Portion of the Site: petroleum-related volatile organic compounds (PVOCs) and polycyclic aromatic hydrocarbons (PAHs) exceedances of Restricted Residential (RR) NYSDEC Soil Cleanup Objectives (SCOs) were detected in investigation locations in the northeastern quadrant of the Site around and beneath the northern portion of the main manufacturing building. Two of the bedrock/overburden interface wells located in the northeast quadrant (MW-104 and MW-106) of the Site and the off-Site monitoring well

(MW-9) located in the sidewalk on the west side of Canal Street, immediately adjacent to the Site boundary, had PVOCs in groundwater above NYSDEC standards and guidance values. These borings and monitoring wells are located in the vicinity of the former USTs or in close proximity to the main building's northern foundations where the petroleum is suspected to have migrated over time.

- Courtyard Area: Two bedrock/overburden interface groundwater monitoring wells (MW-100 and MW-114) located within the courtyard area had groundwater PVOC detections above NYSDEC standards and guidance values.

- Groundwater monitoring well MW-107: Bedrock/overburden interface groundwater monitoring well MW-107 is in the garage/shop building near the western Site boundary and had detections of PVOCs above NYSDEC standards and guidance values. Given the groundwater flow direction and the lack of PVOCs detections in the overburden soils at this location it is suspected that these PVOC groundwater impacts may be from an off-Site source(s).

- Groundwater monitoring well MW-110: Minor concentrations of benzene were reported in overburden well MW-110. Monitoring well MW-110 is in the southwestern corner of the Site, where no potential on-Site sources of petroleum have been identified; this detection may be the result of an off-Site source(s).

- *Chlorinated Volatile Organic Compounds (CVOCs) in Groundwater*: Exceedances of NYSDEC groundwater standards and guidance values were found for CVOCs at wells MWs-02, -100, -107 and -112. Given the groundwater flow direction, the lack of significant CVOCs detections in the overburden soils on the Site and known neighborhood wide CVOC groundwater impacts, it is suspected that the impacts detected in these four wells located on the western/central portion of the Site may be from an off-Site source(s).

- *Semi Volatile Organic Compounds (SVOCs) and Metals in Surface and Subsurface Soils:* Urban Fill was observed in exploration locations across the Site. The most commonly observed fill deposit types were Sand/Gravel mixtures with varying amounts of silt, or Silt/Sand mixtures with varying amounts of gravel (between 0.8 ft and 6 ft thick). Some exploration locations had distinct layers of ash and cinder materials, or these materials were observed to be mixed in with other soil types. Other miscellaneous materials such as metal, brick, concrete and wood were observed in several borings and test pits. Soil sample results demonstrate that there are metal (lead and barium) and PAH impacts in Urban Fill, particularly where ash and/or cinders were observed, above RR SCOs. This condition is similar to what was documented on adjacent properties.

  A surface soil sample was collected from fill materials located in an approximately 8-ft deep, rectangular, lower ground area located between the southern portion of the main building and the one-story loading dock building. The materials in a portion of the depression are a mixture of soil-like fill materials combined with varying amounts of debris. Lead, an estimated concentration of

mercury and eight PAHs were found in the sample at concentrations above their respective RR SCOs.

- *Former Pesticide Storage Room:* Pesticides, cadmium, copper, lead, mercury and zinc were detected in a sample of flooring collected from the former pesticide storage room. Future plans for this room during Site redevelopment include converting the room into a lounge. The flooring will be removed to the original floor decking and a new self-leveling topping will be installed. The walls will be scraped and repainted in accordance with lead safe work practices.

- *Hazardous Building Material Survey:* A hazardous building material survey and asbestos contamination assessment was conducted and included an asbestos survey, contamination assessment of damaged friable asbestos containing materials, limited paint sampling for PCB content and sampling of caulks/window glazing for PCB content. During Site redevelopment, the walls will be scraped and repainted in accordance with lead safe work practices; thus, no lead-based paint testing was conducted. Numerous materials were identified to be either confirmed, assumed or suspect asbestos containing materials. PCBs were not detected above laboratory detection limits in the samples collected.

- *Pesticides in Freight Elevator Pit:* Water in the freight elevator pit was sampled during the remedial investigation. Several pesticide analytes were detected above standards and guidance values; however, it is suspected that these detections may be due to the elevated turbidity in the sample.

No additional investigation is recommended, except for the following:

- In the bottom floor of the main manufacturing building, soil and building debris were observed on a concrete floor. Per the RIWP, samples were proposed to be collected for waste disposal purposes and the floor conditions would then be assessed. During the asbestos survey it was determined that this material was contaminated with friable asbestos, thus samples were not collected for safety reasons. It is proposed that a sample will be collected for waste characterization purposes during asbestos abatement.
- Per the RI Work Plan Addendum, depending on the level of accessibility, a sample of sediment (if present) in the Freight Elevator pit was to be obtained. Given safety concerns, the bottom of the pit could not be evaluated for sediment build-up; as such, potential sediment accumulation in the bottom of the pit will be assessed during Site redevelopment.

Planned redevelopment of the Site involves renovating the manufacturing building into 113 affordable apartment units, of which approximately half will be State Office of Mental Health (OMH)-supported units, with some commercial space on the first floor. The program will meet OMH standards for living and support space. The currently proposed apartment unit count is 78 one-bedroom units, 34 two-bedroom units, and 1 studio unit. The one-bedroom units range up to 821 square feet and the two-bedroom units range up to 1,100 square feet. A designated 8,900 square feet of the building will be used as commercial space including support space. The support spaces include a 1st floor community room with adjacent kitchen, computer lab, and an exercise room, common laundry rooms on each floor, lounge areas, and

support staff offices. The existing one-story concrete masonry loading dock and garage/shop buildings will be removed, allowing for an estimated 63 on-Site surface parking spaces, and a landscaped courtyard for recreation. In order to facilitate remediation of the Site the existing basement floor slab will be removed. Removal of the floor will also allow for installation of utilities beneath the basement floor of the building, and to create a uniform finished floor elevation.

This Remedial Action Work Plan presents a plan to implement a Track 4 Restricted-Residential cleanup to address these areas of environmental impact along with the application of Engineering Controls (ECs) and Institutional Controls (ICs) to allow for the planned restricted-residential redevelopment of the Site. There will be five major components to the proposed remedial program as summarized below:

1. *Excavation and Off-Site Disposal of Impacted Soils, Plus Reuse On-Site:* Basement floor soil remediation and floor removal, northwest exterior building foundation soil remediation, removal of sump and Site wide Urban Fill management for future pavement, remediation of uncapped playground areas and landscape areas to a depth of at least 2 ft, and removal of surface soil between the loading dock building and main manufacturing building. Portions of the Urban Fill excavated, tested and confirmed to meet RR SCOs will be reused on-Site for general backfill and grading purposes;

2. *Enhanced In-Situ Bioremediation of Groundwater:* Includes four areas of *In Situ* treatment of petroleum or chlorinated solvent impacted groundwater;

3. *Mitigation of Soil Vapor Intrusion Within Occupied Building:* Soil vapor intrusion mitigation including a soil vapor barrier (required sealing layer) for the active sub-slab depressurization system; and

4. *Building Drainage System Groundwater:* Building perimeter drain and elevator sump discharge to the sanitary sewer which will require a permit, quarterly sampling and reporting; and

5. *Cover-System*: New Site-wide cover system consisting of either 2 feet of clean soil, other clean fill materials, or an impervious cap of asphalt, concrete sidewalks, brick pavers, the new building floor or composite playground cap

As part of select site-preparation building demolition activities to prepare the Site for subsurface remediation, the General Contractor will properly abate, remove and dispose of the hazardous building materials (asbestos, lead, universal waste, etc.), the pesticide materials in the storage room, and the pesticides in water and/or sediment within the existing elevator pit at the time of building demolition activities, including removal of utilities, basement floor slab components, transformers, electrical equipment, and the elevator equipment room.

The first floor of the main manufacturing building contains a high voltage room with three transformers which have been determined to be owned by Rochester Gas & Electric (RG&E). RG&E will be responsible for removing the transformers from the Site. Given electrical safety concerns, no sampling was conducted in this room, and it is assumed that if any sampling needs to be conducted related to the transformers, it will be the responsibility of RG&E.

Implementation of the preferred remedy in accordance with this RAWP is anticipated to begin in 2021. Implementation of the RAWP will be delayed until the Volunteer secures funding for the project. Redevelopment of the Site is estimated to take 20 months to complete.

Abbreviations

µg	Microgram
AAR	Alternatives Analysis Report
AMSL	Above Mean Sea Level
B	Soil boring
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
bgs	Below ground surface
CAMP	Community Air Monitoring Program
CCD-C	Center City District and Design District Cascade-Canal
CFR	Code of Federal Regulations
COC	Contaminant of Concern
CP	Commissioner Policy
CPP	Citizen Participation Plan
CVOC	Chlorinated volatile organic compound
cy	Cubic yard
DER	Division of Environmental Remediation
DMM	Division of Materials Management
DUSR	Data Usability Summary Report
EC	Engineering Control
EE	Environmental Easement

EISB	Enhanced *In Situ* biodegradation
ERD	Enhanced reductive dechlorination
ESA	Environmental Site Assessment
ESC	Erosion and Sedimentation Controls
FER	Final Engineering Report
FOIL	Freedom of Information Law
ft.	Foot
g	Gram
GAC	Granular Activated Carbon
GPS	Global Positioning System
HASP	Health and Safety Plan
IC	Institutional Control
ISCO	*In Situ* chemical oxidation
kg	Kilogram
L	Liter
lbs.	Pound
m	Meter
MCDES	Monroe County Department of Environmental Services
mg	Milligram
MNA	Monitored natural attenuation
mV	Millivolt
MW	Monitoring well
NYCRR	New York Codes, Rules and Regulations

NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
OMH	Office of Mental Health
ORP	Oxidation reduction potential
PAH	Polycyclic aromatic hydrocarbon
PE	Professional Engineer
PCB	Polychlorinated biphenyl
POGW	Protection of Groundwater
POTW	Publicly Owned Treatment Works
PVOC	Petroleum-related volatile organic compound
QA	Quality Assurance
QAPP	Quality Assurance Project Plan
QC	Quality Control
PAH	Polycyclic Aromatic Hydrocarbon
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RRCDC	Rochester Regional Community Design Center
RE	Remedial Engineer
RI	Remedial Investigation
RIR	Remedial Investigation Report
RIWP	Remedial Investigation Work Plan
ROW	Right-of-way

RR	Restricted Residential
SCG	Standards, Criteria, and Guidance
SCO	Soil Cleanup Objective
SMP	Site Management Plan
SPT	Standard Penetration Test
SRB	Sulfate-reducing bacteria
SSDS	Sub-slab depressurization system
SVI	Soil vapor intrusion
SVOC	Semi-volatile organic compound
TIC	Tentatively Identified Compound
TOGS	Technical and Operational Guidance Series
TP	Test pit
TSDF	Treatment/Storage/Disposal facility
UIC	Underground injection control
USEPA	United States Environmental Protection Agency
USGS	United States Geologic Survey
UST	Underground storage tank
UU	Unrestricted Use
VOA	Volunteers of America
VOC	Volatile organic compound

1.0 INTRODUCTION

In accordance with the New York State Department of Environmental Conservation's (NYSDEC) DER-10, Technical Guidance for Site Investigation and Remediation, (May 2010) Stantec Consulting Services Inc. (Stantec) has prepared this Alternatives Analysis Report (AAR) and Remedial Action Work Plan (RAWP) for the Canal Street Site (Site) located at 67 & 89 Canal Street in the City of Rochester, Monroe County, New York (see Site Location Map, Figure 1). East House Canal Street, LLC, which is not yet the owner of the Site but a prospective purchaser under contract, has entered into a Brownfield Cleanup Agreement (BCA) as a Volunteer for the Site with NYSDEC under the Brownfield Cleanup Program (BCP). The Brownfield Cleanup Agreement between East House Canal Street, LLC and NYSDEC was executed on July 26, 2018. The NYSDEC BCP Site Number is C828206.

This Remedial Action Work Plan presents a plan to implement a Track 4 Restricted-Residential (RR) cleanup to address these areas of environmental impact along with the application of Engineering Controls (ECs) and Institutional Controls (ICs) to allow for the planned redevelopment of the Site.

This AAR/RAWP includes the following elements:

- A brief summary of Site history and investigative activities performed;
- A summary of contaminants identified during the Remedial Investigation (RI);
- Remedial Action Goals and the proposed BCP Cleanup Track for cleanup of the Site;
- Evaluation of remedial technology alternatives with regard to effectiveness, practicality of implementation, cost effectiveness and other factors;
- Recommendations for final Site actions;
- Institutional and Engineering Controls; and
- A remedial implementation schedule.

2.0 BACKGROUND INFORMATION

2.1 SITE DESCRIPTION

The Site is comprised of two continuous tax parcels, 67 Canal Street (Tax Parcel No. 120.36-2-2) and 89 Canal Street (Tax Parcel No. 120.360-2-1), totaling 1.7± acres in the City of Rochester, Monroe County, New York (see Figures 1 and 2). The property and building are currently owned by "67 & 89 Canal Street, LLC," a subsidiary of Buckingham Properties (Owner).

The Site is currently improved with the following, as depicted on an Existing Site Conditions Aerial photograph included as Figure 2A:

- A vacant, five-story U-shaped former manufacturing building, which was constructed in two phases (generally referred to as the northern and southern buildings) and totals 170,000± gross sq. ft. (Main Manufacturing Building). The first floor of the main/manufacturing building is located partially below grade. An asphalt-paved ramp leads down to the lower level on the northern side of the northern building where an interior loading dock is present. The structure's exterior walls are primarily constructed of brick with some stone or concrete block portions. The interior structural elements are primarily large wood columns and floor joists. Floors are generally covered in wood, and a portion of the basement floor is concrete. Large windows are present. Three elevator shafts are present, and stairwells are present in both main buildings and in the middle of the main building.
- A 7,100± sq. ft. concrete block, one-story building with several loading docks located roughly in the center of the Site (Loading Dock Building).
- A 3,030± sq. ft. concrete block garage/shop building is also present in the northwest corner of the property and is utilized by the current owner (Garage/Shop Building).
- Areas in between the buildings are generally covered with asphalt or gravel. An area approximately 10 ft. wide x 70 ft. long, located between the main southern structure and the loading dock building is approximately 8 ft. lower in elevation than the surrounding ground surface. This lower ground area is weed-covered and currently has significant amounts of accumulated debris and trash.

There is an easement for Rochester Gas and Electric (RG&E) associated with a 2-in. diameter steam pipe that is present in a portion of the southern building (see Figure 2).

Ground surface at the Site is generally flat or gently sloping, and ranges in elevation from approximately el. 517 ft above mean sea level (AMSL) to el. 521 ft AMSL.

A narrow former Right-Of-Way (ROW) of the City of Rochester, formerly referred to as Hyland Alley, interjects approximately 60 ft. into the Property from Wiley Street along the western edge of the north building. The City abandoned this ROW in December 2019. The Volunteer intends to add this land to the BCP "Site" via amendment.

The main/manufacturing building was originally constructed in the early 1900s and occupied by J.T Cunningham (carriage manufacturers) followed by Utz and Dunn Co. (shoe manufacturers), Kanty Paper Boxes (box manufacturer), a pasta maker, a storage company, a studio, a graphics company, a woodworking company, general contractors, Fowler & Webster Inc., Volunteers of America (VOA) and as of 2011, and the current Owner.

2.2 LAND USE

2.2.1 Current Site and Surrounding Land Uses

The Site is located in an area of dense Urban development and consists of a largely vacant former manufacturing facility and separate loading dock/storage and garage/shop buildings. The garage/shop building is currently used by the Owner primarily for storage of property maintenance equipment such as snowplows, lawn mowers, various power tools, and vehicles.

Land use in the surrounding area includes commercial and industrial facilities on the properties to the north and east of the Site, a residential facility to the west of the Site (the Former Carriage Factory Apartments) and a vacant building and RG&E electrical substation immediately south (see Figure 2).

The 67 and 89 Canal Street parcels are zoned as part of the Center City District and Design District Cascade-Canal (CCD-C). The design theme for the CCD-C is to promote its industrial warehouse character.

The Site and adjoining properties to the west and south are also located within the Susan B. Anthony historic preservation district, which is one of the oldest residential areas in Rochester (City of Rochester (COR) 2012). The Site is located in the eastern portion of this district, which largely contains commercial/industrial properties. The 2008 Vision Plan for the Susan B. Anthony neighborhood for Plan E Broad Street Area encourages the redevelopment of the on-Site building (referenced as the VOA building) with the vision that the building would be used as a mixed-use, mixed-income development with commercial, community and residential components (Rochester Regional Community Design Center (RRCDC) 2008).

2.2.2 Proposed Development

Planned redevelopment of the Site involves renovating the manufacturing building into 113 affordable apartment units, of which approximately half will be State Office of Mental Health (OMH)-supported units, with some commercial space on the first floor. The program will meet OMH standards for living and support space. The currently proposed apartment unit count is 78 one-bedroom units, 34 two-bedroom units, and 1 studio unit. The one-bedroom units range up to 821 square feet and the two-bedroom units range up to 1,100 square feet. A designated 8,900 square feet of the building will be used as commercial space including support space. The support spaces include a 1st floor community room with adjacent kitchen, computer lab, and an exercise room, common laundry rooms on each floor, lounge areas, and support staff offices.

The existing one-story concrete masonry loading dock and garage/shop buildings will be removed, allowing for an estimated 63 on-Site surface parking spaces, and a landscaped courtyard for recreation. A Concept Site Plan showing the existing Site features and ground surface topography is included in Appendix A (Drawing rc100).

Construction is expected to commence in 2021 contingent on receipt of funding.

2.2.3 Past Uses of the Site

This section provides an abbreviated history of Site use; a more detailed discussion of Site history can be found in the previous *Phase I Environmental Site Assessment* (Stantec, 2018), and the 2018 *Brownfield Cleanup Program Application*.

Historical records indicate that the first known use of the Site was for multiple residential dwellings from the mid-1870s to the early 1900s. In the early 1900s, the southern portion of the main manufacturing building was constructed, and additions were made between 1904 and 1912 to cover the current building footprint. From 1910 until the early 1950s, the Site was utilized as a shoe manufacturing facility, and portions of the Site also contained residential dwellings until the 1930s. In the early 1950s, the shoe manufacturer was replaced by 'Kanty Paper Boxes.' A macaroni manufacturer operated in the northern portion of the building from the 1940s until the early 1950s and occupied the remainder of the Site until the early 1980s, except for the southern portion of the building which was labeled 'Paper Packaging Products Warehouse' in 1971. In the late 1980s-2000s occupants of the Property included a storage company, a studio, a graphics company, a woodworking company, general contractors, Fowler & Webster Inc., and the VOA. The current Owner purchased the Property from the VOA in 2011.

A detailed list of the former operators appears in the BCP Application.

The following historical uses of the adjoining properties were identified during the Phase I Environmental Site Assessment (ESA) investigations:

- The parcel adjacent to the west of the Site at 33 Litchfield is the former Carriage Factory BCP Site (BCP Site #C828184). This property was utilized for multiple residential dwellings and a lumber yard for the 'James Cunningham Son & Co.' carriage manufacturers from the early 1890s to the late 1910s. In the 1920s residential dwellings were no longer present and the carriage/automobile parts manufacturer operated at this property until the 1960s. In the late 1960s-1970s, occupants of the building included a machinery business, gas appliance manufacturer and specialist photo device and film companies. A welding and auto repair shop was located on this property in the 1990s.
- During the late 1800s through the early half of the 20th century, 48 King Street located northwest of the Site was owned by the 'Church of St. Peter and St. Paul' and included a recreation center, club rooms, bowling alley, and a pool. In 1918 this property is first listed as the 'Buffalo Rochester & Pittsburgh (Railroad) Warehouse' and no indications of the church property remain in 1938 aerial photographs. This property remained as a warehouse through the late 1960s. It also housed businesses such as roofing companies, paper companies, an electric appliance company, and chemical companies or distributors through the 1990s.

- The adjacent property to the north across Wiley Street has been utilized as a railway and for residential dwellings since the late 19th century. Between the 1910s to the 1970s, this property was labeled/depicted as a railway, with portions of the Site containing a coal company/coal silos. This property appeared to remain as an active railyard until the 1980s. It currently contains a railway and the portion closest to the Site is a private parking lot.
- In the late 1800s, the 'Municipal Gas Works' occupied 65 Towbridge Street, which is located approximately 85 feet north-northeast of the Site. Part of this property appeared to be utilized by the 'Buffalo Rochester & Pittsburgh Railway Co.' in the 1910s. A business named 'Brewster, Gordon & Co.' was located on this property from the 1910s to the 1930s.
- 90 Canal Street, located to the east of the Site, had been partially occupied by the 'W. B. Morse' lumber yard since the late 1800s. In 1892, a portion of the 'Old Well of Gasometer' on the 65 Towbridge parcel was located on this property, and the Erie Canal slip was depicted just east of this property. In 1904, the gas well was no longer present. Use as a lumber yard continued through the 1930s. A building was constructed on this property before the late 1930s and was listed as the 'Eastman Kodak Co. Camera Works Building' in 1950. The building was utilized by Kodak as storage until the 1980s, and was also occupied as an auto warehouse, machining and manufacturing businesses for plastics and welded materials, and a chemical distributor in the 1980-1990s. Dextrite Enterprises, Dynamold, and Duratec Finishing were the last listed occupants of the facility in 2006.
- 390 West Main Street located east-southeast of the Site has been used for a variety of industrial-related businesses since the 1880s. This property was owned by the 'Buffalo New York Pittsburgh Railroad Trust' in the 1880s, and by the 1890s, this property was being used for 'W. B. Morse' lumber pile staging, a stone yard for the 'Western New York & Pennsylvania Railroad Co.', and the 'Rock Asphalt Paving Co.'. This property was also used by a coal company, and a used tire business in the 1920s through 1930s. 'W. B. Morse' lumber continues to occupy this property with lumber storage and sheds.
- 53 Canal Street and 30 Litchfield Street are located south of the Site. The first development of 53 Canal Street occurred in the early 1900s. It was occupied by manufacturing companies who produced items including gum and vending machines and electric appliances through the 1980s. The building currently appears to be vacant. The building at 30 Litchfield Street was first constructed in the early 1900s as an electric power station and has maintained its use by various electric companies. The building is currently used by 'Rochester Gas & Electric' as an electric substation.

2.3 GEOLOGIC AND HYDROGEOLOGIC SETTING

Based on the subsurface investigations performed as part of the RI, previous investigations by others, and published overburden and bedrock maps (New York State Geologic Survey, 1971/1986), the general subsurface profile observed across the Site consists of the following materials and deposits, in order of increasing depth:

- Fill: The fill materials consist of a wide variety of soil types. The most commonly observed fill deposit types were Sand/Gravel mixtures with varying amounts of silt, or Silt/Sand mixtures with varying amounts of gravel. Some exploration locations had distinct layers of ash and cinder materials, or these materials were observed to be mixed in with other soil types. Other miscellaneous materials such as metal, brick, concrete and wood were observed in several borings and test pits. The fill was found to extend from ground surface to depths ranging up to 8.1 ft., with an average fill depth of 3.1 ft.

- Native Soil (Lacustrine): The native soil underlying the Fill across the Site appears to be a Lacustrine deposit consisting primarily of brown to red-brown Silt and/or fine Sand with varying amounts of gravel, coarse to medium sand, and clay. In the cases where soil samples were obtained with a split spoon sampler, the Standard Penetration Test (SPT) blow counts per foot ("N" value) ranged from 5 in silt and clay layers to >30 in zones containing gravel. The top of native soil, where present, was encountered at depths ranging up to 8.1 ft., with an average depth to top of native material of 3.1 ft. The thickness of the native deposit ranged from 0 to 9.0 ft, with an average thickness at the test boring locations of 3.8 ft.

- Bedrock: The top of apparent bedrock was encountered in the test borings at approximate depths ranging from 2.1 to 13 ft bgs. This corresponds to approximate elevations ranging from el. 506.3 ft AMSL to el. 510.3 ft AMSL. The upper five feet of bedrock in the three locations where rock was cored (B-100, -102, and -104) was generally described as light gray, hard, medium-bedded Dolomite, with occasional stylolites ('serrated' seams) and pits with secondary crystallization. Rock Quality Designation (RQD) values, which indicate the degree to which the bedrock contains discontinuities in the rock mass, ranged from 30 to 53%. Several zones of jointing at varying orientations were observed in the rock core. Drilling fluid loss in borings B-100, -102 and -104 were 30, 350 and 75 gallons, respectively. The larger volume of loss in B-102 may have been in part due to a poor seal between the temporary casing and the top of bedrock, and the high-porosity, coarse granular fill in that area. In addition, two severely weathered seams were observed in the core from this boring that likely also contributed to water loss to the subsurface.

Groundwater elevation data collected during the RI indicate that the water table elevation across the Site during the period of the RI ranged from approximately el. 505.3 ft AMSL (MW-09, October 1, 2018) to el. 512.6 ft AMSL (MW-102, April 22, 2019). The contour plans indicate that groundwater is typically highest on the west side of the Site, and at times a groundwater "mound" has been present in the north central portion of the Site near newly-installed well MW-102, with generally radial flow to the east, northeast and southeast from this area. Well MW-102 is in close proximity to the former USTs removed from this area in the early 1990s (Stantec, 2018). This area appears to have been backfilled with crushed stone at the time of UST removal. In addition, a vapor extraction remediation system was also installed in an adjacent trench at that time; this area is also likely to have been backfilled with porous materials such as sand or gravel, however this was not confirmed. This zone of highly porous backfill is expected to accumulate groundwater more readily than adjacent areas, resulting in a buildup and groundwater "mounding" effect in that part of the Site.

The observed groundwater levels are generally close to the top of rock at the boring locations and appear to fluctuate above and below the bedrock/overburden interface. Groundwater in the overburden, when present, is typically only 1-2 ft above the top of rock.

Based on the elevation that bedrock was encountered in the test borings, and a review of historical sewer and top-of-bedrock probe drawings obtained from Monroe County Department of Environmental Services (MCDES), it appears that at least portions of the combined sewers and associated manholes located in the adjacent streets (Canal, Wiley and Litchfield Streets) are constructed below the top of bedrock. Further, these appear to be “stone trench” sewers that may be constructed in unlined bedrock and are therefore likely to allow infiltration and inflow (I/I). Because the groundwater has been observed to be close to or above the top of bedrock at several well locations, it appears that shallow groundwater may discharge to the sewers at times in certain locations, thus the sewers may be influencing groundwater flow direction.

2.4 PREVIOUS INVESTIGATIONS AND ACTIVITIES

2.4.1 NYSDEC PBS and Spill Files

As part of Stantec’s 2018 Phase I ESA (discussed below in Section 2.4.4) NYSDEC Petroleum Bulk Storage (PBS) and Spill records were reviewed for the Site. According to the information received from the NYSDEC, five tanks with three reported spills had previously been on-Site.

Per the files for PBS No. 8-444804 and spill files, five underground storage tanks (USTs) had previously been on-Site as follows:

- One tank was removed before 1993. This tank was not registered; however, it was discussed in spill information for Spill No. 9300522;
- Two tanks, a 500-gallon gasoline UST (Tank ID 001X) and a 2,000-gallon gasoline UST (Tank ID 002X) were registered and were removed in 1993; and
- Two tanks, a 500-gallon gasoline UST (Tank ID 001A) and a 2,000-gallon diesel UST (Tank ID 001B) were installed in 1993 and removed in 2012.

According to the NYSDEC spill file information from 1993 (Spill No. 9300522), gasoline was discovered in the building sump and northern loading dock area. The problem was reportedly from leaking USTs; at the time, the facility had one diesel UST and one gasoline UST. Upon discovery of the spill, the gasoline tank was pumped out. The NYSDEC sampled from several drilled holes in the ground between the retaining wall and the pavement of the loading dock, elevated PID readings were measured. Both tanks were subsequently removed by Pro Testing, and new tanks were installed. Gasoline odors and staining were noted in the excavation. The 1993 spill information identifies a third UST, which had been removed two to three years earlier within the same area, but there is no documentation of a spill at that time. This was suspected to be the source of contamination within the area since the tanks removed in 1993 appeared to be in good condition. Soil was excavated within the area of the tanks and a trench was installed north of the tank locations in order to install a soil vapor extraction (SVE) system. No other information on this

system was provided in the spill information obtained by Stantec. The spill was closed ten years later since the SVE system had remained in place and there were no other indications of residual contamination causing impacts per the information received. This work was performed by the prior owner, VOA.

According to information received from the NYSDEC, two tanks (one 2,000-gallon gasoline UST and one 500-gallon diesel UST) were removed by Piedmont Equipment, Inc. in 2012 for the current Owner; however, a written report was not generated until two years later in 2014. Two confirmatory soil samples were collected in 2012, and the reported concentrations were well below applicable soil cleanup objectives. The NYSDEC closed the spill file (No. 0910281) associated with the tank removals given the removal of the tanks and then current industrial property usage; however, the NYSDEC also stated that residual soil and groundwater impacts may remain, and the spill file may have to be reopened if these were encountered in the future.

The third identified spill (Spill No. 1005055) was a result of equipment failure that caused a release of hydraulic oil onto the asphalt pavement.

2.4.2 Site Characterization Report, Canal Street Former MGP Site

A Site Characterization Report for the adjoining former RG&E MGP Site was completed by Haley & Aldrich in 2008. The following is a summary of findings as it pertains to this Site:

The property adjacent to the east, 90 Canal Street (see Figure 2), was the location of a former RG&E Canal Street MGP operated in the late 1800s with subsequent industrial operations since that time. In 2008 groundwater samples were collected from monitoring wells throughout the facility including MW-9 which is in the sidewalk on the west side of Canal Street, immediately adjacent to the Site boundary (see Figure 2). Several compounds including 1,2-dichloroethane, 2-butanone (methyl ethyl ketone), acetone, cyclohexane, methylcyclohexane, and six petroleum-related compounds were detected in MW-9, but were either not detected in other wells from the former MGP Site, or if detected, were present at much lower concentrations, suggesting that there may be different source for contaminants in the area of MW-9. Given the analytical results from the 2008 RG&E Site groundwater sampling event, it appeared likely that the northeast portion of the 67 & 89 Canal Street Site was impacted; however, in the area of MW-9 it did not appear to be from the former MGP facility.

2.4.3 2014 Phase II Environmental Site Assessment

A Phase II ESA was completed by LaBella Associates (LaBella) in 2014 to investigate: (1) potential petroleum impacts from the former UST locations on the Site; (2) potential petroleum and chlorinated solvent impacts from the Carriage Factory Brownfield Site (located west of the Property); and (3) potential impacts from the former RG&E Canal Street MGP Site (discussed above in Section 2.4.2). The investigation involved installation of thirteen soil borings and two monitoring wells, and analysis of five soil samples and three groundwater samples, including one groundwater sample collected from the existing RG&E MGP Canal Street Site well, MW-9. The Phase II ESA concluded that no further investigation nor remediation was warranted given the lack of exceedances when compared to NYSDEC's soil cleanup

objectives (SCOs) for Commercial Site usage and NYSDEC's Petroleum Spill Site Inactivation (PSSI) for adult commercial workers. However, given the current intended future use of the Site for residential purposes, the Commercial SCO criteria used in the Phase II ESA are no longer applicable.

Summarized below are the analytical results found during the Phase II ESA compared to restricted residential (RR) SCOs, NYSDEC's Commissioner's Policy CP-51 cleanup levels, and NYSDEC Part 703 Groundwater Standards (as contained in Technical and Operational Guidance Series [TOGS] document 1.1.1):

- One petroleum-related volatile organic compound (PVOC), 1,2,4-Trimethylbenzene was detected at a concentration in excess of its RR SCO in soil boring GP-06/MW-01 located adjacent to the former UST locations (Figure 3). Six compounds at this location were found to exceed NYSDEC's CP-51 cleanup levels. A monitoring well was installed at this location, and nine petroleum-related compounds were detected in a groundwater sample at levels that exceeded NYSDEC groundwater standards.
- Monitoring well GP-11/MW-02 installed to investigate potential impacts from the adjacent Carriage Factory Brownfield Site had detections of three chlorinated volatile organic compounds (CVOCs) at concentrations slightly above groundwater standards.
- The existing monitoring well sampled along the eastern property boundary (MW-9) had chloromethane, acetone, and 13 petroleum-related compounds detected above groundwater standards.

2.4.4 2018 Phase I ESA

Stantec conducted Phase I ESAs in 2017 and 2018 for the Site in accordance with the requirements of American Society for Testing and Materials (ASTM) *Standard Practice for Environmental Site Assessments: Phase I Environmental Site Assessment Process* (ASTM, 2013). The purpose of the 2018 ESA was to update the 2017 findings with new Site information that was subsequently received.

The 2018 Phase I ESA report listed the following RECs:

- The historical use of the Site (including former shoe and box manufacturing facility and garage/shop building operations) in conjunction with floor drains with unknown discharge locations;
- History of tanks, reported spills, and documentation of on-Site petroleum impacts to soil and groundwater from historical gasoline/diesel USTs;
- Presence of a former 25,000-gallon tank with unknown contents within the northern building footprint (it is unknown if this tank was aboveground or underground);
- Presence of a vacuum heating pump with unknown contents in the northern manufacturing building;

- Debris piles consisting of mostly soil, asphalt, rocks, and brick with trace amounts of slag and coal with unknown origin were observed at exterior on-Site locations. Following completion of the Phase I ESA but prior to entering the BCP these materials were removed from the Site by the Owner;
- Past storage of paint and other materials on a pervious surface. Old paint cans and buckets of what appeared to be tar (some containers without covers) were observed under an overhang labeled 'propane storage' adjacent to the building and had been removed by the Owner since the initial Site visit. Minor staining was observed by Stantec on the asphalt and wood shelves where these containers had previously been located;
- Historical storage of pesticides and associated staining and circular 55-gallon drum indentations within a room labeled "Pesticide Room" on the 4th floor of the northern building;
- Urban Fill containing heavy metals and polycyclic aromatic hydrocarbons (PAHs) is known to be present on an adjoining Site. Similar conditions were expected to exist on the Site; and
- An area-wide, generally low-level CVOC contamination plume originating from an off-Site property adjacent to the west. Some of the same CVOC compounds have been documented to be present in groundwater in one well on the west side of the Site, which may affect the Site's soil, soil vapor, and indoor air.

The 2018 Phase I ESA report also identified historical use of adjoining properties as railway lines/coal yard, automobile manufacturing, lumber yard, MGP, electric substation and powerhouse, asphalt paving company and various other manufacturers including camera works, gum and vending machines, and washers and dryers.

At the time of the initial Phase I ESA Site visit on August 15, 2017 two rooms on the lower level of the manufacturing building could not be opened and inspected. During a January 18, 2018 visit to the Site, these two rooms were able to be accessed. The rooms appeared to have been constructed to hold volatile/flammable materials given that the floors for both rooms were slightly below the grade of the rest of the building and apparent explosion-proof light fixtures were observed. Broken concrete, building material debris and apparent manufacturing equipment were present in one of the rooms. In the second room numerous paint cans, five-gallon containers, a soil pile and building material debris were observed. The current Owner has since removed the paint cans and five-gallon containers from this second room which was confirmed by Stantec during a follow-up Site visit on March 21, 2018. The condition of the floor could not be observed due to the presence of soil, asbestos containing debris and other building material debris. Some paint was spilled just outside of the rooms during removal, and cleaned up by the owner, resulting in *de minimis* staining on the concrete floor.

2.4.5 Implications of Previous Investigations

Based on review of the previous environmental investigations summarized above in Sections 2.4.1 to 2.4.4, Stantec developed the following conclusions:

Given the intended future use of the Site for residential purposes, the criteria used for the conclusions/recommendations in the 2014 Phase II ESA, which assumed Commercial Site usage, are no longer applicable. Accordingly, the analytical results from the 2008 RG&E MGP Site Characterization for well MW-9 and the 2014 Phase II ESA are compared below to RR SCOs, CP-51 cleanup levels, and NYSDEC Part 703 Groundwater Standards:

- One compound (1,2,4-Trimethylbenzene) was found in excess of its RR SCO in soil boring GP-06/MW-01 located adjacent to the former UST locations. Six compounds at this location were found to exceed NYSDEC's CP-51 cleanup levels. A monitoring well was installed at this location and nine petroleum-related compounds were detected in a groundwater sample at levels that exceeded NYSDEC groundwater standards.
- Monitoring well GP-11/MW-02 installed to investigate potential impacts from the Carriage Factory Brownfield Site had detections of three CVOC at concentrations slightly above groundwater standards.
- In 2008, an estimated ("J" value) detection of the CVOC 1,2-dichloroethane and five petroleum-related compounds were detected above groundwater standards in MW-9 (installed as part of an investigation on the adjacent MGP Site) located in the Canal Street ROW immediately east of the Site. This well was resampled as part of the 2014 Phase II ESA and chloromethane, acetone, and 13 petroleum-related compounds were detected above groundwater standards. As discussed above, some of these compounds were not detected in groundwater on the MGP Site, thus impacts in this well are likely from a different source, potentially the Site, given the apparent groundwater flow direction.

2.5 REMEDIAL INVESTIGATION SUMMARY

The RI was performed in accordance with the Remedial Investigation Work Plan (RIWP), dated March 2018, and Work Plan Addendum, dated October 9, 2018, which was approved by NYSDEC on December 28, 2018, and Progress Report Number 6 dated January 10, 2019. The primary elements of the RI included (further detail on investigation activities and methodology is provided in the RI report):

- Geophysical (electromagnetic) survey of exterior areas;
- Hazardous building material assessment;
- Utility clearance;
- Video survey and dye testing of accessible interior floor drains and sump, and associated piping;
- Passive soil gas survey;
- Test pit program with associated subsurface soil sampling;
- Interior and exterior test boring program with associated subsurface soil sampling;
- Installation of overburden and overburden/bedrock interface monitoring wells;
- Monitoring well development;

- Monitoring well location survey;
- Groundwater level measurement;
- Groundwater sampling;
- Hydraulic conductivity (slug) testing of selected wells;
- Surface soil sampling;
- Laboratory analysis of soil and groundwater samples; and
- Investigation-derived waste management.

The RI field investigation program was performed during the period August 3, 2018 through April 25, 2019. The findings of the RI are summarized in the Draft RI report which was submitted to NYSDEC on July 19, 2019. Table 1 summarizes the analytical results for soil samples. Figure 3 presents a graphic depiction of samples that exhibited contaminant concentrations in excess of applicable compound specific SCOs which include: Restricted Residential (RR) Use, Protection of Groundwater (POGW) and NYSDEC Commissioner Policy CP-51 (CP-51) Table 1 Supplemental SCOs for RR Use and POGW; Table 2 Soil Cleanup Levels for Gasoline-Contaminated Soils; and Table 3 Soil Cleanup Levels for Fuel Oil-Contaminated Soil. The results for the miscellaneous building material and other suspect material location sampling are summarized on Tables 2a and 2b. Tables 3 and 4 summarizes the analytical results for groundwater samples and exceedances of groundwater standards are illustrated graphically on Figure 4. The following is a summary of the primary findings of the RI:

- *Floor Drains and Piping*: Of the drain lines that could be accessed with the video equipment, the piping was found to be intact with no obvious evidence of piping breaches. One exception to this is the north-south oriented pipe connecting the floor drain in the northern section of the main building's interior loading dock to the sump located adjacent to the dock. This approximately 10 ft.-long section of piping was found to have cracked with broken portions near the floor drain; however, water was observed flowing freely to the sump in the video. This drain and sump were documented to contain apparent gasoline in 1993 per the NYSDEC spill report (#9300522) for the Site.

- *Petroleum Impacts:* Petroleum impacts in soil and/or groundwater were identified in the following four areas of the Site:

    - *Northeastern Portion of the Site:* PVOCs and PAH exceedances of RR SCOs were detected in investigation locations in the northeastern quadrant of the Site around and beneath the northern portion of the main manufacturing building. Two of the bedrock/overburden interface wells located in the northeast quadrant (MW-104 and MW-106) of the Site and the off-Site monitoring well (MW-9) located in the sidewalk on the west side of Canal Street, immediately adjacent to the Site boundary, had PVOCs in groundwater above NYSDEC standards and guidance values. These borings and monitoring wells are in the vicinity of the former USTs or in close proximity to the main

building's northern foundations where the petroleum is suspected to have migrated over time.

- *Courtyard Area:* Two bedrock/overburden interface groundwater monitoring wells (MW-100 and MW-114) located within the courtyard area had groundwater PVOC detections above NYSDEC standards and guidance values.
- *Groundwater monitoring well MW-107:* Bedrock/overburden interface groundwater monitoring well MW-107 is in the garage/shop building near the western Site boundary and had detections of PVOCs above NYSDEC standards and guidance values. Given the groundwater flow direction and the lack of PVOCs detections in the overburden soils at this location it is suspected that these PVOC groundwater impacts may be from an off-Site source(s).
- *Groundwater monitoring well MW-110:* Minor concentrations of benzene were reported in overburden well MW-110. Monitoring well MW-110 is in the southwestern corner of the Site, where no potential on-Site sources of petroleum have been identified; this detection may be the result of an off-Site source.

- *Chlorinated Volatile Organic Compounds (CVOCs) in Groundwater*: Exceedances of NYSDEC groundwater standards and guidance values were found for CVOCs at wells MWs-100, -112, -02 and -107. Given the groundwater flow direction, the lack of significant CVOCs detections in the overburden soils on the Site and known neighborhood wide CVOC groundwater impacts it is suspected that the impacts detected in these four wells located on the western/central portion of the Site may be from an off-Site source(s).

- *Semi Volatile Organic Compounds (SVOCs) and Metals in Surface and Subsurface Soils*: Urban Fill was observed in exploration locations across the Site. The most commonly observed fill deposit types were Sand/Gravel mixtures with varying amounts of silt, or Silt/Sand mixtures with varying amounts of gravel (between 0.8 ft and 6 ft thick). Some exploration locations had distinct layers of ash and cinder materials, or these materials were observed to be mixed in with other soil types. Other miscellaneous materials such as metal, brick, concrete and wood were observed in several borings and test pits. Soil sample results demonstrate that there are metal (lead and barium) and PAH impacts in Urban Fill, particularly where ash and/or cinders were observed, above RR SCOs. This condition is similar to what was documented on adjacent properties.

  A surface soil sample was collected from fill materials located in an approximately 8-ft deep, rectangular, lower ground area located between the southern portion of the main building and the one-story loading dock building. The materials in a portion of the depression are a mixture of soil-like fill materials combined with varying amounts of debris. Lead, an estimated detection [??]of mercury and eight PAHs were found in the sample at concentrations above their respective RR SCOs.

- *Former Pesticide Storage Room:* Pesticides, cadmium, copper, lead, mercury and zinc were detected in a sample of flooring collected from the former pesticide storage room. Future plans

for this room during Site redevelopment include converting the room into a lounge. The flooring will be removed to the original floor decking and a new self-leveling topping will be installed. The walls will be scraped and repainted in accordance with lead safe work practices.

- *Pesticides in Freight Elevator Pit:* Water in the freight elevator pit was sampled during the remedial investigation. Given the high turbidity measured in the sample during collection, the metals sample was submitted to the lab for both dissolved and total constituents. While the total metals had a number of analytes above groundwater standards and guidance values, the dissolved metals only had a detection of sodium above groundwater standards and guidance values. Several pesticide analytes were also detected above standards and guidance values; however, it is suspected that these detections may be due to the elevated turbidity in the sample.

- *Hazardous Building Material Survey:* A hazardous building material survey and asbestos contamination assessment was conducted and included an asbestos survey, contamination assessment of damaged friable asbestos containing materials, limited paint sampling for PCB content and sampling of caulks/window glazing for PCB content. During Site redevelopment the walls will be scraped and repainted in accordance with lead safe work practices; thus, no lead-based paint testing was conducted. Numerous materials were identified to be either confirmed, assumed or suspect asbestos containing materials. PCBs were not detected above laboratory detection limits in the samples collected.

2.5.1 Additional Remedial Investigation Tasks

No additional investigation is recommended, except for the following:

- In the bottom floor of the main manufacturing building, soil and building debris were observed on a concrete floor. Per the RIWP samples were proposed to be collected for waste disposal purposes and the floor conditions would then be assessed. During the asbestos survey it was determined that this material was contaminated with friable asbestos thus samples were not collected for safety reasons. It is proposed that a sample will be collected for waste characterization purposes during asbestos abatement.
- Per the RI Work Plan Addendum, depending on the level of accessibility, a sample of sediment (if present) in the Freight Elevator pit was to be obtained. Given safety concerns, the bottom of the pit could not be evaluated for sediment build-up; as such, potential sediment accumulation in the bottom of the pit will be assessed during Site redevelopment.

3.0 REMEDIAL GOALS AND OBJECTIVES

3.1 FUTURE USE OF SITE

The planned Site remediation and development will include demolition of the garage/shop building, removal of the existing slab to perform the most effective remediation of the Site, replacement of the floor including a vapor barrier (required sealing layer) and sub-slab depressurization system and renovations to the existing building, which will be converted OMH-supported units and commercial space on the first floor. The Site has connections to typical utilities including electrical, power, water, natural gas, and sewer (see Drawing rc100 in Appendix A).

3.2 REMEDIAL GOAL AND REMEDIAL ACTION OBJECTIVES

The general remedial goal for sites in the NYS Brownfield Cleanup Program is to eliminate or mitigate significant threats to the public and the environment posed by the Site contaminants through the proper application of scientific and engineering principles. Accordingly, the identified sources of contamination at the Site have been or will be eliminated or mitigated to a condition acceptable to the NYSDEC under the BCP using appropriate remedial technologies, engineering controls (ECs) and institutional controls (ICs).

Based on the information presented in the preceding sections, the remedial action objectives (RAOs) for the Site include:

- Soil
    - Prevent ingestion, or contact with Site contaminants of concern (COCs) that exceed Standards, Criteria and Guidance (SCGs; discussed further in Section 8.2) in impacted areas identified;
    - Prevent ingestion, or contact with “nuisance characteristics” (i.e. petroleum odors) in soils; and
    - Prevent exposure to post-remediation residual COCs via ECs and ICs, including execution of a NYSDEC Environmental Easement (EE) and Site Management Plan (SMP) limiting the Site usage to Restricted Residential, Commercial or Industrial. Unrestricted and Residential Use will not be allowed.
- Soil Vapor
    - Prevent inhalation with Site COCs that exceed SCGs in impacted areas identified;
    - Prevent inhalation with “nuisance characteristics” (i.e. petroleum odors) in soils; and
    - Prevent exposure to post-remediation residual COCs via ECs and ICs, including execution of a NYSDEC EE and SMP limiting the Site usage to Restricted Residential, Commercial or Industrial. Unrestricted and Residential Use will not be allowed.

- Groundwater
    - Prevent ingestion, inhalation, or contact with COCs that exceed SCGs; and
    - Prevent exposure to post-remediation residual COCs via institutional controls, including execution of a NYSDEC EE and SMP limiting the Site usage to Restricted Residential, Commercial or Industrial. Unrestricted and Residential Use will not be allowed.

3.3 SOIL & GROUNDWATER CLEANUP OBJECTIVES AND BCP CLEANUP TRACK

3.3.1 Soil & Groundwater Cleanup Objectives

This section describes the SCGs used for comparison of COC concentration results for sampled/analyzed media at the Site.

The applicable SCGs used for evaluation of the Site investigation results include water quality standards and guidance values published by the NYSDEC Division of Water and SCOs published by the NYSDEC Division of Environmental Remediation.

The SCGs were provided by:

- *Commissioner Policy CP-51: Soil Cleanup Guidance*, NYSDEC, October 21, 2010;
- *Technical Guidance for Site Investigation and Remediation*, NYSDEC, Division of Environmental Remediation (DER-10), May 2010;
- *Technical and Operational Guidance Series (TOGS) 1.1.1, Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations,* NYSDEC, October 1993, Reissued June 1998 (with addenda dated April 2000 and June 2004);
- 6 NYCRR Part 375-6 SCOs, NYSDEC, Division of Environmental Remediation, December 14, 2006; and
- *Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York*, NYSDOH, Bureau of Environmental Exposure Investigation, October 2006.

This AAR/RAWP concludes that a Track 4 remedial program is most appropriate for the Site. The AAR/RAWP also includes evaluation of remedial alternatives that may be capable of meeting the requirements of Track 1.

The intent to employ a Track 4 cleanup is based on the assumption that a Track 1 remediation is not possible due to the intent to reuse on-Site buildings under which some contamination will remain present. Therefore, the proposed Track 4 Remedial Action to be performed, which is described in this work plan, is intended to reduce on-Site soil and groundwater contamination, prevent off-Site contaminant migration, and protect human health of the occupants of, and visitors to, the Site via vapor mitigation systems.

4.0 REMEDIAL ALTERNATIVES ANALYSIS

4.1 INTRODUCTION

This section summarizes the alternatives evaluated for the remediation of Site conditions identified during the RI.

The contaminants of concern (COCs) for this Site that require remediation include:

- Petroleum Impacts: gasoline impacts (Floor Drains and Piping) and petroleum impacts in soil and/or groundwater (Northeastern Portion of the Site, Courtyard Area, and Groundwater monitoring wells MW-107 and MW-110);
- CVOCs in Groundwater;
- SVOCs and Metals in Surface and Subsurface Soils (Urban Fill):
- Pesticides in a Former Pesticide Storage Room and Freight Elevator Pit; and
- Hazardous Building Materials (lead paint, asbestos, universal wastes).

The pesticides in the former storage room, the hazardous building materials (lead paint, asbestos and universal wastes), and the pesticides in the water and/or sediment of the existing elevator pit will be removed, abated and properly disposed of by the General Contractor during selective demolition activities associated with renovations to the existing building as part of the overall Site redevelopment. Therefore, these items are not discussed further within the evaluation of remedial alternatives presented in the following sections.

The attached Table 5 (Remedial Alternatives Analysis Matrix) presents the remedial alternatives considered in the development of the Remedial Action Work Plan contained herein. The options considered included the following potential processes and technologies:

- No Action/Monitored Natural Attenuation (MNA): No direct remedial actions would be performed, however due to confirmed on-Site and off-Site groundwater impacts, a long-term groundwater monitoring program would be needed.
- *In Situ* Treatment: *In Situ* treatment technologies for contaminated soil and groundwater include such processes as *In Situ* chemical oxidation, air sparging, enhanced *In Situ* bioremediation (EISB), enhanced reductive dechlorination (ERD), thermal desorption, and soil vapor extraction.
- *Ex Situ* Treatment (soil): *Ex Situ* treatment technologies for contaminated soils include excavation, on-Site treatment and reuse of treated soils, low-temperature thermal desorption, ex-situ vapor extraction, biopiles, land farming and off-Site disposal.

- *Ex Situ* treatment (groundwater): Involves groundwater removal and such treatment processes as granular activated carbon (GAC) adsorption, air stripping, oxidation and subsequent discharge; or off-Site transport and discharge to a Publicly-Owned Treatment Works (POTW) or licensed treatment/storage/disposal (TSD) facility for treatment.

- Engineering Controls: ECs such as covering remaining impacted soil with clean soil or impervious cap materials and installation of a vapor barrier (required sealing layer) and SSDS were considered.

- Institutional Controls: ICs were also included as potential elements of the remedial options considered. ICs for the prevention of direct human contact with contaminated soil and groundwater include actions such as:

    - A NYSDEC-enforced Environmental Easement (EE) which would limit land use at the Site to Restricted Residential, Commercial or Industrial use and include appropriate restrictions on groundwater use; and

    - Development of a SMP to provide guidance for potential future activities that could affect the surface cap, disturb the subsurface within areas of known or potential residual impact, and provide requirements for operation, monitoring and maintenance of the active sub-slab depressurization system, groundwater injection systems, and foundation drainage collection and discharge system.

4.2 PRELIMINARY SCREENING OF REMEDIATION METHODS, TECHNOLOGIES & APPROACHES

This section describes the criteria that were used to evaluate two (2) remedial alternatives and lists the remedial elements required to complete a cleanup pursuant to either Track 1 or Track 4. These two (2) options were selected for analysis because a Track 1 remedy would achieve unrestricted use of the Site and analysis is required by DER-10. However, this alternative would require the demolition of the on-Site buildings slated to be reused for the project. The Track 4 RR remedy is the only practical remedy considering the Site reuse plans for the buildings and would allow for the most cost-effective remedial methods that would still achieve the RAOs while considering the intended future predominantly residential use of the Site. Both the Track 1 and Track 4 RR remedy would achieve the RAOs by removing contaminants from the Site and reducing exposure to residual impacted media, but the Track 1 remedy would eliminate the project and thus the Volunteer's desire to perform the remediation and acquire the Site.

According to DER-10, a cleanup pursuant to Track 1 must achieve unrestricted use of the Site. This track requires that the remedial party implement a cleanup that achieves the UU SCOs in the table in 6 NYCRR Table 375 6.8(a). NYSDEC's position is that institutional and engineering controls are not allowed for a Track 1 cleanup other than for a period of less than 5 years (defined as short-term controls) where there is residual soil vapor or groundwater contamination and where a Volunteer has conducted remedial activities resulting in a bulk reduction in groundwater contamination to asymptotic levels.

According to DER-10, a cleanup pursuant to Track 4 may consider the current, intended, or reasonably anticipated use in determining the appropriate cleanup levels for soil. This track allows for the removal of accessible source areas, also known as hot spots, and managing residual contamination in place below an engineered Cover System enforced by institutional and engineering controls to achieve protection of public health and the environment long-term. Soils which are not otherwise covered by structures such as buildings, sidewalks, or pavement (i.e., exposed surface soils) must be covered with soil that complies with the use-based SCOs in 6 NYCRR Table 375 6.8(b) levels for the top 2 ft. (RR use).

A number of on-Site remedial technologies and approaches were pre-screened on the basis of feasibility, pertinence to the environmental conditions and remedial action objectives for the Site, and cost effectiveness. Remedial methods, technologies and approaches considered in this pre-screening process were included on the basis of Stantec's past experience with remedial work involving similar Site characteristics and contaminants, and on the basis of information obtained from the review of resources such as Presumptive/Proven Remedial Technologies for New York State's Remedial Programs, NYSDEC Division of Environmental Remediation (DER-15), 27 February 2007.

Both proven and innovative technologies were considered. Since the Site had more than one impacted media and more than one contaminant "class," combinations of technologies were considered to form a single remedial approach.

It should be noted that technologies that have been documented to be generally slow in producing results were not considered desirable. This was because a primary goal of entering the Site into the BCP was to facilitate timely redevelopment of the property simultaneous with preservation of the existing main building. Several methodologies were also eliminated from further consideration due to the following inadequacies or limitations:

- Unlikely to address Site issues and attain remedial action objectives;
- Precluded by Site conditions;
- Incompatible with Site contaminants;
- Previously not fully demonstrated, unreliable, or have performed poorly;
- Inappropriate based on engineering judgment; or
- Excessively costly without adding significant technical advantages.

The following Table 5 lists the methods, technologies and approaches that were excluded, based on the above criteria, from the subsequent detailed evaluation of alternatives:

**Table 5
Summary of Excluded Remediation Technologies**

Method, Technology or Approach	Description/Justification
Air Sparging & Soil Vapor Extraction	Not conducive to a Site proposed for residential occupancy in the short term; Site groundwater is essentially in bedrock and not in overburden, thus sparging is not feasible since the injected air cannot be distributed in the bedrock mass without artificially enhancing the fracture network (e.g. blasting). In addition, enhanced aerobic biodegradation using air sparging is generally not effective for chlorinated compounds.
Groundwater Pump-and-Treat	Typically requires long time periods for completion; Systems are energy-intensive, with high capital and operating costs; Not applicable to vadose zone; and Can impact groundwater flow regime at distance from the Site.
Dual-Phase or Multi-Phase Extraction/Treatment	Dual-Phase systems extract and treat vapor and aqueous streams; The process can require long time periods for completion; Such a system would require equipment and piping in interior wells, would be energy-intensive and would have high capital and operating costs.
In Situ Conductive Heating	Involves the heating of unsaturated soils to 212° F to 500° F (followed by soil vapor extraction) and is typically a treatment applicable only to the vadose zone – does not address impacts below the water table – therefore, area to be treated must be dewatered in order to be effective; and Also typically applied to larger sites due to the high overall costs.
In Situ, Surfactant-Enhanced Aquifer Flushing	Involves injection of an aqueous surfactant solution into a contaminated zone coupled with simultaneous downgradient groundwater extraction/treatment (and potentially re-injection); and This approach is generally cost-prohibitive and has a high potential for exacerbating the spread of contaminants.
Iron Reactive Wall	High overall cost of approach versus a relatively limited area of groundwater impact; Physical site limitations and radial groundwater flow preclude this approach.

Method, Technology or Approach	Description/Justification
Phytoremediation	Not applicable for bedrock groundwater.
Chemical Treatment/Soil Mixing	*In Situ* chemical treatment is accomplished by applying amendments to the subsurface via soil-mixing methods using large diameter augers. Effective treatment requires sufficient contact and residence time between the COC and the chemical reagent; Not desirable based on contamination located beneath building and limited soil volumes.
Soil Vapor Extraction and Thermal Desorption Soil Heating	Generally requires long time periods for completion; High capital and operating costs (electricity).
Steam Enhanced Extraction	*In Situ* remediation method consisting of a combination of shallow soil vapor extraction, shallow steam injection and shallow groundwater extraction. Typically only cost effective for large-scale sites.

5.0 EVALUATION OF REMEDIAL TECHNOLOGIES

5.1 RETAINED TECHNOLOGIES

The following remedial technologies (in addition to the No Action alternative) were not excluded in the preliminary screening. These retained technologies are summarized in Table 7 below and evaluated in more detail in the following sections based upon the screening criteria set forth in NYSDEC's DER-10 document. Alternatives are comprised of a combination of remedial technologies that could be implemented to meet the requirements of the BCP and would address the RAOs presented in Section 3.2.

Table 6
Summary of Retained Technologies

Evaluated Method, Technology, or Approach	**Description**
No Action / Monitored Natural Attenuation (MNA)	SVOCs and VOCs are capable of being degraded in place by naturally occurring processes. Utilizes periodic sampling and analysis of contaminants and groundwater parameters to monitor the reduction in contaminant levels and change in parameters with time, and the potential reduction in plume areal extent with time. Is not effective for metals in soils.
Soil:	
Removal/Off-Site Disposal of all Impacted Soil	This approach would require the removal of all petroleum impacted soil beneath the building, the removal of all Urban Fill soil in the parking lot area to the west of the building.
Source Area Contaminated Soil Removal / Off-Site Disposal, Plus Reuse on-Site	This alternative includes removal of the source-area soil with the greatest COC impact, disposal (at a permitted landfill), and replacement of the excavated soil with imported clean soil or on-Site soil tested to be suitable for reuse as backfill. The removal of source area soil will facilitate groundwater remediation over time.

Evaluated Method, Technology, or Approach	**Description**
Engineering Controls: Clean Soil Cover or Impervious Cap over Impacted Soil	Residual contaminated soil will remain buried on-Site, but covered with an appropriate engineered cover system consisting of either 2 feet of clean soil, other clean fill materials, or an impervious cap of asphalt, concrete sidewalks, brick pavers, the new building floor or composite playground cap to minimize the potential for inadvertent future exposures.
Groundwater:	
In Situ Chemical Oxidation (ISCO) of Impacted Groundwater	A contaminant-destructive technology involving the injection of chemical reagents into groundwater. Oxidation converts the contaminants into non-hazardous or less-toxic compounds that are more stable and/or inert. The oxidizing agents most commonly used are ozone, hydrogen peroxide, sodium persulfate, or permanganate compounds.
In Situ Treatment of Impacted Groundwater (Bioremediation)	This technology includes the direct application of a carbon substrate material that serves as an electron donor and accelerates naturally occurring contaminant degradation in groundwater by indigenous bacteria. This method often includes ERD of CVOCs (using food-grade sodium lactate or other suitable material). It can also be effective in breakdown of petroleum-related VOCs and SVOCs by sulfate-reducing bacteria aided by a sulfate-rich additive (e.g. agricultural-grade gypsum and magnesium sulfate heptahydrate [Epsom salt]).

Evaluated Method, Technology, or Approach	**Description**
Groundwater Extraction and On-Site/Ex-Situ treatment or off-Site discharge/disposal.	Groundwater entering a source-area excavation or interior elevator pit, or pumped from a well is retained in a storage tank and can then be treated on-Site via a portable treatment system (typically air stripping or granular activated carbon) that removes VOCs and is then discharged on-Site. Alternatively, the water can be transported and treated or disposed of off-Site. This would be intended for relatively minor volumes of water and is not intended as a source area pump-and-treat system, which was eliminated in the preliminary screening in Section 5.2 of this report.
Engineering Control: Vapor Intrusion Mitigation (Vapor Barrier and Active Sub-slab Depressurization System)	Construction of vapor barrier (required sealing layer), Liquid Boot membrane or equivalent, and an active sub-slab depressurization system beneath occupied structures. System to operate in perpetuity until or unless contaminant levels decrease to acceptable levels, as demonstrated through sample analysis.

5.2 DESCRIPTION OF POTENTIAL TECHNOLOGIES

5.2.1 Potential Remedial Technologies to address COC-Impacted Soil

The RI identified impacts to subsurface soils in both interior and exterior areas, an area of surface soil in a depressed exterior area, including petroleum-related VOCs, CVOCs, PAHs, and metals that exceeded RR SCOs. This section provides a generalized description of each retained technology.

5.2.1.1 Technology 1.1: No Action

The No Action response is considered as a remedial technology to provide a baseline effort for comparison to other technologies. With the exception of installing and maintaining a fence along the northern and western sides of the property to keep trespassers off the Site, no remedial actions would be taken for this area.

5.2.1.2 Technology 1.2: Impacted Soil Removal & Off-Site Disposal

Technology 1.2 consists of removal of all impacted soil exhibiting COC concentrations in excess of RR SCOs or nuisance characteristics (staining, odors etc.), and off-Site disposal as non-hazardous waste at a permitted facility. The excavated areas would be backfilled or covered with either on-Site or imported soil demonstrated to meet the requirements for potential COC presence using analytical testing (per DER-10) or covered with impervious materials such as asphalt, concrete or a composite playground surface cap or clean soil. It is estimated this would involve removal and off-Site disposal of 8,600 tons (5,376 cy) of soil. However, this Alternative would also require the removal of all on-Site structures and therefore prohibit the reuse of the Site as contemplated.

5.2.1.3 Technology 1.3: Source Area Impacted Soil Removal, Off-Site Disposal Plus Reuse On-Site

Technology 1.3 consists of removal of source impacted soil exhibiting COC concentrations in excess of RR SCOs or nuisance characteristics (staining, odors, etc.), removal of only that soil required to meet design grades and/or to provide two feet of clean soil in landscaped areas, and off-Site disposal as non-hazardous waste at a permitted facility. The excavated areas would be backfilled or covered with either on-Site or imported soil demonstrated to meet the requirements for potential COC presence using analytical testing (per DER-10) or covered with impervious materials such as asphalt, concrete or a composite playground surface cap. It is estimated this would involve removal and off-Site disposal of 4,000 tons (2,493 cy) of soil. This technology would require the ECs and ICs set forth in Technology 1.4.

5.2.1.4 Technology 1.4: Clean Soil Cover or Impervious Cap

Technology1.4 is an Engineering Control that would consist of covering remaining impacted soils left in place with either an impervious cap or a clean soil cover of sufficient thickness. An impervious cap will be asphalt parking lot, concrete sidewalks, a composite playground cap, 2 feet of clean soil, brick pavers, and new concrete floor slabs. Clean soil cover would consist of either on-Site surplus soil or

imported soil; this material would be demonstrated to meet NYSDEC requirements for potential COC presence by performing analyses in accordance with DER-10 requirements. This material could also include topsoil placed in landscaped areas. Such areas would require seeding with grass or other plant species to stabilize against erosion.

5.2.2 Potential Remedial Technologies to Address Groundwater Impacts

5.2.2.1 Technology 2.1: Monitored Natural Attenuation

The Monitored Natural Attenuation (MNA) response is considered as a remedial technology to provide a baseline effort for comparison to other technologies. This alternative involves no remedial action(s); however, because off-Site groundwater impacts were identified, this approach is not acceptable. At a minimum, long-term groundwater quality monitoring would be required for MNA.

5.2.2.2 Technology 2.2: *In Situ* Chemical Oxidation (ISCO) of Groundwater

Technology 2.2 would consist of *In Situ* remediation of groundwater. This would be performed in conjunction with the removal of all impacted soil as described in Alternative 1.2 above to form a Track 1 cleanup. The ISCO would involve injection of a chemical oxidizer throughout the area of impacted groundwater, which should result in the eventual breakdown of COCs to harmless chemical bi-products such as carbon dioxide and water. Follow-up groundwater monitoring would be required to document the effectiveness of the remedial action. Multiple injections of the chemical oxidizer would be expected to achieve Track 1 remedial objectives.

5.2.2.3 Technology 2.3: *Ex Situ* Treatment of Groundwater

Technology 2.3 consists of removal of groundwater and *Ex Situ* treatment. For this project, this applies to groundwater removed from an excavation and water removed by the sump pump in the elevator pit and building perimeter foundation drain, but does not include pumping and treating of groundwater from wells (pump-and-treat was eliminated from further consideration in the preliminary technology screening process). Thus, this technology would need to be combined with other actions to fully address groundwater impacts at the Site. VOC-impacted groundwater would be extracted from an excavation, the interior elevator pit, or building foundation perimeter drain. This water could be either temporarily stored on-Site in tanks, and then either treated on-Site and discharged to the ground on-Site, discharged to a sanitary sewer under a discharge permit, or transported off-Site for treatment.

5.2.2.4 Technology 2.4: *In Situ* Bioremediation (Enhanced Reductive Dechlorination and Enhanced Biodegradation) of Groundwater

Technology 2.4.A Enhanced Reductive Dechlorination for CVOC Impacts:

Technology 2.4.A consists of *In Situ* treatment of groundwater by enhancing naturally occurring breakdown of CVOCs by indigenous bacteria such as *dehalococcoides, dehalobacter*, or others.

Contaminant degradation is dependent on the presence of the appropriate nutrients and energy sources. The biochemical transformation of contaminants is the result of enzymes produced by the microorganisms that act as catalysts for the degradation reactions.

In reductive dechlorination, the CVOC (e.g. TCE) serves as an electron acceptor (or weak oxidizing agent) that is reduced by electrochemical reactions with other chemicals in the groundwater that serve as electron donors. Therefore, an additional carbon source is required for the reaction to proceed.

Follow-up groundwater quality monitoring would be required to document the effectiveness of this remedial method. Supplemental injection of the donor solution could be performed if needed to achieve remedial objectives.

This technology is generally less expensive; however, it requires more time to achieve the same effectiveness as the ISCO technology presented in Technology 2.2.

Technology 2.4.B Enhanced Biodegradation for Petroleum Impacts:

Technology 2.4.B consists of initial application of the EISB technology using agricultural grade gypsum as a biological polishing step to the planned soil excavation remedy for petroleum impacted soil below the basement floor slab and along the adjacent exterior foundation wall of the building. In addition, an injection of a solution prepared by dissolving magnesium sulfate heptahydrate (Epsom salt) in water to provide a 990 mg/L sulfate solution to stimulate indigenous bacteria populations will be applied for the degradation of residual petroleum impacts in groundwater.

Biodegradation of petroleum impacts occurs naturally when suitable microbial populations and geochemical conditions are present in the subsurface. The major driving force for these biological processes involves the transfer of energy in the form of electrons. During biodegradation, petroleum hydrocarbons serve as the electron donor. The mechanisms for aerobic degradation processes in which oxygen serves as an electron acceptor are well documented. Microorganisms also exist which follow anaerobic processes using ferric iron (Fe3+), nitrate (NO3), sulfate (SO42), and to a lesser extent manganese (Mn4+), as alternative electron acceptors to oxygen.

Sulfate-reducing bacteria (SRB) will utilize sulfate as an electron acceptor to degrade petroleum hydrocarbons in groundwater. The petroleum hydrocarbons are degraded to carbon dioxide and water and the sulfate is reduced to sulfide. Optimum geochemical conditions for SRB degradation pathways include anaerobic conditions [dissolved oxygen (DO) < 2 mg/L], oxidation reduction potential (ORP) of groundwater between 0 and 200 mV, and neutral pH. Biodegradation of hydrocarbons by SRB is relatively common as these bacteria are extremely resilient and can be found in almost every environment.

Follow-up groundwater quality monitoring would be required to document the effectiveness of this remedial method. Supplemental injection of the donor solution could be performed if needed to achieve remedial objectives.

5.2.3 Engineering Control: SSDS Installation

Technology 3 consists of an engineering control to mitigate potential VOC vapor intrusion into the building.

Based on the anticipated presence of remaining VOC contamination in both soil and groundwater beneath the building, and given that the building will be continuously occupied, mitigation of potential soil vapor intrusion would be required and accomplished via installation of a sub-slab depressurization system. The system would incorporate a continuous vapor barrier (required sealing layer) beneath the building's first-floor slab, along with a system of piping connected to electric fans that evacuate air from beneath the slab, discharge those vapors above the building roof, and prevent potential buildup of VOC vapors that might enter the occupied space.

Installation of a vapor barrier (required sealing layer) and an active SSDS beneath the structure would preclude infiltration of VOC vapors into the future residential facility from impacted soil and groundwater that may remain beneath the building. Vacuum monitoring points, installed beneath the floor slab, would confirm vacuum propagation.

5.3 COMPARATIVE ANALYSIS OF ALTERNATIVES FOR PROJECT SITE

This section provides a final evaluation of each of the retained technologies and potential remedial alternatives for each of the impacted media. The retained technologies and potential remedial alternatives are discussed in light of the nine evaluation criteria contained in DER-10, Section 4.2. Refer to the attached Remedial Alternatives Analysis Matrix (Table 7) for summaries of each alternative relative to each of those criteria; numerical scores for each alternative/criterion are also provided. Details on the estimated costs for each alternative are included in Appendix B.

5.3.1 Impacted Soil (Interior and Exterior)

Alternative 1.1 (Technology 1.1 - No Action) is not considered viable primarily because it does not protect human health and the environment, it does not comply with SCGs, it does not reduce toxicity, mobility or volume of contaminants, it would likely not gain community acceptance, it would force the need for engineering and institutional controls and it would be a barrier to Site re-development. Accordingly, this alternative is not considered further.

Alternative 1.2 (Technology 1.2 - Removal & Off-Site Disposal of All Impacted Soil) Track 1: Excavation and off-Site disposal of all impacted soil (Track 1) scores very high as an alternative for several criteria, and would: provide immediate positive impact by eliminating all contaminated soil; rapidly achieve SCGs; have high implementability; have long-term effectiveness and permanence; but might receive less short term community acceptance due to extensive truck traffic and potential dust impacts. While this alternative scores high, due to its excessively high cost, it is not considered practical because it would eliminate the on-Site structures and is cost prohibitive. Thus, this Alternative was not considered any further.

Alternative 1.3 (Technology 1.3- Soil Removal & Off-Site Disposal of Source Area Impacted Soil, Plus Reuse on-Site and 1.4 - Clean Soil Cover or Impervious Cap) Track 4: Excavation and off-Site disposal of source area impacted soil plus the reuse on-Site of excavated Urban Fill tested to confirm compliance with SCGs, scores very high as an alternative for several criteria, and would: provide immediate positive impact by eliminating contaminated material; rapidly achieve many SCGs; have high implementability; have long-term effectiveness and permanence; and be likely to receive community acceptance due to its positive aspects. Clean soil cover or impervious cap is an EC typically used for soils that are impacted with COCs to allow them to remain on-Site, while minimizing potential environmental impact and reducing the potential for exposure.

5.3.2 Impacted Groundwater

Alternative 2.1 (Technology 2.1 - MNA): This alternative is not considered viable primarily because it does not protect human health and the environment, it does not comply with SCGs, since off-site groundwater impacts are occurring, no action is an unacceptable alternative and, at a minimum, would involve excessive long-term monitoring costs. It would be a barrier to Site re-development because the site cannot be safely reused for residential purposes based on the current contaminants on the Site. Based on the identified contaminants, natural processes would likely not be capable of breaking down the

contaminants to levels where exposure threats will be reduced to acceptable levels within a reasonable time frame. This alternative is not considered further.

Alternative 2.2 (Technology 2.2 - *In Situ* Chemical Oxidation in Groundwater) Track 1: This alternative would be combined with Alternative 1.2 Removal and Disposal of All Impacted Soil to form a Track 1 Cleanup Alternative. Although this alternative scores high in some criteria for groundwater VOC remediation (compliance with SCGs, reduction in contaminant toxicity and volume, long-term effectiveness) its cost and the overall lower score indicates it is less desirable than other alternatives for groundwater. The primary drawbacks for this alternative are: 1) lower implementability due to the highly-specialized equipment and contractor requirements, 2) very high overall capital costs, 3) utilizes strong oxidizing chemicals in the process, 4) may have possible negative impacts to naturally-occurring dechlorination; and 5) may require multiple applications of the reagent. Based on these factors the Track 1 alternative is not considered practical or cost-effective and was not considered any further.

Alternative 2.3 (Technology 2.3 - *Ex Situ* Treatment of Groundwater) Track 4: This alternative is intended to partially address groundwater impacts by removing and treating (or disposing off-Site) relatively minor volumes of groundwater from source-area excavations and the interior elevator pit sump. Ex-Situ treatment of the petroleum and CVOC-impacted groundwater could be accomplished with a portable air stripping unit, or a portable carbon absorption system, and the treated effluent discharged slowly to the ground surface on-Site in accordance with a permit from NYSDEC.

As an alternative to water treatment, discharge of untreated water to the Monroe County-operated sanitary sewer under a short-or long-term discharge permit would be a viable option, provided the COC levels are below the MCDES allowable discharge limits.

This alternative achieves high scores with most of the nine evaluation criteria, making it a favorable alternative for addressing initial groundwater impacts; however, it will need to be combined with other technologies to further address Site-wide or off-Site groundwater conditions.

Alternative 2.4 (Technology 2.4.A and 2.4.B – *In Situ* Bioremediation (ERD and EISB) of Groundwater) Track 4: These two bioremediation alternatives would be combined with source-area soil removal plus reuse on-Site (Alternative 1.3) and Ex-Situ Treatment of Groundwater (Alternative 2.3). Implementation of both of these alternatives together scores high in most criteria for groundwater VOC remediation. The most positive aspects include: 1) capitalizes on naturally-occurring dechlorination and biodegradation by indigenous bacteria; 2) will have good long-term effectiveness/permanence; 3) implementability is high – utilizes harmless food-grade additive (lactate), agricultural gypsum and a solution containing Epsom salt; 4) reduces toxicity and volume of contaminants; 5) is cost effective; and 6) should have a high degree of community acceptance.

Potential negative aspects include 1) the possibility of short-term, temporary increases in levels of TCE “daughter products” during the initial reductive dechlorination phase; and 2) additional application of the donor solutions may be required.

Alternative 3 (Technology 3 - Engineering Control – Vapor Intrusion Mitigation) Track 4: This alternative provides direct mitigation of the potential for VOC vapors to prevent impacts to continuously-

occupied interior spaces by residents through installation of a vapor barrier (required sealing layer) in the new building foundation and an SSDS. It provides protection from potential VOC vapors from residual VOC impacts in soil and groundwater. Although the capital costs are significant, this alternative scores high for most other criteria, and is an essential part of the remedial action for the Site to allow for a Restricted Residential use.

5.3.3 Green Remediation Components

Alternative 1: Track 1 Remedy

This alternative would not be considered a green remediation approach. Both direct and indirect greenhouse gases emitted due to Alternative 1 would be more substantial than Alternative 2 due to the increased volume of soil requiring excavation, transportation, and off-Site disposal. Waste generated and sent to landfills would be increased due to the unnecessary volumes of soil and groundwater that would require removal from the Site to achieve UU SCOs. This alternative would also not conserve or efficiently utilize resources due to the larger volume of soil requiring replacement following excavation and off-Site disposal. This alternative would, however, allow for unrestricted redevelopment of the Site and foster green and healthy communities that balance ecological, economic, and social goals.

Alternative 2: Track 4 Restricted-Residential Remedy including Alternatives 1.3, 2.3, 2.4A and 2.4B

The collection of these alternatives, hereinafter defined as Alternative 2, would be considered a green remediation approach. Direct and indirect greenhouse gases emitted due to Alternative 2 would be much less substantial because of the decrease in the volume of soil requiring excavation and off-Site disposal. Waste generated and sent to landfills would be decreased due to the smaller volumes of soil and groundwater requiring removal from the Site to achieve RR SCOs. This alternative would also help to conserve and efficiently use resources since less imported backfill material would be required by maximizing reuse of excavated and soils and Urban Fill to return the Site to grade following excavation. This alternative would also allow for redevelopment of the Site and foster green and healthy communities that balance ecological, economic, and social goals.

6.0 AAR CONCLUSION: RECOMMENDED REMEDIES

6.1 IMPACTED AREAS

Impacted soil, soil vapor and groundwater were identified at the Site. COC presence was identified by pre-RI and RI investigations at levels that warranted remedial action in each media; therefore, a remedial program is required to address each of those impacts. Impacted media at the Site included soil (PVOCs, VOCs, PAHs and metals), groundwater (PVOCS, PAHs and CVOCs), and soil/groundwater vapor (PVOCs and CVOCs).

More specifically, the types of COCs within impacted media at specific areas on-Site include:

- Petroleum Impacts: gasoline impacts (Floor Drains and Piping) and petroleum impacts in Soil and/or Groundwater (Northeastern Portion of the Site, Courtyard Area, and Groundwater monitoring wells MW-9, MW-100, MW-104, MW-106, MW-107, MW-110 and MW-114);
- CVOCs in Groundwater monitoring wells MW-02, MW-100, MW-107 and MW-112; and
- PAHs and Metals in Subsurface and the depressed area Surface Soils (Urban Fill).

6.2 CHOSEN REMEDY

Based on the depth and areal extent of impacted media, the identified COCs and concentrations, and Site geologic and hydrogeologic conditions to achieve a Track 4 RR clean-up, the Track 4 remedial alternative chosen to address the Site impacts include:

1. *Soil (Alternative1.3):*

    a) Removal of the existing floor slab and then excavation and off-Site disposal of source area petroleum-impacted soils from below the basement floor slab, above and adjacent to the west and northwest of the building's exterior foundation, and the loading dock sump and related piping;

    b) Excavation and off-Site disposal of impacted Urban Fill from exterior areas to the extent required to meet general grading and DER-10 requirements for infrastructure improvements (parking lots, landscaped areas (2 ft.), playground, utilities, building perimeter drain, etc.), and soil and Urban Fill from below the building basement floor slab to allow installation of the i*n situ* groundwater injection and SSDS system piping arrays; that exceeds Site SCGs.

    c) Excavation and reuse on-Site of Urban Fill and soil that meet Site SCGs for reuse on-Site for general backfilling purposes on-Site;

d) Excavation and off-Site disposal of surface soil materials located in an approximately 8-ft deep, rectangular, lower ground area located between the southern portion of the main building and the one-story loading dock building; and

e) Installation of an engineered cover system consisting of either 2 feet of clean soil, other clean fill materials, or an impervious cap of asphalt, concrete sidewalks, brick pavers, the new building floor or composite playground cap, as an EC. This includes placement of a demarcation layer, consisting of orange construction fencing or equivalent, placed at the base of all excavations, and cover material consisting of either: two feet of clean soil backfill in landscaped areas; two feet of clean soil or a composite playground cap in the playground area, crushed stone and asphalt pavement/concrete/brick paver sidewalks for remaining areas; and a new concrete floor in the building basement including a vapor barrier (required sealing layer) for the required SSDS.

2. *Groundwater (Alternatives 2.3 and 2.4.A and 2.4.B):*

a) Enhanced *In Situ* Biodegradation of Petroleum Impacts Below Building:

Following floor removal, a series of perforated pipes will be placed in the petroleum affected area, surrounded by washed pea stone, and these pipes will be connected to flush-mounted injection points located within a locking vault outside the building on the west side. Prior to backfilling the pipes, agricultural grade gypsum (a bioremediation amendment) will be applied to the backfill material at a rate of 10% per mass. Therefore, approximately 9,000 pounds of pelleted gypsum will be mixed into the bottom 1-2 feet of the pea stone and backfill below and around the piping. After the basement floor is poured, water will then be added to the system to activate the gypsum to promote biodegradation.

In addition, gypsum will be added to the bottom of the excavation along the adjacent exterior foundation wall of the building opposite of the interior petroleum area. The gypsum will be added to the bottom 1-2 feet of the backfill at a rate of 10% per mass. The amount of gypsum to be added is uncertain at this time and will be calculated based on the final lateral dimensions of the outside petroleum excavation.

Following approximately 1 year after placement of the gypsum, it is anticipated that polishing of the groundwater may be needed to further bioremediate the residual petroleum contaminants in groundwater. If necessary, based on the results of groundwater monitoring, a solution will be injected through these perforated pipes to promote the *In-Situ* bioremediation of the petroleum impacts. The polishing solution will be prepared by dissolving magnesium sulfate heptahydrate (Epsom salt) in water to provide a 990 mg/L sulfate solution. Since Epsom salt is 39% sulfate by weight, approximately 30 pounds of Epsom salt will be required to prepare a 1,500-gallon batch of sulfate solution for injection into each 50 LF of slotted pipe. It is possible that supplemental injections may be needed to address the impacts as the additives will be

consumed during the bioremediation process. Groundwater monitoring will be used to evaluate the success of the *in-situ* bioremediation process and the need for subsequent injection events.

b) Enhanced *In-Situ* Biodegradation of Petroleum Impacts in vicinity of MW-114:

Two injection wells for addressing petroleum impacts will be installed in the vicinity of MW-114, following the construction specifications for the ERD injection wells presented below. A solution will be injected through these two injection wells and MW-114 to promote the *In-Situ* bioremediation of the petroleum impacts. Similar to the injection program described above, the solution will be prepared by dissolving magnesium sulfate heptahydrate (Epsom salt) in water to provide a 990 mg/L sulfate solution. It is possible that supplemental injections may be required to address the impacts as the additives will be consumed during the bioremediation process. Groundwater monitoring will be used to evaluate the success of the *In-Situ* bioremediation process and the need for subsequent injection events.

c) *In Situ* ERD for Chlorinated Solvents at Litchfield Street, MW-112 and MW-100:

In Situ enhanced reductive dechlorination (ERD) using sodium lactate as an electron donor will be used to address the chlorinated solvents in groundwater at the western Site boundary along Litchfield Street and in the vicinity of monitoring wells MW-112 and MW-100. The ERD remediation activities will involve the injection of an electron donor solution into the subsurface to enhance i*n situ* reductive dechlorination. Six injection wells will be installed along Litchfield Street; two wells will be installed in the vicinity of MW-112; and two injection wells will be installed in the vicinity of MW-100. The injection program will also utilize existing monitoring wells MW-107, MW-112 and MW-100.

The electron donor solution will be prepared and injected in a batch process using water obtained from a locally available hydrant. The water will be pumped into a 1,500-gallon poly tank equipped with a submersible pump and sufficient sodium lactate added to provide a 10,000 mg/l solution. The submersible pump will include a valved distribution manifold line with in-line flowmeters to regulate injection flow. The injection plumbing will be configured to utilize 2-in. hose with Camlock fittings to connect the injection hose to the individual injection wells. The system will be capable of injecting into three injection wells simultaneously.

The injection design is based on 2-in. diameter injection wells installed to 5 ft. below the top of bedrock, with a 10 ft. screen interval extending 5 ft. into overburden, with approximately 1,300 gallons of solution to be injected per well. This assumes a 15-25 ft. radius of influence, 20% effective porosity, and a 25% pore volume exchange. Injecting a 2% sodium lactate solution will provide approximately 217 pounds of sodium lactate per injection point.

It is possible that additional injections may be needed to address the impacts as the additives will be consumed during the reductive dechlorination process. Groundwater monitoring will be conducted to evaluate the success of the i*n situ* reductive dechlorination process and the need for subsequent injection events.

d) Post-injection groundwater monitoring will be performed to confirm that the enhanced bioremediation is occurring. Monitoring is proposed to be performed quarterly for a minimum of one year and possibly for a second year after initial application of treatments. The need for additional injections and monitoring will be reviewed with NYSDEC.

e) Periodic pumping of impacted water from interior and exterior excavations, building interior elevator pits and the building's interior perimeter foundation drain will be discharged to the municipal sewer. This will be conducted in accordance with the conditions of short-term (excavation water) and long-term (permanent elevator pit sumps and foundation drain) discharge permits from Monroe County Department of Environmental Services.

3. Soil Vapor Engineering Controls (Alternative 3):

a) Along with the surface engineered cover system installed across the exterior portions of the Site, a vapor barrier (required sealing layer) and an active SSDS will be installed beneath the structure to preclude infiltration of VOC vapors into the residential facility from impacted soil and groundwater that may remain beneath the building.

4. Institutional Controls:

a) An EE will be prepared for the Site that will:

- Preclude groundwater usage at the Site;
- Include a SMP to provide guidance regarding potential environmental and exposure concerns relative to future Site use and activities. The SMP also will include inspection of the cover system at regular intervals to ensure integrity of the surface cap is maintained and an Operations, Maintenance & Monitoring Plan for the SSDS; and
- Require periodic inspection of and reporting on maintenance of ECs.

7.0 REMEDIAL ACTION WORK PLAN

The Preferred Remedy achieves protection of public health and the environment for the intended use of the property. The remedial plan will achieve the Remedial Action Objectives established for the project. The remedial plan is effective in both the short-term and long-term and reduces mobility, toxicity, and volume of contaminants. The remedial plan is cost-effective, able to be implemented, and uses standards and methods that are well established in the industry.

To successfully achieve the Preferred Remedy, the remedial action program will be implemented. This section describes the preparation of necessary governing documents, general remedial construction information, Site preparation, and reporting procedures.

7.1 GOVERNING DOCUMENTS

Several documents, listed below and summarized in the following sections, govern the management of the Remedial Action implementation.

- The Site-Specific Health and Safety Plan (HASP), which describes health and safety protocols to be followed by Stantec personnel during remedial activities, is included as Appendix C.
- The Quality Assurance Project Plan (QAPP), which describes sampling and analytical methods for sampling, is included as Appendix D.
- The Community Air Monitoring Plan (CAMP), which describes protocols for air monitoring to protect the surrounding community, is included as Appendix E.

The following sections summarize these documents, which are included as Appendices to this RAWP.

7.1.1 Site-Specific Health and Safety Plan (HASP)

The HASP, which describes health and safety protocols to be followed by Stantec personnel during remedial activities, is included as Appendix C. The remedial Contractor will prepare a HASP to cover its personnel and subcontractors.

The remedial work performed under this plan will follow governmental requirements, including Site and worker safety requirements mandated by OSHA.

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

The HASP and requirements defined in this RAWP pertain to all remedial and invasive work performed at the Site until the issuance of a Certificate of Completion.

The Site Safety Coordinator is planned to be Katie Nelson. When Ms. Nelson is not on-Site, another member of Stantec's field staff will be designated to fill this role and to report to her.

Although not anticipated, if needed, confined space entry will comply with all OSHA requirements to address the potential risk posed by combustible and toxic gases.

7.1.2 Quality Assurance Project Plan (QAPP)

The QAPP is included as Appendix D.

The QAPP describes quality assurance and quality control procedures to ensure that the proposed remedy accomplishes the remedial goals and is completed in accordance with the design specifications. This document includes proposed sampling and analytical methods for sampling.

7.1.3 Community Air Monitoring Plan (CAMP)

The CAMP is included as Appendix E.

The CAMP describes the methodology for real-time air monitoring for VOCs and particulates in air at the perimeter of the work area. Continuous monitoring will be performed for all ground-intrusive activities and during the handling of contaminated or potentially contaminated material.

7.1.4 Citizen Participation Plan (CPP)

The draft CPP was completed in March 2018 and submitted to the Department for review and comment. A copy of the updated CPP is included in Appendix F. The CPP provides information about how NYSDEC will inform and involve the public during the investigation and cleanup of the Site.

7.2 GENERAL REMEDIAL CONSTRUCTION INFORMATION

7.2.1 Project Organization

Résumés of key Stantec personnel involved with the Remedial Action construction activities are included in the QAPP (Appendix D).

7.2.2 Remedial Engineer

The Remedial Engineer is required by the State of New York to be a Professional Engineer, registered in New York. The Remedial Engineer must certify that the remediation requirements set forth in the RAWP, and any other relevant provisions of ECL 27 1419, have been achieved in full conformance with the Plan. The Remedial Engineer for this project is Kevin Ignaszak, PE, of Stantec Consulting Services Inc. and his designated representatives.

The Remedial Engineer will have primary direct responsibility for implementation of the remedial program for the Site and will certify in the FER that the remedial activities were observed by environmental professionals under his supervision.

The Remedial Engineer and staff of environmental professionals (Project team) will coordinate the work of other contractors and subcontractors involved in remedial construction, including soil excavation, stockpiling, characterization, removal, disposal or reuse, air monitoring, emergency spill response services, import of backfill material, and management of waste transport and disposal. The Remedial Engineer or designated project team member will be responsible for appropriate communication with NYSDEC and NYSDOH.

The Remedial Engineer will review the pre-remedial plans submitted by contractors for compliance with this RAWP and will provide the certifications listed in the FER.

7.2.3 Remedial Action Construction Schedule

A schedule for performance of the remedial work is discussed in Section 16.0. An updated schedule will be submitted to NYSDEC after their approval of the RAWP has been provided.

7.2.4 Work Hours

The hours for operation of remedial construction will conform to the City of Rochester Noise Ordinance, according to City Code §75-10. The City of Rochester's Noise Code for construction activities states that construction working hours begin at 7:00 AM. No excessive noise is permitted beyond the property limits from 10:00pm to 7:00am on any day of the week. Construction activities will be limited to 7:00am to 6:00pm unless alternative hours are approved by the NYSDEC.

7.2.5 Traffic Control

Vehicular and pedestrian traffic is very light in the vicinity of the Site. The Contractor will provide a worker(s) at the Site entrance with flaggers, when deemed necessary, to ensure safe entry and exit of vehicles.

7.2.6 Contingency Plan

If underground tanks or other previously unidentified contaminant sources are found during on-Site remedial excavation, sampling will be performed on product, sediment, and/or surrounding soils. Chemical analytical work will include TAL metals, TCL and CP 51 VOCs and SVOCs. These analyses will not be limited to CP-51 parameters where tanks are identified without prior approval by NYSDEC. Analyses will not be otherwise limited without NYSDEC approval.

Identification of unknown or unexpected contaminated media identified by screening during invasive Site work will be promptly communicated by phone to NYSDEC's Project Manager. These findings will also be included in weekly and monthly progress reports.

7.2.7 Worker Training and Monitoring

Site workers involved with the handling of contaminated materials will have up-to-date OSHA HAZWOPER certification and medical monitoring. All workers will be subject to Site-specific safety training. Attendance at a daily safety briefing will be mandatory for all workers.

7.2.8 Agency Approvals

The RAWP will be performed following approval by the NYSDEC and per requirements of the BCP. Other local permits or government approvals required for the remedial construction activities will be obtained prior to the start of remedial construction by the General Contractor.

7.2.9 Preconstruction Meeting with NYSDEC

The Remedial Engineer and the Contractor will meet with the NYSDEC ten (10) days prior to the start of major construction activities.

7.2.10 Emergency Contact Information

A preliminary emergency contact sheet with names and phone numbers is included in the inside cover of the HASP, included as Appendix C. The list will be updated prior to the start of major construction activities. The contact sheet will define the specific project contacts for use by NYSDEC and NYSDOH in the case of a day or night emergency.

7.3 SITE PREPARATION

Site preparation has included or will include preparations for remedial activity, including the following items, which are detailed in the following sections:

- Kickoff meeting;
- Asbestos abatement and demolition, including but not limited to the existing floor slab;
- Erosion and sedimentation controls;
- Stabilized construction entrances;
- Utility mark-outs;
- Sheeting and shoring (if needed as determined by Contractor);
- Equipment and materials staging;
- Decontamination areas; and
- Site perimeter temporary construction fencing.

The locations of the Site preparation features are shown on a Site Plan in Figure 5. Construction details and notes are included on Figure 5A.

7.3.1 Kickoff Meeting

Prior to the start of intrusive work, a kickoff meeting will be held with the Owner, NYSDEC's project manager, the Contractor and the Remedial Engineer. The objective of this kickoff meeting will be to provide a general overview of the environmental issues and material management requirements (including necessary approvals) during ground intrusive work.

7.3.2 Asbestos Abatement and Demolition

The following building materials were identified as either confirmed, assumed or suspected asbestos containing materials during the previously conducted Hazardous Building Material survey:

- Soil piles in two rooms;
- Pipe insulation and mudded joints;
- Window glaze;
- Caulks (multiple);
- Vapor barrier (located between floors);
- Electrical wiring insulation;
- Surfacing material/fire proofing;
- Mastics (multiple);
- Floor tiles (multiple);
- Cover base;
- Duct fabric;
- Insulation in ceiling;
- Asphalt paper; and
- Roofing materials (multiple).

Asbestos containing materials will be abated by a New York State Department of Labor licensed contracted in accordance with Industrial Code Rule 56 during construction activities.

7.3.3 Erosion and Sedimentation Controls

Best Management Practices will be employed for erosion and sediment controls (ESCs) including silt fence, bermed and lined material stockpiles, stabilized construction entrances, vehicle decontamination and dust control measures. Existing concrete and asphalt surfaces will be kept free of loose soil to minimize the amount of potentially mobile sediment into the combined sewer.

A Truck Wash Station will be installed and operated on-Site and is anticipated to be situated near the exit of the Site, as determined in the field by the Contractor at the time of construction. The Remedial Engineer will be responsible for ensuring through visual observation that outbound trucks are cleaned at the Truck Wash Station before leaving the Site until the remedial construction is complete.

Additional ESC details are included on Figure 5A.

7.3.4 Stabilized Construction Entrance

The Remedial Engineer will be responsible for ensuring that egress points for truck and equipment transport from the Site will be clean of dirt and other materials derived from the Site during Site remediation. Locations where vehicles enter or exit the Site shall be inspected daily for evidence of off-Site sediment tracking. Cleaning of the adjacent streets will be performed as needed by the Contractor to maintain a clean condition with respect to Site-derived materials.

The Remedial Contractor will construct an ingress and egress path according to Detail 2 on Figure 5A.

7.3.5 Utility Marker and Easements Layout

The Volunteer's contractors will be responsible for the identification of utilities that might be affected by work under the RAWP and for implementation of all required, appropriate, or necessary health and safety measures during performance of work under this RAWP. The Volunteer's contractors will be responsible for safe execution of all invasive and other work performed under this RAWP. The Volunteer's contractors will obtain the local, State, or Federal permits or approvals pertinent to such work that may be required to perform work under this RAWP.

The presence of utilities on the Site has been investigated by the Remedial Engineer and the identified utilities are not anticipated to impede the planned work under this RAWP. The Contractor will be responsible for the identification and protection of all existing utilities at the Site and will contact DigSafe New York prior to the start of work.

7.3.6 Sheeting and Shoring

The structural stability of excavations and on-Site and off-Site structures will be appropriately managed by the Volunteer's contractors during on-Site activities, including excavation and building floor removal. Use of standard underground safe work practices may be required during excavations around the building foundations.

7.3.7 Equipment and Material Staging

An Equipment and Material Staging Area will be designated in a portion of the Site away from areas that will require remediation. As excavations are planned throughout the Site, multiple equipment and material staging areas may be required for different phases of work. Decontamination Areas and Truck Wash Station Decontamination Areas will be designated in portions of the Site near the areas that will

require remediation. The Decontamination Areas will be equipped with Alconox and water to wash equipment after handling impacted material.

7.3.8 Site Fencing

The Site is currently partially fenced. A temporary perimeter construction fence will be installed along the northern and western property lines.

In addition to the Site perimeter fence, the Contractor shall erect and maintain orange construction fencing surrounding open subsurface excavations until excavations have been backfilled to surrounding grade.

7.3.9 Monitoring Well Decommissioning and Replacement

Monitoring wells MW-102, MW-106, MW-111 and MW-113 will be decommissioned in accordance with NYSDEC CP-43 prior to the start of excavation activities. One monitoring well will be reinstalled as MW-106R at a similar depth as MW-106 following completion of Site grading activities in the general vicinity. All other existing groundwater monitoring wells not designated to be decommissioned will require riser height adjustments to be made based on final surface elevations and new flush mount protective surface covers will be installed following construction. All well related work will be completed by a qualified environmental drilling company.

7.4 REPORTING

Monthly Progress Reports will be included in the FER.

7.4.1 Monthly Reports

Monthly Reports will be submitted to the NYSDEC and NYSDOH Project Managers within ten (10) days following the end of the month of the reporting period and will include:

- Activities related to the Site during the previous reporting period and those anticipated for the next reporting period, including a quantitative presentation of work performed (e.g., tons of material exported and imported);
- Description of approved activity modifications, including changes of work scope and/or schedule;
- A summary of any complaints with relevant details (names, phone numbers) and an explanation regarding how each issue was resolved or addressed;
- A summary of CAMP findings, including action level exceedances, odor issues or related complaints as applicable. In the event of an action level exceedance, odor issue, or related complaint, the NYSDEC and NYSDOH Project Managers must be notified within 24 hours of the occurrence;
- An explanation of notable Site conditions;
- Sampling results received following internal data review and validation, as applicable; and

- An update of the remedial schedule, unresolved delays encountered or anticipated that may affect the future schedule, and efforts made to mitigate such delays.

The NYSDEC assigned project number will appear on all reports.

7.4.2 Other Reporting

Photographs will be taken of remedial activities and submitted to NYSDEC in digital (JPEG) format. Photos will illustrate remedial program elements and will be of acceptable quality. A comprehensive collection of photos will be included in the FER.

Jobsite recordkeeping for remedial work will be appropriately documented. These records will be maintained on-Site during the project and will be available for inspection by NYSDEC and NYSDOH staff.

7.4.3 Complaint Management Plan

Public complaints will be discussed with the NYSDEC Project Manager. The Contractor will be responsible to resolve the issue once a solution is developed. In the event of a health-related public complaint, the NYSDEC and NYSDOH Project Managers must be notified as soon as possible, or within 24 hours of the occurrence.

7.4.4 Deviations from the Remedial Action Work Plan

A deviation from the RAWP may be required under the following conditions:

- Unexpected subsurface conditions are encountered including previously undetected structures or soil characteristics;
- Confirmatory endpoint sampling reveals a greater extent of impact than expected;
- Confirmatory endpoint sampling reveals contaminants other than those expected; or
- Project delays caused by outside parties.

Any unexpected condition will be reported to the NYSDEC Project Manager immediately and a proposed deviation to the RAWP will be submitted for approval as soon as possible. The proposed deviation plan will include details of the proposed changes and its effect on the overall remedy.

7.5 DEMOBILIZATION

After the completion of the remedial action, ESCs, Stabilized Construction Entrances, the Equipment and Materials Staging Area, and the Decontamination Area will be dismantled and removed for proper off-Site disposal. Excess material (sweepings, hay bales, general refuse, decontamination materials, etc.) will be disposed of in accordance with applicable rules and regulations.

Equipment will be properly decontaminated before removal from the Site.

8.0 PROPOSED MATERIAL REMOVAL FROM THE SITE

This section includes descriptions of the soil and other materials that will be removed from the Site under the proposed Remedial Action. These descriptions include figures that identify the excavation locations and depths, estimated excavation volumes, and tables of analytical results to indicate the expected contaminant concentrations to be removed. Also included are descriptions of the SCOs for each COC, the post-remediation sampling plan, and a soil and materials management plan.

Demolition of the above-grade structures are discussed in Section 8.1.

Other proposed Remedial Elements, including groundwater treatment and installation of a Cover System are discussed in Sections 9 and 11.

The soil and other materials that will be excavated, removed from the Site, and transported for appropriate off-Site disposal include the following:

- Soils documented to be impacted by PVOCs and petroleum-related PAHs (Excavation Areas 1A-C, 2 and 3A);
- Soils from the depressed area impacted by metals and PAHs (Excavation Area 3B);
- Petroleum impacted soils removed for EISB Injection Piping Trenches (Excavation Area 4)
- All soils exceeding RR SCOs to a depth of 2 ft. unless covered by one of the Cover System options proposed in Section 11 and a mix of Urban Fill and native materials to be cut during Site work and general grading (Excavation Area 6); and
- Other materials, including portions of the above-grade structures, concrete and asphalt, groundwater, decontamination water, and other materials generated during the proposed remediation activities.

Proposed excavation locations and depths are shown on Figure 5 and associated volumes are summarized in Section 8.4. The areal extent of the excavation areas may deviate based on endpoint sampling results if the results show grossly contaminated source material soils remain present. Additional soil may also be excavated and removed from the Site to create sloped sidewalls or benches for the excavations.

8.1 DEMOLITION OF ABOVE-GRADE STRUCTURES

Proposed redevelopment includes demolition of the following structures:

- Garage/Shop Building;
- Loading Dock Building;
- Former Propane Storage Shed;

- Freight Elevator in the northern portion of the Main/Manufacturing Building;
- Single story portion of the northern portion of the Main/Manufacturing Building;
- Single story portions of the southern portion of the Main/Manufacturing Building;
- Portions of retaining walls for lowered ground areas along the Main/Manufacturing Building;
- Exterior Stairs; and
- Fences.

A drawing depicting proposed demolition is provided in Appendix A.

The remainder of the main/manufacturing building will be renovated into apartment units or commercial space. Planned renovation activities will include removal of the lowest level floor and floor subbase. Removal of the building floor may require the use of jack hammers and manual labor, with a mini excavator and a compact skid steer to remove material from the building.

8.2 SOIL CLEANUP OBJECTIVES, GROUNDWATER CLEANUP STANDARDS AND GUIDANCE VALUES

The SCGs are described in the sections below.

8.2.1 Soil

Given the planned use of the Site for Restricted Residential purposes, the applicable SCGs for soils includes the following:

- 6 NYCRR Part 375 SCOs for Restricted-Residential (RR) Use;
- NYSDEC CP-51 Supplemental SCOs for RR Use;
- NYSDEC CP-51 Soil Cleanup Levels for Gasoline Contaminated Soils;
- NYSDEC CP-51 Soil Cleanup Levels for Fuel Oil Contaminated Soils; and
- 12 NYCRR Part 56 – Requirements for remediation of Asbestos Contaminated Soils.

Note that pursuant to 6 NYCRR 375-6.5, the POGW SCOs are considered not to be applicable for the Site because: 1) the use of groundwater for potable purposes within the limits of the City of Rochester is prohibited by the City Code; and 2) Site groundwater is planned to undergo *In Situ* remediation, as described in this report.

While endpoint samples will be compared to the above SCGs, metals and non-petroleum related SVOCs will only be targeted for removal within the top two feet in surface soils not covered by the concrete, asphalt or play surface cap. As a result, this is a Track 4 RR remedy. Exposure to any residual contamination remaining above these SCOs will be contained beneath the engineered Cover System.

Soil and materials management on-Site and off-Site will be conducted in accordance with the soil and material management practices described in Section 8.5.

8.2.2 Groundwater

Groundwater cleanup standards and guidance values are derived from the following guidance document:

- Class GA standards and guidance values listed in NYSDEC's Ambient Water Quality Standards and Guidance Values, Division of Water Technical and Operational Guidance Series (TOGS 1.1.1) Memorandum dated October 22, 1993, Reissued June 1998, and addenda dated April 2000 and June 2004.

The remedy has been designed to attempt to achieve these standards over time. However, monitoring is proposed to be discontinued if two consecutive groundwater monitoring events demonstrate decreasing concentrations, or if asymptotic conditions are achieved.

8.3 REMEDIAL PERFORMANCE EVALUATION (POST-EXCAVATION ENDPOINT SAMPLING)

This section includes a discussion of endpoint sampling for soil. Post-implementation groundwater monitoring is discussed in Section 15.1.

8.3.1 Endpoint Sampling Frequency and Methodology

Endpoint sampling frequency for excavations will be performed in accordance with Section 5.4 of DER-10.

For soil excavations of:

- Less than 20 ft. in perimeter, one (1) sidewall sample; and
- Greater than 20 ft. in perimeter, one (1) sample from the bottom of each sidewall for every 30 ft. of sidewall.

In an excavation where multiple layers of contamination have been visually or analytically identified, additional sidewall samples in the horizon in which contamination was identified will be collected.

Each excavation within a larger excavation will be considered a separate excavation and the sampling frequency will comply with the guidelines listed above.

Sidewall samples will not be collected where a building foundation wall is the sidewall of the excavation. The bottoms of some excavations where endpoint sampling is required is expected to be bedrock thus no bottom samples are proposed to be collected from those locations.

When VOC endpoint samples are collected from the bottom of an excavation, if samples are collected, they will be taken:

- Within 24 hours of excavation from the 0 in. to 6 in. interval at the excavation floor; and
- After 24 hours at 6 in. to 12 in. below the excavation floor.

Endpoint sample results will be compared with the SCGs discussed in Section 3. If endpoint samples are above SCGs then the excavation area will be expanded in the required direction, and the endpoint sampling repeated, depending on the feasibility to expand the excavation given the Site border and building location.

8.3.2 Reporting of Results

Sampling data will be submitted to NYSDEC in the appropriate EQuIS Electronic Data Deliverable format pursuant to DER-10.

8.3.3 QA/QC

Sampling and analytical activities will be conducted in accordance with standard environmental sampling and analytical guidelines and protocols contained in the QAPP, presented in Appendix D.

8.3.4 DUSR

Analytical data collected as post-excavation endpoint sampling will undergo a data usability evaluation in accordance with the NYSDEC's "Guidance for the Development of Data Usability Summary Reports," revised 1997 and DER-10. Analytical summary tables will be prepared that summarize the data and compare them to applicable New York State Standards, Objectives, and Guidance. Refer to the QAPP in Appendix D for further details on DUSRs.

8.3.5 Reporting of Endpoint Data in FER

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

Endpoint sampling, including bottom and sidewall sampling, will be performed in accordance with DER-10 sample frequency requirements, as listed in Section 8.3.1. The FER will include a tabular and map summary of all endpoint sample results and exceedances of the SCOs to document the final soil cleanup levels achieved.

8.4 ESTIMATED MATERIAL REMOVAL QUANTITIES

The quantities reported in this section are estimates. Final quantities will be reported in the FER.

The total estimate of materials to be excavated is estimated at 5,376 cy, as based upon the following:

- Basement Sub-Slab Soils = 663 cy (overburden = 451 cy, petroleum impacted 212 cy)
- Dock and Sump Soils = 32 cy (overburden = 0 cy, petroleum impacted 32 cy)

- Building Exterior Soils = 130 cy (overburden = 115 cy, petroleum impacted 15 cy)
- Depression Area Fill = 12 cy (overburden = 0 cy, lead and SVOC impacted 12 cy)
- Injection and SSDS Piping Arrays = 108 cy (overburden = 100 cy, petroleum impacted 8 cy)
- Exterior Grading and Site Work for Redevelopment = 4,431 cy (Urban Fill)

Given prior findings, a portion of the excavated overburden soil and Urban Fill are expected to be clean enough that they may be available for reuse on-Site. These materials will first be staged and undergo laboratory testing per DER-10 to determine their eligibility to be suitable for reuse. This quantity of soil and Urban Fill estimated to be eligible for reuse on-Site is estimated at 2,883 cy.

Therefore, the remaining overburden soils, Urban Fill, and miscellaneous petroleum, SVOC and metals impacted soils anticipated to be removed and properly disposed off-Site is estimated at 2,493 cy. Utilizing an assumed density of these materials of 1.6 tons/cy, the estimated quantity of soil and fill to be removed and disposed off-Site is approximately 4,000 tons.

The areal extent of the excavations, and corresponding volume estimates, may change based on endpoint sampling results to the extent contaminated soil is encountered at the bottoms or sidewalls of the planned excavations. Additional soil may also be excavated to create sloped sidewalls or benches for the excavations.

The excavations will be backfilled with tested and DEC-approved reused materials or imported structural fill (currently estimated at 900 cy based upon conceptual redevelopment plans), to meet proposed subgrades required for redevelopment construction. Given the proposed redevelopment of the Site, excavations will be backfilled in lifts not to exceed one foot in depth and compacted to 95% modified proctor and tested using nuclear soil density testing procedures.

8.5 SOIL AND MATERIALS MANAGEMENT

The following sections include descriptions of how soils and materials will be managed during remedial actions:

- Soil screening, stockpiling, and excavation;
- Load out, transportation, disposal and reuse of soil and other materials;
- Fluids management;
- Demarcation;
- Backfill;
- Stormwater management;
- Contingency planning;
- CAMP; and

- Odor, dust, and nuisance controls.

8.5.1 Soil Screening Methods

Visual, olfactory, and PID soil screening and assessment will be performed by an environmental professional under the direction of the Remedial Engineer during remedial and development excavations into known or potentially contaminated material. Soil screening will be performed when invasive work is done during the Preferred Remedy, prior to issuance of the Certificate of Completion. Soil screening during future construction of the development will be governed by the Site Management Plan.

8.5.2 Stockpile Methods

Stockpiles will be kept covered with appropriately anchored tarps. Stockpiles will be routinely inspected, and damaged tarp covers will be promptly replaced.

Water will be available on-Site at suitable supply and pressure for use in dust control. The amount of water utilized will be minimized to prevent runoff.

Proposed details and notes related to stockpiles for impacted soil are provided in Figure 5A.

8.5.3 Soil and Materials Excavation and Load Out

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

The Volunteer's contractors are responsible for safe execution of invasive and other work performed under this Plan.

Proposed details and notes related to excavation are shown on Figures 5 and 5A. Stantec will stakeout the corners of each proposed excavation area using GPS or field ties.

Loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, and local requirements.

Future Site development activities will not interfere with, or otherwise impair or compromise, remedial activities proposed in this RAWP. Handling of residual impacted soils during the future development activities will be governed by the Site Management Plan.

Each source area to be remediated will be removed and endpoint remedial performance sampling will be completed before excavations related to future Site development commence near the remediated area.

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

Mechanical processing of historical fill and contaminated soil on-Site will not take place.

8.5.4 Soil and Materials Transport Off-Site

Transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded.

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

8.5.5 Soil and Materials Disposal Off-Site

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

Material that does not meet Track 1 UU SCOs is prohibited from being taken to a New York State recycling facility (6 NYCRR Part 360-16 Registration Facility).

Historical fill and contaminated soils from the Site are prohibited from being disposed at Part 360-16 Registration Facilities (also known as Soil Recycling Facilities).

Soils that are contaminated but non-hazardous and are being removed from the Site are considered by the Division of Materials Management (DMM) in NYSDEC to be Construction and Demolition (C/D) materials with contamination not typical of virgin soils. These soils may be sent to a permitted Part 360 landfill. They may be sent to a permitted C/D processing facility without permit modifications only upon prior notification of NYSDEC Region 8 DMM. This material is prohibited from being sent or redirected to a Part 360-16 Registration Facility. In this case, as dictated by DMM, special procedures will include, at a minimum, a letter to the C/D facility that provides a detailed explanation that the material is derived from a DER remediation Site, that the soil material is contaminated and that it must not be redirected to on-Site or off-Site Soil Recycling Facilities. The letter will provide the project identity and the name and phone number of the Remedial Engineer. The letter will include, as an attachment, a summary of chemical data for the material being transported.

Hazardous wastes derived from on-Site will be stored, transported, and disposed of in compliance with applicable local, State, and Federal regulations. Potential soil that will need to potentially be handled and disposed of as a hazardous waste will be subject to the performance of a Contained in Demonstration in accordance with NYSDEC procedural requirements to evaluate if the waste soil can be more economically disposed of as non-hazardous waste

Appropriately licensed haulers will be used for material removed from this Site and will follow applicable local, State and Federal regulations.

Waste characterization will be performed for off-Site disposal in a manner suitable to the receiving facility and in conformance with applicable permits. Sampling and analytical methods, sampling frequency, analytical results, and QA/QC will be reported in the FER. Data available for soil/material to be disposed at a given facility must be submitted to the disposal facility with suitable explanation prior to shipment and receipt.

8.5.6 Soil and Materials Disposal Documentation

The following documentation will be obtained and reported by the Remedial Engineer for each disposal location used in this project to demonstrate and document that the disposal of material derived from the Site conforms with applicable laws:

- Email correspondence from the Remedial Engineer or Volunteer to the receiving facility with a waste profile describing the material to be disposed and requesting acceptance of the material. This correspondence will state that material to be disposed is contaminated material generated at an environmental remediation Site in New York State. The correspondence will provide the project identity and the name and phone number of the Remedial Engineer. The correspondence will include as an attachment a summary of the chemical data for the material being transported (including Site Characterization data); and

- A waste profile approval from the receiving facilities stating it is in receipt of the correspondence (above) and is approved to accept the material.

These email correspondences and approved waste profiles will be submitted to NYSDEC for review and approval; they will also be included in the FER.

The FER will include an accounting of the destination of the material removed from the Site during this Remedial Action, including excavated soil, contaminated soil, historic fill, solid waste, and hazardous waste, non-regulated material, and fluids. Documentation associated with disposal of hazardous material must also include records and approvals for receipt of the material, manifests for transportation, and Certificates of Disposal.

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

8.5.7 Soil and Materials Reuse On-Site

Material anticipated to be reused or relocated on-Site will be sampled in accordance with DER-10 and meet RR SCOs. The Remedial Engineer will ensure that procedures defined for materials reuse in this RAWP are followed and that unacceptable material will not remain on-Site.

Testing for material anticipated to be reused or relocated on-Site will also include 1,4-dioxane using EPA Method 8270 and Per- and Polyfluoroalkyl Substances (PFAS) using EPA Method 537.1 (modified) at the frequencies as specified DER-10. For 1,4-dioxane soil exceeding the Unrestricted SCO of 0.1 ppm will

be rejected for reuse. If PFOA or PFOS are detected above 1 ppb then a soil sample will be submitted for Synthetic Precipitation Leaching Procedure (SPLP) analysis. If the SPLP analysis is above 70 ppt than the material will be rejected for reuse.

Unless it appears to be clean, is subsequently tested per DER-10 and determined to be suitable for reuse, soil and fill cannot be reused or relocated on-Site during excavation.

Other material will be removed from the Site for appropriate off-Site disposal and excavations will either be backfilled with reused soil or imported structural fill, and/or crushed stone to match existing grade.

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

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

8.5.8 Fluids Management

Excavation related stormwater and/or groundwater, and other remedial related liquids will be containerized and tested in accordance with Monroe County's Requirements. Contingent on Monroe County's approval, it is anticipated that these fluids will be discharged to the combined sanitary sewer.

8.5.9 Demarcation

After the completion of soil removal and any other invasive remedial activities, and prior to backfilling, excavation locations will be surveyed for horizontal control with a GeoXT, which is a handheld GPS instrument with sub-meter accuracy (or equal) and the depth to the top of residual contaminated soils will be measured by a licensed Land Surveyor. A physical demarcation layer, consisting of orange snow fencing material or equivalent material, will be placed on this surface to provide a visual reference. This demarcation layer will constitute the top of the 'Residuals Management Zone', the zone that requires adherence to special conditions for disturbance of contaminated residual soils defined in the Site Management Plan. The survey will measure the grade covered by the demarcation layer before the placement of cover soils, pavement and sub-soils, structures, or other materials. This survey and the demarcation layer placed on this grade surface will constitute the physical and written record of the upper surface of the 'Residuals Management Zone' in the Site Management Plan. A map showing the survey results will be included in the FER and the Site Management Plan.

8.5.10 Backfill from Off-Site Sources

Trucks entering the Site with imported soils will be securely covered with tight fitting covers. Materials proposed for import onto the Site will be approved by NYSDEC and the Remedial Engineer and will comply with the provisions in this RAWP prior to receipt at the Site.

Materials proposed for import onto the Site will be approved by NYSDEC and the Remedial Engineer and will be in accordance with DER-10 Appendix 5 for Restricted Residential Use and CP-51 Table 1 for Restricted Residential, Table 2 and Table 3. Additionally, 1,4-dioxane and PFAs will be tested for and material will be accepted or rejected as specified in Section 8.5.7 of this Work Plan.

In addition, backfill from off-Site sources must be sampled for Emerging Contaminants in general conformance with DER-10, Section 5.4(e). Non-compliant backfill materials will not be imported onto the Site without prior approval by NYSDEC.

Backfill materials that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this Site, will not be imported onto the Site without prior approval by NYSDEC.

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

8.5.11 Stormwater Management

Erosion and sedimentation controls will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by NYSDEC. Necessary repairs shall be made immediately.

Accumulated sediments will be removed as required to keep the ESCs functional.

Manufacturer's recommendations will be followed for replacing filter socks damaged due to weathering.

Erosion and sediment control measures identified in the RAWP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.

8.5.12 Contingency Plan

If underground tanks or other previously unidentified contaminant sources are found during on-Site remedial excavation, sampling will be performed on product, sediment, and surrounding soils. Chemical analytical work will include TAL metals, TCL and CP 51 VOCs and SVOCs. These analyses will not be limited to CP-51 parameters where tanks are identified without prior approval by NYSDEC. Analyses will not be otherwise limited without NYSDEC approval.

Identification of unknown or unexpected contaminated media identified by screening during invasive Site work will be promptly communicated by phone to NYSDEC's Project Manager. These findings will also be included in weekly and monthly progress reports.

8.5.13 Community Air Monitoring Plan

The CAMP will follow the guidance set forth in Appendix 1A and 1B of DER-10, the Generic Community Air Monitoring Plan, which is presented in Appendix E.

Fixed and mobile sampling stations will be placed downwind of designated work areas. Monitoring locations will be moved as needed to account for changes in wind direction or the work location.

CAMP action level exceedances, odor issues or related complaints will be reported to the NYSDEC and NYSDOH Project Managers within 24 hours of the occurrence and included in weekly and monthly progress reports.

8.5.14 Odor, Dust, and Nuisance Control Plan

This section discusses the plans that will be implemented to control odor, dust, and other nuisances during remediation activities. In the event of a health-related public complaint, the NYSDEC and NYSDOH Project Managers must be notified as soon as possible, or within 24 hours of the occurrence.

8.5.14.1 Odor Control Plan

An odor control plan capable of controlling emissions of nuisance odors off-Site will be implemented. Specific odor control methods to be used on a routine basis will include odor masking, containment, and counteraction. If nuisance odors are identified by field personnel, work will be halted, and the source of odors will be identified and corrected. Work will not resume until nuisance odors have been abated, as determined by the Remedial Engineer. NYSDEC and NYSDOH will be notified of odor events and of other complaints about the project. Implementation of all odor controls, including the halt of work, will be the responsibility of the Remedial Engineer, who is responsible for certifying the FER, as described in Section 14.1.

Necessary means will be employed to minimize on- and off-Site nuisances. At a minimum, procedures will include:

- Limiting the area of open excavations;
- Shrouding open excavations with tarps and other covers;
- Using BioSolve, or equivalent, to cover exposed soils with nuisance characteristics.

If odors develop and cannot be otherwise controlled, additional means to minimize odor nuisances will include:

- Direct load-out of soils to trucks for off-Site disposal;
- Use of chemical odorants in spray or misting systems; and
- Use of staff to monitor odors in surrounding neighborhoods.

8.5.14.2 Dust Control Plan

A dust suppression plan that addresses dust management during invasive on-Site work will, at a minimum, include:

- Water available on-Site at suitable supply and pressure for use in dust control;

- Gravel used on roadways to provide a clean and dust-free road surface; and
- On-Site roads limited in total area to minimize the area required for water spraying.

8.5.14.3 Other Nuisances

A plan will be developed and utilized by the Contractor for remedial work and will conform, at a minimum, to Monroe County noise control standards. These standards require:

- Development of a noise mitigation plan that will be posted at the job Site;
- Work hours between 7:00 am and 6:00 pm on weekdays; and
- Noise not to exceed 10 decibels above ambient sound levels as measured 15 ft. from the source when handling containers and construction materials on public streets.

9.0 PROPOSED ENGINEERING CONTROLS: SOIL AND GROUNDWATER TREATMENT AND VAPOR MITIGATION SYSTEMS

Residual impacts to groundwater and saturated soil will remain after the source removal excavation phase of the Remedial Action is complete. Soil vapor impacts originating from these impacted media may exist. Soil and groundwater treatment described in the following sections, will be utilized to address these soil and groundwater impacts and potential soil vapor impacts originating from those impacted media. Vapor mitigation systems including vapor barriers (required sealing layer) and an active SSDS will be installed compatible with the design and proposed use of the building.

The soil and groundwater treatment systems will include:

- Enhanced *In Situ* Biodegradation (EISB), which will be applied as a polishing step and to treat residual petroleum-related impacts below the building; and
- Enhanced Reductive Dechlorination (ERD), which will be implemented to treat chlorinated solvents in MW-2, MW-100, MW-107 and MW-112.

9.1 ENHANCED *IN SITU* BIODEGRADATION

Implementation of the EISB technology will be completed using agricultural-grade gypsum to stimulate indigenous bacteria populations for the degradation of residual petroleum-related COC impacts within the saturated zone. The process will be incorporated as a biological polishing step to the planned soil excavation remedy for petroleum-related impacts. Based on the results of the remedial investigation, the north area of the building has been identified for EISB application to remove these impacts in saturated soils or groundwater, as shown on Figures 6 and 6A.

The sections below include a description of the EISB technology and the gypsum application procedure.

9.1.1 Technology Description

Biodegradation of PVOCs and petroleum related SVOCs occurs naturally when suitable microbial populations and geochemical conditions are present in the subsurface. The major driving force for these biological processes involves the transfer of energy in the form of electrons. During biodegradation, petroleum hydrocarbons serve as the electron donor. The mechanisms for aerobic degradation processes in which oxygen serves as an electron acceptor are well documented. Microorganisms also exist which follow anaerobic processes using ferric iron (Fe^{3+}), nitrate (NO_3^-), sulfate (SO_4^{2-}), and to a lesser extent manganese (Mn^{4+}), as alternative electron acceptors to oxygen.

Sulfate-reducing bacteria (SRB) will utilize sulfate as an electron acceptor to degrade petroleum hydrocarbons in groundwater. The petroleum hydrocarbons are degraded to carbon dioxide and water and the sulfate is reduced to sulfide. Optimum geochemical conditions for SRB degradation pathways include anaerobic conditions [dissolved oxygen (DO) < 2 mg/L], oxidation reduction potential (ORP) of

groundwater between 0 and -200 mV, and neutral pH. Biodegradation of hydrocarbons by SRB is relatively common as these bacteria are extremely resilient and can be found in almost every environment.

Groundwater monitoring results indicate that natural geochemical conditions of the saturated soils within the identified areas of subsurface petroleum hydrocarbon impacts at the Site are anaerobic (DO < 2 mg/L) and reducing (negative ORP). This makes conditions optimal for use of a biodegradation metabolic pathway using an alternative electron acceptor to oxygen, such as sulfate. The design rationale for implementing an EISB program utilizing sulfate as an alternative electron acceptor to oxygen is that an aerobic remedial option would require reversing naturally occurring conditions. In addition, solubility limitations associated with oxygen also make it easier to provide sulfate to the indigenous petroleum-degrading bacteria for a longer timeframe.

Agricultural gypsum [calcium sulfate dehydrate ($CaSO_4 \cdot 2H_2O$)] is approximately 56% sulfate by weight and has a moderate solubility (2.1 g/L). The blending of gypsum with backfill material to be applied to the bottom of the proposed soil excavations will provide a long-term sulfate source to address residual petroleum hydrocarbon impacts within the saturated soils. Excavation activities will result in subsurface aeration, but this will be mainly isolated to the vadose zone soils and the upper portion of the saturated zone, depending on the overall depth of excavations. The oxygen provided during these activities will readily be consumed by indigenous bacteria populations, some of which will result in aerobic petroleum hydrocarbon degradation, before the geochemistry reverts to natural conditions. At this point, SRB populations will utilize the sulfate provided by the applied agricultural gypsum and continue degradation of residual petroleum hydrocarbons.

9.1.2 Gypsum Application

Following excavation, residual petroleum impacts are expected to remain in the north area of the existing building. The areas of the Site identified for soil excavation and gypsum application are shown on Figure 6. In the identified area, a series of perforated pipes will be placed in the petroleum affected area, surrounded by washed pea stone. These pipes will be connected to flush-mounted injection points located within a locking vault outside the building on the west side (see Figure 6). Prior to backfilling the pipes, agricultural-grade gypsum (a bioremediation amendment) will be applied to the backfill material at a rate of 10% per mass, which equates to 297 lbs. of gypsum per cubic yard of backfill. Therefore, approximately 9,000 pounds of gypsum will be mixed into the bottom 1-2 feet of the pea stone and backfill below and around the piping. Water will then be added to the system to activate the gypsum to promote biodegradation.

In addition, gypsum will be added to the bottom of the excavation along the adjacent exterior foundation wall of the building opposite of the interior petroleum area. The gypsum will be added to the bottom 1-2 feet of the backfill at a rate of 10% per mass. The amount of gypsum to be added is uncertain at this time and will be calculated based on the final lateral dimensions of the outside petroleum excavation.

It is currently anticipated that agricultural-grade gypsum will be delivered to the Site in 1,500 lb. canvas sacks. The agricultural-grade gypsum will be stored on-Site and kept dry from precipitation or stormwater and will only be uncovered when in-use.

The actual extent and depth of the excavations may change depending on conditions encountered in the field. Record drawings, diagrams, and calculations for treatment application will be presented in the FER.

9.1.3 Sulfate Solution Application

Approximately 1 year after placement of the gypsum, it is possible that polishing of the groundwater may be needed to further bioremediate the residual petroleum contaminants in groundwater. If needed, a solution will be injected through these perforated pipes to promote the *in situ* bioremediation of the petroleum impacts. The polishing solution would be prepared by dissolving magnesium sulfate heptahydrate (Epsom salt) in water to provide a 990 mg/L sulfate solution. Since Epsom salt is 39% sulfate by weight, approximately 30 pounds of Epsom salt will be required to prepare a 1,500-gallon batch of sulfate solution for injection. It is possible that supplemental injections will be needed to address the impacts as the additives will be consumed during the bioremediation process. Groundwater monitoring will be needed to evaluate the success of the *in situ* bioremediation process and the need for subsequent injection events.

9.1.4 Sulfate Solution Injection

Two bedrock/overburden interface groundwater monitoring wells (MW-100 and MW-114) located within the courtyard area had groundwater PVOC detections above NYSDEC standards and guidance values.

To treat this area, EISB will be performed via the injection of a 990 mg/L sulfate solution into the subsurface via three vertical injection wells. The application of EISB via the vertical injection wells will be conducted in a phased approach similar to the ERD injection including:

- Project preparation and permitting;
- Installation of injection wells;
- Direct injection of electron donor solution; and
- Post-Injection monitoring.

The three vertical EISB injection wells will require a permit as specified in Section 9.2.2.1.

9.2 ENHANCED REDUCTIVE DECHLORINATION

The ERD remediation technology will be used to treat groundwater documented to be impacted by CVOCs above TOGS 1.1.1 groundwater standards and guidance values, as shown on Figure 4. The CVOCs include tetrachloroethene (PCE), trichloroethene (TCE), and their daughter product cis-1, 2-dichloroethene (cis-1,2-DCE).

The sections below include a description of the ERD technology, a description of the ERD remedy work scope, analytical methods, data management, and evaluation and reporting of results.

9.2.1 Technology Description

CVOCs are recalcitrant compounds that are often difficult to remove from soils and groundwater using conventional treatment technologies (pump and treat, multi-phase extraction, etc.). Reductive dechlorination is an anaerobic biological process whereby naturally occurring microorganisms degrade chlorinated compounds like PCE and TCE. The process serves as the major metabolic pathway used for natural attenuation of chlorinated solvents. Contaminant degradation is dependent on the presence of the appropriate microorganisms, nutrients, and energy sources. The biochemical transformation of contaminants is the result of enzymes produced by the microorganisms that act as catalysts for the degradation reactions. The overall contaminant reduction mechanisms are greatly influenced by the interrelationship between several microorganisms and a series of chemical reactions that occur within the subsurface environment.

The major driving force for biodegradation involves the transfer of energy in the form of electrons. Consequently, successful applications require both an electron donor and an electron acceptor. During reductive dechlorination, the chlorinated hydrocarbon acts as an electron acceptor, therefore, requiring an electron donor for the reaction to proceed. Potential hydrocarbon sources undergo degradation via a variety of cleavage, hydrolysis, oxidation/reduction, dehydrogenation, and/or substitution reactions due to the production of hydrogen and electrons from the electron donor. The resulting energy is then used to replace chlorine in the case of TCE, with hydrogen through reductive reactions such as hydrogenolysis or dihaloelimination.

In anaerobic environments, complete degradation of organic contaminants typically occurs as a result of the interactions between several specialized microorganisms. These reactions are biologically driven and will proceed only if the indigenous bacteria in the soil are capable of producing the desired biochemical reactions. Bacteria such as dehalospirillum multivorans, dehalobacter restrictus, defulfitobecterium, clostricium bifermentans, desulfuromonas, dehalococcoides ethenogenes and others are responsible for the degradation of chlorinated solvents in subsurface environments. Dehalococcoides bacteria are responsible for the complete dechlorination of cis-1,2-DCE, and in its absence, the overall reductive dechlorination process stalls with the production of this compound. Optimal geochemical conditions for the ERD process include DO levels < 2 mg/L and a negative ORP.

Selection of the proper electron donor is dependent on the physical properties of the contaminants, the geology of the subsurface, and the estimated clean-up time frames. The complexity and solubility of the proposed carbon source needs to be accounted for when evaluating contact limitation and availability issues. Many studies and projects have been completed using carbon sources ranging from simple sugars to more complex food oils. Less complex electron donors such as acetate and lactate are advantageous because of their high solubility and low molecular weight. These compounds readily dissolve in the groundwater and are quickly accessible as a food source for indigenous microorganisms, thus minimizing acclimation periods. The use of these less-complex compounds can quickly convert the subsurface into a reductive state where dechlorination processes can readily occur.

9.2.2 ERD Remedy Work Scope

The application of the ERD technology at the Site will be conducted in a phased approach. The work tasks to be completed include the following:

- Project preparation and permitting;
- Installation of injection wells;
- Direct injection of electron donor solution; and
- Post-Injection monitoring.

9.2.2.1 Project Preparation and Permitting

During this phase of operations, the following work will be completed:

- Procurement of equipment and materials;
- Scheduling and coordination activities; and
- Acquisition of all required permits.

The ERD remedy will involve the injection of an electron donor solution into the subsurface to enhance *In Situ* biodegradation of CVOCs. Injection of treatment solutions into the groundwater for remedial purposes is permitted by rule under 40 CFR Part 144 since it involves a beneficial use, Class V, underground injection control (UIC) well for aquifer remediation (classified as a category 5X26 well in EPA 570/9-87-006). However, there are inventory reporting requirements as described in 40 CFR 144.83.

New York is a direct implementation state so USEPA oversees the Class V UIC program in New York. The inventory reporting requirements to USEPA can therefore be satisfied by submitting a completed Office of Management and Budget No. 2040-0042 form to the UIC Program Director in USEPA Region 2 with a copy submitted to the NYSDEC project manager. This form may be submitted before or after installation of the Class V UIC wells. If it is submitted after well installation, there may be a requirement to wait 90 days prior to performing any injection activities, although the UIC Program Director can authorize an earlier injection.

The State of New York does not have primacy over the UIC program, but the Department and/or local regulatory agencies may also require notification or additional permitting requirements prior to injection of solutions into the ground.

The above permitting requirements are applicable to the ERD and EISB vertical injection wells but are not applicable to the EISB horizontal piping arrays.

9.2.2.2 Injection Well Installation

In situ ERD using sodium lactate as an electron donor has been proposed to address the chlorinated solvents in groundwater at the western Site boundary along Litchfield Street and in the vicinity of monitoring well MW-100. The ERD remediation activities will involve the injection of an electron donor solution into the subsurface to enhance i*n situ* biodegradation. As shown in Figure 7, seven injection wells will be installed along Litchfield Street and two injection wells will be installed in the vicinity of MW-100. The injection program will also utilize existing monitoring wells MW-107 and MW-100.

9.2.2.3 Electron Donor Injection Operations

The electron donor solution will be prepared and injected in a batch process using water obtained from a locally available hydrant. The water will be pumped into a 1,500-gallon poly tank equipped with a submersible pump and sufficient sodium lactate added to provide a 10,000 mg/l solution. The submersible pump will include a valved distribution manifold line with in-line flowmeters to regulate injection flow. The injection plumbing will be configured to utilize 2-inch hose with Camlock fittings to connect the injection hose to the individual injection wells (see Figure 7A). The system will be capable of injecting into three injection wells simultaneously.

The injection design is based on 2" diameter injection wells installed to a depth of 5 feet into and below the top of bedrock, with a 10 ft. screen interval that straddles the overburden/bedrock interface, with approximately 1,300 gallons of solution to be injected per well. This assumes a 15-25' radius of influence, 20% effective porosity, and a 25% pore volume exchange. Injecting a 2% sodium lactate solution will provide approximately 217 pounds of sodium lactate per injection point.

9.3 POST-INJECTION MONITORING

It is possible that a second injection may be needed to address the impacts as the additives will be consumed during the bioremediation process. Groundwater monitoring will be performed to evaluate the success of the *In-Situ* bioremediation process and the need for subsequent injection events.

9.4 ANALYTICAL METHODS

All samples collected as part of the ERD and EISB remediation activities will be screened on-Site or sent for off-Site laboratory analyses. Analytes, methods, sample containers, preservatives, and holding times are listed in the QAPP, included as Appendix C.

9.5 DATA MANAGEMENT

Analyses for most ERD process parameters will be performed by an ELAP laboratory. Parameters measured in the field rather than off-Site will include pH, ORP, conductivity, DO, and temperature. The results for these parameters will be recorded on field log sheets.

9.6 EVALUATION AND REPORTING OF RESULTS

Stantec will prepare a post-injection summary detailing the methodologies, activities, and results obtained during implementation of the ERD technology at the Site. The initial report will cover electron donor injection activities. Subsequent reports will address the post-treatment groundwater sampling results. Post-injection performance monitoring data will be provided in regular progress reports as may be applicable (or otherwise agreed to by NYSDEC). As presented in Section 15.1 post injection groundwater monitoring will initially be conducted quarterly for a minimum of one year and possibly a second year and adjusted as appropriate in consultations with NYSDEC.

9.7 POST-REMEDIATION GROUNDWATER MONITORING

Post- remediation groundwater monitoring will include collecting groundwater samples to monitor contaminant levels in groundwater, including monitoring field parameters such as DO and ORP that will provide an indication of the effectiveness of the remediation.

9.8 VAPOR MITIGATION

Due to the documented presence of volatile organic compounds in soil gas, soil and groundwater, a vapor barrier (required sealing layer) and active sub-slab depressurization system (SSDS) will be installed. The installation of a vapor barrier and a sub-slab vapor collection network will occur after the groundwater treatment piping system is installed. A network of vapor collection/discharge pipes and fans will be installed to convey vapors to above the building roof line.

Installation of a vapor barrier (required sealing layer) and an SSDS beneath the structure will mitigate infiltration of VOC vapors into the future residential facility from impacted soil and groundwater that may remain beneath the building. Installation of the active components of the SSDS will be completed during the construction phase of the remediation. Vacuum monitoring points will be installed beneath the floor slab and will be monitored to confirm vacuum propagation.

Preliminary SSDS design is included in Figures 9 through 12. Final design of the SSDS will be completed contingent upon final building design and renovations and will involve the following:

- Coordination with the Architect to regarding design preferences for vertical pipe enclosures and stack locations on the roof;
- Finalization of layout of suction points;
- Finalization of sub-slab collection system layout; and
- Finalization of discharge locations.

The final SSDS design will be submitted to the NYSDEC for review and approval prior to the commencement of SSDS installation.

During construction, an environmental professional working under the direction of the Remedial Engineer will provide full-time observations of the installations of the sub-slab components and provide periodic construction observation for aboveground components.

Following system start-up, Stantec will perform an initial visit to confirm vacuum propagation below the floor and then perform annual SSDS operation and monitoring Site visits.

The SSDS will be designed in accordance with the performance guidelines specified in the NYSDOH's "Guidance for Evaluating Soil Vapor Intrusion in the State of New York" dated October 2006, with matrices updated May 2017, the RAWP requirements of the Department's "DER-10 Technical Guidance of Site Investigation and Remediation" dated May 2010, and applicable building codes.

10.0 RESIDUAL CONTAMINATION TO REMAIN ON-SITE

Since residual contaminated soil, groundwater, and possibly soil vapor will exist beneath the Site after implementation of the Remedial Action is complete, ECs and ICs will be utilized to protect human health and the environment. These ECs and ICs are described in Sections 11 through 14. Long-term management of EC/ICs and of residual contamination will be implemented under the SMP that will be developed and included in the FER.

ECs will be implemented to protect public health and the environment by appropriately managing residual contamination. The Controlled Property (the Site) will have five (5) primary EC systems, which will consist of:

1. Installation of an engineered Cover System consisting of a new building foundation, concrete floor slab,] clean soil cover or impervious cap over the entire Site exterior, including remaining impacted areas, as an EC. This includes a demarcation layer consisting of orange snow fencing or equivalent material, placed at the base of all excavations, and cover material consisting of either: two feet of clean soil backfill in landscaped areas; two feet of clean soil or a composite playground cap in the playground area, crushed stone and asphalt pavement/concrete/brick paver sidewalks for remaining areas; and a concrete floor in the building basement (Section 11);

2. EISB via agricultural-grade gypsum applied to treat residual petroleum-related VOCs and SVOCs in soils below the basement floor slab and exterior building foundation wall (Section 9.1);

3. EISB via an injection of a solution prepared by dissolving magnesium sulfate heptahydrate (Epsom salt) in water to treat petroleum-related VOCs and SVOCs in groundwater (Section 9.1);

4. Enhanced Reductive Dechlorination (ERD) implemented to treat CVOCs in groundwater (Section 9.2); and

5. A vapor barrier (required sealing layer) and active SSDS compatible with the design and proposed use of building (Section 9.3).

The FER will report residual contamination on the Site in tabular and map form and will also be included in the SMP. Note that exceedances expected to be treated by EISB and ERD are included at this time, but these impacts are not anticipated to be long-term concerns.

10.1 SOIL

10.1.1 PVOCs and PAHs

PVOC and PAH impacts will remain following excavation below the existing basement floor slab and at several areas outside of the building, both in the vadose and saturated zones. However, the application of EISB in the form of agricultural-grade gypsum and injection of a solution prepared by dissolving

magnesium sulfate heptahydrate (Epsom salt) are expected to address the residual impacts over time in the saturated and smear zones.

10.1.2 Non-Petroleum VOCs

Acetone was found in exceedance of its POGW SCO at one location in the vadose zone; however, acetone is a common laboratory contaminant, and was not detected in any on-Site groundwater samples in exceedance of its TOGS 1.1.1 groundwater standard.

10.1.3 Non-Petroleum SVOCs

Non petroleum related SVOC impacts will remain following excavation below the basement floor slab and at several areas outside of the building, both in the vadose and saturated zones. However, the application of EISB in the form of agricultural-grade gypsum and injection of a solution prepared by dissolving magnesium sulfate heptahydrate (Epsom salt) are expected to address the residual impacts over time, in the saturated and smear zones.

10.1.4 Metals

Metals were detected in two locations across the Site in the vadose zone in exceedance of applicable SCOs at concentrations indicative of Urban Fill. It is anticipated that metal impacts will remain on-Site beneath the Cover System, except where removed as part of excavations to address other on-Site impacts or Site grading.

10.2 GROUNDWATER

Following implementation of the EISB and ERD (as described in Section 9.0), CVOCs and petroleum-related impacts are expected to dissipate over time. Long-term groundwater monitoring will be conducted to monitor the effectiveness of the groundwater injections.

Residual groundwater contaminants that may remain on-Site include the following:

- Petroleum related VOCS and/or SVOCs in groundwater at MW-01, MW-100, MW-104, MW-106, MW-107, MW-110, and MW-114; and
- CVOCs in groundwater at MW-02, MW-100, MW-107, and MW-112.

Petroleum related VOCs detected in groundwater in off-Site well MW-09 are expected to remain but are expected to slowly dissipate over time given that this well is located downgradient of the groundwater injection areas located on-Site. Although the Volunteer is not responsible to remediate off-Site impacts, the Volunteer is required to mitigate further offsite migration of contamination at the property boundary. which is expected to be accomplished by the proposed EISB and ERD groundwater remediation technologies.

10.3 SOIL VAPOR

The potential for soil vapor impacts to the building is expected following implementation of remedial actions. This issue will be addressed and mitigated via the installation of a soil vapor barrier (required sealing layer) and active SSDS system pursuant to the requirements in the SMP and Environmental Easement.

11.0 PROPOSED ENGINEERING CONTROLS: COVER SYSTEM

Exposure to remaining contamination in soil and Urban Fill at the Site will be prevented by a non-impacted engineered cover system placed across the Site. The cover system will consist of a demarcation layer (orange geotextile, snow fence, filter fabric, Geogrid or equal) placed on top of remaining impacted soil, overlain by one of the following combinations of materials as a cap:

- Paved areas: a minimum of 15 in. of crushed stone, 2 in. of asphalt concrete binder course, capped by approximately 1.5 in. of asphalt pavement;
- Play Surface will either be:
    - Poured in place surface: a minimum of 2 in laid on a 4 in. concrete slab, resting on an 8 in. stone subbase; or
    - Loose surface: 6 to 8 in. wood fiber surface on top of 6 in. stone subbase over 10 to 12 in. of non-impacted on-Site soil or imported, granular fill soil.
- Landscaped areas: A total of two ft. of non-impacted on-Site soil or imported, granular fill soil, and topsoil. Sidewalks will be constructed of concrete or paver stones or landscape stone;
- New concrete floor slab: the entire first floor of the building will be a new concrete floor slab. In addition, a vapor barrier (required sealing layer) and SSDS will be installed within and beneath the floor slab.

Figure 8 depicts the approximate locations where these exterior cover system types will be installed on top of the demarcation layer. Final horizontal and vertical locations of the exterior cover system types will be measured and recorded by a Licensed Surveyor. Note that soil remaining below the demarcation layer does not necessarily contain contaminants at concentrations in excess of RR SCOs and in some locations there may be no appreciable impacts to soil left in place.

The FER will include a Site Management Plan, which will outline the procedures to be followed if the Cover System and underlying residual contamination are disturbed after the Remedial Action is complete, as well as a description of inspection and maintenance procedures for the Cover System.

12.0 CRITERIA FOR TERMINATION OF ENGINEERING CONTROLS

12.1 COVER SYSTEM

The Cover System will serve as a permanent engineering control while residual contamination remains on the Site. Residual impacts will remain unless a future remedial action program is completed. The quality and integrity of this system will be inspected at regular intervals defined by the SMP.

12.2 VAPOR MITIGATION SYSTEMS

Vapor barrier (required sealing layer) and an active SSDS will be an engineering control for the future renovated building while residual VOC contamination remains on the Site. The quality and integrity of these systems would be inspected at regular intervals defined by the SMP.

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

12.3 TREATMENT SYSTEMS

Groundwater monitoring activities will continue, as determined by NYSDOH and NYSDEC, until residual groundwater concentrations are found to be below NYSDEC standards or have become asymptotic over an extended period. ERD and possibly EISB reapplication may occur based on the measured response. Monitoring will continue until permission to discontinue is granted in writing by NYSDEC and NYSDOH. Monitoring activities will be outlined in the Monitoring Plan section of the SMP.

13.0 PROPOSED INSTITUTIONAL CONTROLS

After the Remedial Action is complete, the Site will have residual contamination remaining in place. ECs for the residual contamination have been incorporated into the remedy to render the overall Site protective of public health and the environment. Two (2) Institutional Controls (ICs) have been designed to ensure continual and proper management of residual contamination in perpetuity: an Environmental Easement and a Site Management Plan (SMP).

Record drawings, diagrams, calculations, and manufacturer's documentation for treatment systems will be presented in the FER. A Site-specific Environmental Easement will be recorded with Monroe County to provide an enforceable means of ensuring the continual and proper management of residual contamination and protection of public health and the environment in perpetuity or until Track 1 SCOs are achieved and the easement is released in writing by NYSDEC. The easement requires that the grantor of the Environmental Easement and the grantor's successors and assigns adhere to all Engineering and Institutional Controls (ECs/ICs) placed on this Site by this NYSDEC-approved remedy. ICs provide restrictions for on-Site usage and mandate operation, maintenance, monitoring, and reporting measures for all ECs and ICs. The SMP describes appropriate methods and procedures to ensure compliance with all ECs and ICs that are required by the Environmental Easement. Once the SMP has been approved by the NYSDEC, compliance with the SMP is required by the grantor of the Environmental Easement and grantor's successors and assigns.

13.1 ENVIRONMENTAL EASEMENT

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

The Environmental Easement renders the Site a Controlled Property. The Environmental Easement must be recorded with the City of Rochester before the Certificate of Completion can be issued by NYSDEC. A series of Institutional Controls are required under this remedy to implement, maintain, and monitor Engineering Control systems, prevent future exposure to residual contamination by controlling disturbances of the subsurface soil, and restricting the use of the Site to Restricted-Residential, Commercial, or Industrial uses only. These Institutional Controls are requirements or restrictions placed on the Site that are listed in, and required by, the Environmental Easement. Institutional Controls can, generally, be subdivided between controls that support Engineering Controls, and those that place general restrictions on-Site usage or other requirements. Institutional Controls in both groups are closely integrated with the Site Management Plan, which provides the methods and procedures to be followed to comply with this remedy.

The Institutional Controls that support Engineering Controls contained within the easement are:

- Vegetable gardens and farming on the Controlled Property are prohibited;

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

The Engineering Controls required by the Easement are:

- Groundwater treatment systems including EISB to treat residual petroleum-related impacts below the building and ERD to treat CVOCs in groundwater will be continued until NYSDEC agrees that continued operation is not required based on groundwater monitoring results;
- The quality and integrity of the Cover System will be inspected at regular intervals and repaired as necessary as defined in the SMP;
- An active SSDS system and vapor barrier (required sealing layer) is present, and must be inspected, certified, operated and maintained as required by the SMP; and
- A statement that the Engineering Controls may not be discontinued without an amendment or extinguishment of the Environmental Easement.

Adherence to these Institutional and Engineering Controls for the Site is mandated by the Environmental Easement and will be implemented under the SMP, as discussed in Section 13.2.

13.2 SITE MANAGEMENT PLAN

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

The SMP is intended to provide a detailed description of the procedures required to manage residual contamination left in place at the Site following completion of the Remedial Action in accordance with the BCA with the NYSDEC. This includes:

- Development, implementation, and management of all Engineering and Institutional Controls;
- Development and implementation of monitoring systems and a Monitoring Plan;
- Development of a plan to operate and maintain any treatment, collection, containment, or recovery systems (including, where appropriate, preparation of an Operation and Maintenance Manual);
- Submittal of Site Management Reports, performance of inspections and certification of results, and demonstration of proper communication of Site information to NYSDEC; and
- Defining criteria for termination of treatment system operations.

To address these needs, this SMP will include four (4) plans:

- An Engineering and Institutional Control Plan for implementation and management of EC/ICs;
- A Monitoring Plan for implementation of Site Monitoring;
- An Operation and Maintenance Plan for implementation of remedial collection, containment, treatment, recovery systems, SSDS, and eventual well decommissioning procedures; and
- A Site Management Reporting Plan for submittal of data, information, recommendations, and certifications to NYSDEC. The SMP will be prepared in accordance with the requirements in NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation and the guidelines provided by NYSDEC.

Site management activities, reporting, and EC/IC certification will be scheduled on a certification period basis. The certification period will be annually. The Site Management Plan will be based on a calendar year and will be due for submission as specified by NYSDEC following the reporting period.

The SMP in the FER will include a monitoring plan for groundwater to evaluate Site-wide performance of the remedy. Appropriately placed groundwater monitoring wells will be used to monitor VOC remediation areas for evaluation of the effectiveness of the remedy that is implemented.

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

14.0 FINAL ENGINEERING REPORT

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

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

The FER will provide a summary of residual contamination left on the Site after the remedy is complete. The FER will provide an explanation for why the material was not removed as part of the Remedial Action. Residual contamination includes contamination that exceeds the UU and RR SCOs in 6 NYCRR Part 375 6. A table that shows exceedances from UU and RR SCOs for soil/fill remaining at the Site after the Remedial Action and a map that shows the location and summarizes exceedances from UU and RR SCOs for soil/fill remaining at the Site after the Remedial Action will be included in the FER.

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

Before approval of a FER and issuance of a Certificate of Completion, all project reports must be submitted in digital form on electronic media (PDF).

14.1 CERTIFICATIONS

The following certification will appear in front of the Executive Summary of the FER. The certification will be signed by a representative of the Remedial Engineer (Stantec Consulting Services Inc.) who is a Professional Engineer registered in New York State. This certification will be appropriately signed and stamped. The certification will include the following statements:

"I, Kevin Ignaszak, certify that I am currently a NYS registered professional engineer. I had primary direct responsibility for the implementation of the subject construction program, and I certify that the Remedial Work Plan was implemented and that all construction activities were completed in substantial conformance with the DER-approved Remedial Work Plan.

The data submitted to DER demonstrates that the remediation requirements set forth in the Remedial Work Plan and all applicable statues and regulations have been or will be achieved in accordance with the time frames, if any, established in the work plan.

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

A Site Management Plan has been submitted for the continual and proper operation, maintenance, and monitoring of any engineering controls employed at the Site including the proper maintenance of any remaining monitoring wells, and that such plan has been approved by DER."

It is a violation of Article 130 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 130, New York State Education Law.

15.0 POST CONSTRUCTION

15.1 SITE GROUNDWATER MONITORING PROGRAM

Following completion of the Remedial Actions it is proposed to conduct quarterly groundwater for the first year in order to monitor the effectiveness of the ERD and EISB applications and determine if applications are needed which will be discussed with the Department. The proposed plan for up to two years of quality monitoring are presented in Table 9. The post injection monitoring plan will be finalized in the Site Management Plan. As results are received, the cumulative results will be reviewed with NYSDEC to assess the future monitoring schedule.

These ongoing Site activities will be performed utilizing the measures provided in the project Health and Safety Plan, included in Appendix C. Ongoing groundwater sampling and laboratory analyses will continue to be performed in accordance with the Quality Assurance Project Plan (Appendix D).

15.2 ELEVATOR PIT SUMP AND PERIMETER DRAIN DISCHARGE

The proposed Site redevelopment includes three elevators and installation of a building perimeter foundation drain in the main/manufacturing building. Periodic pumping and discharge from the elevator pit sumps and perimeter drain will be required to keep them free of accumulated water. Due to the presence of PVOCs in the groundwater beneath the building, the accumulated water is likely to be impacted with these contaminants for the near-term. Accordingly, a long-term discharge permit will be obtained from MCDES to regulate this discharge, and sampling is expected to occur on a permit-required quarterly sampling frequency. It is anticipated the permit will require that samples be analyzed for Halogenated VOCs and metals (as required by MCDES) for the elevator sumps and perimeter drain. The results will be submitted to MCDES as required by the permit conditions.

Because the groundwater is proposed to undergo *In Situ* bioremediation, contaminant levels may eventually be sufficiently reduced such that cessation of the monitoring program may be allowable. Sampling and reporting will not cease without written approval from MCDES.

16.0 SCHEDULE

Stantec will provide NYSDEC with notification of the schedule for implementation of remedial action measures no less than one week prior to initiation of such activities.

Implementation of the preferred remedy in accordance with this RAWP is anticipated to begin in 2021. The implementation of the RAWP is contingent on the ability of the Volunteer to secure funding for the project. Redevelopment of the Site is estimated to take 20 months to complete.

Updates and changes to the implementation schedule will be reported to NYSDEC as part of monthly progress reporting.

17.0 REFERENCES

17.1 FEDERAL STANDARDS, CRITERIA AND GUIDANCE

1. 29 CFR Part 1926, Subpart D, Section 1926.62 – Safety and Health Regulations for Construction, Occupational Health and Environmental Controls, Lead.

2. 29 CFR Part 1926, Subpart D, Section 1926.65 – Safety and Health Regulations for Construction, Occupational Health and Environmental Controls, Hazardous Waste Operations and Emergency Response.

3. 29 CFR Part 1926, Subpart Z, Section 1926.1101 – Safety and Health Regulations for Construction, Toxic and Hazardous Substances, Asbestos.

4. 40 CFR Part 61, Subpart M – National Emission Standards for Hazardous Air Pollutants, National Emission Standard for Asbestos.

5. 40 CFR Part 144 – Underground Injection Control Program.

6. USEPA Title X – Residential Lead-Based Paint Hazard Reduction Act of 1992.

17.2 NEW YORK STATE STANDARDS, CRITERIA AND GUIDANCE

1. 6 NYCRR Part 364 – Waste Transporter Permits.

2. 6 NYCRR Part 360 – Solid Waste Management Facilities.

3. 6 NYCRR Part 375 – Environmental Remediation Programs.

4. 6 NYCRR Part 750 – State Pollutant Discharge Elimination System (SPDES) Permits.

5. 12 NYCRR Part 56 – Asbestos.

6. Commissioner Policy CP 43: Groundwater Monitoring Well Decommissioning Policy. New York State Department of Environmental Conservation, November 3, 2009.

7. Commissioner Policy CP 51: Soil Cleanup Guidance. New York State Department of Environmental Conservation, October 21, 2010.

8. Environmental Conservation Law (ECL) Article 27 Title 14 – Collection, Treatment and Disposal of Refuse and Other Solid Waste, Brownfield Cleanup Program.

9. Environmental Conservation Law (ECL) Article 71 Title 36 – Enforcement, Environmental Easements.

10. *Guidance for the Development of Data Usability Summary Reports*. New York State Department of Environmental Conservation, revised 1997.

11. *Guidance for Evaluating Soil Vapor Intrusion in the State of New York*. New York State Department of Health, October 2006.

12. New York State Education Law, Title VIII, Article 145 – Professional Engineering, Land Surveying and Geology.

13. New York State Penal Law Title L, Article 210, Section 45 – Making a Punishable False Written Statement.

14. New York State Standards and Specifications for Erosion and Sediment Control. New York State Department of Environmental Conservation, November 2016.

15. *Program Policy DER-10: Technical Guidance for Site Investigation and Remediation*. New York State Department of Environmental Conservation, May 3, 2010.

16. *Program Policy DER-31: Green Remediation*. New York State Department of Environmental Conservation, August 11, 2010.

17. *Technical and Operational Guidance Series (TOGS 1.1.1) Memorandum: Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations*. New York State Department of Environmental Conservation, Division of Water, October 22, 1993, Reissued June 1998, and addenda dated April 2000 and June 2004.

17.3 OTHER REFERENCES

1. *Draft Remedial Investigation Report, Canal Street Manufacturing Site, 67 & 89 Canal Street, City of Rochester, Monroe County, New York*, Stantec Consulting Services Inc., July 2019.

2. *Phase I Environmental Site Assessment, 67 & 89 Canal Street, City of Rochester, Monroe County, New York*, Stantec Consulting Services Inc., March 2018 (Revised).

3. *Phase II Environmental Site Assessment,* 67 and 89 Canal Street, Rochester, New York, LaBella Associates, D.P.C., July 2014.

4. *Site Characterization Report*, Canal Street Former MGP Site, Rochester New York. Haley & Aldrich of New York, Rochester, New York, 2008.

TABLES

Table 1
Summary of Analytical Results - Soil Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Sample Location				GP-01	GP-06/MW-01	GP-10	GP-11/MW-02	GP-12	B/MW-100		B-101	B/MW-102	B-103		B/MW-104		B-105			B/MW-106
Sample Date				11-Jun-14	11-Jun-14	11-Jun-14	11-Jun-14	11-Jun-14	29-Aug-18	29-Aug-18	29-Aug-18	29-Aug-18	30-Aug-18	30-Aug-18	31-Aug-18	31-Aug-18	4-Sep-18	4-Sep-18	4-Sep-18	4-Sep-18
Sample ID				GP-01 5.7FT	GP-06 8-8.1FT	GP-10 8-8.2FT	GP-11 7.4FT	GP-12 9FT	CNL-B100-S	CNL-B100-SD	CNL-B101-S	CNL-B102-S	CNL-B103-S	CNL-B103-S	CNL-B104-S	CNL-B104-SD	CNL-B105A-S	CNL-B105B-S	CNL-B105B-S	CNL-B106-S
Sample Depth				5.7 ft	8 - 8.1 ft	8 - 8.2 ft	7.4 ft	9 ft	8 - 9.3 ft	8 - 9.3 ft	6 - 7.5 ft	8 - 8.1 ft	6 - 8.5 ft	6 - 8.5 ft	2 - 3.6 ft	2 - 3.6 ft	0.3 - 0.6 ft	4.5 - 4.9 ft	4.5 - 4.9 ft	0.3 - 2.1 ft
Sampling Company				LABRNY	LABRNY	LABRNY	LABRNY	LABRNY	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory				ESC	ESC	ESC	ESC	ESC	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL
Laboratory Work Order				L704675	L704675	L704675	L704675	L704675	480-141385-1	480-141068-1	480-141385-1	480-141068-1	480-141177-1	480-141385-1	480-141177-1	480-141177-1	480-141228-1	480-141228-1	480-141385-1	480-141228-1
Laboratory Sample ID				L704675-01	L704675-02	L704675-03	L704675-04	L704675-05	480-141385-3	480-141068-2	480-141385-4	480-141068-4	480-141177-1	480-141385-5	480-141177-2	480-141177-3	480-141228-1	480-141228-2	480-141385-6	480-141228-3
Sample Type										Field Duplicate						Field Duplicate				
Sample Location	**Units**	**NYSDEC-Part 375**	**NYSDEC CP-51**																	
General Chemistry																				
Cyanide	mg/kg	27$_n^{AB}$ 40$_q^C$	n/v	-	-	-	-	-	-	-	-	-	-	-	1.7	1.1 UJ	1.1	-	-	-
Cyanide (Reactive)	mg/kg	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Flashpoint	deg F	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
pH, lab	S.U.	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulfide (Reactive)	mg/kg	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Temperature, Lab	deg C	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Solids	%	n/v	n/v	89.2	89.5	87.2	89.7	83.9	-	-	-	-	-	-	-	-	-	-	-	-
Total Solids (Fixed)	%	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Solids (Volatile)	%	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals																				
Aluminum	mg/kg	10,000$_e^{ABC}$	n/v	-	-	-	-	-	4,550	-	5,000	-	-	3,720	6,090	4,530	1,950	3,430	2,920	3,650
Antimony	mg/kg	10,000$_e^{ABC}$	n/v	-	-	-	-	-	17.6 U	-	16.7 U	-	-	16.3 U	16.6 U	16.4 U	15.4 U	15.8 U	16.7 U	15.7 U
Arsenic	mg/kg	13$_n^A$ 16$_q^{BC}$	n/v	-	-	-	-	-	2.3 U	-	2.2	-	-	2.2 U	2.2	2.2 U	6.4	2.1 U	2.2 U	2.1 U
Barium	mg/kg	350$_n^A$ 400^B 820^C	n/v	-	-	-	-	-	19.3	-	23.4	-	-	23.3	29.9	24.1	18.3	15.7	32.8	18.9
Beryllium	mg/kg	7.2^A 72^B 47^C	n/v	-	-	-	-	-	0.23 U	-	0.22	-	-	0.22 U	0.27	0.22 U	0.20 U	0.21 U	0.22 U	0.21 U
Cadmium	mg/kg	2.5$_n^A$ 4.3^B 7.5^C	n/v	-	-	-	-	-	0.23 U	-	0.22 U	-	-	0.22 U	0.22 U	0.22 U	0.20 U	0.21 U	0.22 U	0.21 U
Calcium	mg/kg	10,000$_e^{ABC}$	n/v	-	-	-	-	-	7,670	-	**53,900^{ABC}**	-	-	**18,100^{ABC}**	**34,400^{ABC}**	**37,800^{ABC}**	**18,200^{ABC}**	**39,500^{ABC}**	**31,700^{ABC}**	**40,900^{ABC}**
Chromium	mg/kg	30$_{n,i}^A$ 180^B $_{NS,q}^C$	n/v	-	-	-	-	-	6.5	-	8.6	-	-	5.0	8.6	7.6	3.0	7.2	4.7	5.8
Cobalt	mg/kg	10,000$_e^{ABC}$	n/v	-	-	-	-	-	3.1	-	3.8	-	-	4.2	4.8	19.0	64.0	4.3	2.7	3.2
Copper	mg/kg	50^A 270^B 1,720^C	n/v	-	-	-	-	-	7.2	-	6.4	-	-	6.9	7.4	24.1	**83.3^A**	7.8	5.0	6.2
Iron	mg/kg	10,000$_e^{ABC}$	n/v	-	-	-	-	-	9,180	-	9,850	-	-	**10,100^{ABC}**	**11,300^{ABC}**	9,760	4,260	7,720	6,860	7,130
Lead	mg/kg	63$_n^A$ 400^B 450^C	n/v	-	-	-	-	-	5.9	-	4.8	-	-	3.1	3.4	3.8	7.5	3.7	2.4	3.2
Magnesium	mg/kg	10,000$_e^{ABC}$	n/v	-	-	-	-	-	4,000	-	6,930	-	-	5,420	8,560	8,530	4,410	9,960	7,280	7,950
Manganese	mg/kg	1,600$_n^A$ 2,000$_q^{BC}$	n/v	-	-	-	-	-	299	-	281	-	-	237	298	293	153	260	257	348
Mercury	mg/kg	0.18$_n^A$ 0.81^B 0.73^C	n/v	-	-	-	-	-	0.024 U	-	0.022 U	-	-	0.021 U	0.022 U	0.022 U	0.021 U	0.021 U	0.022 U	0.021 U
Nickel	mg/kg	30^A 310^B 130^C	n/v	-	-	-	-	-	6.6	-	7.7	-	-	6.4	9.5	6.9	5.1 U	5.3 U	5.6 U	5.8
Potassium	mg/kg	10,000$_e^{ABC}$	n/v	-	-	-	-	-	1,130	-	1,350	-	-	944	1,640	1,290	536	1,120	758	1,070
Selenium	mg/kg	3.9$_n^A$ 180^B 4$_q^C$	n/v	-	-	-	-	-	4.7 U	-	4.4 U	-	-	4.3 U	4.4 U	4.4 U	4.1 U	4.2 U	4.4 U	4.2 U
Silver	mg/kg	2^A 180^B 8.3^C	n/v	-	-	-	-	-	0.70 U	-	0.67 U	-	-	0.65 U	0.66 U	0.66 U	**4.2^A**	0.63 U	0.67 U	0.63 U
Sodium	mg/kg	10,000$_e^{ABC}$	n/v	-	-	-	-	-	164 U	-	155 U	-	-	152 U	231	200	143 U	179	156 U	204
Thallium	mg/kg	10,000$_e^{ABC}$	n/v	-	-	-	-	-	7.0 U	-	6.7 U	-	-	6.5 U	6.6 U	6.6 U	6.1 U	6.3 U	6.7 U	6.3 U
Vanadium	mg/kg	10,000$_e^{ABC}$	n/v	-	-	-	-	-	12.3	-	14.8	-	-	13.5	16.8	13.5	5.8	10.5	9.5	9.4
Zinc	mg/kg	109$_n^A$ 10,000$_e^B$ 2,480^C	n/v	-	-	-	-	-	23.3	-	17.2	-	-	20.6	22.3	16.7	17.1	18.2	15.3 ^	15.4
Metals - TCLP																				
Arsenic	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Polychlorinated Biphenyls																				
Aroclor 1016	mg/kg	$_o^{ABC}$	n/v	-	-	-	-	-	-	-	-	-	-	-	0.20 U	0.28 U	0.23 U	-	-	-
Aroclor 1221	mg/kg	$_o^{ABC}$	n/v	-	-	-	-	-	-	-	-	-	-	-	0.20 U	0.28 U	0.23 U	-	-	-
Aroclor 1232	mg/kg	$_o^{ABC}$	n/v	-	-	-	-	-	-	-	-	-	-	-	0.20 U	0.28 U	0.23 U	-	-	-
Aroclor 1242	mg/kg	$_o^{ABC}$	n/v	-	-	-	-	-	-	-	-	-	-	-	0.20 U	0.28 U	0.23 U	-	-	-
Aroclor 1248	mg/kg	$_o^{ABC}$	n/v	-	-	-	-	-	-	-	-	-	-	-	0.20 U	0.28 U	0.23 U	-	-	-
Aroclor 1254	mg/kg	$_o^{ABC}$	n/v	-	-	-	-	-	-	-	-	-	-	-	0.20 U	0.28 U	0.23 U	-	-	-
Aroclor 1260	mg/kg	$_o^{ABC}$	n/v	-	-	-	-	-	-	-	-	-	-	-	0.20 U	0.28 U	0.23 U	-	-	-
Polychlorinated Biphenyls (PCBs)	mg/kg	0.1^A 1^B 3.2^C	n/v	-	-	-	-	-	-	-	-	-	-	-	ND	ND	ND	-	-	-
Pesticides																				
Aldrin	µg/kg	5$_m^A$ 97^B 190^C	n/v	-	-	-	-	-	-	-	-	-	-	-	9.4 U	1.9 U	170 U	-	-	-
BHC, alpha-	µg/kg	20^{AC} 480^B	n/v	-	-	-	-	-	-	-	-	-	-	-	9.4 U	1.9 U	170 U	-	-	-
BHC, beta-	µg/kg	36^A 360^B 90^C	n/v	-	-	-	-	-	-	-	-	-	-	-	9.4 U	1.9 U	170 U	-	-	-
BHC, delta-	µg/kg	40$_n^A$ 100,000$_b^B$ 250^C	n/v	-	-	-	-	-	-	-	-	-	-	-	9.4 U	1.9 U	170 U	-	-	-
Camphechlor (Toxaphene)	µg/kg	100,000$_a^A$ 100,000$_b^B$ 1,000,000$_q^C$	n/v	-	-	-	-	-	-	-	-	-	-	-	94 U	19 U	1,700 U	-	-	-
Chlordane, alpha-	µg/kg	94^A 4,200^B 2,900^C	n/v	-	-	-	-	-	-	-	-	-	-	-	9.4 U	11	170 U	-	-	-
Chlordane, trans- (gamma-Chlordane)	µg/kg	100,000$_a^A$ 100,000$_b^B$ 1,000,000$_q^C$	n/v	-	-	-	-	-	-	-	-	-	-	-	9.4	9.5 J	170 U	-	-	-
DDD (p,p'-DDD)	µg/kg	3.3$_m^A$ 13,000^B 14,000^C	n/v	-	-	-	-	-	-	-	-	-	-	-	9.4 UJ	**27 J^A**	170 U	-	-	-
DDE (p,p'-DDE)	µg/kg	3.3$_m^A$ 8,900^B 17,000^C	n/v	-	-	-	-	-	-	-	-	-	-	-	**19^A**	**13^A**	170 U	-	-	-
DDT (p,p'-DDT)	µg/kg	3.3$_m^A$ 7,900^B 136,000^C	n/v	-	-	-	-	-	-	-	-	-	-	-	9.4 U	2.5	170 U	-	-	-
Dieldrin	µg/kg	5$_m^A$ 200^B 100^C	n/v	-	-	-	-	-	-	-	-	-	-	-	9.4 U	1.9 U	170 U	-	-	-
Endosulfan I	µg/kg	2,400$_n^A$ 24,000^B 102,000^C	n/v	-	-	-	-	-	-	-	-	-	-	-	9.4 U	1.9 U	170 U	-	-	-
Endosulfan II	µg/kg	2,400$_n^A$ 24,000^B 102,000^C	n/v	-	-	-	-	-	-	-	-	-	-	-	9.4 U	1.9 U	170 U	-	-	-
Endosulfan Sulfate	µg/kg	2,400$_n^A$ 24,000^B 1,000,000$_q^C$	n/v	-	-	-	-	-	-	-	-	-	-	-	9.4 U	1.9 U	170 U	-	-	-
Endrin	µg/kg	14^A 11,000^B 60^C	n/v	-	-	-	-	-	-	-	-	-	-	-	9.4 U	1.9 U	170 U	-	-	-
Endrin Aldehyde	µg/kg	100,000$_a^A$ 100,000$_b^B$ 1,000,000$_q^C$	n/v	-	-	-	-	-	-	-	-	-	-	-	9.4 U	1.9 U	170 U	-	-	-
Endrin Ketone	µg/kg	100,000$_a^A$ 100,000$_b^B$ 1,000,000$_q^C$	n/v	-	-	-	-	-	-	-	-	-	-	-	9.4 U	1.9 U	170 U	-	-	-
Heptachlor	µg/kg	42^A 2,100^B 380^C	n/v	-	-	-	-	-	-	-	-	-	-	-	9.4 U	1.9 U	170 U	-	-	-
Heptachlor Epoxide	µg/kg	100,000$_a^A$ 100,000$_b^B$ 1,000,000$_q^C$	n/v	-	-	-	-	-	-	-	-	-	-	-	9.4 U	1.9 U	170 U	-	-	-
Lindane (Hexachlorocyclohexane, gamma)	µg/kg	100^{AC} 1,300^B	n/v	-	-	-	-	-	-	-	-	-	-	-	9.4 U	1.9 U	170 U	-	-	-
Methoxychlor (4,4'-Methoxychlor)	µg/kg	100,000$_a^A$ 100,000$_b^B$ 1,000,000$_q^C$	n/v	-	-	-	-	-	-	-	-	-	-	-	9.4 U	1.9 U	170 U	-	-	-

See notes on last page.

Table 1
Summary of Analytical Results - Soil Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Sample Location				GP-01	GP-06/MW-01	GP-10	GP-11/MW-02	GP-12	B/MW-100		B-101	B/MW-102	B-103		B/MW-104		B-105			B/MW-106
Sample Date				11-Jun-14	11-Jun-14	11-Jun-14	11-Jun-14	11-Jun-14	29-Aug-18	29-Aug-18	29-Aug-18	29-Aug-18	30-Aug-18	30-Aug-18	31-Aug-18	31-Aug-18	4-Sep-18	4-Sep-18	4-Sep-18	4-Sep-18
Sample ID				GP-01 5.7FT	GP-06 8-8.1FT	GP-10 8-8.2FT	GP-11 7.4FT	GP-12 9FT	CNL-B100-S	CNL-B100-SD	CNL-B101-S	CNL-B102-S	CNL-B103-S	CNL-B103-S	CNL-B104-S	CNL-B104-SD	CNL-B105A-S	CNL-B105B-S	CNL-B105B-S	CNL-B106-S
Sample Depth				5.7 ft	8 - 8.1 ft	8 - 8.2 ft	7.4 ft	9 ft	8 - 9.3 ft	8 - 9.3 ft	6 - 7.5 ft	8 - 8.1 ft	6 - 8.5 ft	6 - 8.5 ft	2 - 3.6 ft	2 - 3.6 ft	0.3 - 0.6 ft	4.5 - 4.9 ft	4.5 - 4.9 ft	0.3 - 2.1 ft
Sampling Company				LABRNY	LABRNY	LABRNY	LABRNY	LABRNY	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory				ESC	ESC	ESC	ESC	ESC	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL
Laboratory Work Order				L704675	L704675	L704675	L704675	L704675	480-141385-1	480-141068-1	480-141385-1	480-141068-1	480-141177-1	480-141385-1	480-141177-1	480-141177-1	480-141228-1	480-141228-1	480-141385-1	480-141228-1
Laboratory Sample ID				L704675-01	L704675-02	L704675-03	L704675-04	L704675-05	480-141385-3	480-141068-2	480-141385-4	480-141068-4	480-141177-1	480-141385-5	480-141177-2	480-141177-3	480-141228-1	480-141228-2	480-141385-6	480-141228-3
Sample Type	Units	NYSDEC-Part 375	NYSDEC CP-51							Field Duplicate						Field Duplicate				
Polycyclic Aromatic Hydrocarbons																				
Acenaphthene	µg/kg	20,000[A] 100,000[B] 98,000[C]	20,000[F]	-	37 U	38 U	-	39 U	960 U	-	930 U	-	-	910 U	190 U	190 U	-	190	-	3,600 U
Acenaphthylene	µg/kg	100,000[A] 100,000[B] 107,000[C]	100,000[F]	-	37 U	38 U	-	39 U	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Anthracene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	100,000[F]	-	37 U	38 U	-	39 U	960 U	-	930 U	-	-	910 U	190 U	190 U	-	1,100	-	3,600 U
Benzo(a)anthracene	µg/kg	1,000[A] 1,000[BC]	1,000[F]	-	37 U	38 U	-	39 U	960 U	-	930 U	-	-	910 U	190 U	190 U	-	**1,300[ABCF]**	-	3,600 U
Benzo(a)pyrene	µg/kg	1,000[A] 1,000[B] 22,000[C]	1,000[F]	-	37 U	38 U	-	39 U	960 U	-	930 U	-	-	910 U	190 U	190 U	-	1,000	-	3,600 U
Benzo(b)fluoranthene	µg/kg	1,000[A] 1,000[B] 1,700[C]	1,000[F]	-	37 U	38 U	-	39 U	960 U	-	930 U	-	-	910 U	190 U	190 U	-	**1,200[ABF]**	-	3,600 U
Benzo(g,h,i)perylene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	100,000[F]	-	37 U	38 U	-	39 U	960 U	-	930 U	-	-	910 U	190 U	190 U	-	730	-	3,600 U
Benzo(k)fluoranthene	µg/kg	800[A] 3,900[B] 1,700[C]	800[F]	-	37 U	38 U	-	39 U	960 U	-	930 U	-	-	910 U	190 U *	190 U *	-	720	-	3,600 U
Chrysene	µg/kg	1,000[A] 3,900[B] 1,000[C]	1,000[F]	-	37 U	38 U	-	39 U	960 U	-	930 U	-	-	910 U	190 U	190 U	-	**1,200[ACF]**	-	3,600 U
Dibenzo(a,h)anthracene	µg/kg	330[A] 330[B] 1,000,000[C]	330[F]	-	37 U	38 U	-	39 U	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Fluoranthene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	100,000[F]	-	37 U	38 U	-	39 U	960 U	-	930 U	-	-	910 U	190 U	190 U	-	3,700	-	3,600 U
Fluorene	µg/kg	30,000[A] 100,000[B] 386,000[C]	30,000[F]	-	37 U	38 U	-	39 U	960 U	-	930 U	-	-	910 U	190 U	190 U	-	310	-	3,600 U
Indeno(1,2,3-cd)pyrene	µg/kg	500[A] 500[B] 8,200[C]	500[F]	-	37 U	38 U	-	39 U	960 U	-	930 U	-	-	910 U	190 U	190 U	-	**670[ABF]**	-	3,600 U
Naphthalene	µg/kg	12,000[AC] 100,000[B]	12,000[EF]	-	1,700	38 U	-	39 U	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Phenanthrene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	100,000[F]	-	37 U	38 U	-	39 U	960 U	-	930 U	-	-	910 U	190 U	190 U	-	4,500	-	3,600 U
Pyrene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	100,000[F]	-	37 U	38 U	-	39 U	960 U	-	930 U	-	-	910 U	190 U	190 U	-	2,700	-	3,600 U
Total PAH	µg/kg	n/v	n/v	-	1,700	ND	-	ND	ND	-	ND	-	-	ND	ND	ND	-	19,320	-	ND
Semi-Volatile Organic Compounds																				
Acetophenone	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Atrazine	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Benzaldehyde	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Biphenyl	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Bis(2-Chloroethoxy)methane	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Bis(2-Chloroethyl)ether	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Bis(2-Chloroisopropyl)ether (2,2-oxybis(1-Chloropropane))	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Bis(2-Ethylhexyl)phthalate (DEHP)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Bromophenyl Phenyl Ether, 4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Butyl Benzyl Phthalate	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Caprolactam	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Carbazole	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	580	-	3,600 U
Chloro-3-methyl phenol, 4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Chloroaniline, 4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Chloronaphthalene, 2-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Chlorophenol, 2- (ortho-Chlorophenol)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Chlorophenyl Phenyl Ether, 4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Cresol, o- (Methylphenol, 2-)	µg/kg	330[A] 100,000[B] 330[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Cresol, p- (Methylphenol, 4-)	µg/kg	330[A] 100,000[B] 330[C]	n/v	-	-	-	-	-	1,900 U	-	1,800 U	-	-	1,800 U	370 U	370 U	-	350 U	-	6,900 U
Dibenzofuran	µg/kg	7,000[A] 59,000[B] 210,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	460	-	3,600 U
Dibutyl Phthalate (DBP)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Dichlorobenzidine, 3,3'-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	1,900 U	-	1,800 U	-	-	1,800 U	370 U	370 U	-	350 U	-	6,900 U
Dichlorophenol, 2,4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Diethyl Phthalate	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U *	190 U *	-	180 U	-	3,600 U
Dimethyl Phthalate	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Dimethylphenol, 2,4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Dinitro-o-cresol, 4,6-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	1,900 U	-	1,800 U	-	-	1,800 U	370 U	370 U	-	350 U	-	6,900 U
Dinitrophenol, 2,4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	9,400 U	-	9,100 U	-	-	8,900 U	1,900 U	1,900 U	-	1,700 U	-	35,000 U
Dinitrotoluene, 2,4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Dinitrotoluene, 2,6-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Di-n-Octyl phthalate	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Hexachlorobenzene	µg/kg	330[A] 1,200[B] 3,200[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Hexachlorocyclopentadiene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Hexachloroethane	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Isophorone	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Methylnaphthalene, 2-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Nitroaniline, 2-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	1,900 U	-	1,800 U	-	-	1,800 U	370 U	370 U	-	350 U	-	6,900 U
Nitroaniline, 3-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	1,900 U	-	1,800 U	-	-	1,800 U	370 U	370 U	-	350 U	-	6,900 U
Nitroaniline, 4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	1,900 U	-	1,800 U	-	-	1,800 U	370 U	370 U	-	350 U	-	6,900 U
Nitrobenzene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	15,000[D]	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Nitrophenol, 2-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Nitrophenol, 4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	1,900 U	-	1,800 U	-	-	1,800 U	370 U *	370 U *	-	350 U	-	6,900 U
N-Nitrosodi-n-Propylamine	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
n-Nitrosodiphenylamine	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Pentachlorophenol	µg/kg	800[A] 6,700[B] 800[C]	n/v	-	-	-	-	-	1,900 U	-	1,800 U	-	-	1,800 U	370 U	370 U	-	350 U	-	**6,900[ABC]**
Phenol	µg/kg	330[A] 100,000[B] 330[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Trichlorophenol, 2,4,5-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Trichlorophenol, 2,4,6-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	960 U	-	930 U	-	-	910 U	190 U	190 U	-	180 U	-	3,600 U
Total SVOC	µg/kg	n/v	n/v	-	-	-	-	-	ND	-	ND	-	-	ND	ND	ND	-	1,040	-	ND
SVOC TICs																				
Total SVOC TICs	µg/kg	n/v	n/v	-	-	-	-	-	5,200 TJ	-	4,500 TJ	-	-	2,300 TJ	4,800 TJ	4,760 TJ	-	12,150 TJN	-	135,100 TJN

See notes on last page.

Table 1
Summary of Analytical Results - Soil Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Sample Location				GP-01	GP-06/MW-01	GP-10	GP-11/MW-02	GP-12	B/MW-100		B-101	B/MW-102	B-103		B/MW-104		B-105			B/MW-106
Sample Date				11-Jun-14	11-Jun-14	11-Jun-14	11-Jun-14	11-Jun-14	29-Aug-18	29-Aug-18	29-Aug-18	29-Aug-18	30-Aug-18	30-Aug-18	31-Aug-18	31-Aug-18	4-Sep-18	4-Sep-18	4-Sep-18	4-Sep-18
Sample ID				GP-01 5.7FT	GP-06 8-8.1FT	GP-10 8-8.2FT	GP-11 7.4FT	GP-12 9FT	CNL-B100-S	CNL-B100-SD	CNL-B101-S	CNL-B102-S	CNL-B103-S	CNL-B103-S	CNL-B104-S	CNL-B104-SD	CNL-B105A-S	CNL-B105B-S	CNL-B105B-S	CNL-B106-S
Sample Depth				5.7 ft	8 - 8.1 ft	8 - 8.2 ft	7.4 ft	9 ft	8 - 9.3 ft	8 - 9.3 ft	6 - 7.5 ft	8 - 8.1 ft	6 - 8.5 ft	6 - 8.5 ft	2 - 3.6 ft	2 - 3.6 ft	0.3 - 0.6 ft	4.5 - 4.9 ft	4.5 - 4.9 ft	0.3 - 2.1 ft
Sampling Company				LABRNY	LABRNY	LABRNY	LABRNY	LABRNY	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory				ESC	ESC	ESC	ESC	ESC	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL
Laboratory Work Order				L704675	L704675	L704675	L704675	L704675	480-141385-1	480-141068-1	480-141385-1	480-141068-1	480-141177-1	480-141385-1	480-141177-1	480-141177-1	480-141228-1	480-141228-1	480-141385-1	480-141228-1
Laboratory Sample ID				L704675-01	L704675-02	L704675-03	L704675-04	L704675-05	480-141385-3	480-141068-2	480-141385-4	480-141068-4	480-141177-1	480-141385-5	480-141177-2	480-141177-3	480-141228-1	480-141228-2	480-141385-6	480-141228-3
Sample Type										Field Duplicate						Field Duplicate				
	Units	NYSDEC-Part 375	NYSDEC CP-51																	
Semi-Volatile Organic Compounds - TCLP																				
Cresol, m- (Methylphenol, 3-)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cresol, o- (Methylphenol, 2-)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cresol, p- (Methylphenol, 4-)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dichlorobenzene, 1,4-	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dinitrotoluene, 2,4-	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachlorobenzene	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachloroethane	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrobenzene	mg/L	n/v	15[D]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pentachlorophenol	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Pyridine	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichlorophenol, 2,4,5-	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichlorophenol, 2,4,6-	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Volatile Organic Compounds																				
Acetone	µg/kg	50[AC] 100,000[B]	n/v	280 U	**76,000[AC]**	290 U	280 U	300 U	-	28 U	-	570 U	26 U	-	28 U F1	-	2,100 U	26 U vs	-	2,200 U
Benzene	µg/kg	60[AC] 4,800[B]	60[EF]	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Bromodichloromethane	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Bromoform (Tribromomethane)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Bromomethane (Methyl bromide)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	28 U	1,100 U	29 U	28 U	30 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 UJ
Butylbenzene, n-	µg/kg	12,000[AC] 100,000[B]	12,000[EF]	5.6 U	3,900	5.7 U	5.6 U	6.0 U	-	5.7 U	-	310	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Butylbenzene, sec- (2-Phenylbutane)	µg/kg	11,000[AC] 100,000[B]	11,000[EF]	5.6 U	1,600	5.7 U	5.6 U	6.0 U	-	5.7 U	-	150	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U *
Butylbenzene, tert-	µg/kg	5,900[AC] 100,000[B]	5,900[EF]	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U *
Carbon Disulfide	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Carbon Tetrachloride (Tetrachloromethane)	µg/kg	760[AC] 2,400[B]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U F1	-	430 U	5.2 U vs	-	440 U
Chlorobenzene (Monochlorobenzene)	µg/kg	1,100[AC] 100,000[B]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Chlorobromomethane	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	-	-	-	-	-	-	-	-	-	-	-
Chloroethane (Ethyl Chloride)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	28 U	1,100 U	29 U	28 U	30 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Chloroform (Trichloromethane)	µg/kg	370[AC] 49,000[B]	n/v	28 U	1,100 U	29 U	28 U	30 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U F1	-	430 U	5.2 U vs	-	440 U
Chloromethane	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	14 U	560 U	14 U	14 U	15 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U F1	-	430 U	5.2 U vs	-	440 U
Cyclohexane	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.6 U	3,800	5.7 U	5.6 U	6.0 U	-	5.7 U	-	3,400	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	1,200
Dibromo-3-Chloropropane, 1,2- (DBCP)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	28 U	1,100 U	29 U	28 U	30 U	-	5.7 U	-	110 U	5.2 U	-	5.6 UJ	-	430 U	5.2 U vs	-	440 U
Dibromochloromethane	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Dichlorobenzene, 1,2-	µg/kg	1,100[AC] 100,000[B]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Dichlorobenzene, 1,3-	µg/kg	2,400[AC] 49,000[B]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Dichlorobenzene, 1,4-	µg/kg	1,800[AC] 13,000[B]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Dichlorodifluoromethane (Freon 12)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	28 U	1,100 U	29 U	28 U	30 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Dichloroethane, 1,1-	µg/kg	270[AC] 26,000[B]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Dichloroethane, 1,2-	µg/kg	20[A] 3,100[B] 20[C]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U F1	-	430 U	5.2 U vs	-	440 U
Dichloroethene, 1,1-	µg/kg	330[AC] 100,000[B]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Dichloroethene, cis-1,2-	µg/kg	250[AC] 100,000[B]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Dichloroethene, trans-1,2-	µg/kg	190[AC] 100,000[B]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Dichloropropane, 1,2-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Dichloropropene, cis-1,3-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U F1	-	430 U	5.2 U vs	-	440 U
Dichloropropene, trans-1,3-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Ethylbenzene	µg/kg	1,000[AC] 41,000[B]	1,000[EF]	5.6 U	**4,400[ACEF]**	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U F1	-	430 U	5.2 U vs	-	**1,300[ACEF]**
Ethylene Dibromide (Dibromoethane, 1,2-)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Hexanone, 2- (Methyl Butyl Ketone)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	56 U	2,200 U	57 U	56 U	60 U	-	28 U	-	570 U	26 U	-	28 U	-	2,100 U	26 U vs	-	2,200 U
Isopropylbenzene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	2,300[EF]	56 U	**3,800[EF]**	57 U	56 U	60 U	-	5.7 U	-	260	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Isopropyltoluene, p- (Cymene)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	10,000[EF]	5.6 U	3,600	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U *
Methyl Acetate	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	110 U	66,000	110 U	110 U	120 U	-	28 U	-	570 U	26 U	-	28 U	-	2,100 U	26 U vs	-	2,200 U
Methyl Ethyl Ketone (MEK) (2-Butanone)	µg/kg	120[AC] 100,000[B]	n/v	56 U	2,200 U	57 U	56 U	60 U	-	28 U	-	570 U	26 U	-	28 UJ	-	2,100 U	26 U vs	-	2,200 U
Methyl Isobutyl Ketone (MIBK)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	56 U	2,200 U	57 U	56 U	60 U	-	28 U	-	570 U	26 U	-	28 U	-	2,100 U	26 U vs	-	2,200 U
Methyl tert-butyl ether (MTBE)	µg/kg	930[AC] 100,000[B]	930[E]	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Methylcyclohexane	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.6 U	27,000 E	5.7 U	5.6 U	6.0 U	-	5.7 U	-	1,500	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	930
Methylene Chloride (Dichloromethane)	µg/kg	50[AC] 100,000[B]	n/v	28 U	1,100 U	29 U	28 U	30 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Naphthalene	µg/kg	12,000[AC] 100,000[B]	12,000[EF]	28 U	**17,000[ACEF]**	29 U	28 U	30 U	-	-	-	-	-	-	-	-	-	-	-	-
Propylbenzene, n-	µg/kg	3,900[AC] 100,000[B]	3,900[EF]	5.6 U	**14,000[ACEF]**	5.8	5.6 U	6.0 U	-	5.7 U	-	810	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Styrene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Tetrachloroethane, 1,1,2,2-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 UJ	-	430 U	5.2 U vs	-	440 U
Tetrachloroethene (PCE)	µg/kg	1,300[AC] 19,000[B]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Toluene	µg/kg	700[AC] 100,000[B]	700[EF]	28 U	1,100 U	29 U	28 U	30 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Trichlorobenzene, 1,2,3-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	-	-	-	-	-	-	-	-	-	-	-
Trichlorobenzene, 1,2,4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Trichloroethane, 1,1,1-	µg/kg	680[AC] 100,000[B]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U F1	-	430 U	5.2 U vs	-	440 U
Trichloroethane, 1,1,2-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Trichloroethene (TCE)	µg/kg	470[AC] 21,000[B]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Trichlorofluoromethane (Freon 11)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	28 U	1,100 U	29 U	28 U	30 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Trichlorotrifluoroethane (Freon 113)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Trimethylbenzene, 1,2,4-	µg/kg	3,600[AC] 52,000[B]	3,600[EF]	5.6 U	**110,000[ABCEF]**	25	20	6.0 U	-	5.7 U	-	**6,900[ACEF]**	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	3,400
Trimethylbenzene, 1,3,5-	µg/kg	8,400[AC] 52,000[B]	8,400[EF]	5.6 U	**35,000[ACEF]**	8.1	5.6 U	6.0 U	-	5.7 U	-	710	5.2 U	-	5.6 U	-	430 U	5.2 U vs	-	440 U
Vinyl Chloride	µg/kg	20[AC] 900[B]	n/v	5.6 U	220 U	5.7 U	5.6 U	6.0 U	-	5.7 U	-	110 U	5.2 U	-	5.6 U F1	-	430 U	5.2 U vs	-	440 U
Xylene, m & p-	µg/kg	260[A] 100,000[B] 1,600[C]	n/v	11 U	**38,000[AC]**	11 U	11 U	12 U	-	-	-	-	-	-	-	-	-	-	-	-
Xylene, o-	µg/kg	260[A] 100,000[B] 1,600[C]	n/v	5.6 U	**4,000[AC]**	5.7 U	5.6 U	6.0 U	-	-	-	-	-	-	-	-	-	-	-	-
Xylenes, Total	µg/kg	260[A] 100,000[B] 1,600[C]	260[EF]	-	-	-	-	-	-	11 U	-	**340[AEF]**	10 U	-	11 U	-	860 U	10 U vs	-	**1,500[AEF]**
Total VOC	µg/kg	n/v	n/v	ND	408,100	38.9	20	ND	-	ND	-	14,040	ND	-	ND	-	ND	ND	-	6,830
VOC TICs																				
Total VOC TICs	µg/kg	n/v	n/v	-	-	-	-	-	-	ND	-	48,000 TJN	ND	-	ND	-	199,000 TJN	ND	-	59,100 TJN

See notes on last page.

Table 1
Summary of Analytical Results - Soil Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Sample Location				GP-01	GP-06/MW-01	GP-10	GP-11/MW-02	GP-12	B/MW-100		B-101	B/MW-102	B-103		B/MW-104		B-105			B/MW-106
Sample Date				11-Jun-14	11-Jun-14	11-Jun-14	11-Jun-14	11-Jun-14	29-Aug-18	29-Aug-18	29-Aug-18	29-Aug-18	30-Aug-18	30-Aug-18	31-Aug-18	31-Aug-18	4-Sep-18	4-Sep-18	4-Sep-18	4-Sep-18
Sample ID				GP-01 5.7FT	GP-06 8-8.1FT	GP-10 8-8.2FT	GP-11 7.4FT	GP-12 9FT	CNL-B100-S	CNL-B100-SD	CNL-B101-S	CNL-B102-S	CNL-B103-S	CNL-B103-S	CNL-B104-S	CNL-B104-SD	CNL-B105A-S	CNL-B105B-S	CNL-B105B-S	CNL-B106-S
Sample Depth				5.7 ft	8 - 8.1 ft	8 - 8.2 ft	7.4 ft	9 ft	8 - 9.3 ft	8 - 9.3 ft	6 - 7.5 ft	8 - 8.1 ft	6 - 8.5 ft	6 - 8.5 ft	2 - 3.6 ft	2 - 3.6 ft	0.3 - 0.6 ft	4.5 - 4.9 ft	4.5 - 4.9 ft	0.3 - 2.1 ft
Sampling Company				LABRNY	LABRNY	LABRNY	LABRNY	LABRNY	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory				ESC	ESC	ESC	ESC	ESC	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL
Laboratory Work Order				L704675	L704675	L704675	L704675	L704675	480-141385-1	480-141068-1	480-141385-1	480-141068-1	480-141177-1	480-141385-1	480-141177-1	480-141177-1	480-141228-1	480-141228-1	480-141385-1	480-141228-1
Laboratory Sample ID				L704675-01	L704675-02	L704675-03	L704675-04	L704675-05	480-141385-3	480-141068-2	480-141385-4	480-141068-4	480-141177-1	480-141385-5	480-141177-2	480-141177-3	480-141228-1	480-141228-2	480-141385-6	480-141228-3
Sample Type	Units	NYSDEC-Part 375	NYSDEC CP-51							Field Duplicate						Field Duplicate				
Volatile Organic Compounds - TCLP																				
Benzene	mg/L	n/v	0.06[EF]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Carbon Tetrachloride (Tetrachloromethane)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chlorobenzene (Monochlorobenzene)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloroform (Trichloromethane)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dichloroethane, 1,2-	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Dichloroethene, 1,1-	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Methyl Ethyl Ketone (MEK) (2-Butanone)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Tetrachloroethene (PCE)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichloroethene (TCE)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vinyl Chloride	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-

See notes on last page.

Table 1
Summary of Analytical Results - Soil Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Sample Location				B/MW-107	B-108	B-109	B/MW-110	B/MW-111	B/MW-112	B/MW-113	B/MW-114	B-115	B-117	B-118		B-119
Sample Date				5-Sep-18	7-Sep-18	7-Sep-18	7-Sep-18	7-Sep-18	18-Feb-19	18-Feb-19	19-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19
Sample ID				CNL-B107-S	CNL-B108-S	CNL-B109-S	CNL-B110-S	CNL-B111-S	CNL-B112-S	CNL-B113-S	CNL-B114-S	CNL-B115-S	CNL-B117-S	CNL-B118-S	CNL-BDUP-S (VOCs)	CNL-B119-S
Sample Depth				0.3 - 2 ft	3 - 3.6 ft	5 - 5.5 ft	2 - 3.5 ft	3 - 4 ft	6 - 6.6 ft	9.5 - 10 ft	5.9 - 6.6 ft	9 - 11 ft	5.4 - 5.9 ft	3.2 - 3.7 ft	3.2 - 3.7 ft	4.5 - 5 ft
Sampling Company				STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory				TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL
Laboratory Work Order				480-141294-1	480-141438-1	480-141438-1	480-141438-1	480-141438-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1
Laboratory Sample ID				480-141294-1	480-141438-1	480-141438-2	480-141438-3	480-141438-4	480-149215-1	480-149215-2	480-149215-3	480-149425-1	480-149425-2	480-149425-8	480-149425-7	480-149425-3
Sample Type	Units	NYSDEC-Part 375	NYSDEC CP-51												Field Duplicate	
General Chemistry																
Cyanide	mg/kg	27[AB] 40[C]	n/v	1.2 U	-	-	-	-	-	-	-	-	-	-	-	-
Cyanide (Reactive)	mg/kg	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Flashpoint	deg F	n/v	n/v	-	-	-	-	-	-	-	-	-	-	> 176	-	-
pH, lab	S.U.	n/v	n/v	-	-	-	-	-	-	-	-	-	-	8.0 HF	-	-
Sulfide (Reactive)	mg/kg	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Temperature, Lab	deg C	n/v	n/v	-	-	-	-	-	-	-	-	-	-	19.6 HF	-	-
Total Solids	%	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Solids (Fixed)	%	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Total Solids (Volatile)	%	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals																
Aluminum	mg/kg	10,000$_e$[ABC]	n/v	7,160	3,110	3,330	4,530	5,460	4,250 J	4,730	4,840	-	-	-	-	-
Antimony	mg/kg	10,000$_e$[ABC]	n/v	17.7 U	16.8 U	17.1 U	16.0 U	16.9 U	17.0 U	17.4 U	17.0 U	-	-	-	-	-
Arsenic	mg/kg	13$_h$[A] 16$_q$[BC]	n/v	6.3	2.2 U	2.3 U	4.0	3.0	2.5	2.8	2.8	2.3 U	2.2 U	-	-	2.2 U
Barium	mg/kg	350$_h$[A] 400[B] 820[C]	n/v	73.7	18.8	14.9	21.2	25.6	20.3	21.3	22.8	25.4 J-	18.2	-	-	23.7
Beryllium	mg/kg	7.2[A] 72[B] 47[C]	n/v	0.34	0.22 U	0.23 U	0.23	0.29	0.23 U	0.24	0.23 U	-	-	-	-	-
Cadmium	mg/kg	2.5$_h$[A] 4.3[B] 7.5[C]	n/v	0.96	0.22 U	0.23 U	0.21 U	0.23 U	0.23 U	0.23 U	0.23 U	0.23 U	0.22 U	-	-	0.22 U
Calcium	mg/kg	10,000$_e$[ABC]	n/v	**22,700**[ABC]	**33,400**[ABC]	**29,300**[ABC]	**30,100**[ABC]	2,070	**27,900**[ABC]	3,640	3,410	-	-	-	-	-
Chromium	mg/kg	30$_{s,t}$[A] 180[B] $_{NS,q}$[C]	n/v	9.8	5.6	5.1	6.0	7.7	6.2 J-	6.9	7.2	8.1 J-	4.6	-	-	7.0
Cobalt	mg/kg	10,000$_d$[ABC]	n/v	4.4	2.7	2.5	3.5	3.7	3.3	3.6	3.8	-	-	-	-	-
Copper	mg/kg	50[A] 270[B] 1,720[C]	n/v	49.0	4.7	5.0	6.7	15.7	7.2	9.9	8.1	-	-	-	-	-
Iron	mg/kg	10,000$_e$[ABC]	n/v	**11,900**[ABC]	7,410	7,580	**11,300**[ABC]	**11,700**[ABC]	8,960	9,690	9,970	-	-	-	-	-
Lead	mg/kg	63$_h$[A] 400[B] 450[C]	n/v	**421**[AB]	2.8	2.7	**107**[A]	8.5	3.2	6.1	5.1	5.8	3.5	-	-	4.6
Magnesium	mg/kg	10,000$_e$[ABC]	n/v	6,110	6,850	7,500	8,340	1,510	5,990	2,130	2,080	-	-	-	-	-
Manganese	mg/kg	1,600$_h$[A] 2,000$_q$[BC]	n/v	358	294	225	324	557	290	384	324	-	-	-	-	-
Mercury	mg/kg	0.18$_h$[A] 0.81[B] 0.73[C]	n/v	**0.66**[A]	0.023 U	0.023 U	0.021 U	0.023 U	0.022 U	0.024 U	0.023 U	0.023 U	0.022 U	-	-	0.023 U
Nickel	mg/kg	30[A] 310[B] 130[C]	n/v	10.8	5.6 U	5.7 U	7.6	8.1	7.1	7.5	9.0	-	-	-	-	-
Potassium	mg/kg	10,000$_e$[ABC]	n/v	1,170	888	861	1,020	916	1,050 J	1,360	1,260	-	-	-	-	-
Selenium	mg/kg	3.9$_h$[A] 180[B] 4$_q$[C]	n/v	4.7 U	4.5 U	4.5 U	4.3 U	4.5 U	4.5 U	4.6 U	4.5 U	4.5 U	4.5 U	-	-	4.5 U
Silver	mg/kg	2[A] 180[B] 8.3[C]	n/v	0.71 U	0.67 U	0.68 U	0.64 U	0.68 U	0.68 U	0.69 U	0.68 U	0.68 U	0.67 U	-	-	0.67 U
Sodium	mg/kg	10,000$_e$[ABC]	n/v	1,410	186	159 U	149 U	228	208	162 U	159 U	-	-	-	-	-
Thallium	mg/kg	10,000$_e$[ABC]	n/v	7.1 U	6.7 U	6.8 U	6.4 U	6.8 U	6.8 U	6.9 U	6.8 U	-	-	-	-	-
Vanadium	mg/kg	10,000$_e$[ABC]	n/v	15.2	10.9	10.3	12.3	14.0	12.4	13.4	14.0	-	-	-	-	-
Zinc	mg/kg	109$_h$[A] 10,000[B] 2,480[C]	n/v	**381**[A]	13.7	11.6	14.1	21.4	17.9	18.8	17.2	-	-	-	-	-
Metals - TCLP																
Arsenic	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Lead	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Polychlorinated Biphenyls																
Aroclor 1016	mg/kg	$_o$[ABC]	n/v	0.21 U	-	-	-	-	-	-	-	-	-	-	-	-
Aroclor 1221	mg/kg	$_o$[ABC]	n/v	0.21 U	-	-	-	-	-	-	-	-	-	-	-	-
Aroclor 1232	mg/kg	$_o$[ABC]	n/v	0.21 U	-	-	-	-	-	-	-	-	-	-	-	-
Aroclor 1242	mg/kg	$_o$[ABC]	n/v	0.21 U	-	-	-	-	-	-	-	-	-	-	-	-
Aroclor 1248	mg/kg	$_o$[ABC]	n/v	0.21 U	-	-	-	-	-	-	-	-	-	-	-	-
Aroclor 1254	mg/kg	$_o$[ABC]	n/v	0.21 U	-	-	-	-	-	-	-	-	-	-	-	-
Aroclor 1260	mg/kg	$_o$[ABC]	n/v	0.21 U	-	-	-	-	-	-	-	-	-	-	-	-
Polychlorinated Biphenyls (PCBs)	mg/kg	0.1[A] 1[B] 3.2[C]	n/v	ND	-	-	-	-	-	-	-	-	-	-	-	-
Pesticides																
Aldrin	µg/kg	5$_m$[A] 97[B] 190[C]	n/v	3.8 U	-	-	-	-	-	-	-	-	-	-	-	-
BHC, alpha-	µg/kg	20[AC] 480[B]	n/v	3.8 U	-	-	-	-	-	-	-	-	-	-	-	-
BHC, beta-	µg/kg	36[A] 360[B] 90[C]	n/v	3.8 U	-	-	-	-	-	-	-	-	-	-	-	-
BHC, delta-	µg/kg	40$_n$[A] 100,000$_n$[B] 250[C]	n/v	3.8 U	-	-	-	-	-	-	-	-	-	-	-	-
Camphechlor (Toxaphene)	µg/kg	100,000$_a$[A] 100,000$_n$[B] 1,000,000$_q$[C]	n/v	38 U	-	-	-	-	-	-	-	-	-	-	-	-
Chlordane, alpha-	µg/kg	94[A] 4,200[B] 2,900[C]	n/v	3.8 U	-	-	-	-	-	-	-	-	-	-	-	-
Chlordane, trans- (gamma-Chlordane)	µg/kg	100,000$_a$[A] 100,000$_n$[B] 1,000,000$_q$[C]	n/v	3.8 U	-	-	-	-	-	-	-	-	-	-	-	-
DDD (p,p'-DDD)	µg/kg	3.3$_m$[A] 13,000[B] 14,000[C]	n/v	3.8 U	-	-	-	-	-	-	-	-	-	-	-	-
DDE (p,p'-DDE)	µg/kg	3.3$_m$[A] 8,900[B] 17,000[C]	n/v	3.8 U	-	-	-	-	-	-	-	-	-	-	-	-
DDT (p,p'-DDT)	µg/kg	3.3$_m$[A] 7,900[B] 136,000[C]	n/v	3.8 U	-	-	-	-	-	-	-	-	-	-	-	-
Dieldrin	µg/kg	5$_m$[A] 200[B] 100[C]	n/v	3.8 U	-	-	-	-	-	-	-	-	-	-	-	-
Endosulfan I	µg/kg	2,400$_n$[A] 24,000$_n$[B] 102,000[C]	n/v	3.8 U	-	-	-	-	-	-	-	-	-	-	-	-
Endosulfan II	µg/kg	2,400$_n$[A] 24,000$_n$[B] 102,000[C]	n/v	3.8 U	-	-	-	-	-	-	-	-	-	-	-	-
Endosulfan Sulfate	µg/kg	2,400$_n$[A] 24,000$_n$[B] 1,000,000$_q$[C]	n/v	3.8 U	-	-	-	-	-	-	-	-	-	-	-	-
Endrin	µg/kg	14[A] 11,000[B] 60[C]	n/v	3.8 U	-	-	-	-	-	-	-	-	-	-	-	-
Endrin Aldehyde	µg/kg	100,000$_a$[A] 100,000$_n$[B] 1,000,000$_q$[C]	n/v	3.8 U	-	-	-	-	-	-	-	-	-	-	-	-
Endrin Ketone	µg/kg	100,000$_a$[A] 100,000$_n$[B] 1,000,000$_q$[C]	n/v	3.8 U	-	-	-	-	-	-	-	-	-	-	-	-
Heptachlor	µg/kg	42[A] 2,100[B] 380[C]	n/v	3.8 U	-	-	-	-	-	-	-	-	-	-	-	-
Heptachlor Epoxide	µg/kg	100,000$_a$[A] 100,000$_n$[B] 1,000,000$_q$[C]	n/v	3.8 U	-	-	-	-	-	-	-	-	-	-	-	-
Lindane (Hexachlorocyclohexane, gamma)	µg/kg	100[AC] 1,300[B]	n/v	3.8 U	-	-	-	-	-	-	-	-	-	-	-	-
Methoxychlor (4,4'-Methoxychlor)	µg/kg	100,000$_a$[A] 100,000$_n$[B] 1,000,000$_q$[C]	n/v	3.8 U	-	-	-	-	-	-	-	-	-	-	-	-

See notes on last page.

Table 1
Summary of Analytical Results - Soil Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Sample Location				B/MW-107	B-108	B-109	B/MW-110	B/MW-111	B/MW-112	B/MW-113	B/MW-114	B-115	B-117	B-118		B-119
Sample Date				5-Sep-18	7-Sep-18	7-Sep-18	7-Sep-18	7-Sep-18	18-Feb-19	18-Feb-19	19-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19
Sample ID				CNL-B107-S	CNL-B108-S	CNL-B109-S	CNL-B110-S	CNL-B111-S	CNL-B112-S	CNL-B113-S	CNL-B114-S	CNL-B115-S	CNL-B117-S	CNL-B118-S	CNL-BDUP-S (VOCs)	CNL-B119-S
Sample Depth				0.3 - 2 ft	3 - 3.6 ft	5 - 5.5 ft	2 - 3.5 ft	3 - 4 ft	6 - 6.6 ft	9.5 - 10 ft	5.9 - 6.6 ft	9 - 11 ft	5.4 - 5.9 ft	3.2 - 3.7 ft	3.2 - 3.7 ft	4.5 - 5 ft
Sampling Company				STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory				TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL
Laboratory Work Order				480-141294-1	480-141438-1	480-141438-1	480-141438-1	480-141438-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1
Laboratory Sample ID				480-141294-1	480-141438-1	480-141438-2	480-141438-3	480-141438-4	480-149215-1	480-149215-2	480-149215-3	480-149425-1	480-149425-2	480-149425-8	480-149425-7	480-149425-3
Sample Type	Units	NYSDEC-Part 375	NYSDEC CP-51												Field Duplicate	
Polycyclic Aromatic Hydrocarbons																
Acenaphthene	µg/kg	20,000[A] 100,000[B] 98,000[C]	20,000[F]	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	9,000	-	-	5,400
Acenaphthylene	µg/kg	100,000[A] 100,000[B] 107,000[C]	100,000[F]	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Anthracene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	100,000[F]	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	21,000	-	-	18,000
Benzo(a)anthracene	µg/kg	1,000[A] 1,000[RC]	1,000[F]	340	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	**20,000[ABCF]**	-	-	**14,000[ABCF]**
Benzo(a)pyrene	µg/kg	1,000[A] 1,000[B] 22,000[C]	1,000[F]	290	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	**16,000[ABF]**	-	-	**12,000[ABF]**
Benzo(b)fluoranthene	µg/kg	1,000[A] 1,000[B] 1,700[C]	1,000[F]	360	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	**20,000[ABCF]**	-	-	**13,000[ABCF]**
Benzo(g,h,i)perylene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	100,000[F]	280	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	9,900	-	-	7,900
Benzo(k)fluoranthene	µg/kg	800[A] 3,900[B] 1,700[C]	800[F]	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	**8,400[ABCF]**	-	-	**7,900[ABCF]**
Chrysene	µg/kg	1,000[A] 3,900[B] 1,000[C]	1,000[F]	350	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	**19,000[ABCF]**	-	-	**14,000[ABCF]**
Dibenzo(a,h)anthracene	µg/kg	330[A] 330[B] 1,000,000[C]	330[F]	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Fluoranthene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	100,000[F]	750	190 U	200	180 U	190 U	190 U	190 U	190 U	190 U	57,000	-	-	39,000
Fluorene	µg/kg	30,000[A] 100,000[B] 386,000[C]	30,000[F]	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	10,000	-	-	8,500
Indeno(1,2,3-cd)pyrene	µg/kg	500[A] 500[B] 8,200[C]	500[F]	240	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	**9,800[ABCF]**	-	-	**7,300[ABF]**
Naphthalene	µg/kg	12,000[AC] 100,000[B]	12,000[EF]	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	2,700 F2F1	**20,000[ACEF]**	-	-	2,000 U
Phenanthrene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	100,000[F]	500	190 U	270	180 U	190 U	190 U	190 U	190 U	190 U	93,000	-	-	58,000
Pyrene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	100,000[F]	550	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	41,000	-	-	30,000
Total PAH	µg/kg	n/v	n/v	3,660	ND	470	ND	ND	ND	ND	ND	2,700	354,100	-	-	235,000
Semi-Volatile Organic Compounds																
Acetophenone	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	2,000 F1	3,800 U	-	-	2,000 U
Atrazine	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Benzaldehyde	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Biphenyl	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	4,500	-	-	2,000
Bis(2-Chloroethoxy)methane	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Bis(2-Chloroethyl)ether	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Bis(2-Chloroisopropyl)ether (2,2-oxybis(1-Chloropropane))	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Bis(2-Ethylhexyl)phthalate (DEHP)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Bromophenyl Phenyl Ether, 4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Butyl Benzyl Phthalate	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Caprolactam	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Carbazole	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	10,000	-	-	7,600
Chloro-3-methyl phenol, 4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Chloroaniline, 4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Chloronaphthalene, 2-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Chlorophenol, 2- (ortho-Chlorophenol)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Chlorophenyl Phenyl Ether, 4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Cresol, o- (Methylphenol, 2-)	µg/kg	330[m,A] 100,000[B] 330[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Cresol, p- (Methylphenol, 4-)	µg/kg	330[m,A] 100,000[B] 330[C]	n/v	380 U	370 U	370 U	360 U	380 U	370 U	370 U	380 U	370 U	7,500 U	-	-	3,800 U
Dibenzofuran	µg/kg	7,000[A] 59,000[B] 210,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	**20,000[A]**	-	-	**11,000[A]**
Dibutyl Phthalate (DBP)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Dichlorobenzidine, 3,3'-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	380 U	370 U	370 U	360 U	380 U	370 U	370 U	380 U	370 U	7,500 U	-	-	3,800 U
Dichlorophenol, 2,4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Diethyl Phthalate	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Dimethyl Phthalate	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Dimethylphenol, 2,4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Dinitro-o-cresol, 4,6-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	380 U	370 U	370 U	360 U	380 U	370 U	370 U	380 U	370 U	7,500 U	-	-	3,800 U
Dinitrophenol, 2,4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 U	1,900 U	1,900 U	1,800 U	1,900 U	1,900 U	1,900 U	1,900 U	1,900 U	37,000 U	-	-	19,000 U
Dinitrotoluene, 2,4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Dinitrotoluene, 2,6-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Di-n-Octyl phthalate	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Hexachlorobenzene	µg/kg	330[m,A] 1,200[B] 3,200[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Hexachlorocyclopentadiene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Hexachloroethane	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Isophorone	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Methylnaphthalene, 2-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	5,500 F2F1	13,000	-	-	3,500
Nitroaniline, 2-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	380 U	370 U	370 U	360 U	380 U	370 U	370 U	380 U	370 U	7,500 U	-	-	3,800 U
Nitroaniline, 3-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	380 U	370 U	370 U	360 U	380 U	370 U	370 U	380 U	370 U	7,500 U	-	-	3,800 U
Nitroaniline, 4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	380 U	370 U	370 U	360 U	380 U	370 U	370 U	380 U	370 U	7,500 U	-	-	3,800 U
Nitrobenzene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	15,000[D]	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Nitrophenol, 2-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Nitrophenol, 4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	380 U	370 U	370 U	360 U	380 U	370 U	370 U	380 U	370 U	7,500 U	-	-	3,800 U
N-Nitrosodi-n-Propylamine	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
n-Nitrosodiphenylamine	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Pentachlorophenol	µg/kg	800[m,A] 6,700[B] 800[C]	n/v	380 U	370 U	370 U	360 U	380 U	370 U	370 U	380 U	370 U	7,500 U	-	-	3,800 U
Phenol	µg/kg	330[m,A] 100,000[B] 330[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Trichlorophenol, 2,4,5-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Trichlorophenol, 2,4,6-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	200 U	190 U	190 U	180 U	190 U	190 U	190 U	190 U	190 U	3,800 U	-	-	2,000 U
Total SVOC	µg/kg	n/v	n/v	ND	ND	ND	ND	ND	ND	ND	ND	7,500	47,500	-	-	24,100
SVOC TICs																
Total SVOC TICs	µg/kg	n/v	n/v	8,660 TJN	2,830 TJN	4,920 TJ	2,800 TJ	4,570 TJ	960 TJ	1,940 TJN	1,690 TJN	72,800 TJN	73,200 TJN	-	-	47,000 TJN

See notes on last page.

Table 1
Summary of Analytical Results - Soil Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Sample Location				B/MW-107	B-108	B-109	B/MW-110	B/MW-111	B/MW-112	B/MW-113	B/MW-114	B-115	B-117	B-118		B-119
Sample Date				5-Sep-18	7-Sep-18	7-Sep-18	7-Sep-18	7-Sep-18	18-Feb-19	18-Feb-19	19-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19
Sample ID				CNL-B107-S	CNL-B108-S	CNL-B109-S	CNL-B110-S	CNL-B111-S	CNL-B112-S	CNL-B113-S	CNL-B114-S	CNL-B115-S	CNL-B117-S	CNL-B118-S	CNL-BDUP-S (VOCs)	CNL-B119-S
Sample Depth				0.3 - 2 ft	3 - 3.6 ft	5 - 5.5 ft	2 - 3.5 ft	3 - 4 ft	6 - 6.6 ft	9.5 - 10 ft	5.9 - 6.6 ft	9 - 11 ft	5.4 - 5.9 ft	3.2 - 3.7 ft	3.2 - 3.7 ft	4.5 - 5 ft
Sampling Company				STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory				TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL
Laboratory Work Order				480-141294-1	480-141438-1	480-141438-1	480-141438-1	480-141438-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1
Laboratory Sample ID				480-141294-1	480-141438-1	480-141438-2	480-141438-3	480-141438-4	480-149215-1	480-149215-2	480-149215-3	480-149425-1	480-149425-2	480-149425-8	480-149425-7	480-149425-3
Sample Type	Units	NYSDEC-Part 375	NYSDEC CP-51												Field Duplicate	
Semi-Volatile Organic Compounds - TCLP																
Cresol, m- (Methylphenol, 3-)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Cresol, o- (Methylphenol, 2-)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Cresol, p- (Methylphenol, 4-)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Dichlorobenzene, 1,4-	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Dinitrotoluene, 2,4-	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachlorobenzene	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Hexachloroethane	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Nitrobenzene	mg/L	n/v	15[D]	-	-	-	-	-	-	-	-	-	-	-	-	-
Pentachlorophenol	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Pyridine	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichlorophenol, 2,4,5-	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichlorophenol, 2,4,6-	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Volatile Organic Compounds																
Acetone	µg/kg	50[AC] 100,000[B]	n/v	29 U vs	28 vs	30	27 U vs	28 U vs	28 U vs	29 U vs	28 U vs	15,000 U	6,000 U	28 U vs	28 U vsF1	1,200 U
Benzene	µg/kg	60[AC] 4,800[B]	60[EF]	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Bromodichloromethane	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Bromoform (Tribromomethane)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Bromomethane (Methyl bromide)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Butylbenzene, n-	µg/kg	12,000[AC] 100,000[B]	12,000[EF]	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	11,000 F1	1,700	5.6 U vs	5.7 U vs	250 U
Butylbenzene, sec- (2-Phenylbutane)	µg/kg	11,000[AC] 100,000[B]	11,000[EF]	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Butylbenzene, tert-	µg/kg	5,900[AC] 100,000[B]	5,900[EF]	5.8 U vsF1	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Carbon Disulfide	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Carbon Tetrachloride (Tetrachloromethane)	µg/kg	760[AC] 2,400[B]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Chlorobenzene (Monochlorobenzene)	µg/kg	1,100[AC] 100,000[B]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Chlorobromomethane	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloroethane (Ethyl Chloride)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.8 U vsF1	5.6 U F1vs	5.5 U	5.4 U vs	5.6 U vsF1	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Chloroform (Trichloromethane)	µg/kg	370[AC] 49,000[B]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Chloromethane	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Cyclohexane	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U F1	1,200 U	5.6 U vs	5.7 U vs	250 U
Dibromo-3-Chloropropane, 1,2- (DBCP)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 UJ	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 UJ	250 U
Dibromochloromethane	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Dichlorobenzene, 1,2-	µg/kg	1,100[AC] 100,000[B]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Dichlorobenzene, 1,3-	µg/kg	2,400[AC] 49,000[B]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Dichlorobenzene, 1,4-	µg/kg	1,800[AC] 13,000[B]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Dichlorodifluoromethane (Freon 12)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Dichloroethane, 1,1-	µg/kg	270[AC] 26,000[B]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Dichloroethane, 1,2-	µg/kg	20[A] 3,100[B] 20[C]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Dichloroethene, 1,1-	µg/kg	330[AC] 100,000[B]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Dichloroethene, cis-1,2-	µg/kg	250[AC] 100,000[B]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Dichloroethene, trans-1,2-	µg/kg	190[AC] 100,000[B]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Dichloropropane, 1,2-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Dichloropropene, cis-1,3-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Dichloropropene, trans-1,3-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Ethylbenzene	µg/kg	1,000[AC] 41,000[B]	1,000[EF]	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	**5,900 J[ACEF]**	1,200 U	5.6 U vs	5.7 U vs	250 U
Ethylene Dibromide (Dibromoethane, 1,2-)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Hexanone, 2- (Methyl Butyl Ketone)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	29 U vs	28 U vs	28 U	27 U vs	28 U vs	28 U vs	29 U vs	28 U vs	15,000 U F2	6,000 U	28 U vs	28 U vs	1,200 U
Isopropylbenzene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	2,300[EF]	5.8 U vsF1	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Isopropyltoluene, p- (Cymene)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	10,000[EF]	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Methyl Acetate	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	29 U vs	28 U vs	28 U	27 U vs	28 U vs	28 U vs	29 U vs	28 U vs	15,000 U F1	6,000 U	28 U vs	28 U vs	1,200 U
Methyl Ethyl Ketone (MEK) (2-Butanone)	µg/kg	120[AC] 100,000[B]	n/v	29 U vs	28 U vs	28 U	27 U vs	28 UJ	28 U vs	29 U vs	28 U vs	15,000 U	6,000 U	28 U vs	28 U vsF1	1,200 U
Methyl Isobutyl Ketone (MIBK)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	29 U vs	28 U vs	28 U	27 U vs	28 U vsF1	28 U vs	29 U vs	28 U vs	15,000 U	6,000 U	28 U vs	28 U vsF1	1,200 U
Methyl tert-butyl ether (MTBE)	µg/kg	930[AC] 100,000[B]	930[E]	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Methylcyclohexane	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U F1	2,800	5.6 U vs	5.7 U vs	250 U
Methylene Chloride (Dichloromethane)	µg/kg	50[AC] 100,000[B]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	6.3 vs	6.3 vs	5.6 vs	3,000 U	1,200 U	5.6 U	5.7 U	250 U
Naphthalene	µg/kg	12,000[AC] 100,000[B]	12,000[EF]	-	-	-	-	-	5.6 U vs	5.7 U vs	5.6 U vs	**14,000[ACEF]**	1,300	54 J	36 J	880
Propylbenzene, n-	µg/kg	3,900[AC] 100,000[B]	3,900[EF]	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	**6,200[ACEF]**	1,300	5.6 U vs	10 vs	250 U
Styrene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Tetrachloroethane, 1,1,2,2-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 UJ	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U F1	1,200 U	5.6 U vs	5.7 UJ	250 U
Tetrachloroethene (PCE)	µg/kg	1,300[AC] 19,000[B]	n/v	20 vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Toluene	µg/kg	700[AC] 100,000[B]	700[EF]	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U F1	1,200 U	5.6 U vs	5.7 U vs	250 U
Trichlorobenzene, 1,2,3-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichlorobenzene, 1,2,4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.8 UJ	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Trichloroethane, 1,1,1-	µg/kg	680[AC] 100,000[B]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Trichloroethane, 1,1,2-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Trichloroethene (TCE)	µg/kg	470[AC] 21,000[B]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Trichlorofluoromethane (Freon 11)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Trichlorotrifluoroethane (Freon 113)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U	1,200 U	5.6 U vs	5.7 U vs	250 U
Trimethylbenzene, 1,2,4-	µg/kg	3,600[AC] 52,000[B]	3,600[EF]	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	**87,000[ABCEF]**	**7,300[ACEF]**	5.6 U vs	5.7 U vs	250 U
Trimethylbenzene, 1,3,5-	µg/kg	8,400[AC] 52,000[B]	8,400[EF]	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	**28,000[ACEF]**	1,900	5.6 U vs	5.7 U vs	250 U
Vinyl Chloride	µg/kg	20[AC] 900[B]	n/v	5.8 U vs	5.6 U vs	5.5 U	5.4 U vs	5.6 U vs	5.6 U vs	5.7 U vs	5.6 U vs	3,000 U F2	1,200 U	5.6 U vs	5.7 U vs	250 U
Xylene, m & p-	µg/kg	260[A] 100,000[B,p] 1,600[C]	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Xylene, o-	µg/kg	260[A] 100,000[B,o] 1,600[C]	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-
Xylenes, Total	µg/kg	260[A] 100,000[B] 1,600[C]	260[EF]	12 U vs	11 U vs	11 U	11 U vs	11 U vs	11 U vs	11 U vs	11 U vs	**49,000[ACEF]**	2,400 U	11 U vs	11 U vs	500 U
Total VOC	µg/kg	n/v	n/v	20	28	30	ND	ND	6.3	6.3	5.6	152,100	16,300	70	46	880
VOC TICs																
Total VOC TICs	µg/kg	n/v	n/v	ND	ND	56.4 TJN	ND	ND	387.9 TJN	379.6 TJN	378.3 TJN	282,000 TJN	79,600 TJN	86.8 TJN	176.9 TJN	13,300 TJN

See notes on last page.

Table 1
Summary of Analytical Results - Soil Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Sample Location				B/MW-107	B-108	B-109	B/MW-110	B/MW-111	B/MW-112	B/MW-113	B/MW-114	B-115	B-117	B-118		B-119
Sample Date				5-Sep-18	7-Sep-18	7-Sep-18	7-Sep-18	7-Sep-18	18-Feb-19	18-Feb-19	19-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19
Sample ID				CNL-B107-S	CNL-B108-S	CNL-B109-S	CNL-B110-S	CNL-B111-S	CNL-B112-S	CNL-B113-S	CNL-B114-S	CNL-B115-S	CNL-B117-S	CNL-B118-S	CNL-BDUP-S (VOCs)	CNL-B119-S
Sample Depth				0.3 - 2 ft	3 - 3.6 ft	5 - 5.5 ft	2 - 3.5 ft	3 - 4 ft	6 - 6.6 ft	9.5 - 10 ft	5.9 - 6.6 ft	9 - 11 ft	5.4 - 5.9 ft	3.2 - 3.7 ft	3.2 - 3.7 ft	4.5 - 5 ft
Sampling Company				STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory				TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL
Laboratory Work Order				480-141294-1	480-141438-1	480-141438-1	480-141438-1	480-141438-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1
Laboratory Sample ID				480-141294-1	480-141438-1	480-141438-2	480-141438-3	480-141438-4	480-149215-1	480-149215-2	480-149215-3	480-149425-1	480-149425-2	480-149425-8	480-149425-7	480-149425-3
Sample Type	Units	NYSDEC-Part 375	NYSDEC CP-51												Field Duplicate	
Volatile Organic Compounds - TCLP																
Benzene	mg/L	n/v	0.06[EF]	-	-	-	-	-	-	-	-	-	-	0.010 U	-	-
Carbon Tetrachloride (Tetrachloromethane)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	0.010 U	-	-
Chlorobenzene (Monochlorobenzene)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	0.010 U	-	-
Chloroform (Trichloromethane)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	0.010 U	-	-
Dichloroethane, 1,2-	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	0.010 U	-	-
Dichloroethene, 1,1-	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	0.010 U	-	-
Methyl Ethyl Ketone (MEK) (2-Butanone)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	0.050 U	-	-
Tetrachloroethene (PCE)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	0.010 U	-	-
Trichloroethene (TCE)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	0.010 U	-	-
Vinyl Chloride	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-	-	0.010 U	-	-

See notes on last page.

Table 1
Summary of Analytical Results - Soil Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Sample Location				B-120					B-122/B-125	B-123	B-125	B-126	B-127	
Sample Date				21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19
Sample ID				CNL-B120-S (SVOCs)	CNL-BDUP-S (SVOCs)	CNL-B120-S (VOCs)	CNL-B120-S (Metals)	CNL-BDUP-S (Metals)	CNL-B122-B125-S	CNL-B123-S	CNL-B125-S	CNL-B126-S	CNL-B127-S	CNL-B127-S (VOCs)
Sample Depth				3.5 - 3.7 ft	3.5 - 3.7 ft	3.7 - 4 ft	4 - 4.5 ft	4 - 4.5 ft	2 - 4 ft	2 - 3 ft	4.2 - 4.4 ft	1 - 4 ft	2.5 - 3 ft	4.2 - 4.5 ft
Sampling Company				STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory				TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL
Laboratory Work Order				480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1
Laboratory Sample ID				480-149425-4	480-149425-7	480-149425-4	480-149425-4	480-149425-7	480-149425-11	480-149425-5	480-149425-10	480-149425-13	480-149425-6	480-149425-6
Sample Type	Units	NYSDEC-Part 375	NYSDEC CP-51		Field Duplicate			Field Duplicate						
General Chemistry														
Cyanide	mg/kg	27[AB] 40[C]	n/v	-	-	-	-	-	-	-	-	-	-	-
Cyanide (Reactive)	mg/kg	n/v	n/v	-	-	-	-	-	-	-	9.3 U	9.4 U	-	-
Flashpoint	deg F	n/v	n/v	-	-	-	-	-	-	-	> 176	-	-	-
pH, lab	S.U.	n/v	n/v	-	-	-	-	-	-	-	8.7 HF	-	-	-
Sulfide (Reactive)	mg/kg	n/v	n/v	-	-	-	-	-	-	-	9.3 U	9.4 U	-	-
Temperature, Lab	deg C	n/v	n/v	-	-	-	-	-	-	-	19.7 HF	-	-	-
Total Solids	%	n/v	n/v	-	-	-	-	-	-	-	82.8 B	88.8 B	-	-
Total Solids (Fixed)	%	n/v	n/v	-	-	-	-	-	-	-	98.7 B	99.4 B	-	-
Total Solids (Volatile)	%	n/v	n/v	-	-	-	-	-	-	-	1.3 B	0.61 B	-	-
Metals														
Aluminum	mg/kg	10,000$_e$[ABC]	n/v	-	-	-	-	-	-	-	-	-	-	-
Antimony	mg/kg	10,000$_e$[ABC]	n/v	-	-	-	-	-	-	-	-	-	-	-
Arsenic	mg/kg	13$_h$[A] 16$_q$[BC]	n/v	-	-	-	2.3 U	2.3 U	-	2.5	-	-	2.4 U	-
Barium	mg/kg	350$_h$[A] 400[B] 820[C]	n/v	-	-	-	25.0	18.5	-	24.8	-	-	26.2	-
Beryllium	mg/kg	7.2[A] 72[B] 47[C]	n/v	-	-	-	-	-	-	-	-	-	-	-
Cadmium	mg/kg	2.5$_h$[A] 4.3[B] 7.5[C]	n/v	-	-	-	0.23 U	0.23 U	-	0.23 U	-	-	0.24 U	-
Calcium	mg/kg	10,000$_e$[ABC]	n/v	-	-	-	-	-	-	-	-	-	-	-
Chromium	mg/kg	30$_{h,I}$[A] 180[B] $_{NS,q}$[C]	n/v	-	-	-	5.9	4.8	-	7.6	-	-	6.2	-
Cobalt	mg/kg	10,000$_d$[ABC]	n/v	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/kg	50[A] 270[B] 1,720[C]	n/v	-	-	-	-	-	-	-	-	-	-	-
Iron	mg/kg	10,000$_e$[ABC]	n/v	-	-	-	-	-	-	-	-	-	-	-
Lead	mg/kg	63$_h$[A] 400[B] 450[C]	n/v	-	-	-	2.9	2.5	-	5.5	-	-	4.9	-
Magnesium	mg/kg	10,000$_e$[ABC]	n/v	-	-	-	-	-	-	-	-	-	-	-
Manganese	mg/kg	1,600$_h$[A] 2,000$_q$[BC]	n/v	-	-	-	-	-	-	-	-	-	-	-
Mercury	mg/kg	0.18$_h$[A] 0.81[B] 0.73[C]	n/v	-	-	-	0.023 U	0.021 U	-	0.021 U	-	-	0.024 U	-
Nickel	mg/kg	30[A] 310[B] 130[C]	n/v	-	-	-	-	-	-	-	-	-	-	-
Potassium	mg/kg	10,000$_e$[ABC]	n/v	-	-	-	-	-	-	-	-	-	-	-
Selenium	mg/kg	3.9$_h$[A] 180[B] 4$_q$[C]	n/v	-	-	-	4.5 U	4.6 U	-	4.6 U	-	-	4.8 U	-
Silver	mg/kg	2[A] 180[B] 8.3[C]	n/v	-	-	-	0.68 U	0.69 U	-	0.69 U	-	-	0.71 U	-
Sodium	mg/kg	10,000$_e$[ABC]	n/v	-	-	-	-	-	-	-	-	-	-	-
Thallium	mg/kg	10,000$_e$[ABC]	n/v	-	-	-	-	-	-	-	-	-	-	-
Vanadium	mg/kg	10,000$_e$[ABC]	n/v	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/kg	109$_h$[A] 10,000[B] 2,480[C]	n/v	-	-	-	-	-	-	-	-	-	-	-
Metals - TCLP														
Arsenic	mg/L	n/v	n/v	-	-	-	-	-	0.015 U	-	-	0.015 U	-	-
Barium	mg/L	n/v	n/v	-	-	-	-	-	1.0 U	-	-	1.0 U	-	-
Cadmium	mg/L	n/v	n/v	-	-	-	-	-	0.0020 U	-	-	0.0020 U	-	-
Chromium	mg/L	n/v	n/v	-	-	-	-	-	0.020 U	-	-	0.020 U	-	-
Lead	mg/L	n/v	n/v	-	-	-	-	-	0.020 U	-	-	0.020 U	-	-
Mercury	mg/L	n/v	n/v	-	-	-	-	-	0.00020 U	-	-	0.00020 U	-	-
Selenium	mg/L	n/v	n/v	-	-	-	-	-	0.025 U	-	-	0.025 U	-	-
Silver	mg/L	n/v	n/v	-	-	-	-	-	0.0060 U	-	-	0.0060 U	-	-
Polychlorinated Biphenyls														
Aroclor 1016	mg/kg	[ABC]	n/v	-	-	-	-	-	-	-	-	-	-	-
Aroclor 1221	mg/kg	[ABC]	n/v	-	-	-	-	-	-	-	-	-	-	-
Aroclor 1232	mg/kg	[ABC]	n/v	-	-	-	-	-	-	-	-	-	-	-
Aroclor 1242	mg/kg	[ABC]	n/v	-	-	-	-	-	-	-	-	-	-	-
Aroclor 1248	mg/kg	[ABC]	n/v	-	-	-	-	-	-	-	-	-	-	-
Aroclor 1254	mg/kg	[ABC]	n/v	-	-	-	-	-	-	-	-	-	-	-
Aroclor 1260	mg/kg	[ABC]	n/v	-	-	-	-	-	-	-	-	-	-	-
Polychlorinated Biphenyls (PCBs)	mg/kg	0.1[A] 1[B] 3.2[C]	n/v	-	-	-	-	-	-	-	-	-	-	-
Pesticides														
Aldrin	µg/kg	5$_n$[A] 97[B] 190[C]	n/v	-	-	-	-	-	92 U	-	-	9.4 U	-	-
BHC, alpha-	µg/kg	20[AC] 480[B]	n/v	-	-	-	-	-	92 U F1	-	-	9.4 U	-	-
BHC, beta-	µg/kg	36[A] 360[B] 90[C]	n/v	-	-	-	-	-	92 U F1	-	-	9.4 U	-	-
BHC, delta-	µg/kg	40$_n$[A] 100,000$_b$[B] 250[C]	n/v	-	-	-	-	-	92 U F2F1	-	-	9.4 U	-	-
Camphechlor (Toxaphene)	µg/kg	100,000$_a$[A] 100,000$_b$[B] 1,000,000$_d$[C]	n/v	-	-	-	-	-	920 U	-	-	94 U	-	-
Chlordane, alpha-	µg/kg	94[A] 4,200[B] 2,900[C]	n/v	-	-	-	-	-	92 U	-	-	9.4 U	-	-
Chlordane, trans- (gamma-Chlordane)	µg/kg	100,000$_a$[A] 100,000$_b$[B] 1,000,000$_d$[C]	n/v	-	-	-	-	-	92 U	-	-	9.4 U	-	-
DDD (p,p'-DDD)	µg/kg	3.3$_m$[A] 13,000[B] 14,000[C]	n/v	-	-	-	-	-	92 U F1	-	-	9.4 U	-	-
DDE (p,p'-DDE)	µg/kg	3.3$_m$[A] 8,900[B] 17,000[C]	n/v	-	-	-	-	-	92 U	-	-	9.4 U	-	-
DDT (p,p'-DDT)	µg/kg	3.3$_m$[A] 7,900[B] 136,000[C]	n/v	-	-	-	-	-	**1,100 F2[A]**	-	-	**32[A]**	-	-
Dieldrin	µg/kg	5$_n$[A] 200[B] 100[C]	n/v	-	-	-	-	-	92 U	-	-	9.4 U	-	-
Endosulfan I	µg/kg	2,400[A] 24,000[B] 102,000[C]	n/v	-	-	-	-	-	92 U F1	-	-	9.4 U	-	-
Endosulfan II	µg/kg	2,400[A] 24,000[B] 102,000[C]	n/v	-	-	-	-	-	92 U F1	-	-	9.4 U	-	-
Endosulfan Sulfate	µg/kg	2,400[A] 24,000[B] 1,000,000$_d$[C]	n/v	-	-	-	-	-	92 U F1	-	-	9.4 U	-	-
Endrin	µg/kg	14[A] 11,000[B] 60[C]	n/v	-	-	-	-	-	92 U F1	-	-	9.4 U	-	-
Endrin Aldehyde	µg/kg	100,000$_a$[A] 100,000$_b$[B] 1,000,000$_d$[C]	n/v	-	-	-	-	-	92 U F1	-	-	9.4 U	-	-
Endrin Ketone	µg/kg	100,000$_a$[A] 100,000$_b$[B] 1,000,000$_d$[C]	n/v	-	-	-	-	-	92 U	-	-	9.4 U	-	-
Heptachlor	µg/kg	42[A] 2,100[B] 380[C]	n/v	-	-	-	-	-	92 U	-	-	9.4 U	-	-
Heptachlor Epoxide	µg/kg	100,000$_a$[A] 100,000$_b$[B] 1,000,000$_d$[C]	n/v	-	-	-	-	-	92 U	-	-	9.4 U	-	-
Lindane (Hexachlorocyclohexane, gamma)	µg/kg	100[AC] 1,300[B]	n/v	-	-	-	-	-	92 U F2F1	-	-	9.4 U	-	-
Methoxychlor (4,4'-Methoxychlor)	µg/kg	100,000$_a$[A] 100,000$_b$[B] 1,000,000$_d$[C]	n/v	-	-	-	-	-	92 U	-	-	9.4 U	-	-

See notes on last page.

Table 1
Summary of Analytical Results - Soil Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Sample Location				B-120					B-122/B-125	B-123	B-125	B-126	B-127	
Sample Date				21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19
Sample ID				CNL-B120-S (SVOCs)	CNL-BDUP-S (SVOCs)	CNL-B120-S (VOCs)	CNL-B120-S (Metals)	CNL-BDUP-S (Metals)	CNL-B122-B125-S	CNL-B123-S	CNL-B125-S	CNL-B126-S	CNL-B127-S	CNL-B127-S (VOCs)
Sample Depth				3.5 - 3.7 ft	3.5 - 3.7 ft	3.7 - 4 ft	4 - 4.5 ft	4 - 4.5 ft	2 - 4 ft	2 - 3 ft	4.2 - 4.4 ft	1 - 4 ft	2.5 - 3 ft	4.2 - 4.5 ft
Sampling Company				STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory				TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL
Laboratory Work Order				480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1
Laboratory Sample ID				480-149425-4	480-149425-7	480-149425-4	480-149425-4	480-149425-7	480-149425-11	480-149425-5	480-149425-10	480-149425-13	480-149425-6	480-149425-6
Sample Type	Units	NYSDEC-Part 375	NYSDEC CP-51		Field Duplicate			Field Duplicate						
Polycyclic Aromatic Hydrocarbons														
Acenaphthene	µg/kg	20,000[A] 100,000[B] 98,000[C]	20,000[F]	5,700 J	190 UJ	-	-	-	-	1,600	-	-	4,500	-
Acenaphthylene	µg/kg	100,000[A] 100,000[B] 107,000[C]	100,000[F]	3,400 J	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Anthracene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	100,000[F]	24,000 J	270 J	-	-	-	-	6,500	-	-	12,000	-
Benzo(a)anthracene	µg/kg	1,000[A] 1,000[BC]	1,000[F]	**23,000 J[ABCF]**	190 UJ	-	-	-	-	**6,400[ABCF]**	-	-	**12,000[ABCF]**	-
Benzo(a)pyrene	µg/kg	1,000[A] 1,000[B] 22,000[C]	1,000[F]	**18,000 J[ABF]**	190 UJ	-	-	-	-	**4,800[ABF]**	-	-	**8,700[ABF]**	-
Benzo(b)fluoranthene	µg/kg	1,000[A] 1,000[B] 1,700[C]	1,000[F]	**20,000 J[ABCF]**	190 UJ	-	-	-	-	**6,600[ABCF]**	-	-	**10,000[ABCF]**	-
Benzo(g,h,i)perylene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	100,000[F]	12,000 J	190 UJ	-	-	-	-	3,300	-	-	6,400	-
Benzo(k)fluoranthene	µg/kg	800[A] 3,900[B] 1,700[C]	800[F]	**12,000 J[ABCF]**	190 UJ	-	-	-	-	**2,600[ACF]**	-	-	**6,200[ABCF]**	-
Chrysene	µg/kg	1,000[A] 3,900[B] 1,000[C]	1,000[F]	**21,000 J[ABCF]**	190 UJ	-	-	-	-	**6,200[ABCF]**	-	-	**10,000[ABCF]**	-
Dibenzo(a,h)anthracene	µg/kg	330[A] 330[B] 1,000,000[C]	330[F]	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Fluoranthene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	100,000[F]	67,000 J	380 J	-	-	-	-	19,000	-	-	33,000	-
Fluorene	µg/kg	30,000[A] 100,000[B] 386,000[C]	30,000[F]	13,000 J	190 UJ	-	-	-	-	2,100	-	-	4,500	-
Indeno(1,2,3-cd)pyrene	µg/kg	500[A] 500[B] 8,200[C]	500[F]	**11,000 J[ABCF]**	190 UJ	-	-	-	-	**3,300[ABF]**	-	-	**6,000[ABF]**	-
Naphthalene	µg/kg	12,000[AC] 100,000[B]	12,000[EF]	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	**22,000[ACEF]**	-
Phenanthrene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	100,000[F]	**110,000 J[ABF]**	580 J	-	-	-	-	27,000	-	-	54,000	-
Pyrene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	100,000[F]	46,000 J	300 J	-	-	-	-	14,000	-	-	23,000	-
Total PAH	µg/kg	n/v	n/v	386,100	1,530	-	-	-	-	103,400	-	-	212,300	-
Semi-Volatile Organic Compounds														
Acetophenone	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Atrazine	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Benzaldehyde	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Biphenyl	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	2,600	-
Bis(2-Chloroethoxy)methane	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Bis(2-Chloroethyl)ether	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Bis(2-Chloroisopropyl)ether (2,2-oxybis(1-Chloropropane))	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Bis(2-Ethylhexyl)phthalate (DEHP)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Bromophenyl Phenyl Ether, 4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Butyl Benzyl Phthalate	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Caprolactam	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Carbazole	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	12,000 J	190 UJ	-	-	-	-	3,500	-	-	6,000	-
Chloro-3-methyl phenol, 4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Chloroaniline, 4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Chloronaphthalene, 2-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Chlorophenol, 2- (ortho-Chlorophenol)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Chlorophenyl Phenyl Ether, 4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Cresol, o- (Methylphenol, 2-)	µg/kg	330[A] 100,000[B] 330[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Cresol, p- (Methylphenol, 4-)	µg/kg	330[A] 100,000[B] 330[C]	n/v	3,600 UJ	370 UJ	-	-	-	-	1,900 U	-	-	1,900 U	-
Dibenzofuran	µg/kg	7,000[A] 59,000[B] 210,000[C]	n/v	**15,000 J[A]**	190 UJ	-	-	-	-	4,500	-	-	**11,000[A]**	-
Dibutyl Phthalate (DBP)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Dichlorobenzidine, 3,3'-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	3,600 UJ	370 UJ	-	-	-	-	1,900 U	-	-	1,900 U	-
Dichlorophenol, 2,4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Diethyl Phthalate	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Dimethyl Phthalate	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Dimethylphenol, 2,4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Dinitro-o-cresol, 4,6-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	3,600 UJ	370 UJ	-	-	-	-	1,900 U	-	-	1,900 U	-
Dinitrophenol, 2,4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	18,000 UJ	1,900 UJ	-	-	-	-	9,400 U	-	-	9,600 U	-
Dinitrotoluene, 2,4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Dinitrotoluene, 2,6-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Di-n-Octyl phthalate	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Hexachlorobenzene	µg/kg	330[A] 1,200[B] 3,200[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Hexachlorocyclopentadiene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Hexachloroethane	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Isophorone	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Methylnaphthalene, 2-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	1,400	-	-	8,900	-
Nitroaniline, 2-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	3,600 UJ	370 UJ	-	-	-	-	1,900 U	-	-	1,900 U	-
Nitroaniline, 3-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	3,600 UJ	370 UJ	-	-	-	-	1,900 U	-	-	1,900 U	-
Nitroaniline, 4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	3,600 UJ	370 UJ	-	-	-	-	1,900 U	-	-	1,900 U	-
Nitrobenzene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	15,000[D]	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Nitrophenol, 2-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Nitrophenol, 4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	3,600 UJ	370 UJ	-	-	-	-	1,900 U	-	-	1,900 U	-
N-Nitrosodi-n-Propylamine	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
n-Nitrosodiphenylamine	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Pentachlorophenol	µg/kg	800[A] 6,700[B] 800[C]	n/v	3,600 UJ	370 UJ	-	-	-	-	1,900 U	-	-	1,900 U	-
Phenol	µg/kg	330[A] 100,000[B] 330[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Trichlorophenol, 2,4,5-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Trichlorophenol, 2,4,6-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	1,900 UJ	190 UJ	-	-	-	-	960 U	-	-	990 U	-
Total SVOC	µg/kg	n/v	n/v	27,000	ND	-	-	-	-	9,400	-	-	28,500	-
SVOC TICs														
Total SVOC TICs	µg/kg	n/v	n/v	116,900 TJN	7,680 TJN	-	-	-	-	41,000 TJN	-	-	81,500 TJN	-

See notes on last page.

Table 1
Summary of Analytical Results - Soil Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Sample Location						B-120				B-123	B-125	B-126	B-127	
Sample Date				21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19
Sample ID				CNL-B120-S (SVOCs)	CNL-BDUP-S (SVOCs)	CNL-B120-S (VOCs)	CNL-B120-S (Metals)	CNL-BDUP-S (Metals)	CNL-B122-B125-S	CNL-B123-S	CNL-B125-S	CNL-B126-S	CNL-B127-S	CNL-B127-S (VOCs)
Sample Depth				3.5 - 3.7 ft	3.5 - 3.7 ft	3.7 - 4 ft	4 - 4.5 ft	4 - 4.5 ft	2 - 4 ft	2 - 3 ft	4.2 - 4.4 ft	1 - 4 ft	2.5 - 3 ft	4.2 - 4.5 ft
Sampling Company				STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory				TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL
Laboratory Work Order				480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1
Laboratory Sample ID				480-149425-4	480-149425-7	480-149425-4	480-149425-4	480-149425-7	480-149425-11	480-149425-5	480-149425-10	480-149425-13	480-149425-6	480-149425-6
Sample Type	Units	NYSDEC-Part 375	NYSDEC CP-51		Field Duplicate			Field Duplicate						
Semi-Volatile Organic Compounds - TCLP														
Cresol, m- (Methylphenol, 3-)	mg/L	n/v	n/v	-	-	-	-	-	0.040 U	-	-	0.040 U	-	-
Cresol, o- (Methylphenol, 2-)	mg/L	n/v	n/v	-	-	-	-	-	0.020 U	-	-	0.020 U	-	-
Cresol, p- (Methylphenol, 4-)	mg/L	n/v	n/v	-	-	-	-	-	0.040 U	-	-	0.040 U	-	-
Dichlorobenzene, 1,4-	mg/L	n/v	n/v	-	-	-	-	-	0.040 U	-	-	0.040 U	-	-
Dinitrotoluene, 2,4-	mg/L	n/v	n/v	-	-	-	-	-	0.020 U	-	-	0.020 U	-	-
Hexachlorobenzene	mg/L	n/v	n/v	-	-	-	-	-	0.020 U	-	-	0.020 U	-	-
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	mg/L	n/v	n/v	-	-	-	-	-	0.020 U	-	-	0.020 U	-	-
Hexachloroethane	mg/L	n/v	n/v	-	-	-	-	-	0.020 U	-	-	0.020 U	-	-
Nitrobenzene	mg/L	n/v	15[D]	-	-	-	-	-	0.020 U	-	-	0.020 U	-	-
Pentachlorophenol	mg/L	n/v	n/v	-	-	-	-	-	0.040 U	-	-	0.040 U	-	-
Pyridine	mg/L	n/v	n/v	-	-	-	-	-	0.10 U	-	-	0.10 U	-	-
Trichlorophenol, 2,4,5-	mg/L	n/v	n/v	-	-	-	-	-	0.020 U	-	-	0.020 U	-	-
Trichlorophenol, 2,4,6-	mg/L	n/v	n/v	-	-	-	-	-	0.020 U	-	-	0.020 U	-	-
Volatile Organic Compounds														
Acetone	µg/kg	50[AC] 100,000[B]	n/v	-	-	28 U vs	-	-	-	29 U vs	-	-	-	6,300 U
Benzene	µg/kg	60[AC] 4,800[B]	60[EF]	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Bromodichloromethane	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Bromoform (Tribromomethane)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Bromomethane (Methyl bromide)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Butylbenzene, n-	µg/kg	12,000[AC] 100,000[B]	12,000[EF]	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Butylbenzene, sec- (2-Phenylbutane)	µg/kg	11,000[AC] 100,000[B]	11,000[EF]	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Butylbenzene, tert-	µg/kg	5,900[AC] 100,000[B]	5,900[EF]	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Carbon Disulfide	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Carbon Tetrachloride (Tetrachloromethane)	µg/kg	760[AC] 2,400[B]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Chlorobenzene (Monochlorobenzene)	µg/kg	1,100[AC] 100,000[B]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Chlorobromomethane	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	-	-	-	-	-	-
Chloroethane (Ethyl Chloride)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Chloroform (Trichloromethane)	µg/kg	370[AC] 49,000[B]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Chloromethane	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Cyclohexane	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Dibromo-3-Chloropropane, 1,2- (DBCP)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Dibromochloromethane	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Dichlorobenzene, 1,2-	µg/kg	1,100[AC] 100,000[B]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Dichlorobenzene, 1,3-	µg/kg	2,400[AC] 49,000[B]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Dichlorobenzene, 1,4-	µg/kg	1,800[AC] 13,000[B]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Dichlorodifluoromethane (Freon 12)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Dichloroethane, 1,1-	µg/kg	270[AC] 26,000[B]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Dichloroethane, 1,2-	µg/kg	20[A] 3,100[B] 20[C]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Dichloroethene, 1,1-	µg/kg	330[AC] 100,000[B]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Dichloroethene, cis-1,2-	µg/kg	250[AC] 100,000[B]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Dichloroethene, trans-1,2-	µg/kg	190[AC] 100,000[B]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Dichloropropane, 1,2-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Dichloropropene, cis-1,3-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Dichloropropene, trans-1,3-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Ethylbenzene	µg/kg	1,000[AC] 41,000[B]	1,000[EF]	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Ethylene Dibromide (Dibromoethane, 1,2-)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Hexanone, 2- (Methyl Butyl Ketone)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	28 U vs	-	-	-	29 U vs	-	-	-	6,300 U
Isopropylbenzene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	2,300[EF]	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Isopropyltoluene, p- (Cymene)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	10,000[EF]	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Methyl Acetate	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	28 U vs	-	-	-	29 U vs	-	-	-	6,300 U
Methyl Ethyl Ketone (MEK) (2-Butanone)	µg/kg	120[AC] 100,000[B]	n/v	-	-	28 U vs	-	-	-	29 U vs	-	-	-	6,300 U
Methyl Isobutyl Ketone (MIBK)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	28 U vs	-	-	-	29 U vs	-	-	-	6,300 U
Methyl tert-butyl ether (MTBE)	µg/kg	930[AC] 100,000[B]	930[E]	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Methylcyclohexane	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Methylene Chloride (Dichloromethane)	µg/kg	50[AC] 100,000[B]	n/v	-	-	5.6 U	-	-	-	5.7 U	-	-	-	1,300 U
Naphthalene	µg/kg	12,000[AC] 100,000[B]	12,000[EF]	-	-	5.6 U vs	-	-	-	46 vs	-	-	-	4,100
Propylbenzene, n-	µg/kg	3,900[AC] 100,000[B]	3,900[EF]	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Styrene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Tetrachloroethane, 1,1,2,2-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Tetrachloroethene (PCE)	µg/kg	1,300[AC] 19,000[B]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Toluene	µg/kg	700[AC] 100,000[B]	700[EF]	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Trichlorobenzene, 1,2,3-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	-	-	-	-	-	-	-	-	-
Trichlorobenzene, 1,2,4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Trichloroethane, 1,1,1-	µg/kg	680[AC] 100,000[B]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Trichloroethane, 1,1,2-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Trichloroethene (TCE)	µg/kg	470[AC] 21,000[B]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Trichlorofluoromethane (Freon 11)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Trichlorotrifluoroethane (Freon 113)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Trimethylbenzene, 1,2,4-	µg/kg	3,600[AC] 52,000[B]	3,600[EF]	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Trimethylbenzene, 1,3,5-	µg/kg	8,400[AC] 52,000[B]	8,400[EF]	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Vinyl Chloride	µg/kg	20[AC] 900[B]	n/v	-	-	5.6 U vs	-	-	-	5.7 U vs	-	-	-	1,300 U
Xylene, m & p-	µg/kg	260[A] 100,000[b,B] 1,600[C]	n/v	-	-	-	-	-	-	-	-	-	-	-
Xylene, o-	µg/kg	260[A] 100,000[b,B] 1,600[C]	n/v	-	-	-	-	-	-	-	-	-	-	-
Xylenes, Total	µg/kg	260[A] 100,000[B] 1,600[C]	260[EF]	-	-	11 U vs	-	-	-	11 U vs	-	-	-	2,500 U
Total VOC	µg/kg	n/v	n/v	-	-	ND	-	-	-	46	-	-	-	4,100
VOC TICs														
Total VOC TICs	µg/kg	n/v	n/v	-	-	ND	-	-	-	39 TJN	-	-	-	11,100 TJN

See notes on last page.

Table 1
Summary of Analytical Results - Soil Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Sample Location				B-120					B-122/B-125	B-123	B-125	B-126	B-127	
Sample Date				21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19	21-Feb-19
Sample ID				CNL-B120-S (SVOCs)	CNL-BDUP-S (SVOCs)	CNL-B120-S (VOCs)	CNL-B120-S (Metals)	CNL-BDUP-S (Metals)	CNL-B122-B125-S	CNL-B123-S	CNL-B125-S	CNL-B126-S	CNL-B127-S	CNL-B127-S (VOCs)
Sample Depth				3.5 - 3.7 ft	3.5 - 3.7 ft	3.7 - 4 ft	4 - 4.5 ft	4 - 4.5 ft	2 - 4 ft	2 - 3 ft	4.2 - 4.4 ft	1 - 4 ft	2.5 - 3 ft	4.2 - 4.5 ft
Sampling Company				STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory				TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL
Laboratory Work Order				480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1	480-149215-1
Laboratory Sample ID				480-149425-4	480-149425-7	480-149425-4	480-149425-4	480-149425-7	480-149425-11	480-149425-5	480-149425-10	480-149425-13	480-149425-6	480-149425-6
Sample Type	Units	NYSDEC-Part 375	NYSDEC CP-51		Field Duplicate			Field Duplicate						
Volatile Organic Compounds - TCLP														
Benzene	mg/L	n/v	0.06[EF]	-	-	-	-	-	-	-	0.010 U	-	-	-
Carbon Tetrachloride (Tetrachloromethane)	mg/L	n/v	n/v	-	-	-	-	-	-	-	0.010 U	-	-	-
Chlorobenzene (Monochlorobenzene)	mg/L	n/v	n/v	-	-	-	-	-	-	-	0.010 U	-	-	-
Chloroform (Trichloromethane)	mg/L	n/v	n/v	-	-	-	-	-	-	-	0.010 U	-	-	-
Dichloroethane, 1,2-	mg/L	n/v	n/v	-	-	-	-	-	-	-	0.010 U	-	-	-
Dichloroethene, 1,1-	mg/L	n/v	n/v	-	-	-	-	-	-	-	0.010 U	-	-	-
Methyl Ethyl Ketone (MEK) (2-Butanone)	mg/L	n/v	n/v	-	-	-	-	-	-	-	0.050 U	-	-	-
Tetrachloroethene (PCE)	mg/L	n/v	n/v	-	-	-	-	-	-	-	0.010 U	-	-	-
Trichloroethene (TCE)	mg/L	n/v	n/v	-	-	-	-	-	-	-	0.010 U	-	-	-
Vinyl Chloride	mg/L	n/v	n/v	-	-	-	-	-	-	-	0.010 U	-	-	-

See notes on last page.

Table 1
Summary of Analytical Results - Soil Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Sample Location				SS-1		TP-1		TP-2		TP-3	TP-4	TP-5
Sample Date				22-Apr-19	22-Apr-19	28-Aug-18	28-Aug-18	28-Aug-18	28-Aug-18	28-Aug-18	28-Aug-18	28-Aug-18
Sample ID				CNL-SS1-SS	CNL-SS1-SS-DUP	CNL-TP1-S	CNL-TP1-S	CNL-TP2-S	CNL-TP2-S	CNL-TP3-S	CNL-TP4-S	CNL-TP5-S
Sample Depth				0 - 4 in	0 - 4 in	6 ft	6 ft	7.2 ft	7.2 ft	2 ft	4 ft	4 ft
Sampling Company				STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory				TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL
Laboratory Work Order				480-152402-1	480-152402-1	480-140994-1	480-141385-1	480-140994-1	480-141385-1	480-140994-1	480-140994-1	480-140994-1
Laboratory Sample ID				480-152402-1	480-152402-2	480-140994-1	480-141385-1	480-140994-2	480-141385-2	480-140994-3	480-140994-4	480-140994-6
Sample Type	Units	NYSDEC-Part 375	NYSDEC CP-51		Field Duplicate							
General Chemistry												
Cyanide	mg/kg	27$_n^{AB}$ 40$_s^C$	n/v	-	-	-	-	-	-	1.1 U	1.1	-
Cyanide (Reactive)	mg/kg	n/v	n/v	-	-	-	-	-	-	-	-	-
Flashpoint	deg F	n/v	n/v	-	-	-	-	-	-	-	-	-
pH, lab	S.U.	n/v	n/v	-	-	-	-	-	-	-	-	-
Sulfide (Reactive)	mg/kg	n/v	n/v	-	-	-	-	-	-	-	-	-
Temperature, Lab	deg C	n/v	n/v	-	-	-	-	-	-	-	-	-
Total Solids	%	n/v	n/v	-	-	-	-	-	-	-	-	-
Total Solids (Fixed)	%	n/v	n/v	-	-	-	-	-	-	-	-	-
Total Solids (Volatile)	%	n/v	n/v	-	-	-	-	-	-	-	-	-
Metals												
Aluminum	mg/kg	10,000$_e^{ABC}$	n/v	4,340 J	5,230	-	4,930	-	5,670 J	**10,200^{ABC}**	8,020 J	-
Antimony	mg/kg	10,000$_e^{ABC}$	n/v	30.2 U	21.5 U	-	16.6 U	-	16.7 UJ	18.2 U	17.5 UJ	-
Arsenic	mg/kg	13$_h^A$ 16$_g^{BC}$	n/v	9.7	8.5	-	3.0	-	2.4	7.1	7.4	-
Barium	mg/kg	350$_h^A$ 400^B 820^C	n/v	345 F2	289	-	37.1	-	21.9	**567^{AB}**	128 J	-
Beryllium	mg/kg	7.2^A 72^B 47^C	n/v	0.40 U	0.39	-	0.26	-	0.26	0.68	0.37	-
Cadmium	mg/kg	2.5$_h^A$ 4.3^B 7.5^C	n/v	**3.7^A**	**3.8^A**	-	0.22 U	-	0.22 U	0.24 U	0.82	-
Calcium	mg/kg	10,000$_e^{ABC}$	n/v	**39,000 F2^{ABC}**	**31,600^{ABC}**	-	**94,300^{ABC}**	-	**19,800 F2^{ABC}**	2,690	**37,100 F2^{ABC}**	-
Chromium	mg/kg	30$_{s,t}^A$ 180$_{ns,q}^B$ ^{C}	n/v	**91.3^A**	**56.3^A**	-	7.5	-	7.3	18.1	15.0	-
Cobalt	mg/kg	10,000$_d^{ABC}$	n/v	6.9	5.7	-	3.2	-	3.4	7.4	5.1	-
Copper	mg/kg	50^A 270^B 1,720^C	n/v	**108 J^A**	**251 J^A**	-	9.1	-	9.8	37.9	50.0 J	-
Iron	mg/kg	10,000$_e^{ABC}$	n/v	**44,200 F2^{ABC}**	**27,000^{ABC}**	-	8,640	-	**10,200^{ABC}**	**10,700^{ABC}**	**17,600 F2^{ABC}**	-
Lead	mg/kg	63$_h^A$ 400^B 450^C	n/v	**3,170 F2^{ABC}**	**2,530^{ABC}**	-	31.8	-	5.3	**823^{ABC}**	**329 F2^A**	-
Magnesium	mg/kg	10,000$_e^{ABC}$	n/v	9,150 J	**10,700^{ABC}**	-	**54,300^{ABC}**	-	4,620 J	1,990	**10,400 F2^{ABC}**	-
Manganese	mg/kg	1,600$_h^A$ 2,000$_q^{BC}$	n/v	432	391	-	415	-	225 F2	388 B	573 BF2	-
Mercury	mg/kg	0.18$_h^A$ 0.81$_s^B$ 0.73^C	n/v	**1.5 J^{ABC}**	**0.68 J^A**	-	0.039	-	0.023 U	**0.48^A**	**0.45 J^A**	-
Nickel	mg/kg	30^A 310^B 130^C	n/v	22.2	25.8	-	6.9	-	8.0	14.0	11.2	-
Potassium	mg/kg	10,000$_e^{ABC}$	n/v	1,090 F1	905	-	1,450	-	1,430 J	831	1,360 J	-
Selenium	mg/kg	3.9$_h^A$ 180^B 4$_q^C$	n/v	8.0 U	5.7 U	-	4.4 U	-	4.5 U	4.9 U	4.7 U	-
Silver	mg/kg	2^A 180^B 8.3^C	n/v	2.0	**2.9^A**	-	0.67 U	-	0.67 U	0.73 U	0.70 U	-
Sodium	mg/kg	10,000$_e^{ABC}$	n/v	282 U	200 U	-	230	-	240	189	554	-
Thallium	mg/kg	10,000$_e^{ABC}$	n/v	12.1 U	8.6 U	-	6.7 U	-	6.7 U	7.3 U	7.0 U	-
Vanadium	mg/kg	10,000$_e^{ABC}$	n/v	30.5	37.0	-	15.1	-	14.3	25.2	18.1	-
Zinc	mg/kg	109$_h^A$ 10,000$_s^B$ 2,480^C	n/v	**731 F2^A**	**687^A**	-	42.6	-	20.5 J-	**717^A**	**257 J-^{A}**	-
Metals - TCLP												
Arsenic	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-
Barium	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-
Cadmium	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-
Chromium	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-
Lead	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-
Mercury	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-
Selenium	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-
Silver	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-
Polychlorinated Biphenyls												
Aroclor 1016	mg/kg	$^{ABC}_o$	n/v	0.39 U	0.26 U	-	-	-	-	0.26 U	0.29 U	-
Aroclor 1221	mg/kg	$^{ABC}_o$	n/v	0.39 U	0.26 U	-	-	-	-	0.26 U	0.29 U	-
Aroclor 1232	mg/kg	$^{ABC}_o$	n/v	0.39 U	0.26 U	-	-	-	-	0.26 U	0.29 U	-
Aroclor 1242	mg/kg	$^{ABC}_o$	n/v	0.39 U	0.26 U	-	-	-	-	0.26 U	0.29 U	-
Aroclor 1248	mg/kg	$^{ABC}_o$	n/v	0.39 U	0.26 U	-	-	-	-	0.26 U	0.29 U	-
Aroclor 1254	mg/kg	$^{ABC}_o$	n/v	0.39 U	0.26 U	-	-	-	-	0.26 U	0.29 U	-
Aroclor 1260	mg/kg	$^{ABC}_o$	n/v	0.39 U	0.28	-	-	-	-	0.26 U	0.29 U	-
Polychlorinated Biphenyls (PCBs)	mg/kg	0.1^A 1^B 3.2^C	n/v	ND	**0.28^A**	-	-	-	-	ND	ND	-
Pesticides												
Aldrin	µg/kg	5$_m^A$ 97^B 190^C	n/v	170 U	120 U	-	-	-	-	2.0 U	190 U	-
BHC, alpha-	µg/kg	20^{AC} 480^B	n/v	170 U F1F2	120 U	-	-	-	-	2.0 U	190 U	-
BHC, beta-	µg/kg	36^A 360^B 90^C	n/v	170 U F1	120 U	-	-	-	-	2.0 U	190 U	-
BHC, delta-	µg/kg	40$_h^A$ 100,000$_b^B$ 250^C	n/v	170 U F1	120 U	-	-	-	-	2.0 U	190 U	-
Camphechlor (Toxaphene)	µg/kg	100,000$_a^A$ 100,000$_b^B$ 1,000,000$_q^C$	n/v	1,700 U	1,200 U	-	-	-	-	20 U	1,900 U	-
Chlordane, alpha-	µg/kg	94^A 4,200^B 2,900^C	n/v	170 U	120 U	-	-	-	-	2.0 U	190 U	-
Chlordane, trans- (gamma-Chlordane)	µg/kg	100,000$_a^A$ 100,000$_b^B$ 1,000,000$_q^C$	n/v	170 U	120 U	-	-	-	-	2.0 U	190 U	-
DDD (p,p'-DDD)	µg/kg	3.3$_m^A$ 13,000^B 14,000^C	n/v	170 U F1	120 U	-	-	-	-	2.0 U	190 U	-
DDE (p,p'-DDE)	µg/kg	3.3$_m^A$ 8,900^B 17,000^C	n/v	170 U	120 U	-	-	-	-	2.0 U	190 U	-
DDT (p,p'-DDT)	µg/kg	3.3$_m^A$ 7,900^B 136,000^C	n/v	170 U F1	**130^A**	-	-	-	-	2.0 U	190 U	-
Dieldrin	µg/kg	5$_m^A$ 200^B 100^C	n/v	170 U	120 U	-	-	-	-	2.0 U	190 U	-
Endosulfan I	µg/kg	2,400$_n^A$ 24,000^B 102,000^C	n/v	170 U F1	120 U	-	-	-	-	2.0 U	190 U	-
Endosulfan II	µg/kg	2,400$_n^A$ 24,000^B 102,000^C	n/v	170 U	120 U	-	-	-	-	2.0 U	190 U	-
Endosulfan Sulfate	µg/kg	2,400$_n^A$ 24,000^B 1,000,000$_q^C$	n/v	170 U F1	120 U	-	-	-	-	2.0 U	190 U	-
Endrin	µg/kg	14^A 11,000^B 60^C	n/v	170 U F1	120 U	-	-	-	-	2.0 U	190 U	-
Endrin Aldehyde	µg/kg	100,000$_a^A$ 100,000$_b^B$ 1,000,000$_q^C$	n/v	170 U	120 U	-	-	-	-	2.0 U	190 U	-
Endrin Ketone	µg/kg	100,000$_a^A$ 100,000$_b^B$ 1,000,000$_q^C$	n/v	170 U	120 U	-	-	-	-	2.0 U	190 U	-
Heptachlor	µg/kg	42^A 2,100^B 380^C	n/v	170 U	120 U	-	-	-	-	2.0 U	190 U	-
Heptachlor Epoxide	µg/kg	100,000$_a^A$ 100,000$_b^B$ 1,000,000$_q^C$	n/v	170 U	120 U	-	-	-	-	2.0 U	190 U	-
Lindane (Hexachlorocyclohexane, gamma)	µg/kg	100^{AC} 1,300^B	n/v	170 U F1	120 U	-	-	-	-	2.0 U	190 U	-
Methoxychlor (4,4'-Methoxychlor)	µg/kg	100,000$_a^A$ 100,000$_b^B$ 1,000,000$_q^C$	n/v	170 U	120 U	-	-	-	-	2.0 U	190 U	-

See notes on last page.

Table 1
Summary of Analytical Results - Soil Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Sample Location				SS-1		TP-1		TP-2		TP-3	TP-4	TP-5
Sample Date				22-Apr-19	22-Apr-19	28-Aug-18	28-Aug-18	28-Aug-18	28-Aug-18	28-Aug-18	28-Aug-18	28-Aug-18
Sample ID				CNL-SS1-SS	CNL-SS1-SS-DUP	CNL-TP1-S	CNL-TP1-S	CNL-TP2-S	CNL-TP2-S	CNL-TP3-S	CNL-TP4-S	CNL-TP5-S
Sample Depth				0 - 4 in	0 - 4 in	6 ft	6 ft	7.2 ft	7.2 ft	2 ft	4 ft	4 ft
Sampling Company				STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory				TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL
Laboratory Work Order				480-152402-1	480-152402-1	480-140994-1	480-141385-1	480-140994-1	480-141385-1	480-140994-1	480-140994-1	480-140994-1
Laboratory Sample ID				480-152402-1	480-152402-2	480-140994-1	480-141385-1	480-140994-2	480-141385-2	480-140994-3	480-140994-4	480-140994-6
Sample Type	Units	NYSDEC-Part 375	NYSDEC CP-51		Field Duplicate							
Polycyclic Aromatic Hydrocarbons												
Acenaphthene	µg/kg	20,000[A] 100,000[B] 98,000[C]	20,000[F]	67,000 U F2	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Acenaphthylene	µg/kg	100,000[A] 100,000[B] 107,000[C]	100,000[F]	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Anthracene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	100,000[F]	83,000 F2	62,000	-	3,600 U	-	190 U	200 U	**110,000[ABF]**	-
Benzo(a)anthracene	µg/kg	1,000[A] 1,000[BC]	1,000[F]	**150,000 F2[ABCF]**	**110,000[ABCF]**	-	3,600 U	-	190 U	200 U	**310,000[ABCF]**	-
Benzo(a)pyrene	µg/kg	1,000[A] 1,000[B] 22,000[C]	1,000[F]	**120,000 F2[ABCF]**	**80,000[ABCF]**	-	3,600 U	-	190 U	200 U	**250,000[ABCF]**	-
Benzo(b)fluoranthene	µg/kg	1,000[A] 1,000[B] 1,700[C]	1,000[F]	**180,000 F2[ABCF]**	**110,000[ABCF]**	-	3,600 U	-	190 U	200 U	**360,000[ABCF]**	-
Benzo(g,h,i)perylene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	100,000[F]	68,000 F2	48,000 U	-	3,600 U	-	190 U	200 U	**150,000[ABF]**	-
Benzo(k)fluoranthene	µg/kg	800[A] 3,900[B] 1,700[C]	800[F]	67,000 U F2	48,000 U	-	3,600 U	-	190 U	200 U	**130,000[ABCF]**	-
Chrysene	µg/kg	1,000[A] 3,900[B] 1,000[C]	1,000[F]	**150,000 F2[ABCF]**	**96,000[ABCF]**	-	3,600 U	-	190 U	200 U	**330,000[ABCF]**	-
Dibenzo(a,h)anthracene	µg/kg	330[A] 330[B] 1,000,000[C]	330[F]	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Fluoranthene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	100,000[F]	**340,000 F2[ABF]**	**230,000[ABF]**	-	3,600 U	-	190 U	200 U	**830,000[ABF]**	-
Fluorene	µg/kg	30,000[A] 100,000[B] 386,000[C]	30,000[F]	67,000 U F2	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Indeno(1,2,3-cd)pyrene	µg/kg	500[A] 500[B] 8,200[C]	500[F]	**72,000 F2[ABCF]**	**48,000[ABCF]**	-	3,600 U	-	190 U	200 U	**150,000[ABCF]**	-
Naphthalene	µg/kg	12,000[AC] 100,000[B]	12,000[EF]	67,000 U F2	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Phenanthrene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	100,000[F]	**310,000 F2[ABF]**	**210,000[ABF]**	-	3,600 U	-	190 U	200 U	**630,000[ABF]**	-
Pyrene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	100,000[F]	**240,000 F2[ABF]**	**160,000[ABF]**	-	3,600 U	-	190 U	200 U	**540,000[ABF]**	-
Total PAH	µg/kg	n/v	n/v	1,713,000	1,106,000	-	ND	-	ND	ND	3,790,000	-
Semi-Volatile Organic Compounds												
Acetophenone	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Atrazine	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U *	79,000 U *	-
Benzaldehyde	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Biphenyl	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Bis(2-Chloroethoxy)methane	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Bis(2-Chloroethyl)ether	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Bis(2-Chloroisopropyl)ether (2,2-oxybis(1-Chloropropane))	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Bis(2-Ethylhexyl)phthalate (DEHP)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Bromophenyl Phenyl Ether, 4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Butyl Benzyl Phthalate	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Caprolactam	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Carbazole	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U F2	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Chloro-3-methyl phenol, 4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Chloroaniline, 4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Chloronaphthalene, 2-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Chlorophenol, 2- (ortho-Chlorophenol)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Chlorophenyl Phenyl Ether, 4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Cresol, o- (Methylphenol, 2-)	µg/kg	330[A] 100,000[B] 330[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Cresol, p- (Methylphenol, 4-)	µg/kg	330[A] 100,000[B] 330[C]	n/v	130,000 U	93,000 U	-	6,900 U	-	370 U	400 U	150,000 U	-
Dibenzofuran	µg/kg	7,000[A] 59,000[B] 210,000[C]	n/v	67,000 U F2	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Dibutyl Phthalate (DBP)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Dichlorobenzidine, 3,3'-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	130,000 U	93,000 U	-	6,900 U	-	370 U	400 U	150,000 U	-
Dichlorophenol, 2,4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Diethyl Phthalate	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U *	79,000 U *	-
Dimethyl Phthalate	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Dimethylphenol, 2,4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Dinitro-o-cresol, 4,6-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	130,000 U *	93,000 U *	-	6,900 U	-	370 U	400 U	150,000 U	-
Dinitrophenol, 2,4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	660,000 U	470,000 U	-	35,000 U	-	1,900 U	2,000 U	770,000 U	-
Dinitrotoluene, 2,4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Dinitrotoluene, 2,6-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Di-n-Octyl phthalate	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Hexachlorobenzene	µg/kg	330[A] 1,200[B] 3,200[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Hexachlorocyclopentadiene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Hexachloroethane	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Isophorone	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Methylnaphthalene, 2-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Nitroaniline, 2-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	130,000 U	93,000 U	-	6,900 U	-	370 U	400 U	150,000 U	-
Nitroaniline, 3-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	130,000 U	93,000 U	-	6,900 U	-	370 U	400 U	150,000 U	-
Nitroaniline, 4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	130,000 U	93,000 U	-	6,900 U	-	370 U	400 U	150,000 U	-
Nitrobenzene	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	15,000[D]	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Nitrophenol, 2-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Nitrophenol, 4-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	130,000 U	93,000 U	-	6,900 U	-	370 U	400 U *	150,000 U *	-
N-Nitrosodi-n-Propylamine	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
n-Nitrosodiphenylamine	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Pentachlorophenol	µg/kg	800[A] 6,700[B] 800[C]	n/v	130,000 U	93,000 U	-	6,900 U	-	370 U	400 U	150,000 U	-
Phenol	µg/kg	330[A] 100,000[B] 330[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Trichlorophenol, 2,4,5-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Trichlorophenol, 2,4,6-	µg/kg	100,000[A] 100,000[B] 1,000,000[C]	n/v	67,000 U	48,000 U	-	3,600 U	-	190 U	200 U	79,000 U	-
Total SVOC	µg/kg	n/v	n/v	ND	ND	-	ND	-	ND	ND	ND	-
SVOC TICs												
Total SVOC TICs	µg/kg	n/v	n/v	75,000 TJN	46,000 TJN	-	ND	-	5,140 TJ	4,900 TJ	794,000 TJN	-

See notes on last page.

Table 1
Summary of Analytical Results - Soil Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Sample Location				SS-1		TP-1		TP-2		TP-3	TP-4	TP-5
Sample Date				22-Apr-19	22-Apr-19	28-Aug-18	28-Aug-18	28-Aug-18	28-Aug-18	28-Aug-18	28-Aug-18	28-Aug-18
Sample ID				CNL-SS1-SS	CNL-SS1-SS-DUP	CNL-TP1-S	CNL-TP1-S	CNL-TP2-S	CNL-TP2-S	CNL-TP3-S	CNL-TP4-S	CNL-TP5-S
Sample Depth				0 - 4 in	0 - 4 in	6 ft	6 ft	7.2 ft	7.2 ft	2 ft	4 ft	4 ft
Sampling Company				STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory				TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL
Laboratory Work Order				480-152402-1	480-152402-1	480-140994-1	480-141385-1	480-140994-1	480-141385-1	480-140994-1	480-140994-1	480-140994-1
Laboratory Sample ID				480-152402-1	480-152402-2	480-140994-1	480-141385-1	480-140994-2	480-141385-2	480-140994-3	480-140994-4	480-140994-6
Sample Type	Units	NYSDEC-Part 375	NYSDEC CP-51		Field Duplicate							
Semi-Volatile Organic Compounds - TCLP												
Cresol, m- (Methylphenol, 3-)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-
Cresol, o- (Methylphenol, 2-)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-
Cresol, p- (Methylphenol, 4-)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-
Dichlorobenzene, 1,4-	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-
Dinitrotoluene, 2,4-	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-
Hexachlorobenzene	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-
Hexachloroethane	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-
Nitrobenzene	mg/L	n/v	15[D]	-	-	-	-	-	-	-	-	-
Pentachlorophenol	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-
Pyridine	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-
Trichlorophenol, 2,4,5-	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-
Trichlorophenol, 2,4,6-	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-
Volatile Organic Compounds												
Acetone	µg/kg	50[AC] 100,000[B]	n/v	-	-	26 U	-	29 U	-	30 U	29 U	28 U F1
Benzene	µg/kg	60[AC] 4,800[B]	60[EF]	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U
Bromodichloromethane	µg/kg	100,000[a,A] 100,000[b,B] 1,000,000[d,C]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U
Bromoform (Tribromomethane)	µg/kg	100,000[a,A] 100,000[b,B] 1,000,000[d,C]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 UJ
Bromomethane (Methyl bromide)	µg/kg	100,000[a,A] 100,000[b,B] 1,000,000[d,C]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U
Butylbenzene, n-	µg/kg	12,000[AC] 100,000[b,B]	12,000[EF]	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 UJ
Butylbenzene, sec- (2-Phenylbutane)	µg/kg	11,000[AC] 100,000[b,B]	11,000[EF]	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U F1
Butylbenzene, tert-	µg/kg	5,900[AC] 100,000[b,B]	5,900[EF]	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U
Carbon Disulfide	µg/kg	100,000[a,A] 100,000[b,B] 1,000,000[d,C]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U F1
Carbon Tetrachloride (Tetrachloromethane)	µg/kg	760[AC] 2,400[B]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U F1
Chlorobenzene (Monochlorobenzene)	µg/kg	1,100[AC] 100,000[b,B]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U F1
Chlorobromomethane	µg/kg	100,000[a,A] 100,000[b,B] 1,000,000[d,C]	n/v	-	-	-	-	-	-	-	-	-
Chloroethane (Ethyl Chloride)	µg/kg	100,000[a,A] 100,000[b,B] 1,000,000[d,C]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U
Chloroform (Trichloromethane)	µg/kg	370[AC] 49,000[B]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U
Chloromethane	µg/kg	100,000[a,A] 100,000[b,B] 1,000,000[d,C]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U
Cyclohexane	µg/kg	100,000[a,A] 100,000[b,B] 1,000,000[d,C]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U
Dibromo-3-Chloropropane, 1,2- (DBCP)	µg/kg	100,000[a,A] 100,000[b,B] 1,000,000[d,C]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 UJ
Dibromochloromethane	µg/kg	100,000[a,A] 100,000[b,B] 1,000,000[d,C]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U F1
Dichlorobenzene, 1,2-	µg/kg	1,100[AC] 100,000[b,B]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 UJ
Dichlorobenzene, 1,3-	µg/kg	2,400[AC] 49,000[B]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 UJ
Dichlorobenzene, 1,4-	µg/kg	1,800[AC] 13,000[B]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 UJ
Dichlorodifluoromethane (Freon 12)	µg/kg	100,000[a,A] 100,000[b,B] 1,000,000[d,C]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U
Dichloroethane, 1,1-	µg/kg	270[AC] 26,000[B]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U
Dichloroethane, 1,2-	µg/kg	20[a,A] 3,100[B] 20[c,C]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 UJ
Dichloroethene, 1,1-	µg/kg	330[AC] 100,000[b,B]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U
Dichloroethene, cis-1,2-	µg/kg	250[AC] 100,000[b,B]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U F1
Dichloroethene, trans-1,2-	µg/kg	190[AC] 100,000[b,B]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U F1
Dichloropropane, 1,2-	µg/kg	100,000[a,A] 100,000[b,B] 1,000,000[d,C]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U
Dichloropropene, cis-1,3-	µg/kg	100,000[a,A] 100,000[b,B] 1,000,000[d,C]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 UJ
Dichloropropene, trans-1,3-	µg/kg	100,000[a,A] 100,000[b,B] 1,000,000[d,C]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U F1
Ethylbenzene	µg/kg	1,000[AC] 41,000[B]	1,000[EF]	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U F1
Ethylene Dibromide (Dibromoethane, 1,2-)	µg/kg	100,000[a,A] 100,000[b,B] 1,000,000[d,C]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 UJ
Hexanone, 2- (Methyl Butyl Ketone)	µg/kg	100,000[a,A] 100,000[b,B] 1,000,000[d,C]	n/v	-	-	26 U	-	29 U	-	30 U	29 U	28 U
Isopropylbenzene	µg/kg	100,000[a,A] 100,000[b,B] 1,000,000[d,C]	2,300[EF]	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U
Isopropyltoluene, p- (Cymene)	µg/kg	100,000[a,A] 100,000[b,B] 1,000,000[d,C]	10,000[EF]	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U F1
Methyl Acetate	µg/kg	100,000[a,A] 100,000[b,B] 1,000,000[d,C]	n/v	-	-	26 U	-	29 U	-	30 U	29 U	28 U
Methyl Ethyl Ketone (MEK) (2-Butanone)	µg/kg	120[AC] 100,000[b,B]	n/v	-	-	26 U *	-	29 U *	-	30 U *	29 U *	28 UJ
Methyl Isobutyl Ketone (MIBK)	µg/kg	100,000[a,A] 100,000[b,B] 1,000,000[d,C]	n/v	-	-	26 U	-	29 U	-	30 U	29 U	28 U
Methyl tert-butyl ether (MTBE)	µg/kg	930[AC] 100,000[b,B]	930[E]	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U
Methylcyclohexane	µg/kg	100,000[a,A] 100,000[b,B] 1,000,000[d,C]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U
Methylene Chloride (Dichloromethane)	µg/kg	50[AC] 100,000[b,B]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U
Naphthalene	µg/kg	12,000[AC] 100,000[b,B]	12,000[EF]	-	-	-	-	-	-	-	-	-
Propylbenzene, n-	µg/kg	3,900[AC] 100,000[b,B]	3,900[EF]	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U F1
Styrene	µg/kg	100,000[a,A] 100,000[b,B] 1,000,000[d,C]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 UJ
Tetrachloroethane, 1,1,2,2-	µg/kg	100,000[a,A] 100,000[b,B] 1,000,000[d,C]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U F1
Tetrachloroethene (PCE)	µg/kg	1,300[AC] 19,000[B]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U F1
Toluene	µg/kg	700[AC] 100,000[b,B]	700[EF]	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U
Trichlorobenzene, 1,2,3-	µg/kg	100,000[a,A] 100,000[b,B] 1,000,000[d,C]	n/v	-	-	-	-	-	-	-	-	-
Trichlorobenzene, 1,2,4-	µg/kg	100,000[a,A] 100,000[b,B] 1,000,000[d,C]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 UJ
Trichloroethane, 1,1,1-	µg/kg	680[AC] 100,000[b,B]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U
Trichloroethane, 1,1,2-	µg/kg	100,000[a,A] 100,000[b,B] 1,000,000[d,C]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U
Trichloroethene (TCE)	µg/kg	470[AC] 21,000[B]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U F1
Trichlorofluoromethane (Freon 11)	µg/kg	100,000[a,A] 100,000[b,B] 1,000,000[d,C]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U
Trichlorotrifluoroethane (Freon 113)	µg/kg	100,000[a,A] 100,000[b,B] 1,000,000[d,C]	n/v	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U
Trimethylbenzene, 1,2,4-	µg/kg	3,600[AC] 52,000[B]	3,600[EF]	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U F1
Trimethylbenzene, 1,3,5-	µg/kg	8,400[AC] 52,000[B]	8,400[EF]	-	-	5.3 U	-	5.7 U	-	6.1 U	5.8 U	5.6 U F1
Vinyl Chloride	µg/kg	20[AC] 900[B]	n/v	-	-	5.3 UJ	-	5.7 UJ	-	6.1 UJ	5.8 UJ	5.6 UJ
Xylene, m & p-	µg/kg	260[a,A] 100,000[b,a,B] 1,600[b,C]	n/v	-	-	-	-	-	-	-	-	-
Xylene, o-	µg/kg	260[a,A] 100,000[b,a,B] 1,600[b,C]	n/v	-	-	-	-	-	-	-	-	-
Xylenes, Total	µg/kg	260[A] 100,000[b,B] 1,600[C]	260[EF]	-	-	11 U	-	11 U	-	12 U	12 U	11 U F1
Total VOC	µg/kg	n/v	n/v	-	-	ND	-	ND	-	ND	ND	ND
VOC TICs												
Total VOC TICs	µg/kg	n/v	n/v	-	-	ND	-	ND	-	ND	6.8 TJN	ND

See notes on last page.

Table 1
Summary of Analytical Results - Soil Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Sample Location				SS-1		TP-1		TP-2		TP-3	TP-4	TP-5
Sample Date				22-Apr-19	22-Apr-19	28-Aug-18	28-Aug-18	28-Aug-18	28-Aug-18	28-Aug-18	28-Aug-18	28-Aug-18
Sample ID				CNL-SS1-SS	CNL-SS1-SS-DUP	CNL-TP1-S	CNL-TP1-S	CNL-TP2-S	CNL-TP2-S	CNL-TP3-S	CNL-TP4-S	CNL-TP5-S
Sample Depth				0 - 4 in	0 - 4 in	6 ft	6 ft	7.2 ft	7.2 ft	2 ft	4 ft	4 ft
Sampling Company				STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory				TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL
Laboratory Work Order				480-152402-1	480-152402-1	480-140994-1	480-141385-1	480-140994-1	480-141385-1	480-140994-1	480-140994-1	480-140994-1
Laboratory Sample ID				480-152402-1	480-152402-2	480-140994-1	480-141385-1	480-140994-2	480-141385-2	480-140994-3	480-140994-4	480-140994-6
Sample Type	Units	NYSDEC-Part 375	NYSDEC CP-51		Field Duplicate							
Volatile Organic Compounds - TCLP												
Benzene	mg/L	n/v	0.06[EF]	-	-	-	-	-	-	-	-	-
Carbon Tetrachloride (Tetrachloromethane)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-
Chlorobenzene (Monochlorobenzene)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-
Chloroform (Trichloromethane)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-
Dichloroethane, 1,2-	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-
Dichloroethene, 1,1-	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-
Methyl Ethyl Ketone (MEK) (2-Butanone)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-
Tetrachloroethene (PCE)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-
Trichloroethene (TCE)	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-
Vinyl Chloride	mg/L	n/v	n/v	-	-	-	-	-	-	-	-	-

See notes on last page.

Table 1
Summary of Analytical Results - Soil Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Notes and Abbreviations:

NYSDEC-Part 375	NYSDEC 6 NYCRR Part 375 Soil Clean-up Objectives (SCOs)
A	NYSDEC 6 NYCRR Part 375 - Unrestricted Use Soil Cleanup Objectives
B	NYSDEC 6 NYCRR Part 375 - Restricted Use SCO - Protection of Human Health - Restricted Residential
C	NYSDEC 6 NYCRR Part 375 - Restricted Use SCO - Protection of Groundwater
NYSDEC CP-51	New York State Department of Environmental Conservation, DEC Policy CP-51, October 21, 2010
D	Table 1 Supplemental Soil Cleanup Objectives - Restricted Residential
E	Table 2 Soil Cleanup Levels for Gasoline Contaminated Soils
F	Table 3 Soil Cleanup Levels for Fuel Oil Contaminated Soil
6.5[A]	Concentration exceeds the indicated standard.
15.2	Measured concentration did not exceed the indicated standard.
0.03 U	Analyte was not detected at a concentration greater than the laboratory reporting limit.
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
a	The SCOs for unrestricted use were capped at a maximum value of 100 mg/kg. See 6 NYCRR Part 375 TSD Section 9.3
b	The SCOs for residential, restricted-residential and ecological resources use were capped at a maximum value of 100 mg/kg. See 6 NYCRR Part 375 TSD Section 9.3.
b,p	The SCOs for residential, restricted-residential and ecological resources use were capped at a maximum value of 100 mg/kg. See 6 NYCRR Part 375 TSD Section 9.3. The criterion is applicable to total xylenes, and the individual isomers should be added for comparison.
d	The SCOs for industrial use and the protection of groundwater were capped at a maximum value of 1000 mg/kg (Organics) and 10000 mg/kg (Inorganics). See 6 NYCRR Part 375 TSD Section 9.3.
e	The SCOS for metals were capped at a maximum value of 10,000 mg/kg. See 6 NYCRR Part 375 TSD Section 9.3.
f	For constituents where the calculated SCO was lower than the CRQL, the CRQL is used as the SCO value.
g	For constituents where the calculated SCO was lower than the rural soil background concentration as determined by the DEC/DOH rural soil survey, the rural soil background concentration is used as the Track 2 SCO value for this use of the site.
i	The SCO for this specific compound (or family of compounds) is considered to be met if the analysis for the total species of this contaminant is below the specific SCO.
j	This SCO is the sum of endosulfan I, endosulfan II, and endosulfan sulfate.
k	This SCO is the lower of the values for mercury (elemental) or mercury (inorganic salts). See 6 NYCRR Part 375 TSD Table 5.6-1.
m	For constituents where the calculated SCO was lower than the Contract Required Quantitation Limit (CRQL), the CRQL is used as the Track 1 SCO value.
n	For constituents where the calculated SCO was lower than the rural soil background concentration as determined by the DEC/DOH rural soil survey, the rural soil background concentration is used as the Track 1 SCO value for this use of the site.
n,i	For constituents where the calculated SCO was lower than the rural soil background concentration as determined by the DEC/DOH rural soil survey, the rural soil background concentration is used as the Track 1 SCO value for this use of the site. The SCO for this specific compound (or family of compounds) is considered to be met if the analysis for the total species of this contaminant is below the specific SCO.
NS,q	No SCO has been established for this compound. No SCO has been established for total chromium; however, see standards for trivalent and hexavalent chromium.
o	Standard is applicable to total PCBs, and the individual Aroclors should be added for comparison.
p	The criterion is applicable to total xylenes, and the individual isomers should be added for comparison.
*	Indicates analysis is not within the quality control limits.
^	ICV,CCV,ICB,CCB, ISA, ISB, CRI, CRA, DLCK or MRL standard: Instrument related QC exceeds the control limits.
>	Greater than.
B	Indicates analyte was found in associated blank, as well as in the sample.
E	Result exceeded calibration range.
F1	MS (Matrix Spike) and/or MSD (Matrix Spike Duplicate) Recovery is outside acceptance limits.
F2	MS/MSD (Matrix Spike/Matrix Spike Duplicate) RPD exceeds control limits.
H	Sample was prepped or analyzed beyond the specified holding time.
HF	Field parameter with a holding time of 15 minutes. Test performed by laboratory at client's request.
J	The reported result is an estimated value.
J-	The analyte was positively identified; the associated numerical value is an estimated quantity that may be biased low.
ND	Not detected.
TJ	Result is a tentatively identified compound (TIC) and an estimated value.
TJN	Result is a tentatively identified compound (TIC) and an estimated value. Indicates an Estimated Value for TICs. Presumptive evidence of material.
UJ	Indicates estimated non-detect.
vs	Sample bottle contained visible sediment. Sample was shaken to obtain representative aliquot. Result may be biased high due to analyte present int sediment.
ESC	ESC Lab Sciences, Mt.Juliet, TN
LABRNY	Labella Associates, P.C.
TAL	Test America Laboratories Inc.
VOC TICs	Volatile Organic Compounds Tentatively Identified Compounds
SVOC TICs	Semi-Volatile Organic Compounds Tentatively Identified Compounds
TCLP	Toxicity Characteristic Leaching Procedure

Table 2a
Summary of Analytical Results in Solids - Miscellaneous Material Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Sample Location			PESTRMFLR		PUMPPIT
Sample Date			7-Mar-19	7-Mar-19	7-Mar-19
Sample ID			CNL-PESTRMFLR-SO	CNL-PESTRMFLR-SO-DUP	CNL-PUMPPIT-SO
Sample Depth			0 - 2 in	0 - 2 in	0 - 2 in
Sampling Company			STANTEC	STANTEC	STANTEC
Laboratory			TAL	TAL	TAL
Laboratory Work Order			480-149924-1	480-149924-1	480-149924-1
Laboratory Sample ID			480-149924-3	480-149924-4	480-149924-2
Sample Type	Units	NYSDEC-Part 375		Field Duplicate	
Metals					
Aluminum	mg/kg	$10,000_{e}^{ABC}$	2,850 J	2,820	-
Antimony	mg/kg	$10,000_{e}^{ABC}$	15.2 UJ	15.2 U	-
Arsenic	mg/kg	13_{n}^{A} 16_{g}^{BC}	7.4	6.8	-
Barium	mg/kg	350_{n}^{A} 400^{B} 820^{C}	151 J	114	-
Beryllium	mg/kg	7.2^{A} 72^{B} 47^{C}	0.20 U	0.21	-
Cadmium	mg/kg	2.5_{n}^{A} 4.3^{B} 7.5^{C}	**4.3^{A}**	**3.5^{A}**	-
Calcium	mg/kg	$10,000_{e}^{ABC}$	**55,000^{ABC}**	**72,300^{ABC}**	-
Chromium	mg/kg	$30_{n,l}^{A}$ 180_{i}^{B} $_{NS,q}^{C}$	12.6	8.2	-
Cobalt	mg/kg	$10,000_{e}^{ABC}$	10.5 J	3.3 J	-
Copper	mg/kg	50^{A} 270^{B} $1,720^{C}$	**103 J^{A}**	**57.5 J^{A}**	-
Iron	mg/kg	$10,000_{e}^{ABC}$	7,330 J	6,590 B	-
Lead	mg/kg	63_{n}^{A} 400^{B} 450^{C}	**1,220 J^{ABC}**	**483 J^{ABC}**	-
Magnesium	mg/kg	$10,000_{e}^{ABC}$	4,700 J	**11,400 J^{ABC}**	-
Manganese	mg/kg	$1,600_{n}^{A}$ $2,000_{g}^{BC}$	223	189	-
Mercury	mg/kg	0.18_{n}^{A} 0.81_{k}^{B} 0.73^{C}	**0.29 J^{A}**	**0.29^{A}**	-
Nickel	mg/kg	30^{A} 310^{B} 130^{C}	29.1	**30.1^{A}**	-
Potassium	mg/kg	$10,000_{e}^{ABC}$	729 F1	1,100	-
Selenium	mg/kg	3.9_{n}^{A} 180^{B} 4_{g}^{C}	4.0 U	4.1 U	-
Silver	mg/kg	2^{A} 180^{B} 8.3^{C}	0.61 U	0.61 U	-
Sodium	mg/kg	$10,000_{e}^{ABC}$	764	776	-
Thallium	mg/kg	$10,000_{e}^{ABC}$	6.1 U	6.1 U	-
Vanadium	mg/kg	$10,000_{e}^{ABC}$	54.6	67.3	-
Zinc	mg/kg	109_{n}^{A} $10,000_{e}^{B}$ $2,480^{C}$	**616 J^{A}**	**359 J^{A}**	-
Polychlorinated Biphenyls					
Aroclor 1016	mg/kg	$_{o}^{ABC}$	4.4 U F1	4.8 U	2.9 U
Aroclor 1221	mg/kg	$_{o}^{ABC}$	4.4 U	4.8 U	2.9 U
Aroclor 1232	mg/kg	$_{o}^{ABC}$	4.4 U	4.8 U	2.9 U
Aroclor 1242	mg/kg	$_{o}^{ABC}$	4.4 U	4.8 U	2.9 U
Aroclor 1248	mg/kg	$_{o}^{ABC}$	4.4 U	4.8 U	2.9 U
Aroclor 1254	mg/kg	$_{o}^{ABC}$	4.4 U	4.8 U	2.9 U
Aroclor 1260	mg/kg	$_{o}^{ABC}$	4.4 UJ	4.8 U	2.9 U
Polychlorinated Biphenyls (PCBs)	mg/kg	0.1^{A} 1^{B} 3.2^{C}	ND	ND	ND
Pesticides					
Aldrin	µg/kg	5_{n}^{A} 97^{B} 190^{C}	240 U	250 U	-
BHC, alpha-	µg/kg	20^{AC} 480^{B}	240 U	250 U	-
BHC, beta-	µg/kg	36^{A} 360^{B} 90^{C}	240 U	250 U	-
BHC, delta-	µg/kg	40_{n}^{A} $100,000_{b}^{B}$ 250^{C}	240 U	250 U	-
Camphechlor (Toxaphene)	µg/kg	$100,000_{a}^{A}$ $100,000_{b}^{B}$ $1,000,000_{d}^{C}$	2,400 U	2,500 U	-
Chlordane, alpha-	µg/kg	94^{A} $4,200^{B}$ $2,900^{C}$	**3,400 J^{AC}**	**3,600 J^{AC}**	-
Chlordane, trans- (gamma-Chlordane)	µg/kg	$100,000_{a}^{A}$ $100,000_{b}^{B}$ $1,000,000_{d}^{C}$	2,300	2,400	-
DDD (p,p'-DDD)	µg/kg	3.3_{m}^{A} $13,000^{B}$ $14,000^{C}$	240 U	250 U	-
DDE (p,p'-DDE)	µg/kg	3.3_{m}^{A} $8,900^{B}$ $17,000^{C}$	**580^{A}**	**560 J^{A}**	-
DDT (p,p'-DDT)	µg/kg	3.3_{m}^{A} $7,900^{B}$ $136,000^{C}$	**1,800^{A}**	**1,900^{A}**	-
Dieldrin	µg/kg	5_{n}^{A} 200^{B} 100^{C}	240 U	250 U	-
Endosulfan I	µg/kg	$2,400_{j}^{A}$ $24,000_{i}^{B}$ $102,000^{C}$	240 U	250 U	-
Endosulfan II	µg/kg	$2,400_{i}^{A}$ $24,000_{i}^{B}$ $102,000^{C}$	240 U	250 U	-
Endosulfan Sulfate	µg/kg	$2,400_{i}^{A}$ $24,000_{i}^{B}$ $1,000,000_{d}^{C}$	240 U	250 U	-
Endrin	µg/kg	14^{A} $11,000^{B}$ 60^{C}	240 U	250 U	-
Endrin Aldehyde	µg/kg	$100,000_{a}^{A}$ $100,000_{b}^{B}$ $1,000,000_{d}^{C}$	240 U	250 U	-
Endrin Ketone	µg/kg	$100,000_{a}^{A}$ $100,000_{b}^{B}$ $1,000,000_{d}^{C}$	240 U	250 U	-
Heptachlor	µg/kg	42^{A} $2,100^{B}$ 380^{C}	240 U	250 U	-
Heptachlor Epoxide	µg/kg	$100,000_{a}^{A}$ $100,000_{b}^{B}$ $1,000,000_{d}^{C}$	240 U	250 U	-
Lindane (Hexachlorocyclohexane, gamma)	µg/kg	100^{AC} $1,300^{B}$	240 U	250 U	-
Methoxychlor (4,4'-Methoxychlor)	µg/kg	$100,000_{a}^{A}$ $100,000_{b}^{B}$ $1,000,000_{d}^{C}$	240 U	250 U	-

Notes and Abbreviations:

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A	NYSDEC 6 NYCRR Part 375 - Unrestricted Use Soil Cleanup Objectives
B	NYSDEC 6 NYCRR Part 375 - Restricted Use SCO - Protection of Human Health - Restricted Residential
C	NYSDEC 6 NYCRR Part 375 - Restricted Use SCO - Protection of Groundwater
6.5^{A}	Concentration exceeds the indicated standard.
15.2	Measured concentration did not exceed the indicated standard.
0.03 U	Analyte was not detected at a concentration greater than the laboratory reporting limit.
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
a	The SCOs for unrestricted use were capped at a maximum value of 100 mg/kg. See 6 NYCRR Part 375 TSD Section 9.3
b	The SCOs for residential, restricted-residential and ecological resources use were capped at a maximum value of 100 mg/kg. See 6 NYCRR Part 375 TSD Section 9.3.
d	The SCOs for industrial use and the protection of groundwater were capped at a maximum value of 1000 mg/kg (Organics) and 10000 mg/kg (Inorganics). See 6 NYCRR Part 375 TSD Section 9.3.
e	The SCOS for metals were capped at a maximum value of 10,000 mg/kg. See 6 NYCRR Part 375 TSD Section 9.3.
g	For constituents where the calculated SCO was lower than the rural soil background concentration as determined by the DEC/DOH rural soil survey, the rural soil background concentration is used as the Track 2 SCO value for this use of the site.
i	The SCO for this specific compound (or family of compounds) is considered to be met if the analysis for the total species of this contaminant is below the specific SCO.
j	This SCO is the sum of endosulfan I, endosulfan II, and endosulfan sulfate.
k	This SCO is the lower of the values for mercury (elemental) or mercury (inorganic salts). See 6 NYCRR Part 375 TSD Table 5.6-1.
m	For constituents where the calculated SCO was lower than the Contract Required Quantitation Limit (CRQL), the CRQL is used as the Track 1 SCO value.
n	For constituents where the calculated SCO was lower than the rural soil background concentration as determined by the DEC/DOH rural soil survey, the rural soil background concentration is used as the Track 1 SCO value for this use of the site.
n,l	For constituents where the calculated SCO was lower than the rural soil background concentration as determined by the DEC/DOH rural soil survey, the rural soil background concentration is used as the Track 1 SCO value for this use of the site. The SCO for this specific compound (or family of compounds) is considered to be met if the analysis for the total species of this contaminant is below the specific SCO.
NS,q	No SCO has been established for this compound. No SCO has been established for total chromium; however, see standards for trivalent and hexavalent chromium.
o	Standard is applicable to total PCBs, and the individual Aroclors should be added for comparison.
B	Indicates analyte was found in associated blank, as well as in the sample.
F1	MS (Matrix Spike) and/or MSD (Matrix Spike Duplicate) Recovery is outside acceptance limits.
F2	MS/MSD (Matrix Spike/Matrix Spike Duplicate) RPD exceeds control limits.
J	The reported result is an estimated value.
ND	Not detected.
UJ	Indicates estimated non-detect.
TAL	Test America Laboratories Inc.

Table 2b
Summary of Analytical Results in Wipe Sample - Miscellaneous Material Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Sample Location			PUMP
Sample Date			7-Mar-19
Sample ID			CNL-PUMP-Wp
Sampling Company			STANTEC
Laboratory			TAL
Laboratory Work Order			480-149924-1
Laboratory Sample ID	Units	Standard	480-149924-1
Polychlorinated Biphenyls			
Aroclor 1016	µg/wipe	n/v	2.0 U
Aroclor 1221	µg/wipe	n/v	2.0 U
Aroclor 1232	µg/wipe	n/v	2.0 U
Aroclor 1242	µg/wipe	n/v	2.0 U
Aroclor 1248	µg/wipe	n/v	2.0 U
Aroclor 1254	µg/wipe	n/v	2.0 U
Aroclor 1260	µg/wipe	n/v	2.0 U
Polychlorinated Biphenyls (PCBs)	µg/wipe	≥10 <100[A] 100>[B]	ND

Notes and Abbreviations:

Standard	Standard
[A]	Non-porous surfaces exhibiting total PCB concentrations≥10ug/100 cm2 and <100 ug/100 cm2 may be disposed of at a permitted municipal solid waste landfill.
[B]	Bulk Remediation Waste exhibiting total PCBs≥100 ug/100 cm2 must be disposed of in a hazardous waste landfill permitted by EPA under section 3004 of RCRA or by a state authorized under section 3006 of RCRA per 40 CFR 761.61(a)(5)(ii)(B)(2).
6.5[A]	Concentration exceeds the indicated standard.
15.2	Measured concentration did not exceed the indicated standard.
0.03 U	Analyte was not detected at a concentration greater than the laboratory reporting limit.
n/v	No standard/guideline value.
ND	Not detected.
TAL	Test America Laboratories Inc.

Table 3
Summary of Analytical Results - in Water Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Sample Location			MW-01	MW-02				MW-09						B/MW-100					B/MW-102			B/MW-104		
Sample Date			11-Jun-14	11-Jun-14	2-Oct-18	28-Feb-19	24-Apr-19	24-Sep-08	11-Jun-14	2-Oct-18	2-Oct-18	24-Apr-19	1-Oct-18	26-Feb-19	26-Feb-19	24-Apr-19	24-Apr-19	1-Oct-18	28-Feb-19	24-Apr-19	2-Oct-18	26-Feb-19	24-Apr-19
Sample ID			MW-01	MW-02	CNL-MW02-GW	CNL-MW02-W	CNL-MW02-W	MW-9	MW-09	CNL-MW9-GW	CNL-FD-GW	CNL-MW9-W	CNL-MW100-GW	CNL-MW100-W	CNL-MWDUP 100-W	CNL-MW100-W	CNL-MWDUP-W	CNL-MW102-GW	CNL-MW102-W	CNL-MW102-W	CNL-MW104-GW	CNL-MW104-W	CNL-MW104-W
Sampling Company			LABRNY	LABRNY	STANTEC	STANTEC	STANTEC	HAROC	LABRNY	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			ESC	ESC	TAL	TAL	TAL	UNKNOWN	ESC	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL
Laboratory Work Order			L704675	L704675	480-142699-1	480-149237-1	480-152563-1	UNKNOWN	L704675	480-142699-1	480-142699-1	480-152563-1	480-142699-1	480-149237-1	480-149237-1	480-152563-1	480-152563-1	480-142699-1	480-149237-1	480-152563-1	480-142699-1	480-149237-1	480-152563-1
Laboratory Sample ID			L704675-06	L704675-07	480-142788-5	480-149629-2	480-152563-5	A8B79401	L704675-08	480-142788-4	480-142788-6	480-152563-4	480-142699-2	480-149515-1	480-149515-4	480-152563-10	480-152563-11	480-142699-1	480-149629-5	480-152563-12	480-142788-1	480-149515-2	480-152563-2
Sample Type	Units	TOGS									Field Duplicate				Field Duplicate		Field Duplicate							
General Chemistry																								
Nitrate (as N)	mg/L	10[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.47	-	-	0.86	-	-
Sulfate	mg/L	250[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	63.0	-	-	123	-	-
Metals, Dissolved																							
Aluminum	mg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Antimony	mg/L	0.003[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Arsenic	mg/L	0.025[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Barium	mg/L	1[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Beryllium	mg/L	0.003[A]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cadmium	mg/L	0.005[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Calcium	mg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chromium	mg/L	0.05[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Cobalt	mg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Copper	mg/L	0.2[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Iron	mg/L	0.3[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.050 U	-	-	0.050 U	-	-
Lead	mg/L	0.025[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Magnesium	mg/L	35[A]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Manganese	mg/L	0.3[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Mercury	mg/L	0.0007[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Nickel	mg/L	0.1[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Potassium	mg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Selenium	mg/L	0.01[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Silver	mg/L	0.05[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sodium	mg/L	20[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Thallium	mg/L	0.0005[A]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Vanadium	mg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Zinc	mg/L	2[A]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals, Total																							
Aluminum	mg/L	n/v	-	-	-	-	-	-	-	-	-	-	0.20 U	0.20 U	-	-	-	-	-	-	0.26	-	-
Antimony	mg/L	0.003[B]	-	-	-	-	-	-	-	-	-	-	0.020 U	0.020 U	-	-	-	-	-	-	-	0.020 U	-
Arsenic	mg/L	0.025[B]	-	-	-	-	-	-	-	-	-	-	0.015 U	0.015 U	-	-	-	-	-	-	-	0.015 U	-
Barium	mg/L	1[B]	-	-	-	-	-	-	-	-	-	-	0.094	0.084	-	-	-	-	-	-	-	0.056	-
Beryllium	mg/L	0.003[A]	-	-	-	-	-	-	-	-	-	-	0.0020 U	0.0020 U	-	-	-	-	-	-	-	0.0020 U	-
Cadmium	mg/L	0.005[B]	-	-	-	-	-	-	-	-	-	-	0.0020 U	0.0020 U	-	-	-	-	-	-	-	0.0020 U	-
Calcium	mg/L	n/v	-	-	-	-	-	-	-	-	-	-	131	118	-	-	-	-	-	-	-	41.9	-
Chromium	mg/L	0.05[B]	-	-	-	-	-	-	-	-	-	-	0.0040 U	0.0040 U	-	-	-	-	-	-	-	0.0040 U	-
Cobalt	mg/L	n/v	-	-	-	-	-	-	-	-	-	-	0.0040 U	0.0040 U	-	-	-	-	-	-	-	0.0052	-
Copper	mg/L	0.2[B]	-	-	-	-	-	-	-	-	-	-	0.010 U	0.010 U	-	-	-	-	-	-	-	0.010 U	-
Iron	mg/L	0.3[B]	-	-	-	-	-	-	-	-	-	-	0.050 U	0.050 U	-	-	-	0.19	-	-	**30.9[B]**	**0.41[B]**	-
Lead	mg/L	0.025[B]	-	-	-	-	-	-	-	-	-	-	0.010 U	0.010 U	-	-	-	-	-	-	-	0.010 U	-
Magnesium	mg/L	35[A]	-	-	-	-	-	-	-	-	-	-	**38.4[A]**	34.5	-	-	-	-	-	-	-	18.3	-
Manganese	mg/L	0.3[B]	-	-	-	-	-	-	-	-	-	-	**0.32[B]**	0.29	-	-	-	-	-	-	-	0.22	-
Mercury	mg/L	0.0007[B]	-	-	-	-	-	-	-	-	-	-	0.00020 U	0.00020 U	-	-	-	-	-	-	-	0.00020 U	-
Nickel	mg/L	0.1[B]	-	-	-	-	-	-	-	-	-	-	0.010 U	0.010 U	-	-	-	-	-	-	-	0.010 U	-
Potassium	mg/L	n/v	-	-	-	-	-	-	-	-	-	-	10.2	9.3	-	-	-	-	-	-	-	14.1	-
Selenium	mg/L	0.01[B]	-	-	-	-	-	-	-	-	-	-	0.025 U	0.025 U	-	-	-	-	-	-	-	0.025 U	-
Silver	mg/L	0.05[B]	-	-	-	-	-	-	-	-	-	-	0.0060 U	0.0060 U	-	-	-	-	-	-	-	0.0060 U	-
Sodium	mg/L	20[B]	-	-	-	-	-	-	-	-	-	-	**322[B]**	**290[B]**	-	-	-	-	-	-	-	**130[B]**	-
Thallium	mg/L	0.0005[A]	-	-	-	-	-	-	-	-	-	-	0.020 U	0.020 U	-	-	-	-	-	-	-	0.020 U	-
Vanadium	mg/L	n/v	-	-	-	-	-	-	-	-	-	-	0.0050 U	0.0050 U	-	-	-	-	-	-	-	0.0050 U	-
Zinc	mg/L	2[A]	-	-	-	-	-	-	-	-	-	-	0.013	0.012	-	-	-	-	-	-	-	0.010 U	-
Polychlorinated Biphenyls																							
Aroclor 1016	µg/L	0.09[B]	-	-	-	-	-	-	-	-	-	-	0.50 U	0.50 U	-	-	-	-	-	-	-	0.50 U	-
Aroclor 1221	µg/L	0.09[B]	-	-	-	-	-	-	-	-	-	-	0.50 U	0.50 U	-	-	-	-	-	-	-	0.50 U	-
Aroclor 1232	µg/L	0.09[B]	-	-	-	-	-	-	-	-	-	-	0.50 U	0.50 U	-	-	-	-	-	-	-	0.50 U	-
Aroclor 1242	µg/L	0.09[B]	-	-	-	-	-	-	-	-	-	-	0.50 U	0.50 U	-	-	-	-	-	-	-	0.50 U	-
Aroclor 1248	µg/L	0.09[B]	-	-	-	-	-	-	-	-	-	-	0.50 U	0.50 U	-	-	-	-	-	-	-	0.50 U	-
Aroclor 1254	µg/L	0.09[B]	-	-	-	-	-	-	-	-	-	-	0.50 U	0.50 U	-	-	-	-	-	-	-	0.50 U	-
Aroclor 1260	µg/L	0.09[B]	-	-	-	-	-	-	-	-	-	-	0.50 U	0.50 U	-	-	-	-	-	-	-	0.50 U	-
Polychlorinated Biphenyls (PCBs)	µg/L	0.09[B]	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-	-	-	-	ND	-

See notes on last page.

Table 3
Summary of Analytical Results - in Water Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Sample Location			MW-01	MW-02				MW-09						B/MW-100				B/MW-102			B/MW-104		
Sample Date			11-Jun-14	11-Jun-14	2-Oct-18	28-Feb-19	24-Apr-19	24-Sep-08	11-Jun-14	2-Oct-18	2-Oct-18	24-Apr-19	1-Oct-18	26-Feb-19	26-Feb-19	24-Apr-19	24-Apr-19	1-Oct-18	28-Feb-19	24-Apr-19	2-Oct-18	26-Feb-19	24-Apr-19
Sample ID			MW-01	MW-02	CNL-MW02-GW	CNL-MW02-W	CNL-MW02-W	MW-9	MW-09	CNL-MW9-GW	CNL-FD-GW	CNL-MW9-W	CNL-MW100-GW	CNL-MW100-W	CNL-MWDUP 100-W	CNL-MW100-W	CNL-MWDUP-W	CNL-MW102-GW	CNL-MW102-W	CNL-MW102-W	CNL-MW104-GW	CNL-MW104-W	CNL-MW104-W
Sampling Company			LABRNY	LABRNY	STANTEC	STANTEC	STANTEC	HAROC	LABRNY	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			ESC	ESC	TAL	TAL	TAL	UNKNOWN	ESC	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL
Laboratory Work Order			L704675	L704675	480-142699-1	480-149237-1	480-152563-1	UNKNOWN	L704675	480-142699-1	480-142699-1	480-152563-1	480-142699-1	480-149237-1	480-149237-1	480-152563-1	480-152563-1	480-142699-1	480-149237-1	480-152563-1	480-142699-1	480-149237-1	480-152563-1
Laboratory Sample ID			L704675-06	L704675-07	480-142788-5	480-149629-2	480-152563-5	A8B79401	L704675-08	480-142788-4	480-142788-6	480-152563-4	480-142699-2	480-149515-1	480-149515-4	480-152563-10	480-152563-11	480-142699-1	480-149629-5	480-152563-12	480-142788-1	480-149515-2	480-152563-2
Sample Type	Units	TOGS									Field Duplicate				Field Duplicate		Field Duplicate						
Pesticides																							
Aldrin	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	0.050 U	0.050 U	-	-	-	-	-	-	0.050 U	-
BHC, alpha-	µg/L	0.01[B]	-	-	-	-	-	-	-	-	-	-	-	0.050 U	0.050 U	-	-	-	-	-	-	0.050 U	-
BHC, beta-	µg/L	0.04[B]	-	-	-	-	-	-	-	-	-	-	-	0.050 U	0.050 U	-	-	-	-	-	-	0.050 U	-
BHC, delta-	µg/L	0.04[B]	-	-	-	-	-	-	-	-	-	-	-	0.050 U	0.050 U	-	-	-	-	-	-	0.050 U	-
Camphechlor (Toxaphene)	µg/L	0.06[B]	-	-	-	-	-	-	-	-	-	-	-	0.50 U	0.50 U	-	-	-	-	-	-	0.50 U	-
Chlordane, alpha-	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	0.050 U	0.050 U	-	-	-	-	-	-	0.050 U	-
Chlordane, trans- (gamma-Chlordane)	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	0.050 U	0.050 U	-	-	-	-	-	-	0.050 U	-
DDD (p,p'-DDD)	µg/L	0.3[B]	-	-	-	-	-	-	-	-	-	-	-	0.050 U	0.050 U	-	-	-	-	-	-	0.050 U	-
DDE (p,p'-DDE)	µg/L	0.2[B]	-	-	-	-	-	-	-	-	-	-	-	0.050 U	0.050 U	-	-	-	-	-	-	0.050 U	-
DDT (p,p'-DDT)	µg/L	0.2[B]	-	-	-	-	-	-	-	-	-	-	-	0.050 U	0.050 U	-	-	-	-	-	-	0.050 U	-
Dieldrin	µg/L	0.004[B]	-	-	-	-	-	-	-	-	-	-	-	0.050 U	0.050 U	-	-	-	-	-	-	0.050 U	-
Endosulfan I	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	0.050 U	0.050 U	-	-	-	-	-	-	0.050 U	-
Endosulfan II	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	0.050 U	0.050 U	-	-	-	-	-	-	0.050 U	-
Endosulfan Sulfate	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	0.050 U	0.050 U	-	-	-	-	-	-	0.050 U	-
Endrin	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	0.050 U	0.050 U	-	-	-	-	-	-	0.050 U	-
Endrin Aldehyde	µg/L	5–[B]	-	-	-	-	-	-	-	-	-	-	-	0.050 U	0.050 U	-	-	-	-	-	-	0.050 U	-
Endrin Ketone	µg/L	5–[B]	-	-	-	-	-	-	-	-	-	-	-	0.050 U	0.050 U	-	-	-	-	-	-	0.050 U	-
Heptachlor	µg/L	0.04[AB]	-	-	-	-	-	-	-	-	-	-	-	0.050 U	0.050 U	-	-	-	-	-	-	0.050 U	-
Heptachlor Epoxide	µg/L	0.03[B]	-	-	-	-	-	-	-	-	-	-	-	0.050 U	0.050 U	-	-	-	-	-	-	0.050 U	-
Lindane (Hexachlorocyclohexane, gamma)	µg/L	0.05[B]	-	-	-	-	-	-	-	-	-	-	-	0.050 U	0.050 U	-	-	-	-	-	-	0.050 U	-
Methoxychlor (4,4'-Methoxychlor)	µg/L	35[B]	-	-	-	-	-	-	-	-	-	-	-	0.050 U	0.050 U	-	-	-	-	-	-	0.050 U	-
1,4-Dioxane																							
Dioxane, 1,4-	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	0.20 U	0.20 U	-	-	-	-	-	-	0.20 U	-
Polycyclic Aromatic Hydrocarbons																							
Acenaphthene	µg/L	20[B]	11	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Acenaphthylene	µg/L	n/v	3.0	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Anthracene	µg/L	50[A]	5.6	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Benzo(a)anthracene	µg/L	0.002[A]	3.0 U	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Benzo(a)pyrene	µg/L	n/v	3.0 U	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Benzo(b)fluoranthene	µg/L	0.002[A]	3.0 U	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Benzo(g,h,i)perylene	µg/L	n/v	3.0 U	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Benzo(k)fluoranthene	µg/L	0.002[A]	3.0 U	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Chloronaphthalene, 2-	µg/L	10[B]	15 U	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chrysene	µg/L	0.002[A]	3.0 U	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Dibenzo(a,h)anthracene	µg/L	n/v	3.0 U	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Fluoranthene	µg/L	50[A]	3.0 U	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Fluorene	µg/L	50[A]	12	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Indeno(1,2,3-cd)pyrene	µg/L	0.002[A]	3.0 U	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Methylnaphthalene, 1-	µg/L	n/v	1,100	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Methylnaphthalene, 2-	µg/L	n/v	2,400	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	µg/L	10[B]	**2,300[B]**	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	**32[B]**	-
Phenanthrene	µg/L	50[A]	20	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	6.5	-
Pyrene	µg/L	50[A]	4.7	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Total PAH	µg/L	n/v	5,856.3	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-	-	-	38.5	-

See notes on last page.

Table 3
Summary of Analytical Results - in Water Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Sample Location			MW-01	MW-02				MW-09						B/MW-100				B/MW-102			B/MW-104		
Sample Date			11-Jun-14	11-Jun-14	2-Oct-18	28-Feb-19	24-Apr-19	24-Sep-08	11-Jun-14	2-Oct-18	2-Oct-18	24-Apr-19	1-Oct-18	26-Feb-19	26-Feb-19	24-Apr-19	24-Apr-19	1-Oct-18	28-Feb-19	24-Apr-19	2-Oct-18	26-Feb-19	24-Apr-19
Sample ID			MW-01	MW-02	CNL-MW02-GW	CNL-MW02-W	CNL-MW02-W	MW-9	MW-09	CNL-MW9-GW	CNL-FD-GW	CNL-MW9-W	CNL-MW100-GW	CNL-MW100-W	CNL-MWDUP 100-W	CNL-MW100-W	CNL-MWDUP-W	CNL-MW102-GW	CNL-MW102-W	CNL-MW102-W	CNL-MW104-GW	CNL-MW104-W	CNL-MW104-W
Sampling Company			LABRNY	LABRNY	STANTEC	STANTEC	STANTEC	HAROC	LABRNY	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			ESC	ESC	TAL	TAL	TAL	UNKNOWN	ESC	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL
Laboratory Work Order			L704675	L704675	480-142699-1	480-149237-1	480-152563-1	UNKNOWN	L704675	480-142699-1	480-142699-1	480-152563-1	480-142699-1	480-149237-1	480-149237-1	480-152563-1	480-152563-1	480-142699-1	480-149237-1	480-152563-1	480-142788-1	480-149237-1	480-152563-1
Laboratory Sample ID			L704675-06	L704675-07	480-142788-5	480-149629-2	480-152563-5	A8B79401	L704675-08	480-142788-4	480-142788-6	480-152563-4	480-142699-2	480-149515-1	480-149515-4	480-152563-10	480-152563-11	480-142699-1	480-149629-5	480-152563-12	480-142788-1	480-149515-2	480-152563-2
Sample Type	Units	TOGS									Field Duplicate				Field Duplicate		Field Duplicate						
Semi-Volatile Organic Compounds																							
Acetophenone	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Atrazine	µg/L	7.5[B]	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Benzaldehyde	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Biphenyl	µg/L	5--[B]	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Bis(2-Chloroethoxy)methane	µg/L	5--[B]	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Bis(2-Chloroethyl)ether	µg/L	1[B]	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Bis(2-Chloroisopropyl)ether (2,2-oxybis(1-Chloropropane))	µg/L	5--[B]	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Bis(2-Ethylhexyl)phthalate (DEHP)	µg/L	5[B]	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Bromophenyl Phenyl Ether, 4-	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Butyl Benzyl Phthalate	µg/L	50[A]	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Caprolactam	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Carbazole	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Chloro-3-methyl phenol, 4-	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Chloroaniline, 4-	µg/L	5--[B]	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Chloronaphthalene, 2-	µg/L	10[B]	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Chlorophenol, 2- (ortho-Chlorophenol)	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Chlorophenyl Phenyl Ether, 4-	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Cresol, o- (Methylphenol, 2-)	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Cresol, p- (Methylphenol, 4-)	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	10 U	10 U	-	-	-	-	-	-	10 U	-
Dibenzofuran	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	10 U	10 U	-	-	-	-	-	-	10 U	-
Dibutyl Phthalate (DBP)	µg/L	50[B]	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Dichlorobenzidine, 3,3'-	µg/L	5--[B]	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Dichlorophenol, 2,4-	µg/L	5--[B]	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Diethyl Phthalate	µg/L	50[A]	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Dimethyl Phthalate	µg/L	50[A]	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Dimethylphenol, 2,4-	µg/L	50[A]	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Dinitro-o-cresol, 4,6-	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	10 U	10 U	-	-	-	-	-	-	10 U	-
Dinitrophenol, 2,4-	µg/L	10[A]	-	-	-	-	-	-	-	-	-	-	-	10 U	10 U	-	-	-	-	-	-	10 U	-
Dinitrotoluene, 2,4-	µg/L	5--[B]	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Dinitrotoluene, 2,6-	µg/L	5--[B]	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Di-n-Octyl phthalate	µg/L	50[A]	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Hexachlorobenzene	µg/L	0.04[B]	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	µg/L	0.5[B]	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Hexachlorocyclopentadiene	µg/L	5--[B]	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Hexachloroethane	µg/L	5--[B]	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Isophorone	µg/L	50[A]	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Methylnaphthalene, 2-	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	15	-
Nitroaniline, 2-	µg/L	5--[B]	-	-	-	-	-	-	-	-	-	-	-	10 U	10 U	-	-	-	-	-	-	10 U	-
Nitroaniline, 3-	µg/L	5--[B]	-	-	-	-	-	-	-	-	-	-	-	10 U	10 U	-	-	-	-	-	-	10 U	-
Nitroaniline, 4-	µg/L	5--[B]	-	-	-	-	-	-	-	-	-	-	-	10 U	10 U	-	-	-	-	-	-	10 U	-
Nitrobenzene	µg/L	0.4[B]	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Nitrophenol, 2-	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Nitrophenol, 4-	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	10 U	10 U	-	-	-	-	-	-	10 U	-
N-Nitrosodi-n-Propylamine	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
n-Nitrosodiphenylamine	µg/L	50[A]	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Pentachlorophenol	µg/L	1.0[B]	-	-	-	-	-	-	-	-	-	-	-	10 U	10 U	-	-	-	-	-	-	10 U	-
Phenol	µg/L	1.0[B]	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Trichlorophenol, 2,4,5-	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Trichlorophenol, 2,4,6-	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	5.0 U	5.0 U	-	-	-	-	-	-	5.0 U	-
Total SVOC	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	ND	ND	-	-	-	-	-	-	15	-
SVOC TICs																							
Total SVOC TICs	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	211.3 TJN	216 TJN	-	-	-	-	-	-	672 TJN	-

See notes on last page.

Table 3
Summary of Analytical Results - in Water Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Sample Location			MW-01	MW-02				MW-09					B/MW-100					B/MW-102			B/MW-104		
Sample Date			11-Jun-14	11-Jun-14	2-Oct-18	28-Feb-19	24-Apr-19	24-Sep-08	11-Jun-14	2-Oct-18	2-Oct-18	24-Apr-19	1-Oct-18	26-Feb-19	26-Feb-19	24-Apr-19	24-Apr-19	1-Oct-18	28-Feb-19	24-Apr-19	2-Oct-18	26-Feb-19	24-Apr-19
Sample ID			MW-01	MW-02	CNL-MW02-GW	CNL-MW02-W	CNL-MW02-W	MW-9	MW-09	CNL-MW9-GW	CNL-FD-GW	CNL-MW9-W	CNL-MW100-GW	CNL-MW100-W	CNL-MWDUP 100-W	CNL-MW100-W	CNL-MWDUP-W	CNL-MW102-GW	CNL-MW102-W	CNL-MW102-W	CNL-MW104-GW	CNL-MW104-W	CNL-MW104-W
Sampling Company			LABRNY	LABRNY	STANTEC	STANTEC	STANTEC	HAROC	LABRNY	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			ESC	ESC	TAL	TAL	TAL	UNKNOWN	ESC	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL
Laboratory Work Order			L704675	L704675	480-142699-1	480-149237-1	480-152563-1	UNKNOWN	L704675	480-142699-1	480-142699-1	480-152563-1	480-142699-1	480-149237-1	480-149237-1	480-152563-1	480-152563-1	480-142699-1	480-149237-1	480-152563-1	480-142699-1	480-149237-1	480-152563-1
Laboratory Sample ID			L704675-06	L704675-07	480-142788-5	480-149629-2	480-152563-5	A8B79401	L704675-08	480-142788-4	480-142788-6 Field Duplicate	480-152563-4	480-142699-2	480-149515-1	480-149515-4 Field Duplicate	480-152563-10	480-152563-11 Field Duplicate	480-142699-1	480-149629-5	480-152563-12	480-142788-1	480-149515-2	480-152563-2
Sample Type	Units	TOGS																						
Volatile Organic Compounds																								
Acetone	µg/L	50[A]	5,000 U	50 U	20 U	20 U	20 U	24	**810[A]**	200 U	200 U	200 U	20 U	20 U	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U	40 U
Benzene	µg/L	1[B]	100 U	1.0 U	2.0 U	2.0 U	2.0 U	**1,400[B]**	**660[B]**	**880[B]**	**990[B]**	**2,100[B]**	2.0 U	**9.8[B]**	**9.6[B]**	**5.0[B]**	**4.8[B]**	1.0 U	1.0 U	1.0 U	1.0 U	**42[B]**	**5.8[B]**
Bromodichloromethane	µg/L	50[A]	100 U	1.0 U	2.0 U	2.0 U	2.0 U	5.0 U	1.0 U	20 U	20 U	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Bromoform (Tribromomethane)	µg/L	50[A]	100 U	1.0 U	2.0 U	2.0 U	2.0 U *	5.0 UJ	1.0 U	20 U	20 U	20 U *	2.0 U	2.0 U	2.0 U	1.0 U *	2.0 U *	1.0 U	1.0 U	1.0 U *	1.0 U	1.0 U	4.0 U
Bromomethane (Methyl bromide)	µg/L	5--[B]	500 U	5.0 U	2.0 UJ	2.0 U	2.0 U	10 U	5.0 U	20 UJ	20 UJ	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U F2	1.0 U	1.0 U	1.0 UJ	1.0 U	4.0 UJ
Butylbenzene, n-	µg/L	5--[B]	**110[B]**	1.0 U	2.0 U	2.0 U	2.0 U	-	**9.0[B]**	**55[B]**	**58[B]**	**29[B]**	2.0 U	2.0 U	2.3	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**7.8[B]**	4.0 U
Butylbenzene, sec- (2-Phenylbutane)	µg/L	5--[B]	100 U	1.0 U	2.0 U	2.0 U	2.0 U	-	4.9	20 U	20 U	20 U	2.0 U	2.6	2.5	1.0	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	3.2	4.0 U
Butylbenzene, tert-	µg/L	5--[B]	100 U	1.0 U	2.0 U	2.0 U	2.0 U	-	1.0 U	20 U	20 U	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Carbon Disulfide	µg/L	60[A]	100 U	1.0 U	2.0 U	2.0 U	2.0 U	5.0 U	1.0 U	20 U	20 U	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Carbon Tetrachloride (Tetrachloromethane)	µg/L	5[B]	100 U	1.0 U	2.0 U	2.0 U	2.0 U	5.0 U	1.0 U	20 U	20 U	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Chlorobenzene (Monochlorobenzene)	µg/L	5--[B]	100 U	1.0 U	2.0 U	2.0 U	2.0 U	5.0 U	1.0 U	20 U	20 U	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Chloromomethane	µg/L	5--[B]	100 U	1.0 U	-	-	-	-	1.0 U	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloroethane (Ethyl Chloride)	µg/L	5--[B]	500 U	5.0 U	2.0 U	2.0 U	2.0 U	5.0 U	5.0 U	20 U	20 U	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U F2	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Chloroform (Trichloromethane)	µg/L	7[B]	500 U	5.0 U	2.0 U	2.0 U	2.0 U	5.0 U	5.0 U	20 U	20 U	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Chloromethane	µg/L	5--[B]	250 U	2.5 U	2.0 U	2.0 U	2.0 U	5.0 U	**36[B]**	20 U	20 U	20 U	2.0 U	2.0 U *	2.0 U *	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U *	4.0 U
Cyclohexane	µg/L	n/v	160	1.0 U	2.0 U	2.0 U	2.0 U	210	100	250	300	290	2.0 U	27 J	15 J	13	13	1.0 U	1.0 U	1.0 U	11	58	48
Dibromo-3-Chloropropane, 1,2- (DBCP)	µg/L	0.04[B]	500 U	5.0 U	2.0 U	2.0 U	2.0 U	5.0 U	5.0 U	20 U	20 U	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Dibromochloromethane	µg/L	50[A]	100 U	1.0 U	2.0 U	2.0 U	2.0 U *	5.0 U	1.0 U	20 U	20 U	20 U *	2.0 U	2.0 U	2.0 U	1.0 U *	2.0 U *	1.0 U	1.0 U	1.0 U *	1.0 U	1.0 U	4.0 U
Dichlorobenzene, 1,2-	µg/L	3[B]	100 U	1.0 U	2.0 U	2.0 U	2.0 U	5.0 U	1.0 U	20 U	20 U	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Dichlorobenzene, 1,3-	µg/L	3[B]	100 U	1.0 U	2.0 U	2.0 U	2.0 U	5.0 U	1.0 U	20 U	20 U	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Dichlorobenzene, 1,4-	µg/L	3[B]	100 U	1.0 U	2.0 U	2.0 U	2.0 U	5.0 U	1.0 U	20 U	20 U	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Dichlorodifluoromethane (Freon 12)	µg/L	5--[B]	500 U	5.0 U	2.0 U	2.0 U *	2.0 UJ	5.0 U	5.0 U	20 U	20 U	20 UJ	2.0 U	2.0 U *	2.0 U *	1.0 U	2.0 U	1.0 U	1.0 U *	1.0 U	1.0 U	1.0 U *	4.0 U
Dichloroethane, 1,1-	µg/L	5--[B]	100 U	1.0 U	2.0 U	2.0 U	2.0 U	5.0 U	3.8	20 U	20 U	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Dichloroethane, 1,2-	µg/L	0.6[B]	100 U	1.0 U	2.0 U	2.0 U	2.0 U	**2.9 J[B]**	1.0 U	20 U	20 U	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Dichloroethene, 1,1-	µg/L	5--[B]	100 U	1.0 U	2.0 U	2.0 U	2.0 U	5.0 U	1.0 U	20 U	20 U	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Dichloroethene, cis-1,2-	µg/L	5--[B]	100 U	**8.5[B]**	2.0 U	2.0 U	2.0 U	5.0 U	1.0 U	20 U	20 U	20 U	2.1	2.0 U	2.0 U	1.6	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Dichloroethene, trans-1,2-	µg/L	5--[B]	100 U	1.0 U	2.0 U	2.0 U	2.0 U	5.0 U	1.0 U	20 U	20 U	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Dichloropropane, 1,2-	µg/L	1[B]	100 U	1.0 U	2.0 U	2.0 U	2.0 U	5.0 U	1.0 U	20 U	20 U	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Dichloropropene, cis-1,3-	µg/L	0.4[B]	100 U	1.0 U	2.0 U	2.0 U	2.0 U	5.0 U	1.0 U	20 U	20 U	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Dichloropropene, trans-1,3-	µg/L	0.4[B]	100 U	1.0 U	2.0 U	2.0 U	2.0 U	5.0 U	1.0 U	20 U	20 U	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Ethylbenzene	µg/L	5--[B]	**390[B]**	1.0 U	2.0 U	2.0 U	2.0 U	**260[B]**	**730[B]**	**900[B]**	**970[B]**	**1,200[B]**	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**75[B]**	**38[B]**
Ethylene Dibromide (Dibromoethane, 1,2-)	µg/L	0.0006[B]	100 U	1.0 U	2.0 U	2.0 U	2.0 U	5.0 U	1.0 U	20 U	20 U	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Hexanone, 2- (Methyl Butyl Ketone)	µg/L	50[A]	1,000 U	10 U	10 U	10 U	10 U	10 U	10 U	100 U	100 U	100 U	10 U	10 U	10 U	5.0 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	20 U
Isopropylbenzene	µg/L	5--[B]	**190[B]**	1.0 U	2.0 U	2.0 U	2.0 U	**23[B]**	**41[B]**	**72[B]**	**76[B]**	**67[B]**	2.0 U	3.3	3.3	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**11[B]**	4.3
Isopropyltoluene, p- (Cymene)	µg/L	5--[B]	100 U	1.0 U	2.0 U	2.0 U	2.0 U	-	**12[B]**	20 U	20 U	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	2.4	4.0 U
Methyl Acetate	µg/L	n/v	2,000 U	20 U	5.0 U	5.0 U	5.0 U	10 U	20 U	50 U	50 U	50 U	5.0 U	5.0 U	5.0 U	2.5 U	5.0 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	10 U
Methyl Ethyl Ketone (MEK) (2-Butanone)	µg/L	50[A]	1,000 U	10 U	20 U	20 U	20 U	12	10 U	200 U	200 U	200 U	20 U	20 U	20 U	10 U	20 U	10 U	10 U	10 U	10 U	10 U	40 U
Methyl Isobutyl Ketone (MIBK)	µg/L	n/v	1,000 U	10 U	10 U	10 U	10 U	10 U	10 U	100 U	100 U	100 U	10 U	10 U	10 U	5.0 U	10 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	20 U
Methyl tert-butyl ether (MTBE)	µg/L	10[A]	100 U	1.0 U	2.0 U	2.0 U	2.0 U	**130 J[A]**	**29[A]**	**62[A]**	20 U	**270[A]**	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Methylcyclohexane	µg/L	n/v	420	1.0 U	2.0 U	2.0 U	2.0 U	130	62	180	210	170	2.0 U	9.2	9.1	1.8	2.0 U	1.0 U	1.0 U	1.0 U	9.6	53	32
Methylene Chloride (Dichloromethane)	µg/L	5--[B]	500 U	5.0 U	2.0 U	2.0 U	2.0 U	5.0 UJ	5.0 U	20 U	20 U	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Naphthalene	µg/L	10[B]	**1,000[B]**	5.0 U	2.0 U	2.0 U	2.0 U	-	**210[B]**	**310[B]**	**330[B]**	**270[B]**	2.0 U	5.1	5.6	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**23[B]**	10
Propylbenzene, n-	µg/L	5--[B]	**580[B]**	1.0 U	2.0 U	2.0 U	2.0 U	-	**110[B]**	**180[B]**	**180[B]**	**180[B]**	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**33[B]**	**13[B]**
Styrene	µg/L	5--[B]	100 U	1.0 U	2.0 U	2.0 U	2.0 U	5.0 U	1.8	20 U	20 U	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Tetrachloroethane, 1,1,2,2-	µg/L	5--[B]	100 U	1.0 U	2.0 U	2.0 U	2.0 U	5.0 U	1.0 U	20 U	20 U	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Tetrachloroethene (PCE)	µg/L	5--[B]	100 U	**23[B]**	**5.2[B]**	4.2	3.7	5.0 U	1.0 U	20 U	20 U	20 U	**14[B]**	**8.9[B]**	**8.5[B]**	**11[B]**	**9.9[B]**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Toluene	µg/L	5--[B]	500 U	5.0 U	2.0 U	2.0 U	2.0 U	**180[B]**	**82[B]**	**230[B]**	**260[B]**	**490[B]**	2.0 U	2.3	2.0	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**19[B]**	4.2
Trichlorobenzene, 1,2,3-	µg/L	5--[B]	100 U	1.0 U	-	-	-	-	1.0 U	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichlorobenzene, 1,2,4-	µg/L	5--[B]	100 U	1.0 U	2.0 U	2.0 U	2.0 U	5.0 U	1.0 U	20 U	20 U	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Trichloroethane, 1,1,1-	µg/L	5--[B]	100 U	1.0 U	2.0 U	2.0 U	2.0 U	5.0 U	1.0 U	20 U	20 U	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Trichloroethane, 1,1,2-	µg/L	1[B]	100 U	1.0 U	2.0 U	2.0 U	2.0 U	5.0 U	1.0 U	20 U	20 U	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Trichloroethene (TCE)	µg/L	5--[B]	100 U	**7.0[B]**	2.0 U	2.0 U	2.0 U	5.0 UJ	1.0 U	20 U	20 U	20 U	**12[B]**	**5.9[B]**	**6.2[B]**	**5.9[B]**	**5.3[B]**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Trichlorofluoromethane (Freon 11)	µg/L	5--[B]	500 U	5.0 U	2.0 U	2.0 U	2.0 U	5.0 U	5.0 U	20 U	20 U	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Trichlorotrifluoroethane (Freon 113)	µg/L	5--[B]	100 U	1.0 U	2.0 U	2.0 U	2.0 U	5.0 U	1.0 U	20 U	20 U	20 U	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Trimethylbenzene, 1,2,4-	µg/L	5--[B]	**5,600[B]**	1.9	2.0 U	2.0 U	2.0 U	-	**920[B]**	**1,500[B]**	**1,500[B]**	**1,300[B]**	2.0 U	**21[B]**	**22[B]**	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	2.4	**230[B]**	**130[B]**
Trimethylbenzene, 1,3,5-	µg/L	5--[B]	**1,400[B]**	1.0 U	2.0 U	2.0 U	2.0 U	-	**230[B]**	**390[B]**	**390[B]**	**320[B]**	2.0 U	4.1	4.1	1.0 U	2.0 U	1.0 U	1.0 U	1.0 U	**5.8[B]**	**59[B]**	**38[B]**
Vinyl Chloride	µg/L	2[B]	100 U	1.0 U	2.0 U	2.0 U	2.0 UJ	5.0 U	1.0 U	20 U	20 U	20 UJ	2.0 U	2.0 U	2.0 U	1.0 U	2.0 U	1.0 U F2	1.0 U	1.0 U	1.0 U	1.0 U	4.0 U
Xylene, m & p-	µg/L	5--[B]	**2,600[B]**	2.0 U	-	-	-	-	**770[B]**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Xylene, o-	µg/L	5--[B]	**180[B]**	1.0 U	-	-	-	-	**36[B]**	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Xylenes, Total	µg/L	5--[B]	-	-	4.0 U	4.0 U	4.0 U	**1,500[B]**	-	**1,800[B]**	**1,900[B]**	**2,800[B]**	4.0 U	**22[B]**	**22[B]**	2.0 U	4.0 U	2.0 U	2.0 U	2.0 U	2.0 U	**160[B]**	**84[B]**
Total VOC	µg/L	n/v	12,630	40.4	5.2	4.2	3.7	-	4,857.5	5,009	5,264	6,686	28.1	99.2	90.2	39.3	33	ND	ND	ND	28.8	616.4	323.3
VOC TICs																								
Total VOC TICs	µg/L	n/v	-	-	ND	ND	6.2 TJ	-	-	6,560 TJN	8,620 TJN	7,080 TJN	13.3 TJ	589 TJN	551 TJN	278.8 TJN	272 TJN	5.9 TJ	ND	ND	180.3 TJN	924 TJN	859 TJN

See notes on last page.

Table 3
Summary of Analytical Results - in Water Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Sample Location			B/MW-106		B/MW-107			B/MW-110			B/MW-112		B/MW-113		B/MW-114		Freight Elevator Pit
Sample Date			2-Oct-18	24-Apr-19	1-Oct-18	26-Feb-19	25-Apr-19	2-Oct-18	28-Feb-19	24-Apr-19	2-Mar-19	24-Apr-19	28-Feb-19	24-Apr-19	28-Feb-19	24-Apr-19	22-Apr-19
Sample ID			CNL-MW106-GW	CNL-MW106-W	CNL-MW107-GW	CNL-MW107-W	CNL-MW107-W	CNL-MW110-GW	CNL-MW110-W	CNL-MW110-W	CNL-MW112-W	CNL-MW112-W	CNL-MW113-W	CNL-MW113-W	CNL-MW114-W	CNL-MW114-W	CNL-EP-W
Sampling Company			STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL
Laboratory Work Order			480-142699-1	480-152563-1	480-142699-1	480-149237-1	480-152563-1	480-142699-1	480-149237-1	480-152563-1	480-149237-1	480-152563-1	480-149237-1	480-152563-1	480-149237-1	480-152563-1	480-152402-1
Laboratory Sample ID			480-142788-2	480-152563-3	480-142699-3	480-149515-3	480-152675-1	480-142788-3	480-149629-3	480-152563-1	480-149763-1	480-152563-6	480-149629-6	480-152563-7	480-149629-4	480-152563-8	480-152402-5
Sample Type	Units	TOGS															
General Chemistry																	
Nitrate (as N)	mg/L	10[B]	0.050 U	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Sulfate	mg/L	250[B]	5.0 U	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Metals, Dissolved																	
Aluminum	mg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.20 UJ
Antimony	mg/L	0.003[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.020 UJ
Arsenic	mg/L	0.025[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.015 UJ
Barium	mg/L	1[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.18 J
Beryllium	mg/L	0.003[A]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0020 UJ
Cadmium	mg/L	0.005[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0020 UJ
Calcium	mg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	61.2 J
Chromium	mg/L	0.05[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0040 UJ
Cobalt	mg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0040 UJ
Copper	mg/L	0.2[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.010 UJ
Iron	mg/L	0.3[B]	**0.75 J[B]**	-	-	-	-	-	-	-	-	-	-	-	-	-	0.050 UJ
Lead	mg/L	0.025[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.010 UJ
Magnesium	mg/L	35[A]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	14.5 J
Manganese	mg/L	0.3[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0070 J
Mercury	mg/L	0.0007[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.00020 UJ
Nickel	mg/L	0.1[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.010 UJ
Potassium	mg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	11.7 J
Selenium	mg/L	0.01[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.025 UJ
Silver	mg/L	0.05[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0060 UJ
Sodium	mg/L	20[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	**69.7 J[B]**
Thallium	mg/L	0.0005[A]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.020 UJ
Vanadium	mg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.0050 UJ
Zinc	mg/L	2[A]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	0.016 J
Metals, Total																	
Aluminum	mg/L	n/v	-	-	-	0.20 U	-	-	-	-	-	-	-	-	-	-	14.8
Antimony	mg/L	0.003[B]	-	-	-	0.020 U	-	-	-	-	-	-	-	-	-	-	**0.022[B]**
Arsenic	mg/L	0.025[B]	-	-	-	0.015 U	-	-	-	-	-	-	-	-	-	-	**0.13[B]**
Barium	mg/L	1[B]	-	-	-	0.063	-	-	-	-	-	-	-	-	-	-	**1.2[B]**
Beryllium	mg/L	0.003[A]	-	-	-	0.0020 U	-	-	-	-	-	-	-	-	-	-	0.0020 U
Cadmium	mg/L	0.005[B]	-	-	-	0.0020 U	-	-	-	-	-	-	-	-	-	-	**0.11[B]**
Calcium	mg/L	n/v	-	-	-	108	-	-	-	-	-	-	-	-	-	-	184
Chromium	mg/L	0.05[B]	-	-	-	0.0040 U	-	-	-	-	-	-	-	-	-	-	**0.12[B]**
Cobalt	mg/L	n/v	-	-	-	0.0040 U	-	-	-	-	-	-	-	-	-	-	0.028
Copper	mg/L	0.2[B]	-	-	-	0.010 U	-	-	-	-	-	-	-	-	-	-	**0.71[B]**
Iron	mg/L	0.3[B]	**0.46 J[B]**	-	-	0.050 U	-	-	-	-	-	-	-	-	-	-	**371[B]**
Lead	mg/L	0.025[B]	-	-	-	0.010 U	-	-	-	-	-	-	-	-	-	-	**1.8[B]**
Magnesium	mg/L	35[A]	-	-	-	18.2	-	-	-	-	-	-	-	-	-	-	28.1
Manganese	mg/L	0.3[B]	-	-	-	0.15	-	-	-	-	-	-	-	-	-	-	**2.6[B]**
Mercury	mg/L	0.0007[B]	-	-	-	0.00020 U	-	-	-	-	-	-	-	-	-	-	**0.0019[B]**
Nickel	mg/L	0.1[B]	-	-	-	0.010 U	-	-	-	-	-	-	-	-	-	-	**0.12[B]**
Potassium	mg/L	n/v	-	-	-	11.7	-	-	-	-	-	-	-	-	-	-	15.2
Selenium	mg/L	0.01[B]	-	-	-	0.025 U	-	-	-	-	-	-	-	-	-	-	0.025 U
Silver	mg/L	0.05[B]	-	-	-	0.0060 U	-	-	-	-	-	-	-	-	-	-	0.012
Sodium	mg/L	20[B]	-	-	-	**287[B]**	-	-	-	-	-	-	-	-	-	-	**73.8[B]**
Thallium	mg/L	0.0005[A]	-	-	-	0.020 U	-	-	-	-	-	-	-	-	-	-	0.020 U
Vanadium	mg/L	n/v	-	-	-	0.0050 U	-	-	-	-	-	-	-	-	-	-	0.077
Zinc	mg/L	2[A]	-	-	-	0.010 U	-	-	-	-	-	-	-	-	-	-	**4.5[A]**
Polychlorinated Biphenyls																	
Aroclor 1016	µg/L	0.09[B]	-	-	-	0.50 U	-	-	-	-	-	-	-	-	-	-	1.0 U
Aroclor 1221	µg/L	0.09[B]	-	-	-	0.50 U	-	-	-	-	-	-	-	-	-	-	1.0 U
Aroclor 1232	µg/L	0.09[B]	-	-	-	0.50 U	-	-	-	-	-	-	-	-	-	-	1.0 U
Aroclor 1242	µg/L	0.09[B]	-	-	-	0.50 U	-	-	-	-	-	-	-	-	-	-	1.0 U
Aroclor 1248	µg/L	0.09[B]	-	-	-	0.50 U	-	-	-	-	-	-	-	-	-	-	1.0 U
Aroclor 1254	µg/L	0.09[B]	-	-	-	0.50 U	-	-	-	-	-	-	-	-	-	-	1.0 U
Aroclor 1260	µg/L	0.09[B]	-	-	-	0.50 U	-	-	-	-	-	-	-	-	-	-	1.0 U
Polychlorinated Biphenyls (PCBs)	µg/L	0.09[B]	-	-	-	ND	-	-	-	-	-	-	-	-	-	-	ND

See notes on last page.

Table 3
Summary of Analytical Results - in Water Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Sample Location			B/MW-106		B/MW-107			B/MW-110			B/MW-112		B/MW-113		B/MW-114		Freight Elevator Pit
Sample Date			2-Oct-18	24-Apr-19	1-Oct-18	26-Feb-19	25-Apr-19	2-Oct-18	28-Feb-19	24-Apr-19	2-Mar-19	24-Apr-19	28-Feb-19	24-Apr-19	28-Feb-19	24-Apr-19	22-Apr-19
Sample ID			CNL-MW106-GW	CNL-MW106-W	CNL-MW107-GW	CNL-MW107-W	CNL-MW107-W	CNL-MW110-GW	CNL-MW110-W	CNL-MW110-W	CNL-MW112-W	CNL-MW112-W	CNL-MW113-W	CNL-MW113-W	CNL-MW114-W	CNL-MW114-W	CNL-EP-W
Sampling Company			STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL
Laboratory Work Order			480-142699-1	480-152563-1	480-142699-1	480-149237-1	480-152563-1	480-142699-1	480-149237-1	480-152563-1	480-149237-1	480-152563-1	480-149237-1	480-152563-1	480-149237-1	480-152563-1	480-152402-1
Laboratory Sample ID			480-142788-2	480-152563-3	480-142699-3	480-149515-3	480-152675-1	480-142788-3	480-149629-3	480-152563-1	480-149763-1	480-152563-6	480-149629-6	480-152563-7	480-149629-4	480-152563-8	480-152402-5
Sample Type	Units	TOGS															
Pesticides																	
Aldrin	µg/L	n/v	-	-	-	0.050 U	-	-	-	-	-	-	-	-	-	-	0.10 UJ
BHC, alpha-	µg/L	0.01[B]	-	-	-	0.050 U	-	-	-	-	-	-	-	-	-	-	0.10 UJ
BHC, beta-	µg/L	0.04[B]	-	-	-	0.050 U	-	-	-	-	-	-	-	-	-	-	0.10 UJ
BHC, delta-	µg/L	0.04[B]	-	-	-	0.050 U	-	-	-	-	-	-	-	-	-	-	0.10 UJ
Camphechlor (Toxaphene)	µg/L	0.06[B]	-	-	-	0.50 U	-	-	-	-	-	-	-	-	-	-	1.0 UJ
Chlordane, alpha-	µg/L	n/v	-	-	-	0.050 U	-	-	-	-	-	-	-	-	-	-	0.10 UJ
Chlordane, trans- (gamma-Chlordane)	µg/L	n/v	-	-	-	0.050 U	-	-	-	-	-	-	-	-	-	-	0.46 J
DDD (p,p'-DDD)	µg/L	0.3[B]	-	-	-	0.050 U	-	-	-	-	-	-	-	-	-	-	**2.0 J[B]**
DDE (p,p'-DDE)	µg/L	0.2[B]	-	-	-	0.050 U	-	-	-	-	-	-	-	-	-	-	**0.57 J[B]**
DDT (p,p'-DDT)	µg/L	0.2[B]	-	-	-	0.050 U	-	-	-	-	-	-	-	-	-	-	**2.3 J[B]**
Dieldrin	µg/L	0.004[B]	-	-	-	0.050 U	-	-	-	-	-	-	-	-	-	-	0.10 UJ
Endosulfan I	µg/L	n/v	-	-	-	0.050 U	-	-	-	-	-	-	-	-	-	-	0.10 UJ
Endosulfan II	µg/L	n/v	-	-	-	0.050 U	-	-	-	-	-	-	-	-	-	-	0.10 UJ
Endosulfan Sulfate	µg/L	n/v	-	-	-	0.050 U	-	-	-	-	-	-	-	-	-	-	0.10 UJ
Endrin	µg/L	n/v	-	-	-	0.050 U	-	-	-	-	-	-	-	-	-	-	0.10 UJ
Endrin Aldehyde	µg/L	5–[B]	-	-	-	0.050 U	-	-	-	-	-	-	-	-	-	-	0.10 UJ
Endrin Ketone	µg/L	5–[B]	-	-	-	0.050 U	-	-	-	-	-	-	-	-	-	-	0.10 UJ
Heptachlor	µg/L	0.04[AB]	-	-	-	0.050 U	-	-	-	-	-	-	-	-	-	-	0.10 UJ
Heptachlor Epoxide	µg/L	0.03[B]	-	-	-	0.050 U	-	-	-	-	-	-	-	-	-	-	0.10 UJ
Lindane (Hexachlorocyclohexane, gamma)	µg/L	0.05[B]	-	-	-	0.050 U	-	-	-	-	-	-	-	-	-	-	0.10 UJ
Methoxychlor (4,4'-Methoxychlor)	µg/L	35[B]	-	-	-	0.050 U	-	-	-	-	-	-	-	-	-	-	0.10 UJ
1,4-Dioxane																	
Dioxane, 1,4-	µg/L	n/v	-	-	-	0.20 U	-	-	-	-	-	-	-	-	-	-	-
Polycyclic Aromatic Hydrocarbons																	
Acenaphthene	µg/L	20[B]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Acenaphthylene	µg/L	n/v	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Anthracene	µg/L	50[A]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Benzo(a)anthracene	µg/L	0.002[A]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Benzo(a)pyrene	µg/L	n/v	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Benzo(b)fluoranthene	µg/L	0.002[A]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Benzo(g,h,i)perylene	µg/L	n/v	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Benzo(k)fluoranthene	µg/L	0.002[A]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Chloronaphthalene, 2-	µg/L	10[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chrysene	µg/L	0.002[A]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Dibenzo(a,h)anthracene	µg/L	n/v	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Fluoranthene	µg/L	50[A]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Fluorene	µg/L	50[A]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Indeno(1,2,3-cd)pyrene	µg/L	0.002[A]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Methylnaphthalene, 1-	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Methylnaphthalene, 2-	µg/L	n/v	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Naphthalene	µg/L	10[B]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Phenanthrene	µg/L	50[A]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Pyrene	µg/L	50[A]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Total PAH	µg/L	n/v	-	-	-	ND	-	-	-	-	-	-	-	-	-	-	ND

See notes on last page.

Table 3
Summary of Analytical Results - in Water Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Sample Location			B/MW-106		B/MW-107			B/MW-110			B/MW-112		B/MW-113		B/MW-114		Freight Elevator Pit
Sample Date			2-Oct-18	24-Apr-19	1-Oct-18	26-Feb-19	25-Apr-19	2-Oct-18	28-Feb-19	24-Apr-19	2-Mar-19	24-Apr-19	28-Feb-19	24-Apr-19	28-Feb-19	24-Apr-19	22-Apr-19
Sample ID			CNL-MW106-GW	CNL-MW106-W	CNL-MW107-GW	CNL-MW107-W	CNL-MW107-W	CNL-MW110-GW	CNL-MW110-W	CNL-MW110-W	CNL-MW112-W	CNL-MW112-W	CNL-MW113-W	CNL-MW113-W	CNL-MW114-W	CNL-MW114-W	CNL-EP-W
Sampling Company			STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL
Laboratory Work Order			480-142699-1	480-152563-1	480-142699-1	480-149237-1	480-152563-1	480-142699-1	480-149237-1	480-152563-1	480-149237-1	480-152563-1	480-149237-1	480-152563-1	480-149237-1	480-152563-1	480-152402-1
Laboratory Sample ID			480-142788-2	480-152563-3	480-142699-3	480-149515-3	480-152675-1	480-142788-3	480-149629-3	480-152563-1	480-149763-1	480-152563-6	480-149629-6	480-152563-7	480-149629-4	480-152563-8	480-152402-5
Sample Type	Units	TOGS															
Semi-Volatile Organic Compounds																	
Acetophenone	µg/L	n/v	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Atrazine	µg/L	7.5[B]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Benzaldehyde	µg/L	n/v	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Biphenyl	µg/L	5--[B]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Bis(2-Chloroethoxy)methane	µg/L	5--[B]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Bis(2-Chloroethyl)ether	µg/L	1[B]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Bis(2-Chloroisopropyl)ether (2,2-oxybis(1-Chloropropane))	µg/L	5--[B]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Bis(2-Ethylhexyl)phthalate (DEHP)	µg/L	5[B]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Bromophenyl Phenyl Ether, 4-	µg/L	n/v	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Butyl Benzyl Phthalate	µg/L	50[A]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Caprolactam	µg/L	n/v	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Carbazole	µg/L	n/v	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Chloro-3-methyl phenol, 4-	µg/L	n/v	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Chloroaniline, 4-	µg/L	5--[B]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Chloronaphthalene, 2-	µg/L	10[B]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Chlorophenol, 2- (ortho-Chlorophenol)	µg/L	n/v	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Chlorophenyl Phenyl Ether, 4-	µg/L	n/v	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Cresol, o- (Methylphenol, 2-)	µg/L	n/v	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Cresol, p- (Methylphenol, 4-)	µg/L	n/v	-	-	-	10 U	-	-	-	-	-	-	-	-	-	-	50 U
Dibenzofuran	µg/L	n/v	-	-	-	10 U	-	-	-	-	-	-	-	-	-	-	50 U
Dibutyl Phthalate (DBP)	µg/L	50[B]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Dichlorobenzidine, 3,3'-	µg/L	5--[B]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Dichlorophenol, 2,4-	µg/L	5--[B]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Diethyl Phthalate	µg/L	50[A]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Dimethyl Phthalate	µg/L	50[A]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Dimethylphenol, 2,4-	µg/L	50[A]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Dinitro-o-cresol, 4,6-	µg/L	n/v	-	-	-	10 U	-	-	-	-	-	-	-	-	-	-	50 U
Dinitrophenol, 2,4-	µg/L	10[A]	-	-	-	10 U	-	-	-	-	-	-	-	-	-	-	50 U
Dinitrotoluene, 2,4-	µg/L	5--[B]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Dinitrotoluene, 2,6-	µg/L	5--[B]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Di-n-Octyl phthalate	µg/L	50[A]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Hexachlorobenzene	µg/L	0.04[B]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Hexachlorobutadiene (Hexachloro-1,3-butadiene)	µg/L	0.5[B]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Hexachlorocyclopentadiene	µg/L	5--[B]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Hexachloroethane	µg/L	5--[B]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Isophorone	µg/L	50[A]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Methylnaphthalene, 2-	µg/L	n/v	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Nitroaniline, 2-	µg/L	5--[B]	-	-	-	10 U	-	-	-	-	-	-	-	-	-	-	50 U
Nitroaniline, 3-	µg/L	5--[B]	-	-	-	10 U	-	-	-	-	-	-	-	-	-	-	50 UJ
Nitroaniline, 4-	µg/L	5--[B]	-	-	-	10 U	-	-	-	-	-	-	-	-	-	-	50 U
Nitrobenzene	µg/L	0.4[B]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Nitrophenol, 2-	µg/L	n/v	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Nitrophenol, 4-	µg/L	n/v	-	-	-	10 U	-	-	-	-	-	-	-	-	-	-	50 U
N-Nitrosodi-n-Propylamine	µg/L	n/v	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
n-Nitrosodiphenylamine	µg/L	50[A]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Pentachlorophenol	µg/L	1.0[B]	-	-	-	10 U	-	-	-	-	-	-	-	-	-	-	50 U
Phenol	µg/L	1.0[B]	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Trichlorophenol, 2,4,5-	µg/L	n/v	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Trichlorophenol, 2,4,6-	µg/L	n/v	-	-	-	5.0 U	-	-	-	-	-	-	-	-	-	-	25 U
Total SVOC	µg/L	n/v	-	-	-	ND	-	-	-	-	-	-	-	-	-	-	ND
SVOC TICs																	
Total SVOC TICs	µg/L	n/v	-	-	-	151.2 TJN	-	-	-	-	-	-	-	-	-	-	150 TJN

See notes on last page.

Table 3
Summary of Analytical Results - in Water Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Sample Location			B/MW-106		B/MW-107			B/MW-110			B/MW-112		B/MW-113		B/MW-114		Freight Elevator Pit
Sample Date			2-Oct-18	24-Apr-19	1-Oct-18	26-Feb-19	25-Apr-19	2-Oct-18	28-Feb-19	24-Apr-19	2-Mar-19	24-Apr-19	28-Feb-19	24-Apr-19	28-Feb-19	24-Apr-19	22-Apr-19
Sample ID			CNL-MW106-GW	CNL-MW106-W	CNL-MW107-GW	CNL-MW107-W	CNL-MW107-W	CNL-MW110-GW	CNL-MW110-W	CNL-MW110-W	CNL-MW112-W	CNL-MW112-W	CNL-MW113-W	CNL-MW113-W	CNL-MW114-W	CNL-MW114-W	CNL-EP-W
Sampling Company			STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL	TAL
Laboratory Work Order			480-142699-1	480-152563-1	480-142699-1	480-149237-1	480-152563-1	480-142699-1	480-149237-1	480-152563-1	480-149237-1	480-152563-1	480-149237-1	480-152563-1	480-149237-1	480-152563-1	480-152402-1
Laboratory Sample ID			480-142788-2	480-152563-3	480-142699-3	480-149515-3	480-152675-1	480-142788-3	480-149629-3	480-152563-1	480-149763-1	480-152563-6	480-149629-6	480-152563-7	480-149629-4	480-152563-8	480-152402-5
Sample Type	Units	TOGS															
Volatile Organic Compounds																	
Acetone	µg/L	50[A]	100 U	1,000 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	100 U	100 U	10 U
Benzene	µg/L	1[B]	**680[B]**	**290[B]**	1.0 U	1.0 U	1.0 U	**1.2[B]**	**1.7[B]**	**3.2[B]**	1.0 U	1.0 U	1.0 U	1.0 U	**12[B]**	**16[B]**	1.0 U
Bromodichloromethane	µg/L	50[A]	10 U	100 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Bromoform (Tribromomethane)	µg/L	50[A]	10 U	100 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U *	1.0 U	1.0 U F1*	10 U	10 U *	1.0 UJ
Bromomethane (Methyl bromide)	µg/L	5--[B]	10 UJ	100 UJ	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Butylbenzene, n-	µg/L	5--[B]	10 U	100 U	1.0 U	2.3	1.3	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	**11[B]**	1.0 U
Butylbenzene, sec- (2-Phenylbutane)	µg/L	5--[B]	10 U	100 U	1.0 U	2.0	1.2	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Butylbenzene, tert-	µg/L	5--[B]	10 U	100 U	1.0 U	1.0 U F1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Carbon Disulfide	µg/L	60[A]	10 U	100 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Carbon Tetrachloride (Tetrachloromethane)	µg/L	5[B]	10 U	100 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U F1	10 U	10 U	1.0 U *
Chlorobenzene (Monochlorobenzene)	µg/L	5--[B]	10 U	100 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Chloroeromomethane	µg/L	5--[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Chloroethane (Ethyl Chloride)	µg/L	5--[B]	10 U	100 U F2	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Chloroform (Trichloromethane)	µg/L	7[B]	10 U	100 U	3.3	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Chloromethane	µg/L	5--[B]	10 U	100 U F1	1.0 U	1.0 U F1*	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U *	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Cyclohexane	µg/L	n/v	200	100 U	1.3	10 F1	9.9	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	5.0	1.0 U	80	92	1.0 U
Dibromo-3-Chloropropane, 1,2- (DBCP)	µg/L	0.04[B]	10 U	100 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Dibromochloromethane	µg/L	50[A]	10 U	100 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U *	1.0 U	1.0 U F1*	10 U	10 U *	1.0 U *
Dichlorobenzene, 1,2-	µg/L	3[B]	10 U	100 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Dichlorobenzene, 1,3-	µg/L	3[B]	10 U	100 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Dichlorobenzene, 1,4-	µg/L	3[B]	10 U	100 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Dichlorodifluoromethane (Freon 12)	µg/L	5--[B]	10 U	100 U	1.0 U	1.0 U F1*	1.0 U	1.0 U	1.0 U *	1.0 U	1.0 U *	1.0 UJ	1.0 U *	1.0 UJ	10 U *	10 UJ	1.0 U
Dichloroethane, 1,1-	µg/L	5--[B]	10 U	100 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Dichloroethane, 1,2-	µg/L	0.6[B]	10 U	100 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Dichloroethene, 1,1-	µg/L	5--[B]	10 U	100 U	1.0 U	1.0 U F1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Dichloroethene, cis-1,2-	µg/L	5--[B]	10 U	100 U	1.3	1.0 U	1.1	1.0 U	1.0 U	1.0 U	**7.4[B]**	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Dichloroethene, trans-1,2-	µg/L	5--[B]	10 U	100 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Dichloropropane, 1,2-	µg/L	1[B]	10 U	100 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Dichloropropene, cis-1,3-	µg/L	0.4[B]	10 U	100 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Dichloropropene, trans-1,3-	µg/L	0.4[B]	10 U	100 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U *
Ethylbenzene	µg/L	5--[B]	**920[B]**	**260[B]**	1.0 U	**8.9[B]**	**5.8[B]**	1.0 U	1.0 U	2.1	1.0 U	1.0 U	1.0 U	1.0 U	**75[B]**	**70[B]**	1.0 U
Ethylene Dibromide (Dibromoethane, 1,2-)	µg/L	0.0006[B]	10 U	100 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Hexanone, 2- (Methyl Butyl Ketone)	µg/L	50[A]	50 U	500 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	50 U	50 U	5.0 U
Isopropylbenzene	µg/L	5--[B]	**34[B]**	100 U	1.0 U	**5.7[B]**	3.6	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**10[B]**	**13[B]**	1.0 U
Isopropyltoluene, p- (Cymene)	µg/L	5--[B]	10 U	100 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Methyl Acetate	µg/L	n/v	25 U	250 U	2.5 U	2.5 U F1	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U	2.5 U F1	25 U	25 U	2.5 U
Methyl Ethyl Ketone (MEK) (2-Butanone)	µg/L	50[A]	100 U	1,000 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	10 U	100 U	100 U	10 U
Methyl Isobutyl Ketone (MIBK)	µg/L	n/v	50 U	500 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	5.0 U	50 U	50 U	5.0 U
Methyl tert-butyl ether (MTBE)	µg/L	10[A]	**53[A]**	**290[A]**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Methylcyclohexane	µg/L	n/v	79	100 U	1.0 U	7.3 F1	4.8	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.2	1.0 U	62	80	1.0 U
Methylene Chloride (Dichloromethane)	µg/L	5--[B]	10 U	100 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	**12[B]**	1.0 U
Naphthalene	µg/L	10[B]	**310[B]**	100 U	1.0 U	5.0	2.6	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**27[B]**	**30[B]**	1.0 U
Propylbenzene, n-	µg/L	5--[B]	**49[B]**	100 U	1.0 U	**15[B]**	**8.8[B]**	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**28[B]**	**28[B]**	1.0 U
Styrene	µg/L	5--[B]	10 U	100 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Tetrachloroethane, 1,1,2,2-	µg/L	5--[B]	10 U	100 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Tetrachloroethene (PCE)	µg/L	5--[B]	10 U	100 U	1.7	1.6	1.6	1.0 U	1.0 U	1.0 U	**67[B]**	**7.1[B]**	1.0 U	1.0 U	10 U	10 U	1.0 U
Toluene	µg/L	5--[B]	**230[B]**	100 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**12[B]**	**16[B]**	1.0 U
Trichlorobenzene, 1,2,3-	µg/L	5--[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Trichlorobenzene, 1,2,4-	µg/L	5--[B]	10 U	100 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Trichloroethane, 1,1,1-	µg/L	5--[B]	10 U	100 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Trichloroethane, 1,1,2-	µg/L	1[B]	10 U	100 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Trichloroethene (TCE)	µg/L	5--[B]	10 U	100 U	**8.7[B]**	4.6	4.6	1.0 U	1.0 U	1.0 U	**9.7[B]**	1.1	1.0 U	1.0 U	10 U	10 U	1.0 U
Trichlorofluoromethane (Freon 11)	µg/L	5--[B]	10 U	100 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U F2	10 U	10 U	1.0 U
Trichlorotrifluoroethane (Freon 113)	µg/L	5--[B]	10 U	100 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	10 U	10 U	1.0 U
Trimethylbenzene, 1,2,4-	µg/L	5--[B]	**1,300 J-[B]**	**140[B]**	1.0 U	**64[B]**	**41[B]**	1.0 U	1.0 U	1.3	1.0 U	1.0 U	2.4	1.0 U	**260[B]**	**310[B]**	1.0 U
Trimethylbenzene, 1,3,5-	µg/L	5--[B]	**380[B]**	100 U	1.0 U	1.5	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	**56[B]**	**53[B]**	1.0 U
Vinyl Chloride	µg/L	2[B]	10 U	100 U F1	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 U	1.0 UJ	1.0 U	1.0 UJ	10 U	10 UJ	1.0 U
Xylene, m & p-	µg/L	5--[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Xylene, o-	µg/L	5--[B]	-	-	-	-	-	-	-	-	-	-	-	-	-	-	-
Xylenes, Total	µg/L	5--[B]	**5,000 J-[B]**	200 U	2.0 U	**6.1[B]**	3.7	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	2.0 U	**150[B]**	**220[B]**	2.0 U
Total VOC	µg/L	n/v	17,835	980	16.3	127.9	86.3	1.2	1.7	6.6	84.1	8.2	8.6	ND	622	731	ND
VOC TICs																	
Total VOC TICs	µg/L	n/v	9,210 TJN	1,400 TJ	3.2 TJ	172 TJN	147.3 TJN	ND	ND	25.3 TJN	ND	ND	68.2 TJN	17.2 TJ	1,488 TJN	2,010 TJN	ND

See notes on last page.

Table 3
Summary of Analytical Results - in Water Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Notes and Abbreviations:

TOGS	NYSDEC TOGS 1.1.1 (Reissued June 1998 with errata in January 1999 and addenda in April 2000 and June 2004)
[A]	TOGS 1.1.1 - Table 1 - Ambient Water Quality Standards and Guidance Values, Division of Water, Technical and Operational Guidance Series (TOGS 1.1.1); Guidance
[B]	TOGS 1.1.1 - Table 1 - Ambient Water Quality Standards and Guidance Values, Division of Water, Technical and Operational Guidance Series (TOGS 1.1.1); Standards
6.5[A]	Concentration exceeds the indicated standard.
15.2	Measured concentration did not exceed the indicated standard.
0.03 U	Analyte was not detected at a concentration greater than the laboratory reporting limit.
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
.[B]	The standard for Iron and Manganese is 500 ug/L, which applies to the sum of these substances. As individual standards, the standard is 300 ug/L.
..	The principal organic contaminant standard for groundwater of 5 ug/L (described elsewhere in the TOGS table) applies to this substance.
[b]	Standard applies to the sum of all polychlorinated biphenyls.
[p]	Applies to the sum of cis- and trans-1,3-dichloropropene.
*	Indicates analysis is not within the quality control limits.
F1	MS (Matrix Spike) and/or MSD (Matrix Spike Duplicate) Recovery is outside acceptance limits.
H	Sample was prepped or analyzed beyond the specified holding time.
J	The reported result is an estimated value.
J-	The analyte was positively identified; the associated numerical value is an estimated quantity that may be biased low.
ND	Not detected.
TJ	Result is a tentatively identified compound (TIC) and an estimated value.
TJN	Result is a tentatively identified compound (TIC) and an estimated value. Presumptive evidence of material.
UJ	Indicates estimated non-detect.
ESC	ESC Lab Sciences, Mt.Juliet, TN
HAROC	Haley & Aldrich of NY
LABRNY	Labella Associates, P.C.
TAL	Test America Laboratories Inc.

Table 4
Summary of Analytical Results - Groundwater PFAS Samples
AAR/RAWP
67 and 89 Canal Street, Rochester, NY
BCP Site #C82820

Sample Location			B/MW-100		B/MW-104	B/MW-107
Sample Date			26-Feb-19	26-Feb-19	26-Feb-19	26-Feb-19
Sample ID			CNL-MW100-W	CNL-MWDUP 100-W	CNL-MW104-W	CNL-MW107-W
Sampling Company			STANTEC	STANTEC	STANTEC	STANTEC
Laboratory			TAL	TAL	TAL	TAL
Laboratory Work Order			480-149237-1	480-149237-1	480-149237-1	480-149237-1
Laboratory Sample ID			480-149515-1	480-149515-4	480-149515-2	480-149515-3
Sample Type	Units	EPA		Field Duplicate		
Per- and Polyfluoroalkyl Substances (PFAS)						
Perfluorobutanoic Acid (PFBA)	ng/L	n/v	25	32	21 CI	12
Perfluoropentanoic Acid (PFPeA)	ng/L	n/v	2.5	2.3	11	7.3
Perfluorohexanoic Acid (PFHxA)	ng/L	n/v	2.0	2.0	18	4.8
Perfluoroheptanoic Acid (PFHpA)	ng/L	n/v	1.9 U	1.9 U	6.1	4.3
Perfluoro-n-Octanoic Acid (PFOA)	ng/L	n/v	2.7	3.0	14	11
Perfluorononanoic Acid (PFNA)	ng/L	n/v	1.9 U	1.9 U	1.9 U	4.2
Perfluorodecanoic Acid (PFDA)	ng/L	n/v	1.9 U	1.9 U	1.9 U	1.8 U
Perfluoroundecanoic Acid (PFUnA)	ng/L	n/v	1.9 U	1.9 U	1.9 U	1.8 U
Perfluorododecanoic Acid (PFDoA)	ng/L	n/v	1.9 U	1.9 U	1.9 U	1.8 U
Perfluorotridecanoic Acid (PFTriA)	ng/L	n/v	1.9 U	1.9 U	1.9 U	1.8 U
Perfluorotetradecanoic Acid (PFTeA)	ng/L	n/v	1.9 U	1.9 U	1.9 U	1.8 U
Perfluorobutane Sulfonate (PFBS)	ng/L	n/v	2.9	2.6	5.6	3.9
Perfluorohexanesulfonic acid (PFHxS)	ng/L	n/v	1.9 U	1.9 U	2.0	2.3
Perfluoroheptane Sulfonate (PFHpS)	ng/L	n/v	1.9 U	1.9 U	1.9 U	1.8 U
Perfluorooctane Sulfonate (PFOS)	ng/L	n/v	1.9	1.9 U	4.7	26
Perfluorodecane Sulfonate (PFDS)	ng/L	n/v	1.9 U	1.9 U	1.9 U	1.8 U
Perfluorooctanesulfonamide (PFOSA)	ng/L	n/v	1.9 U	1.9 U	1.9 U	1.8 U
2-(N-methyl perfluorooctanesulfonamido) acetic acid (NMeFOSAA)	ng/L	n/v	19 U	19 U	19 U	18 U
N-ethyl perfluorooctane sulfonamidoacetic acid (NEtFOSAA)	ng/L	n/v	19 U	19 U	19 U	18 U
6:2 Fluorotelomer sulfonate	ng/L	n/v	19 U	19 U	19 U	18 U
8:2 Fluorotelomer sulfonate	ng/L	n/v	19 U	19 U	19 U	18 U
Sum of PFAS Analyte List	ng/L	n/v	37	41.9	82.4	75.8
Sum of PFOS & PFOA Ratios	ng/L	70[A]	4.6	3.0	18.7	37

Notes and Abbreviations:

EPA	United States Environmental Protection Agency
[A]	Fact Sheet PFOA & PFOS Drinking Water Health Advisories (2016) Lifetime Health Advisories
70[A]	Concentration exceeds the indicated standard.
15.2	Measured concentration did not exceed the indicated standard.
0.03 U	Analyte was not detected at a concentration greater than the laboratory reporting limit.
n/v	No standard/guideline value.
-	Parameter not analyzed / not available.
CI	Sample results are biased high due to color interference in matrix.
ND	Not detected.
STANTEC	Stantec Consulting Services Inc.
TAL	Test America Laboratories Inc.

Table 5
Remedial Alternative Analysis Matrix
AAR/RAWP
Canal Street Manufacturing Site
67 - 89 Canal Street, Rochester, New York
BCP Site #C828206

	Remedial Alternative		Description of Alternative	1 - Protection of Human Health and the Environment		2 - Standards, Criteria, & Guidance (SCG)		3 - Short-term Impacts		4 - Long-term Effectiveness & Permanence		5 - Reduction of Toxicity, Mobility, or Volume	
				Score	Discussion	Score	Discussion	Score	Discussion	Score	Discussion	Score	Discussion
	Scoring System:			0 = Least protective 10 = Most protective		0 = Least likely to meet SCGs 10 = Most likely to meet SCGs		0 = Most short term impact 10 = Least short-term impact		0 = Least effective & permanent 10 = Most effective & permanent		0 = Least reduction 10 = Most reduction	
	1.1/2.1	No Action / Monitored Natural Attenuation (MNA)	**- Assume 30 years of quarterly groundwater monitoring and fence installation**	1	- Immediate risks associated with additional off-Site migration if VOCs are not mitigated in the short term. - Potential on-site exposure risks related to proposed immediate site development and use.	1	- Compliance with SCGs will not be achieved for an extended period of time, assuming natural mechanisms are in place to degrade contaminants;	3	- Hinders or precludes successful site re-development without also implementing significant engineering controls. - Does not address or monitor in areas of impacted soil above water table, or soil vapor.	2	- Residual contamination would remain on-Site following implementation of MNA, but long-term reduction is expected. - Natural processes that induce attenuation of contaminant impacts to the subsurface are dependent upon several factors such as subsurface conditions, amount of contaminant present and presence of free product (NAPL). Given this uncertainty, exposure risks outlined in criteria 1 are most likely to persist for an undetermined period of time; - Monitoring alone will not mitigate exposure risks but will provide some quantification; - High degree of uncertainty associated with meeting remedial action objectives in the future. - Requires Engineering and Institutional Controls to protect from exposure to residual contamination.	2	- Mobility of contaminants not reduced, and may increase with time. - Volume very slowly reduced through natural degradation. - Toxicity would show temporary increase as Vinyl Chloride and other VOC daughter product concentrations in groundwater will temporarily rise due to natural degradation of TCE. - Metals and PAH impacts in Urban Fill would remain
SOIL	1.2	**All Impacted Soil Removal and Offsite Disposal (Track 1)**	**- Excavate/dispose all petroleum soil and Urban Fill soils -Exterior** - - - - - - - - - - - - - - - **- Excavate/dispose all petroleum-impacted soil -Interior**	9	- Immediate positive impact through the removal of source contaminated soil, with reuse of soils meeting RR SCOs.	9	- High degree of compliance with SCGs by replacing all impacted soil and replacing with clean backfill soil.	6	- Short term impacts include truck traffic (dump trucks for soil); potential for exposure due to dust generation and potential vapor release from soil.	9	- High degree of long-term effectiveness and permanence, since all contaminated soil is physically removed from the site.	9	- High degree of reduction of toxicity, mobility and volume, due to immediate physical removal of all contaminated soil.
	1.3	**Source Area Soil Removal and Offsite Disposal, in Conjunction with Urban Fill Reuse on Site**	**- Excavate/dispose source area Chlorinated VOC-contaminated soil and Urban Fill soils -Exterior** - - - - - - - - - - - - - - - **- Excavate/dispose source area chlorinated and petroleum-impacted soil -Interior**	8	- Immediate positive impact through the removal of most contaminant source.	8	- Relatively high degree of compliance with SCGs by excavating source area soil.	6	- Short term impacts include truck traffic (dump trucks for soil); potential for exposure due to dust generation and potential vapor release from soil.	8	- High degree of long-term effectiveness and permanence, since source area contaminated soil is physically removed from the site.	8	- High degree of reduction of toxicity, mobility and volume, due to immediate physical removal of source area contaminants.
	1.4	**Engineering Controls: Covering Impacted Soil With Clean Soil or impervious surfaces.**	**- Place asphalt, concrete, brick pavers and/or composite playground cap over majority of site -Place two-ft-thick cover of clean soil on landscape areas. Cover would include sufficient topsoil to support vegetation.** **- Seed cover with appropriate vegetative cover.** **- Maintain/repair cover as necessary.**	8	- Clean cover eliminates contact with potentially-impacted soils; - Especially effective for metals, which are generally not mobile in the environment.	8	- Can result in potentially impacted soil being in compliance with SCGs.	7	- Short term impacts include: potential for dust generation during site grading & burial; minor truck traffic to import clean topsoil, pavement and concrete.	7	- Reasonable long-term effectiveness due to immobility of metals and slow breakdown of SVOCs and VOCs - Reasonable degree of permanence since potential impacted soil would be covered reducing likelihood of future disturbance. - Requires Institutional Controls to maintain ECs, protect public from exposure to potential residual contamination.	8	- Reduction of mobility is high since impactedsource material is removed and remaining soils will be covered in place. - Reduction in volume; - Reduction in toxicity over time through natural degradation of SVOCs and VOCs.
GROUNDWATER	2.2	**In-situ Chemical Oxidation (ISCO) of Impacted Groundwater (Track 1)**	**- Introducing strong chemical oxidizers directly into groundwater to break down chemical contaminants in place.**	8	- Likely short-term increase in TCE /PERC daughter-product VOCs, followed by overall reduction of residual contaminant levels. - Oxidizing chemicals used in process (typically permanganate, hydrogen peroxide, persulfate or ozone) have exposure risks to workers and can be mildly harmful to the environment.	9	- Compliance with SCGs anticipated within relatively moderate time frame, following multiple application events.	6	- Short-term impacts may include short-term increase in Vinyl Chloride or other TCE/PERC "daughter" products; - Possible negatives impacts to natural attenuation processes that may already be occurring.	9	- Anticipated to effectively reduce VOCs in groundwater to levels below SCGs. - Ability to reach and treat impacted groundwater in bedrock is uncertain. - Generally achieves cleanup to low contaminant concentration levels. - Typically requires multiple applications.	9	- Anticipated to be effective in reducing toxicity, mobility and volume of contaminant mass via breakdown of contaminant compounds to harmless byproducts through chemical oxidation, following multiple applications.
	2.3	**Ex-situ Treatment/Disposal of Source-area Groundwater.**	**- Removal of limited volumes of source-area groundwater from excavations and elevator pit (via elevator pit sump pump);** **- On-site treatment/discharge; or offsite treatment.**	8	- Protective of health and the environment (if combined with source-area soil removal): combines removal and destruction of contaminants from subsurface.	5	- Generally achieves "non-detect" levels of VOC contaminants prior to discharge, however, it will not reduce site-wide groundwater impacts	7	- Temporary storage in frac tanks; - Truck trips for tank mob/demob; - Temporary pumping system; - Water discharged slowly with no impacts.	6	- Generally applies to limited amount of source area groundwater; not entire plume. - High degree of permanence; - Partial removal of the most contaminated zone (source area) of groundwater when combined with source-area soil removal;	7	- Moderate reduction in toxicity and volume of contaminants by removal of limited source-area groundwater, when combined with source-area soils removal; - Little change to mobility of contaminants left in place.
	2.4A and 2.4B	**In-situ Biological Treatment of Impacted Groundwater.**	**- Placement of electron donor material such as sodium lactate solution (for ERD of CVOCs) and agricultural gypsum and epsom salt (for EISB of petroleum constituents) into source-area excavation and groundwater plume areas.** **- - - - - - - - - - - - - - - - - -** **- 2 yrs. of quarterly groundwater quality monitoring for each RAOC.**	9	- Electron donor materials and EISB are generally harmless in the environment. - Likely short-term increase in TCE and PERC daughter-product VOCs, followed by rapid overall reduction of residual contaminant levels.	9	- Compliance with SCGs anticipated within relatively short time frame.	7	- Short-term ERD impacts may include a temporary increase in or other TCE/PERC "daughter" products;	9	- Anticipated to effectively remove remaining residual VOCs in groundwater to levels below SCGs, with little to no long-term "rebound" effect. - Generally achieves cleanup to low contaminant concentration levels' may require more than one application of electron donor or EISB solution.	8	- Anticipated to be effective in reducing toxicity, mobility and volume of contaminant mass via breakdown of contaminant compounds to harmless byproducts through biodegradation.
SOIL VAPOR	3.0	**Engineering Control: VOC Vapor Intrusion Mitigation using Vapor Barrier and Sub-slab Depressurization System under entire occupied building.**	**- Liquid Boot (or equal) vapor membrane and Sub-slab Depressurization System under entire occupied building.**	10	- Effectively prevents human exposure, provided system operation remains continuous.	8	- Good - Generally achieves "non-detect" levels of VOC contaminants in occupied spaces.	9	- No significant short-term impacts, since system design can be relatively easily incorporated into building development design.	7	- High degree of long-term effectiveness provided system remains in continuous operation. - Will likely require periodic replacement of blowers or other electrical components.	5	- Does not address or remove source of VOCs

Notes:
1. See text for more detailed discussion criteria

Table 5
Remedial Alternative Analysis Matrix
AAR/RAWP
Canal Street Manufacturing Site
67 - 89 Canal Street, Rochester, New York
BCP Site #C828206

	Remedial Alternative		Description of Alternative	6 - Implementability		7a - Cost Effectiveness - Capital			7b - Cost Effectiveness - OM&M			8 - Community Acceptance (see CPP)		9 - Land Use		Overall (sum of all scores)		
				Score	Discussion	Score	Opinion of Probable Costs (OPC)[2]	Discussion	Score	Opinion of Probable Costs (OPC)[2]	Discussion	Score	Discussion	Score	Discussion	Total Score	Total Opinion of Probable Cost	Conclusions and recommendations
	Scoring System:			0 = Least implementable 10 = Most implementable		0 = Least cost effective 10 = Most cost effective			0 = Least cost effective 10 = Most cost effective			0 = Least accepted 10 = Most accepted		0 = Worst based on 15 criteria [1] 10 = Best based on 15 criteria [1]		0 = Worst overall 100 = Best overall		
	1.1/2.1	- No Action / Monitored Natural Attenuation (MNA)	- Assume 30 years of quarterly groundwater monitoring and fence installation	9	- Successful implementation depends largely on presence of natural organisms and processes that are degrading petroleum and CVOC contaminants. - If natural degradation phenomena are observed, implementation would be straightforward, using existing monitoring well network. -Would require fence installation	5	$35,000	- Monitoring well network already exists, however, fence would be needed to keep people off the site	2	$459,130	- Highest OM&M costs of all alternatives, due to the 30-year duration of monitoring program, and maintenance of institutional/ engineering controls.	1	- Community acceptance for MNA is anticipated to be low due to the lack of control of off-Site contaminant migration. - To be completed following review of public comments	2	- Proposed land use is Restricted Residential. - Engineering and Institutional controls will be required at the Site under this alternative for an undetermined period of time. - Potential receptors (adjacent residential and commercial properties) are cross or downgradient with respect to groundwater flow.	**28**	**$494,130**	- Very costly alternative; - Least favorable alternative overall due to poor performance with the 'protection of human health and the environment', 'SCG', 'long-term effectiveness and permanence' and 'reduction of toxicity, mobility or volume' criteria. - Poor remedial 'value' : costs of this alternative approach versus that of an aggressive remedial program that is more likely to comply with regulatory agency requirements.
S O I L	1.2	**- All Impacted Soil Removal and Offsite Disposal (Track 1)**	**- Excavate/dispose all petroleum soil and Urban Fill soils -Exterior** - - - - - - - - - - - - - - - **- Excavate/dispose all petroleum-impacted soil -Interior**	9	- High implementability - no specialty contractor or highly-technical equipment required. - Year-round implementation feasible.	1	$1,687,782	- Much more costly than source area removal	9	$0	- No OM&M costs for soil due to removal of all contaminated soil	9	- Anticipated to be high due to relatively quick and permanent nature of the method.	9	- Proposed land use is Restricted Residential. Engineering and Institutional Controls would not be needed for soil due to removal of all impacted soil.	**79**	**$1,687,782**	Favorable alternative of those considered for chlorinated VOC-, Petroleum-, and metals impacted soil: High scores in many categories; however, much more costly than source area removal. Would still need to be used in conjunction with a groundwater remedial method.
	1.3	**Source Area Soil Removal and Offsite Disposal, in Conjunction with Reuse on Site**	**- Excavate/dispose source area Chlorinated VOC-contaminated soil and Urban Fill soils -Exterior** - - - - - - - - - - - - - - - **- Excavate/dispose source area chlorinated and petroleum-impacted soil -Interior**	9	- High implementability - no specialty contractor or highly-technical equipment required. - Year-round implementation feasible.	9	$816,660	- Less costly and more effective compared to complete soil removal but would require Engineering Controls as per Alt. 1.4 for costs not included here.	8	$0	- OM&M costs would be required to maintain cover cap (see Alt. 1.4 for costs not included here)	8	- Anticipated to be high due to relatively quick and permanent nature of the method.	8	- Proposed land use is Restricted Residential. Engineering and Institutional Controls would be needed for remaining impacted soils.	**80**	**$816,660**	Best alternative of those considered for chlorinated VOC-, Petroleum-, and metals impacted soil: High scores in all categories and considerably less costly than removal of all impacted soil. Would need to be used in conjunction with an impervious cap and clean soil cover and a groundwater remedial method.
	1.4	**- Engineering Controls: Covering Impacted Soil With Clean Soil or impervious surfaces.**	**- Place asphalt, concrete, brick pavers and/or composite playground cap over majority of site -Place two-ft-thick cover of clean soil on landscape areas. Cover would include sufficient topsoil to support vegetation.** **- Seed cover with appropriate vegetative cover.** **- Maintain/repair cover as necessary.**	8	- High implementability - no specialty contractor, technical equipment/methods required. Utilizes on site soil and readily-obtainable imported topsoil for final cover material.	8	$313,000	Lower cost than offsite disposal, high effectiveness.	9	$35,000	- Low OM&M costs, related primarily to periodic inspection and reporting. - Possible minor maintenance costs related to potential occasional cover material repair. - Assume 10 years of inspections (1 year of quarterly, 9 years of annual)	6	- Anticipated to be moderate due to low potential impacts and rapid implementation, but leaves residual contamination on site. - Does not address groundwater impacts.	7	- Proposed land use is Restricted Residential. - Potential receptors (adjacent residential and commercial properties) are cross or downgradient with respect to groundwater flow.	**76**	**$348,000**	Favorable alternative for areas of low-level metals and SVOCs impacts to soil (Urban Fill).
G R O U N D W A T E R	2.2	**- In-situ Chemical Oxidation (ISCO) of Impacted Groundwater (Track 1)**	**- Introducing strong chemical oxidizers directly into groundwater to break down chemical contaminants in place.**	6	- Chemox additives are readily available. - Thorough groundwater chemistry understanding is critical and bench-scale testing would be required. - Requires specialized equipment, chemicals and experienced contractors. - Existing well network already in place in areas of concern; this would facilitate rapid implementation. - Typically requires multiple application events. - Ability to reach and treat bedrock groundwater uncertain	4	$843,750	- Capital cost associated with multiple applications of Chemox additives is high.	6	$244,900	- OM&M activities include: Bench-scale testing and analyses; Baseline groundwater sampling/analysis; quarterly post-injection groundwater sampling and analysis; results reporting. - Cost assumes the likely need for supplemental application(s) of oxidizer chemical.	8	- The anticipated improvement of groundwater quality likely makes this alternative acceptable; - Use of strong oxidizer chemical is a negative aspect.	8	- Proposed land use is Restricted Residential. - Potential receptors (adjacent residential and commercial properties) are cross or downgradient with respect to groundwater flow.	**73**	**$1,088,650**	Very costly alternative; lower score than other groundwater alternatives that should achieve similar results, at lower cost.
	2.3	**- Ex-situ Treatment/Disposal of Source-area Groundwater.**	**- Removal of limited volumes of source-area groundwater from excavations and elevator pit (via elevator pit sump pump);** **- On-site treatment/discharge; or offsite treatment.**	9	High degree of implementability: ready access to equipment and materials required (excavation, pumps and water storage equipment); - Sewer discharge is allowable in City of Rochester with within permit threshold limits.	9	$28,350	Capital costs include short-term expenses: pump and tank rental, fuel, lab analyses and labor, discharge permit.	7	$47,400	OM&M costs include long-term discharge monitoring; - See Alternative F for groundwater monitoring costs (not included in this alternative).	8	- High acceptance due to positive scores on most categories.	8	- Proposed land use is Restricted Residential. - Potential receptors (adjacent residential and commercial properties) are cross or downgradient with respect to groundwater flow.	**74**	**$75,750**	- Favorable groundwater alternative (for limited amounts of source-area groundwater) due to good overall performance, however it will not address larger site-wide issues.
	2.4A and 2.4B	**- In-situ Biological Treatment of Impacted Groundwater.**	**- Placement of electron donor material such as sodium lactate solution (for ERD of CVOCs) and agricultural gypsum and epsom salt (for EISB of petroleum constituents) into source-area excavation and groundwater plume areas.** **- - - - - - - - - - - - - - -** **- 2 yrs. of quarterly groundwater quality monitoring for each RAOC.**	9	- Bench-scale test indicated site groundwater conditions favor effective ERD implementation for CVOCs; - Existing well network already in place in areas of concern, supplemental injection system wells and injection piping network under building would be advisable to provide more thorough source-area distribution.	9	$208,600	- Capital cost associated with placement of donor solution is moderate for bedrock applications. - Includes installation of new piping system under basement slab.	8	$101,650	- OM&M activities include: Baseline groundwater sampling/analysis; Bench-scale testing; quarterly post-injection groundwater sampling and analysis; results reporting. - potential need for injection of supplemental lactate material.	9	- The anticipated rapid improvement of groundwater quality likely makes this alternative acceptable; - More rapid closure of site likely makes this alternative acceptable. - To be completed following review of public comments	9	- Proposed land use at the Site is Restricted Residential. - Institutional controls, which are not currently in place, would be lessened due to greater compliance with SCGs; - Residential and commercial properties to the west are cross- or down-gradient to groundwater flow.	**86**	**$310,250**	- Very favorable groundwater alternative due to good overall performance and no low-scoring criteria.
SOIL VAPOR	3.0	**- Engineering Control: VOC Vapor Intrusion Mitigation using Vapor Barrier and Sub-slab Depressurization System**	**- Liquid Boot (or equal) vapor membrane and Sub-slab Depressurization System under entire occupied building.**	9	- Highly implementable with design and construction integrated into structure reconstruction.	8	$297,300	- Moderate design and construction fee but high degree of effectiveness.	7	$101,590	- Requires annual inspection, OM&M and reporting.	9	- High due to direct positive impact on potential human exposure.	9	- Proposed land use at the Site is Restricted Residential. - This Engineering Control facilitates occupancy as a residential facility in spite of residual contamination	**81**	**$398,890**	- Favorable alternative for vapor intrusion due to good overall performance and generally high-scoring criteria.

Notes:
1. See text for more detailed discussion criteria

Table 8
Excavation Point Sampling Plan
AAR/RAWP
Canal Street Manufacturing Site
67 - 89 Canal Street, Rochester, New York
BCP Site #C828206

Excavation	Purpose of Excavation	Endpoint Sample Parameter(s)
Area 1-A	Petroleum Impacted Sub Slab Soils	VOCs, SVOCs
Area 1-B	Petroleum Impacted Sub Slab Soils	VOCs, SVOCs
Area 1-C	Petroleum Impacted Sub Slab Soils	VOCs, SVOCs
Area 2	Petroleum Impacted Soils in Loading Dock Area, Sump and Associated Piping Removal	VOCs, SVOCs
Area 3-A	Exterior Petroleum Impacted Soil	VOCs, SVOCs
Area 3-B	Metal and PAH Impacted Surface Soil on Concrete Slab	-
Area 3-C	Asbestos Impacted Soil Piles on Concrete Slab	-
Area 4	EISB Injection Piping Trenches	-
Area 5	SSDS Piping Trenches	-
Area 6	Exterior Site Work	-

Notes:

-	End Point Sampling Not Required
SVOC	TCL Semi-Volatile Organic Compounds plus up to 20 TICs (Method 8270)
TCL	Target Compound List
VOC	TCL Volatile Organic Compounds plus additional NYSDEC CP-51 VOCs and up to 10 TICs (Method 8260)

QA/QC sample analysis will be performed at the following required sampling frequencies:
- Field duplicates - 1 per 20 samples for each sample medium
- Matrix Spike/Matrix Spike Duplicates - 1 each per 20 samples for each sample medium C8
- Rinsate blanks - 1 per mobilization for each sampling method using non-dedicated sampling equipment

Table 9
Proposed Post EISB and ERD Implementation Groundwater Monitoring Plan
AAR/RAWP
Canal Street Manufacturing Site
67 - 89 Canal Street, Rochester, New York
BCP Site #C828206

		Groundwater Samples[1]						
Location ID	Sample Rationale	TCL VOCs	TCl SVOCs	TOC	Total Na and Fe	Dissolved Mn and As	Nitrate, Nitrite, Sulfate	Field Parameters
MW-100	ERD and EISB monitoring	1		1	1	1	1	1
MW-104	EISB monitoring	1	1				1	1
MW-106R	EISB monitoring	1	1				1	1
MW-107	ERD monitoring	1		1	1	1	1	1
MW-110	Perimeter monitoring	1						1
MW-112	ERD monitoring	1		1	1	1		1
MW-114	EISB monitoring	1		1	1	1		1
MW-9	EISB monitoring and Perimeter monitoring	1	1				1	1
MW-02	ERD monitoring	1					1	1
	Anticipated totals:	9	3	4	4	4	6	9

Notes:

[1]QA/QC samples, including field duplicates and matrix spike/matrix spike duplicate, will not be collected until the anticipated final round of groundwater sampling. There will be a trip blank for each cooler that contains aqueous samples to be analyzed for VOCs.

[2]Samples will be collected on a quaterly basis for the first year after intial application of treatments. Subsequent sampling events after the first year will be based on the analytical results and will be discussed and approved by the Department.

[3]The post injection monitoring plan will be finalized in the Site Management Plan (SMP).

Dissolved Mn and As = Manganese and Arsenic analysis per EPA Method 6010

ERD = Enhanced reductive dechlorination

EISB = Enhance in-situ biodegradation

Field Parameters = Temperature, conductivity, pH dissolved oxygen (DO), oxidation-reduction potential (ORP) and ferrous iron collected at the time of sampling

MW = Monitoring well

Nitrate, Nitrite and Sulfate = Analysis per EPA Method 300.0

SVOCs = TCL Semivolatile organic compounds plus up to 20 TICs analysis per EPA Method 8270

TCL = USEPA's Target Compound List

TICs = Tentatively identified compounds

TOC = Total organic carbon analysis per EPA Method 415.1

VOCs = TCL Volatile organic compounds plus additional NYSDEC CP-51 VOCs and up to 10 TICs analysis per EPA Method 8260

FIGURES

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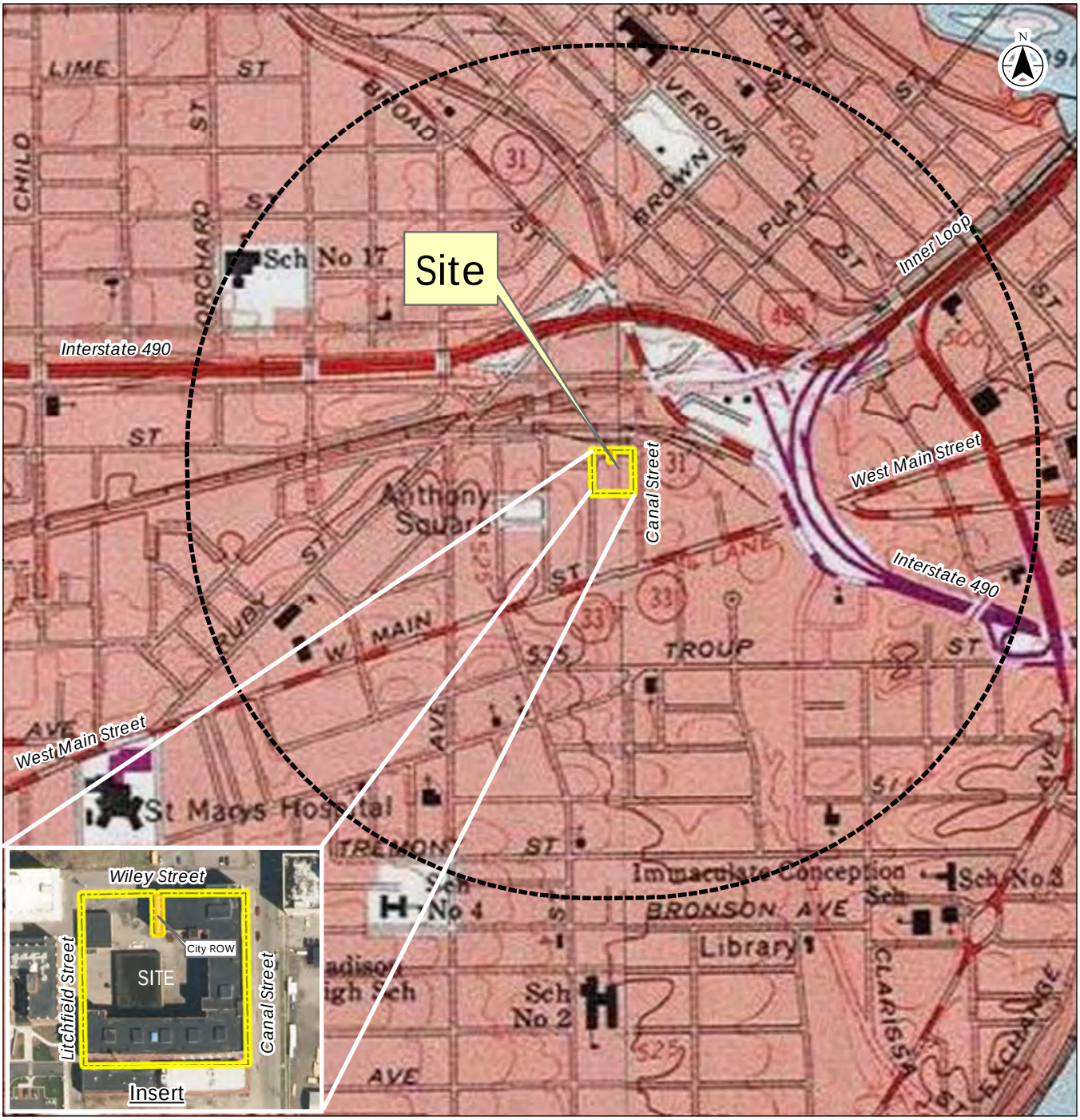

Legend

- Site Boundary
- City of Rochester Right-of-Way *
- 1/2-mile Site Radius

0 1,000 2,000 Feet

1:12,000 (at original document size of 8.5x11)

Notes
1. Coordinate System: NAD 1983 StatePlane New York West FIPS 3103 Feet
2. ArcGIS Basemaps: USA Topo Maps (main frame) and World Street Map (key map).
3. *The City of Rochester ROW is anticipated to become part of the Canal Street Site upon abandonment by the City of Rochester and submission and acceptance of a NYSDEC BCP Amendment application.

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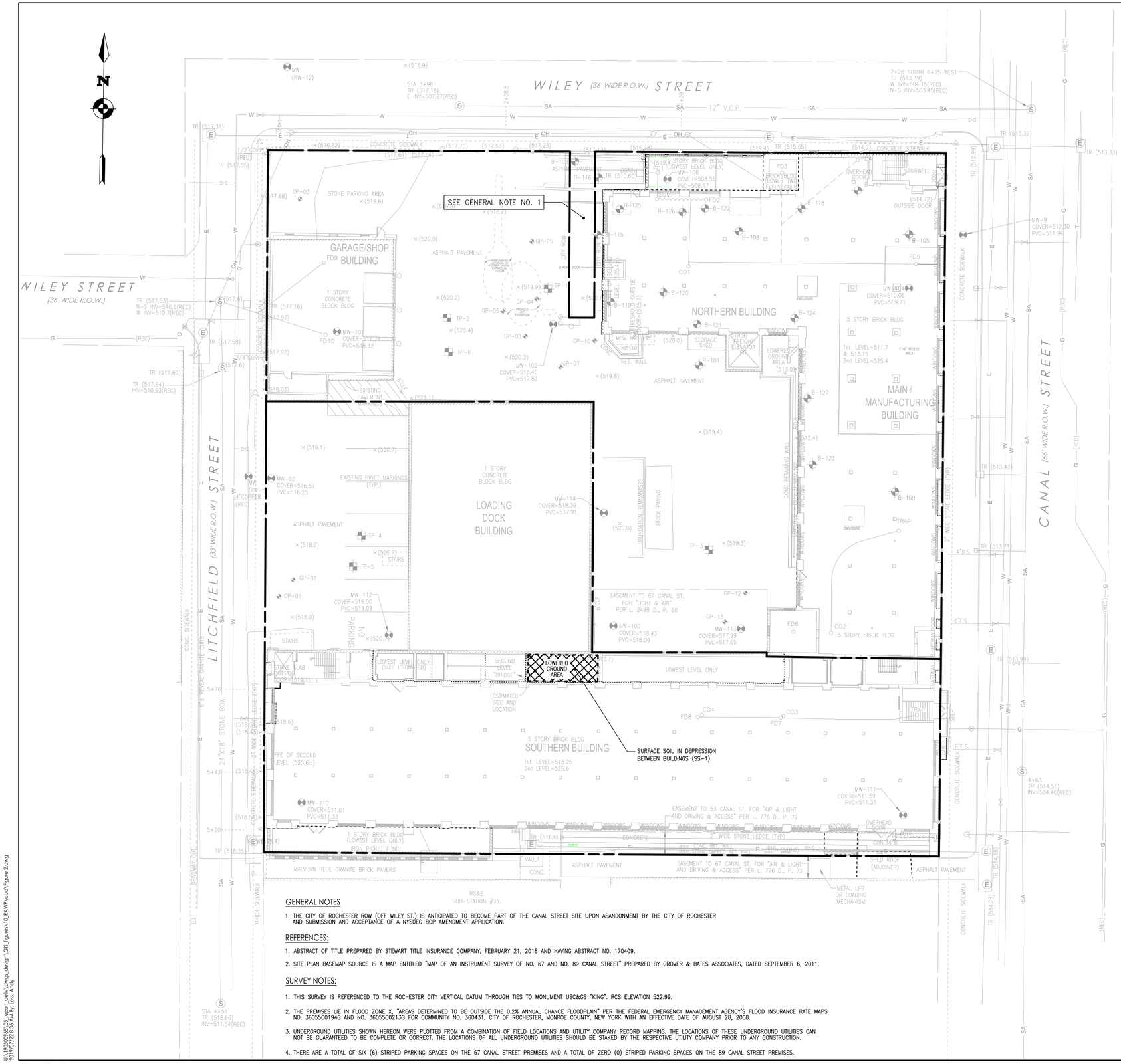
Project Location
67 - 89 Canal Street
City of Rochester,
Monroe Co., NY

190500965
Prepared by APL on 2019-06-22
Technical Review by KI on 2019-07-11
Independent Review by MPS on 2019-07-15

Client/Project
East House Canal Street, LLC - BCP Site # 828206
Alternatives Analysis Report
and Remedial Action Work Plan

Figure No.
1

Title
Site Location Map



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Notes

Revision	By	Appd.	YY.MM.DD

Issued	By	Appd.	YY.MM.DD

File Name: Figure 2.dwg	APL	PN/MPS	KI	19.07
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project
EAST HOUSE CANAL STREET, LLC
CANAL STREET MANUFACTURING SITE

ALTERNATIVES ANALYSIS REPORT AND REMEDIAL ACTION WORK PLAN
67 - 89 CANAL STREET, ROCHESTER, NY

Title
EXISTING SITE PLAN WITH SAMPLE, BORING AND WELL LOCATIONS

Project No. 190500965
Scale AS SHOWN

Drawing No.
FIGURE 2

VIEW FROM THE NORTH
LOOKING SOUTH

VIEW FROM THE WEST
LOOKING EAST

VIEW FROM THE SOUTH
LOOKING NORTH

VIEW FROM THE EAST
LOOKING WEST

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Notes

Revision	By	Appd.	YY.MM.DD

Issued	By	Appd.	YY.MM.DD

File Name: Figure 2A.dwg	APL	PN/MPS	KI	19.07
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project
EAST HOUSE CANAL STREET, LLC
CANAL STREET MANUFACTURING SITE

ALTERNATIVES ANALYSIS REPORT AND REMEDIAL ACTION WORK PLAN
67 - 89 CANAL STREET, ROCHESTER, NY

Title
EXISTING SITE CONDITIONS
AERIAL VIEW

Project No.
190500965

Scale
NOT TO SCALE

Drawing No.
FIGURE 2A

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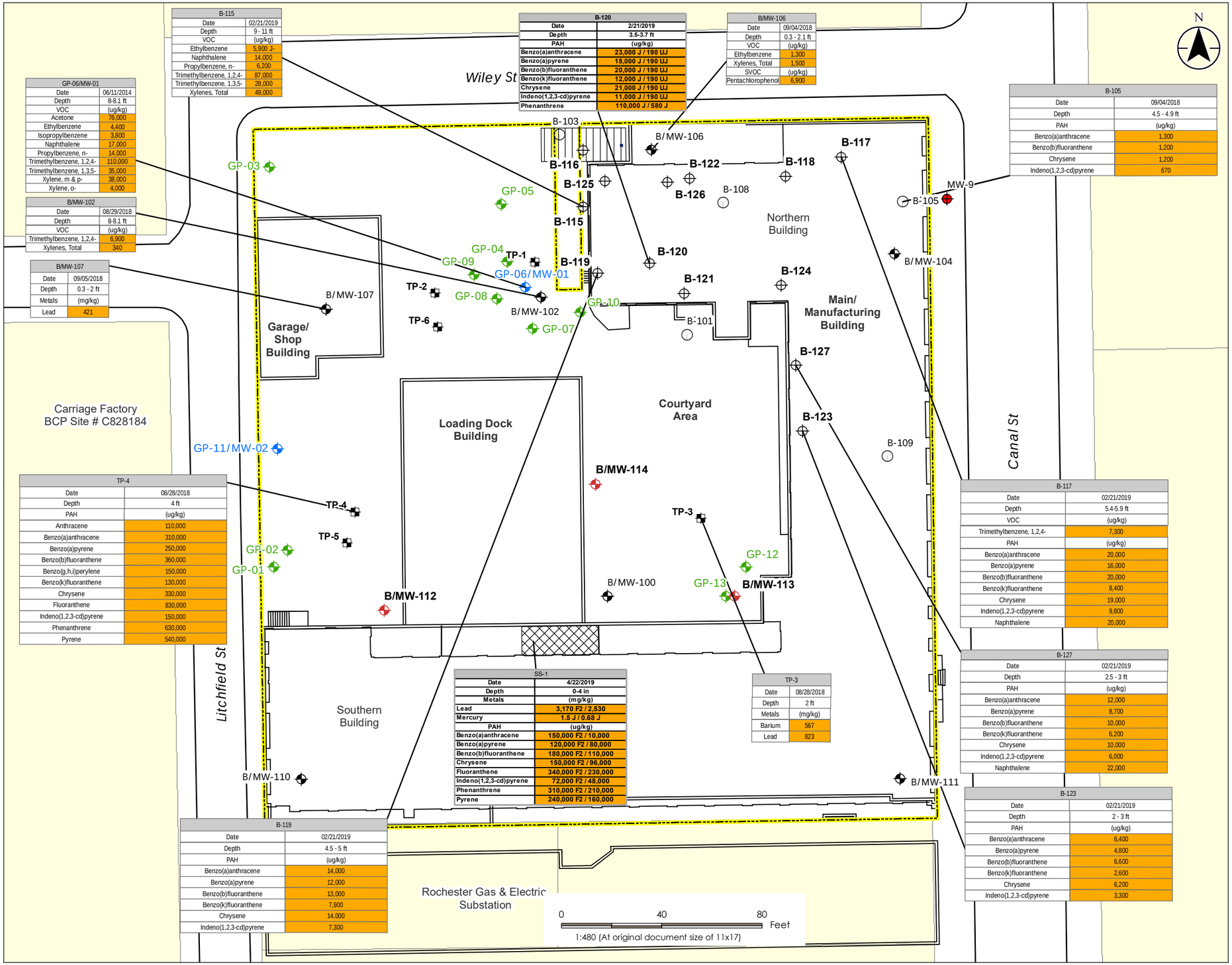

B-115	
Date	02/21/2019
Depth	9 - 11 ft
VOC	(ug/kg)
Ethylbenzene	5,900 J-
Naphthalene	14,000
Propylbenzene, n-	6,200
Trimethylbenzene, 1,2,4-	87,000
Trimethylbenzene, 1,3,5-	28,000
Xylenes, Total	49,000

B-120	
Date	**2/21/2019**
Depth	**3.5-3.7 ft**
PAH	**(ug/kg)**
Benzo(a)anthracene	**23,000 J / 190 UJ**
Benzo(a)pyrene	**18,000 J / 190 UJ**
Benzo(b)fluoranthene	**20,000 J / 190 UJ**
Benzo(k)fluoranthene	**12,000 J / 190 UJ**
Chrysene	**21,000 J / 190 UJ**
Indeno(1,2,3-cd)pyrene	**11,000 J / 190 UJ**
Phenanthrene	**110,000 J / 580 J**

B/MW-106	
Date	09/04/2018
Depth	0.3 - 2.1 ft
VOC	(ug/kg)
Ethylbenzene	1,300
Xylenes, Total	1,500
SVOC	(ug/kg)
Pentachlorophenol	6,900

B-105	
Date	09/04/2018
Depth	4.5 - 4.9 ft
PAH	(ug/kg)
Benzo(a)anthracene	1,300
Benzo(b)fluoranthene	1,200
Chrysene	1,200
Indeno(1,2,3-cd)pyrene	670

GP-06/MW-01	
Date	06/11/2014
Depth	8-8.1 ft
VOC	(ug/kg)
Acetone	76,000
Ethylbenzene	4,400
Isopropylbenzene	3,800
Naphthalene	17,000
Propylbenzene, n-	14,000
Trimethylbenzene, 1,2,4-	110,000
Trimethylbenzene, 1,3,5-	35,000
Xylene, m & p-	38,000
Xylene, o-	4,000

B/MW-102	
Date	08/29/2018
Depth	8-8.1 ft
VOC	(ug/kg)
Trimethylbenzene, 1,2,4-	6,900
Xylenes, Total	340

B/MW-107	
Date	09/05/2018
Depth	0.3 - 2 ft
Metals	(mg/kg)
Lead	421

TP-4	
Date	08/28/2018
Depth	4 ft
PAH	(ug/kg)
Anthracene	110,000
Benzo(a)anthracene	310,000
Benzo(a)pyrene	250,000
Benzo(b)fluoranthene	360,000
Benzo(g,h,i)perylene	150,000
Benzo(k)fluoranthene	130,000
Chrysene	330,000
Fluoranthene	830,000
Indeno(1,2,3-cd)pyrene	150,000
Phenanthrene	630,000
Pyrene	540,000

SS-1	
Date	**4/22/2019**
Depth	**0-4 in**
Metals	**(mg/kg)**
Lead	**3,170 F2 / 2,530**
Mercury	**1.5 J / 0.68 J**
PAH	**(ug/kg)**
Benzo(a)anthracene	**150,000 F2 / 10,000**
Benzo(a)pyrene	**120,000 F2 / 80,000**
Benzo(b)fluoranthene	**180,000 F2 / 110,000**
Chrysene	**150,000 F2 / 96,000**
Fluoranthene	**340,000 F2 / 230,000**
Indeno(1,2,3-cd)pyrene	**72,000 F2 / 48,000**
Phenanthrene	**310,000 F2 / 210,000**
Pyrene	**240,000 F2 / 160,000**

TP-3	
Date	08/28/2018
Depth	2 ft
Metals	(mg/kg)
Barium	567
Lead	823

B-119	
Date	02/21/2019
Depth	4.5 - 5 ft
PAH	(ug/kg)
Benzo(a)anthracene	14,000
Benzo(a)pyrene	12,000
Benzo(b)fluoranthene	13,000
Benzo(k)fluoranthene	7,900
Chrysene	14,000
Indeno(1,2,3-cd)pyrene	7,300

B-117	
Date	02/21/2019
Depth	5.4-5.9 ft
VOC	(ug/kg)
Trimethylbenzene, 1,2,4-	7,300
PAH	(ug/kg)
Benzo(a)anthracene	20,000
Benzo(a)pyrene	16,000
Benzo(b)fluoranthene	20,000
Benzo(k)fluoranthene	8,400
Chrysene	19,000
Indeno(1,2,3-cd)pyrene	9,800
Naphthalene	20,000

B-127	
Date	02/21/2019
Depth	2.5 - 3 ft
PAH	(ug/kg)
Benzo(a)anthracene	12,000
Benzo(a)pyrene	8,700
Benzo(b)fluoranthene	10,000
Benzo(k)fluoranthene	6,200
Chrysene	10,000
Indeno(1,2,3-cd)pyrene	6,000
Naphthalene	22,000

B-123	
Date	02/21/2019
Depth	2 - 3 ft
PAH	(ug/kg)
Benzo(a)anthracene	6,400
Benzo(a)pyrene	4,800
Benzo(b)fluoranthene	6,600
Benzo(k)fluoranthene	2,600
Chrysene	6,200
Indeno(1,2,3-cd)pyrene	3,300

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Legend

- Site Boundary
- Prior On-Site Investigation Location (LaBella Phase II ESA, 2014) - Soil Boring
- Prior On-Site Investigation Location (LaBella Phase II ESA, 2014) - Soil Boring/Monitoring Well
- Previously Installed Off-Site Well (RGE MGP Site)
- 2019 RI Soil Boring Location
- 2019 RI Soil Boring/Monitoring Well Location
- 2019 RI Test Pit
- 2018 RI Soil Boring Location
- 2018 RI Soil Boring/Monitoring Well Location
- Surface Soil Location (Composite Sample)

Notes:

1. Coordinate System:
   NAD 1983 State Plane New York West FIPS 3103 Feet
2. Key Map basemap: ArcGIS World Street Map.
3. Locations are approximate.
4. Abbreviations:
   ug/kg = micrograms per kilogram
   mg/kg = milligrams per kilogram
   PAHs = polycyclic aromatic hydrocarbons
   SVOC = semi-volatile organic compounds
   VOCs = volatile organic compounds

4. Exceedances are shown of one or more of the following: NYSDEC Soil Cleanup Objectives (SCOs) for Restricted Residential Use and Protection of Groundwater and CP-51 Table1 (Supplemental Restricted Residential) and Tables 2 and 3 (SCOs for Gasoline and Fuel Oil Impacted Soil).
5. Data Qualifier
   J The reported result is an estimated value.
   J- The analyte was positively identified; the associated numerical value is an estimated quantity that may be biased low.
   F2 MS/MSD Relative Percent Difference (RPD) exceeds control limits.
   190 U Analyte was not detected at a concentration greater than the laboratory reporting limit.
6. Soil results exceeding SCOs for aluminum, calcium, iron and magnesium are not included.
7. The 2014 data were not collected with quality control samples, and were not reported with NYSDEC ASP Category B deliverables; therefore, a Data Usability Review was not performed.

Project Location
67 - 89 Canal Street
C. of Rochester, Monroe Co., NY

190500965
Prepared by APL on 2019-06-22
Technical Review by KI on 2019-07-22
Independent Review by MPS on 2019-07-22

Client/Project
East House Canal Street, LLC
Alternatives Analysis Report
and Remedial Action Work Plan - BCP Site # 828206

Figure No.
3

Title
Exceedances of NYSDEC Applicable Soil Cleanup Objectives

B/MW-107			
VOC (ug/L)	10/01/2018	02/26/2019	04/25/2019
Ethylbenzene	-	8.9	5.8
Isopropylbenzene	-	5.7	-
Propylbenzene, n-	-	15	8.8
Trichloroethene (TCE)	8.7	-	-
Trimethylbenzene, 1,2,4-	-	64	41
Xylenes, Total	-	6.1	-

MW-01	
VOC (ug/L)	06/11/2014
Butylbenzene, n-	110
Ethylbenzene	390
Isopropylbenzene	190
Naphthalene	1,000
Propylbenzene, n-	580
Trimethylbenzene, 1,2,4-	5,600
Trimethylbenzene, 1,3,5-	1,400
Xylene, m & p-	2,600
Xylene, o-	180
PAH	06/11/2014
Naphthalene	2,300

B/MW-106		
VOC (ug/L)	10/02/2018	04/24/2019
Benzene	680	290
Ethylbenzene	920	260
Isopropylbenzene	34	-
Methyl tert-butyl ether (MTBE)	53	290
Naphthalene	310	-
Propylbenzene, n-	49	-
Toluene	230	-
Trimethylbenzene, 1,2,4-	1,300 J-	140
Trimethylbenzene, 1,3,5-	380	-
Xylenes, Total	5,000 J-	-

B/MW-114		
VOC (ug/L)	02/28/2019	04/24/2019
Benzene	12	16
Butylbenzene, n-	-	11
Ethylbenzene	75	70
Isopropylbenzene	10	13
Methylene Chloride (Dichloromethane)	-	12
Naphthalene	27	30
Propylbenzene, n-	28	28
Toluene	12	16
Trimethylbenzene, 1,2,4-	260	310
Trimethylbenzene, 1,3,5-	56	53
Xylenes, Total	150	220

Freight Elevator Pit	
Pesticides	4/22/2019
DDD (p,p'-DDD)	2.0
DDE (p,p'-DDE)	0.57
DDT (p,p'-DDT)	2.3

B/MW-104			
VOC (ug/L)	10/02/2018	02/26/2019	04/24/2019
Benzene	-	42	5.8
Butylbenzene, n-	-	7.8	-
Ethylbenzene	-	75	38
Isopropylbenzene	-	11	-
Naphthalene	-	23	-
Propylbenzene, n-	-	33	13
Toluene	-	19	-
Trimethylbenzene, 1,2,4-	-	230	130
Trimethylbenzene, 1,3,5-	5.8	59	38
Xylenes, Total	-	160	84
PAH	10/02/2018	02/26/2019	02/26/2019
Naphthalene	-	32	-

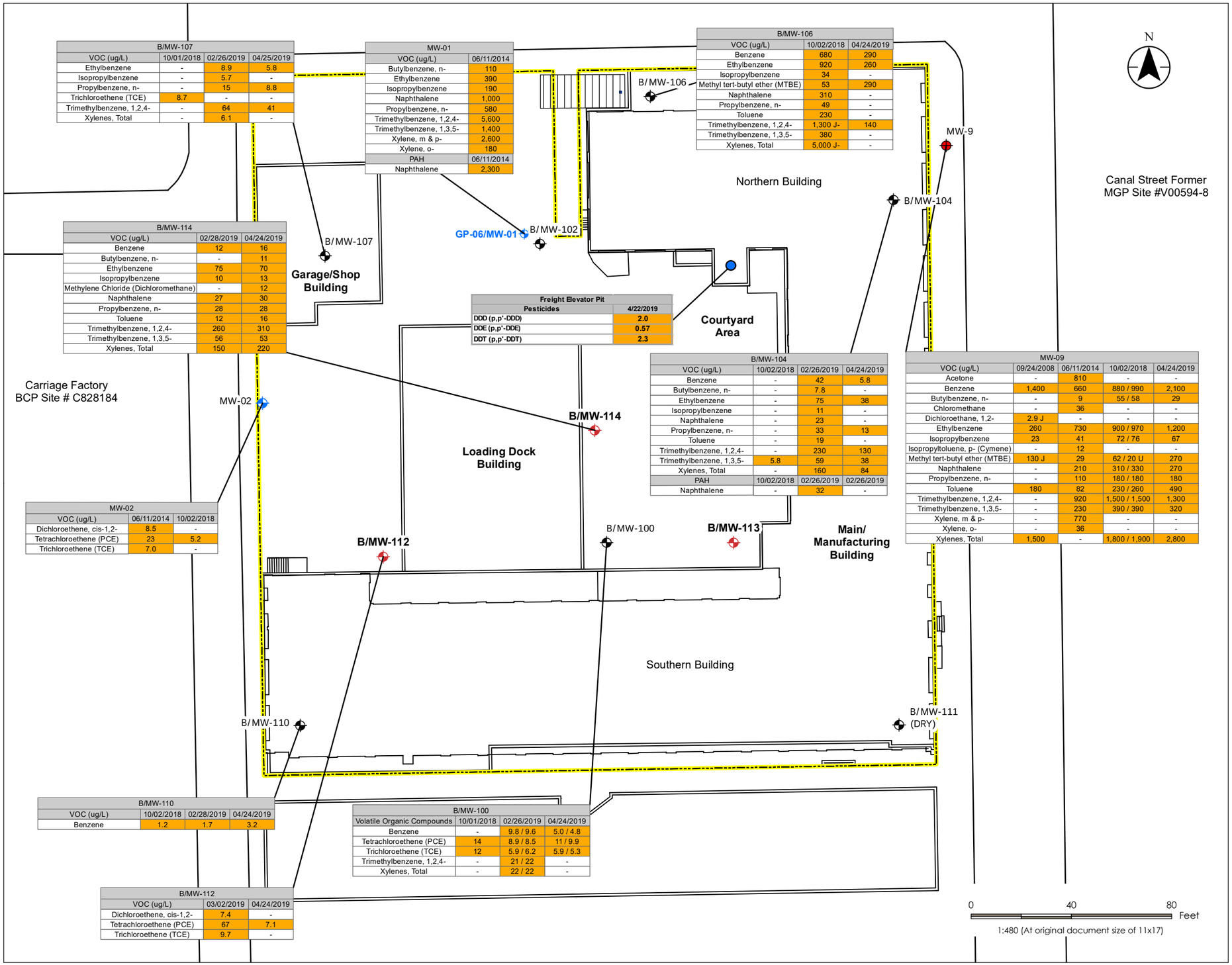
MW-09				
VOC (ug/L)	09/24/2008	06/11/2014	10/02/2018	04/24/2019
Acetone	-	810	-	-
Benzene	1,400	660	880 / 990	2,100
Butylbenzene, n-	-	9	55 / 58	29
Chloromethane	-	36	-	-
Dichloroethane, 1,2-	2.9 J	-	-	-
Ethylbenzene	260	730	900 / 970	1,200
Isopropylbenzene	23	41	72 / 76	67
Isopropyltoluene, p- (Cymene)	-	12	-	-
Methyl tert-butyl ether (MTBE)	130 J	29	62 / 20 U	270
Naphthalene	-	210	310 / 330	270
Propylbenzene, n-	-	110	180 / 180	180
Toluene	180	82	230 / 260	490
Trimethylbenzene, 1,2,4-	-	920	1,500 / 1,500	1,300
Trimethylbenzene, 1,3,5-	-	230	390 / 390	320
Xylene, m & p-	-	770	-	-
Xylene, o-	-	36	-	-
Xylenes, Total	1,500	-	1,800 / 1,900	2,800

MW-02		
VOC (ug/L)	06/11/2014	10/02/2018
Dichloroethene, cis-1,2-	8.5	-
Tetrachloroethene (PCE)	23	5.2
Trichloroethene (TCE)	7.0	-

B/MW-110			
VOC (ug/L)	10/02/2018	02/28/2019	04/24/2019
Benzene	1.2	1.7	3.2

B/MW-100			
Volatile Organic Compounds	10/01/2018	02/26/2019	04/24/2019
Benzene	-	9.8 / 9.6	5.0 / 4.8
Tetrachloroethene (PCE)	14	8.9 / 8.5	11 / 9.9
Trichloroethene (TCE)	12	5.9 / 6.2	5.9 / 5.3
Trimethylbenzene, 1,2,4-	-	21 / 22	-
Xylenes, Total	-	22 / 22	-

B/MW-112		
VOC (ug/L)	03/02/2019	04/24/2019
Dichloroethene, cis-1,2-	7.4	-
Tetrachloroethene (PCE)	67	7.1
Trichloroethene (TCE)	9.7	-



Legend

- Site Boundary
- 2019 RI Monitoring Well Location
- 2018 RI Monitoring Well Location
- Previously Installed On-Site Overburden Well (LaBella Phase II)
- Previously Installed Off-Site Well (RGE MGP Site)

Notes:

1. Coordinate System:
   NAD 1983 State Plane New York West FIPS 3103 Feet
2. Key Map basemap: ArcGIS World Street Map.
3. Locations are approximate.
4. Orange highlight indicate the results exceed NYSDEC TOGS 1.1.1 Ambient Water Quality Standards and Guidance Values.
5. Units are in micrograms per liter (ug/L)
6. Data Qualifier
   - F1 MS and/or MSD recovery is outside acceptance limits
   - J The reported result is an estimated value
   - J- The analyte was positively identified; the associated numerical value is an estimated quantity that may be biased low.
   - - Parameter not analyzed or not detected above standard and guidance values
   - 20 U = Analyte was not detected at a concentration greater than the laboratory reporting limit
7. Results exceeding Standard and Guidance Values for iron, sodium, magnesium and manganese are not included.
8. For the freight elevator pit sample dissolved metal concentrations were used in this figure. Total metal concentrations as well as dissolved metal concentrations are provided in Table 14.
9. The 2008 and 2014 data were not collected with quality control samples, and were not reported
   with NYSDEC ASP Category B deliverables; therefore, a Data Usability Review was not performed.
10. For wells with no exceedances of Standard and Guidance Values for any sampling event data are not presented.

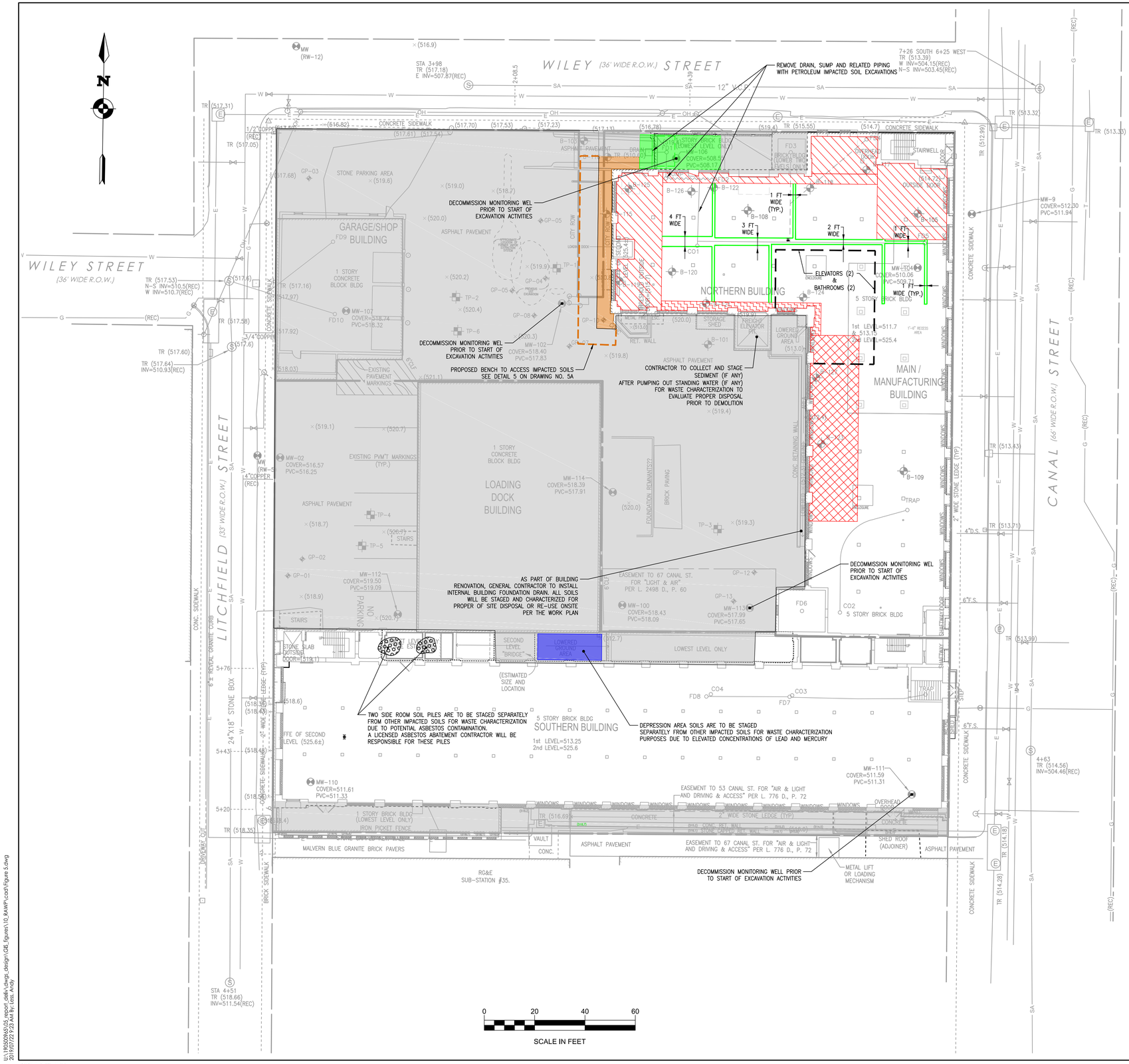
Project Location
67 - 89 Canal Street
C. of Rochester, Monroe Co., NY

190500965
Prepared by APL on 2019-06-22
Technical Review by KI on 2019-07-22
Independent Review by MPS on 2019-07-22

Client/Project
East House Canal Street, LLC
Alternatives Analysis Report
and Remedial Action Work Plan - BCP Site # 828206

Figure No.
4

Title
Exceedances of Standards and Guidance Values in Groundwater Samples



EXCAVATION TYPE/ AREA

AREA 1 – PETROLEUM IMPACTED SUBBASE SOILS TO TOP OF BEDROCK

AREA 1–A
REMOVAL DEPTH ±1.0 – ±5.9
(FEET BELOW TOP OF SLAB)

AREA 1–B
REMOVAL DEPTH ±2.0 – ±4.5
(FEET BELOW TOP OF SLAB)

AREA 1–C
REMOVAL DEPTH ± 4.0 – ±4.5
(FEET BELOW TOP OF SLAB)

AREA 2 – DOCK AND SUMP

AREA 2
REMOVAL DEPTH ±0.3 – ±5.0
(FEET BELOW TOP OF SLAB)

AREA 3 – EXTERIOR PERIMETER SOILS

AREA 3–A
EXTERIOR PERIMETER IMPACTED SOILS
REMOVAL DEPTH ±7.2 – ±8.1
(FEET BELOW GROUND SURFACE)
NOTE BENCH IN CROSS SECTION

AREA 3–B
DEPRESSION AREA SURFACE IMPACTED SOILS
REMOVAL DEPTH ±0 – ±0.5
(FEET BELOW GROUND SURFACE)

AREA 3–C
SIDE ROOM SOIL PILES

AREA 4 – EISB INJECTION PIPING TRENCHES TO TOP OF ROCK

AREA 4
IMPACTED SOILS
REMOVAL DEPTH ±4.5 – ±4.9
(FEET BELOW TOP OF SLAB)

AREA 5 – SSDS PIPING TRENCHES

AREA 5
T.B.D.
SSDS TRENCHES, NOT SHOWN – LOCATIONS TO BE DETERMINED BASED UPON FINAL ARCHITECTURAL BUILDING DESIGN

AREA 6 – EXTERIOR SITEWORK

AREA 6
MIX OF URBAN FILL AND NATIVE MATERIALS TO BE CUT AND FORMER BUILDING FOUNDATION TO BE REMOVED FOR SITE WORK AND GENERAL GRADING (DEPTH VARIES)

NOTES:

1. ALL UTILITY PENETRATIONS INCLUDING SUBSLAB INJECTION PIPING AND SSDS PIPING SYSTEM SHALL BE COORDINATED BY CONTRACTOR, REGARDING INSTALLATION PLACEMENT, PENETRATION SEALING AND FINAL BACKFILLING.
2. LOCATION OF TEMPORARY STOCKPILES / FRAC TANKS TO BE DETERMINED BY CONTRACTOR IN FIELD. UNDER NO CIRCUMSTANCES SHALL ANY MATERIAL BE STORED OFF-SITE.
3. CONCRETE BASEMENT FLOOR SLAB TO BE REMOVED IN ITS ENTIRETY AS PART OF SELECT BUILDING DEMOLITION COMPLETED BY OTHERS.
4. THE PESTICIDE IMPACTS IN THE FORMER STORAGE ROOM FLOOR AND THE HAZARDOUS BUILDING MATERIALS (LEAD PAINT, ASBESTOS AND UNIVERSAL WASTES) WILL BE REMOVED, ABATED AND PROPERLY DISPOSED AS PART OF SELECT BUILDING DEMOLITION COMPLETED BY OTHERS.
5. DURING CONSTRUCTION SITE SECURITY FENCING SHALL BE INSTALLED AROUND THE ENTIRE SITE.
6. ALL EROSION CONTROL MEASURES SHALL BE PUT INTO PLACE ACCORDING TO THE LATEST VERSION OF THE NEW YORK STATE STANDARDS AND SPECIFICATIONS FOR EROSION AND SEDIMENT CONTROL.
7. MAINTENANCE AND PROTECTION OF TRAFFIC ALONG WITH SECURING THE WORK AREA SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
8. ALL CONES, DRUMS, CONCRETE BARRIERS AND MARKERS ARE TO BE PLACED SO AS TO PROVIDE A MINIMUM 2' CLEARANCE TO THE TRAVELED WAY UNLESS OTHERWISE SHOWN ON THE PLANS AND/OR DIRECTED BY THE OWNER'S REPRESENTATIVE. THE CONTRACTOR SHALL MAKE CERTAIN PLACEMENT OF CONES, DRUMS AND MARKERS OR BARRICADES SO THEY SHALL NOT INTERFERE WITH SIGHT DISTANCE.
9. ALL DEBRIS AND SOILS DERIVED FROM THE CONTRACTOR'S OPERATIONS FOUND IN THE PUBLIC RIGHT-OF-WAY OR CAUSING NUISANCE TO OPERATIONS SHALL BE CLEANED AND REMOVED ON A DAILY BASIS OR WHEN NOTIFIED BY THE OWNER'S REPRESENTATIVE.
10. THE CONTRACTOR SHALL PROTECT AND MAINTAIN ALL EXISTING GROUNDWATER MONITORING WELLS NOT DESIGNATED TO BE DECOMMISSIONED. MONITORING WELL MW-106 WILL BE REPLACED. ALL OTHER WELLS WILL REQUIRE RISER HEIGHT ADJUSTMENTS TO BE MADE BASED ON FINAL ELEVATIONS AND NEW PROTECTIVE FLUSH MOUNT WELL SURFACE CAPS TO BE INSTALLED FOLLOWING CONSTRUCTION. ALL WELL RELATED WORK WILL BE PERFORMED BY A QUALIFED ENVIRONMENTAL DRILLING COMPANY.

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Legend

Notes

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File Name: Figure 5.dwg	APL	PN/MPS	KI	19.07
	Dwn.	Chkd.	Dsgn.	YY.MM.DD

Permit-Seal

Client/Project

EAST HOUSE CANAL STREET, LLC
CANAL STREET MANUFACTURING SITE

ALTERNATIVES ANALYSIS REPORT AND REMEDIAL ACTION WORK PLAN

67 - 89 CANAL STREET, ROCHESTER, NY

Title

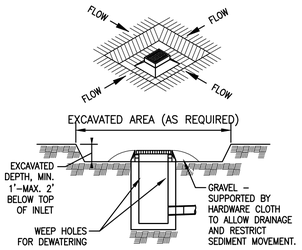
PROPOSED EXCAVATIONS AND GYPSUM APPLICATION LOCATIONS TO REMEDIATE SOIL

Project No. 190500965

Scale AS SHOWN

Drawing No.

FIGURE 5

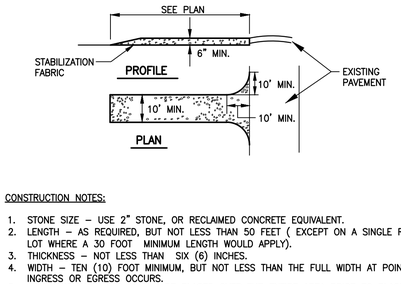


CONSTRUCTION SPECIFICATIONS

NOTES:

1. CLEAR THE AREA OF ALL DEBRIS THAT WILL HINDER EXCAVATION.
2. GRADE APPROACH TO THE INLET UNIFORMLY AROUND THE BASIN.
3. WEEP HOLES SHALL BE PROTECTED BY GRAVEL.
4. UPON STABILIZATION OF CONTRIBUTING DRAINAGE AREA, SEAL WEEP HOLES. FILL BASIN WITH STABLE SOIL TO FINAL GRADE. COMPACT IT PROPERLY AND STABILIZE WITH PERMANENT SEEDING.
5. MAXIMUM DRAINAGE AREA 1 ACRE.

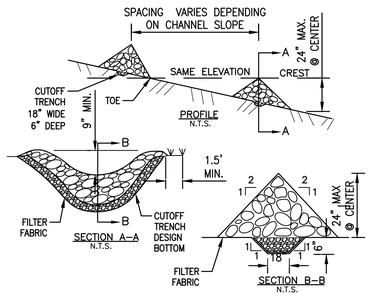
1 / 5A — EXCAVATED INLET PROTECTION DETAIL
N.T.S.



CONSTRUCTION NOTES:

1. STONE SIZE – USE 2" STONE, OR RECLAIMED CONCRETE EQUIVALENT.
2. LENGTH – AS REQUIRED, BUT NOT LESS THAN 50 FEET (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30 FOOT MINIMUM LENGTH WOULD APPLY).
3. THICKNESS – NOT LESS THAN SIX (6) INCHES.
4. WIDTH – TEN (10) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS.
5. STABILIZATION FABRIC – WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING STONE.
6. SURFACE WATER – ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SIDE SLOPES WILL BE PERMITTED.
7. MAINTENANCE – THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS–OF–WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS–OF–WAY MUST BE REMOVED IMMEDIATELY.
8. WASHING – WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC RIGHTS–OF–WAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS TO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

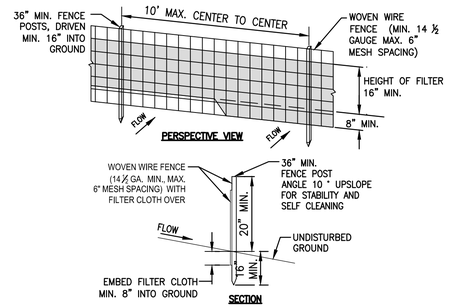
2 / 5A — STABILIZED CONSTRUCTION ENTRANCE
N.T.S.



NOTES:

1. STONE WILL BE PLACED ON A FILTER FABRIC FOUNDATION TO THE LINES, GRADES AND LOCATIONS SHOWN IN THE PLAN.
2. SET SPACING OF CHECK DAMS TO ASSUME THAT THE ELEVATIONS OF THE CREST OF THE DOWNSTREAM DAM IS AT THE SAME ELEVATION OF THE TOE OF THE UPSTREAM DAM.
3. EXTEND THE STONE A MINIMUM OF 1.5 FEET BEYOND THE DITCH BANKS TO PREVENT CUTTING AROUND THE DAM.
4. PROTECT THE CHANNEL DOWNSTREAM OF THE LOWEST CHECK DAM FROM SCOUR AND EROSION WITH STONE OR LINER AS APPROPRIATE.
5. ENSURE THAT CHANNEL APPURTENANCES SUCH AS CULVERT ENTRANCES BELOW CHECK DAMS ARE NOT SUBJECT TO DAMAGE OR BLOCKAGE FROM DISPLACED STONE.

3 / 5A — STONE CHECK DAM
N.T.S.



CONSTRUCTION NOTES FOR FABRICATED FENCE:

1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE WITH WIRE TIES OR STAPLES.
2. FILTER CLOTH TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER, THEY SHALL BE OVER–LAPPED BY SIX INCHES AND FOLDED.
4. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.

POSTS: STEEL EITHER T OR U TYPE 2" HARDWOOD
FENCE: WOVEN WIRE, 14 GA. 6" MAX. MESH OPENING FILTER
CLOTH: FILTER X, MIRAFI 100X, STABILINKA T140N OR APPROVED EQUAL

PREFABRICATED UNIT: GEOFAB, ENVIROFENCE, OR APPROVED EQUAL

4 / 5A — SILT FENCE
N.T.S.

GENERAL GRADING NOTES

A. CLEARLY IDENTIFY PROJECT WORK LIMITS IDENTIFYING ALL AREAS WHERE CONSTRUCTION DISTURBANCE SHALL NOT BE PERMITTED INCLUDING, BUT NOT LIMITED TO SELECT TREES AND ADJOINING PROPERTIES.

B. INSTALL PERIMETER EROSION CONTROL MEASURES. CONSTRUCT TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES AS NECESSARY TO DIVERT RUNOFF FROM ENTERING AREAS OF PLANNED DISTURBANCE.

C. INSTALL A STABILIZED CONSTRUCTION ENTRANCE AS SHOWN ON PLANS OR AS DIRECTED BY OWNER'S REPRESENTATIVE.

D. ESTABLISH EROSION AND SEDIMENT CONTROL MEASURES PRIOR TO COMMENCING EARTHWORK OPERATIONS.

E. DISPOSE OF ALL REMOVED VEGETATION AND DEMOLITION DEBRIS OFF-SITE.

F. ESTABLISH MASS GRADE ELEVATIONS.

G. REMOVE UTILITIES, ETC. DESIGNATED FOR REMOVAL.

H. ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES AS WELL AS STOCK PILES ARE TO BE SEEDED FOR TEMPORARY VEGETATIVE COVER IMMEDIATELY FOLLOWING GRADING.

I. CONSTRUCT UTILITIES AND INFRASTRUCTURE IMPROVEMENTS.

J. FINE GRADE, INSTALL LANDSCAPING, SITE AMENITIES AND PERMANENT SEEDING.

K. REMOVE TEMPORARY EROSION AND SEDIMENT CONTROL FEATURES UPON ESTABLISHMENT OF PERMANENT GROUND COVER.

L. NOTIFY OWNER'S REPRESENTATIVE OF COMPLETION OF FINAL SITE STABILIZATION.

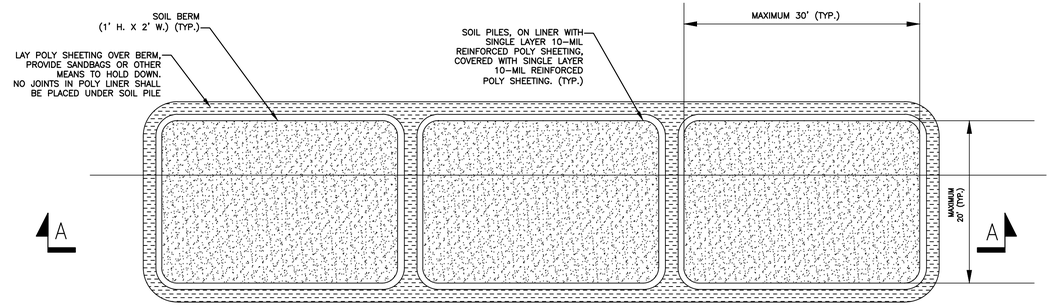
GENERAL EROSION CONTROL NOTES

THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE MAINTENANCE OF ALL TEMPORARY AND PERMANENT EROSION CONTROL FEATURES THROUGHOUT THE DURATION OF CONSTRUCTION.

A. ALL SEDIMENT TRAPPING DEVICES SHALL BE CLEANED OF ACCUMULATED SILT WHEN STORAGE CAPACITY HAS BEEN REDUCED BY APPROXIMATELY 50% OF THEIR DESIGN CAPACITY.

B. ALL SEDIMENT SHALL BE REMOVED FROM BEHIND SILT FENCE WHEN IT ACCUMULATES TO A MAXIMUM HEIGHT OF 6" DEEP AT THE FENCE UNLESS OTHERWISE DIRECTED.

C. SEDIMENT COLLECTED BY EROSION CONTROL MEASURES SHALL BE PROPERLY DISPOSED OF OFF-SITE IF DETERMINED TO BE UNSUITABLE FOR FILL.



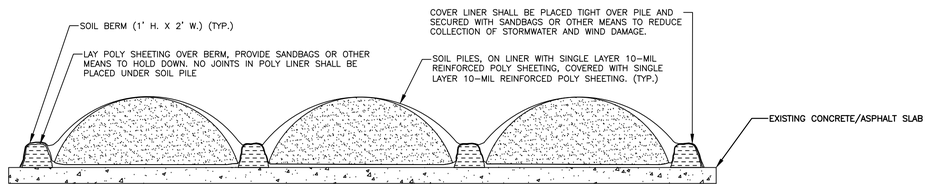
GENERAL NOTES:

1. SOIL BERM SHALL BE CONSTRUCTED USING CLEAN IMPORTED SAND. THE SOIL CONTAINMENT BERM AREA SHALL BE SWEPT CLEAN PRIOR TO PLACING LINER MATERIAL.
2. POLY SHEETING UNDER THE SOIL PILE SHALL BE MINIMUM OF 10–MIL REINFORCED POLY WITH NO SEAMS. SOIL PILE COVER MATERIAL SHALL BE MINIMUM OF 6–MIL NON–REINFORCED POLY.
3. EXCAVATED MATERIAL SHALL BE LOADED IN MANAGEABLE VOLUMES TO PREVENT SPILLAGE DURING HANDLING ON–SITE AND TRANSPORTING. ANY SPILLED MATERIAL SHALL BE CLEANED UP NO LATER THAN THE END OF DAY IT IS SPILLED. IN THE EVENT OF RAIN, THE SPILLED MATERIAL SHALL BE CLEANED UP IMMEDIATELY.
4. STOCKPILES SHALL BE ROUTINELY INSPECTED AND DAMAGED COVERS SHALL BE PROMPTLY REPAIRED OR REPLACED. STOCKPILES SHALL BE INSPECTED AT A MINIMUM ONCE EACH WEEK AND AFTER EVERY STORM EVENT. RESULTS OF INSPECTIONS SHALL BE RECORDED IN A LOGBOOK AND AVAILABLE FOR INSPECTION BY NYSDEC.
5. IF CONCRETE AND ASPHALT ARE FREE OF STAINS, ODORS, AND ELEVATED PID READINGS, THEY SHALL BE PLACED IN A SEGREGATED CONTAINMENT BERM PILE SEPARATE FROM THE SOILS FOR POSSIBLE RECYCLING FOLLOWING APPROVAL FROM THE ENGINEER.

SOIL STOCKPILE(S) – PLAN VIEW
SCALE: N.T.S.

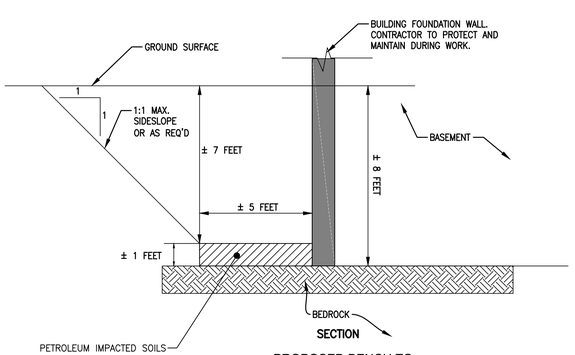
NOTES:

1. CONTRACTOR SHALL ADJUST SIZE AND NUMBER OF SOIL PILE BERMS TO ACCOMMODATE VOLUMES ENCOUNTERED BASED ON REQUIRED SOIL SEGREGATION CRITERIA LISTED IN GENERAL NOTES BELOW AND WITH PRIOR APPROVAL OF THE ENGINEER.

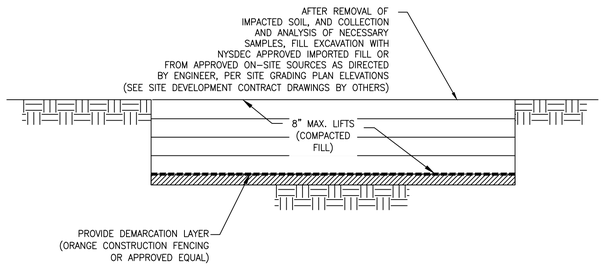


A / 5A — SOIL STOCKPILE(S) – SECTION VIEW A–A
SCALE: N.T.S.

7 / 5A — STOCKPILE IMPACTED SOIL EXCAVATION AREA (TYPICAL)
N.T.S.



5 / 5A — PROPOSED BENCH TO ACCESS IMPACTED SOILS
N.T.S.



FILL AND COVER DETAIL

6 / 5A — ACCESS IMPACTED SOIL EXCAVATION AREA (TYPICAL)
N.T.S.

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Notes

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Client/Project
EAST HOUSE CANAL STREET, LLC
CANAL STREET MANUFACTURING SITE

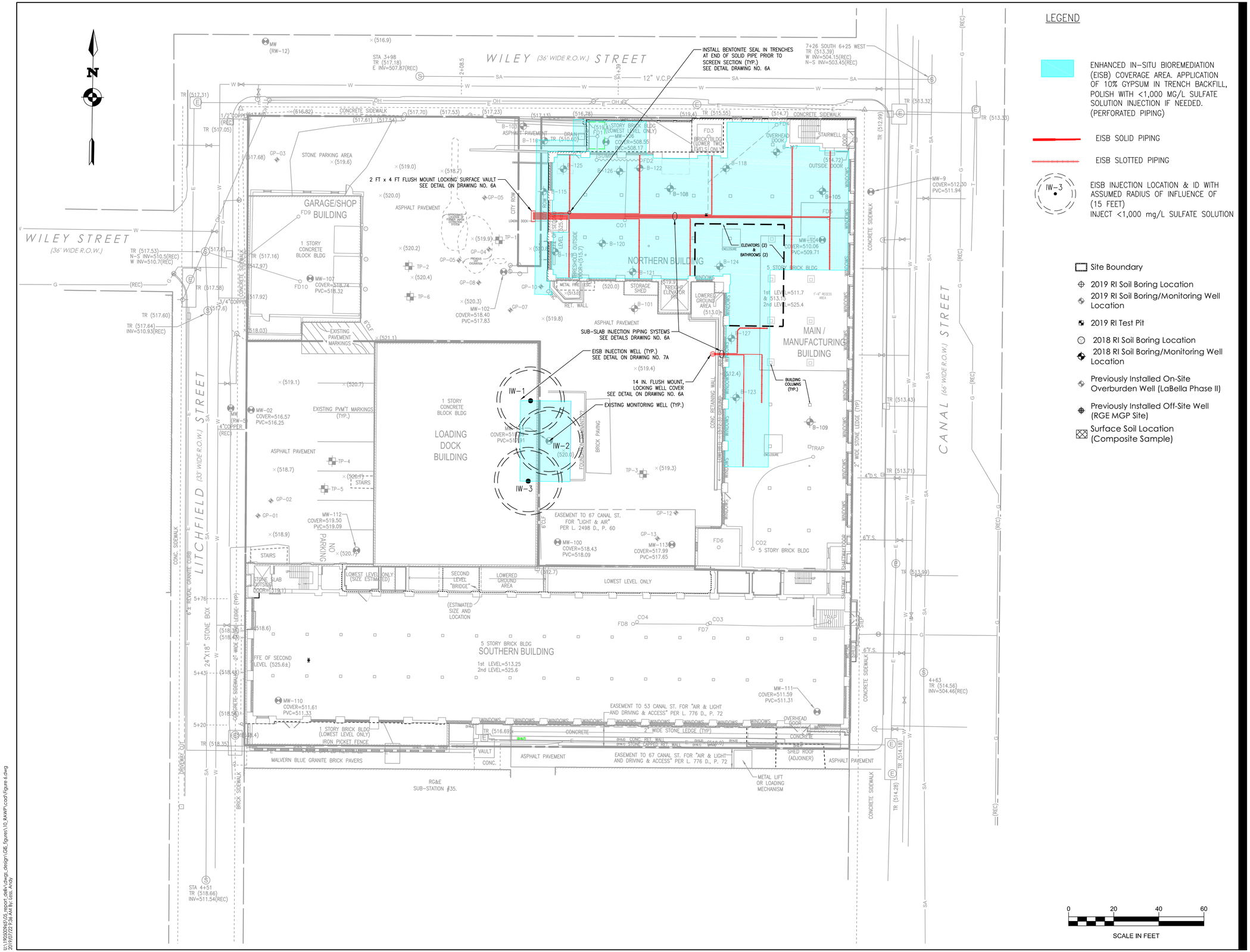
ALTERNATIVES ANALYSIS REPORT AND REMEDIAL ACTION WORK PLAN
67 - 89 CANAL STREET, ROCHESTER, NY

Title
SOIL REMEDIATION CROSS-SECTIONS AND DETAILS

Project No. 190500965
Scale AS SHOWN

Drawing No.
FIGURE 5A

ORIGINAL SHEET - ANSI D



LEGEND

- ENHANCED IN-SITU BIOREMEDIATION (EISB) COVERAGE AREA. APPLICATION OF 10% GYPSUM IN TRENCH BACKFILL, POLISH WITH <1,000 MG/L SULFATE SOLUTION INJECTION IF NEEDED. (PERFORATED PIPING)
- EISB SOLID PIPING
- EISB SLOTTED PIPING
- IW-3 — EISB INJECTION LOCATION & ID WITH ASSUMED RADIUS OF INFLUENCE OF (15 FEET) INJECT <1,000 mg/L SULFATE SOLUTION

- Site Boundary
- 2019 RI Soil Boring Location
- 2019 RI Soil Boring/Monitoring Well Location
- 2019 RI Test Pit
- 2018 RI Soil Boring Location
- 2018 RI Soil Boring/Monitoring Well Location
- Previously Installed On-Site Overburden Well (LaBella Phase II)
- Previously Installed Off-Site Well (RGE MGP Site)
- Surface Soil Location (Composite Sample)

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Client/Project
EAST HOUSE CANAL STREET, LLC
CANAL STREET MANUFACTURING SITE

ALTERNATIVES ANALYSIS REPORT AND REMEDIAL ACTION WORK PLAN
67 - 89 CANAL STREET, ROCHESTER, NY

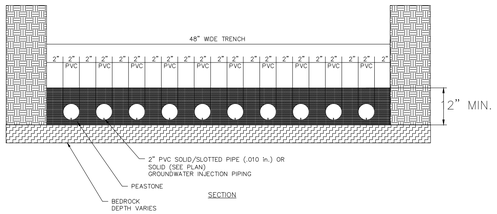
Title
PROPOSED ENHANCED IN-SITU BIOREMEDIATION APPLICATION AREAS

Project No. 190500965

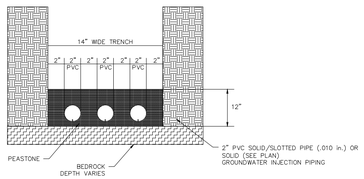
Scale AS SHOWN

Drawing No.
FIGURE 6

ORIGINAL SHEET - ANSI D



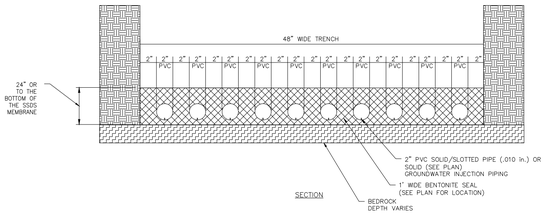
SECTION



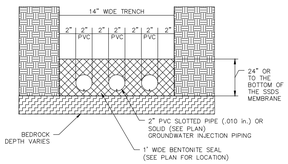
SECTION

1 / 6A CROSS SECTION THROUGH TRENCH (TYP.)

N.T.S.



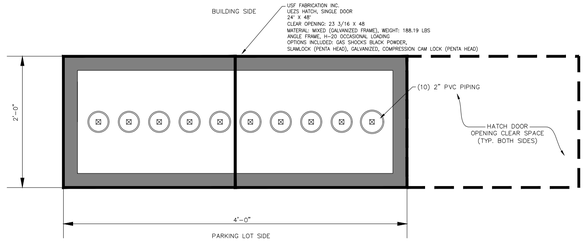
SECTION



SECTION

2 / 6A BENTONITE SEAL (TYP.)

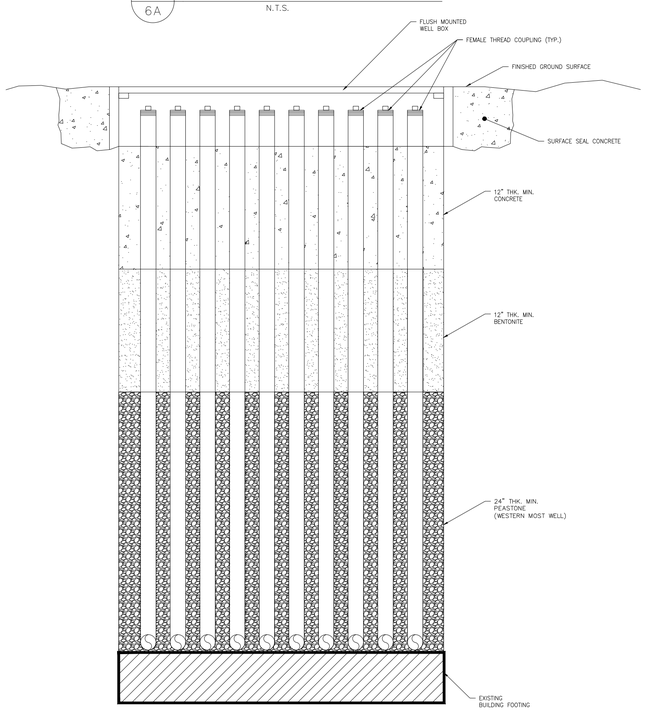
N.T.S.



PLAN

3 / 6A VAULT FRAME AND COVER DETAIL

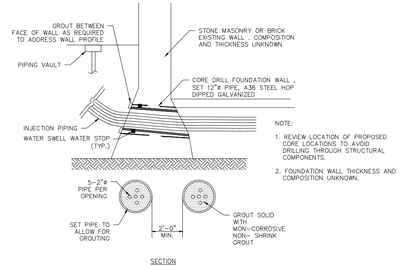
N.T.S.



SECTION

6 / 6A EXTERIOR DETAIL (10 PIPES)(TYP.)

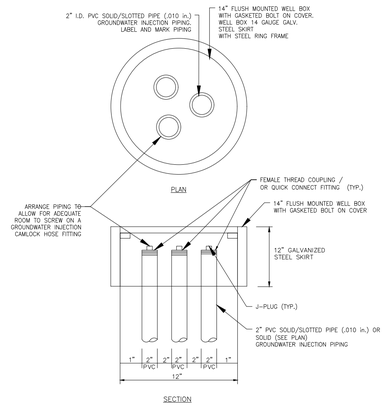
N.T.S.



SECTION

5A / 6A CORE DRILL THROUGH BUILDING WALL (TYP.)

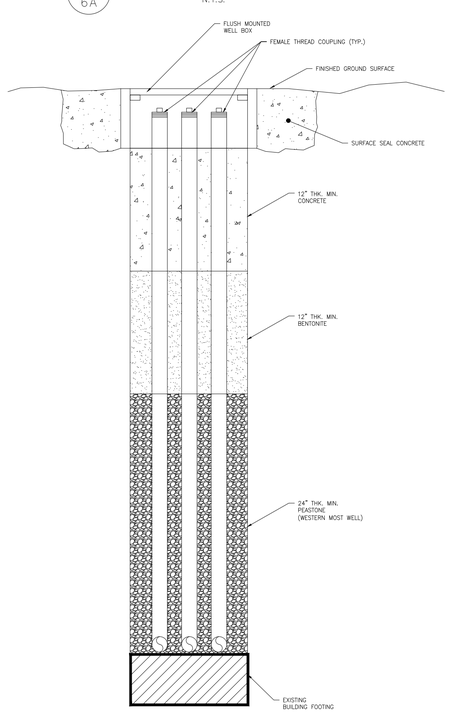
N.T.S.



SECTION

4 / 6A WELL BOX DETAIL (TYP.)

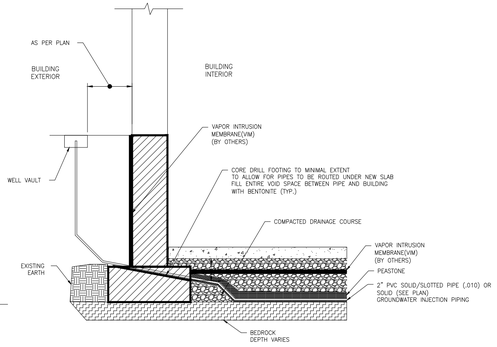
N.T.S.



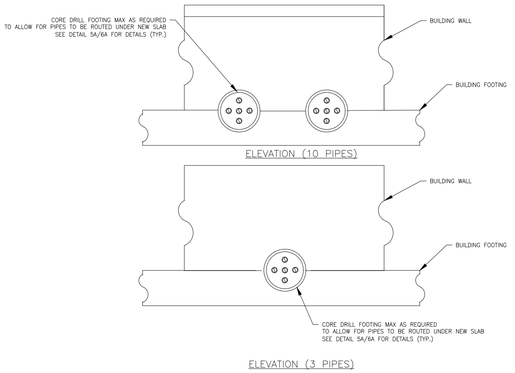
SECTION

7 / 6A EXTERIOR DETAIL (3 PIPES)(TYP.)

N.T.S.



SECTION

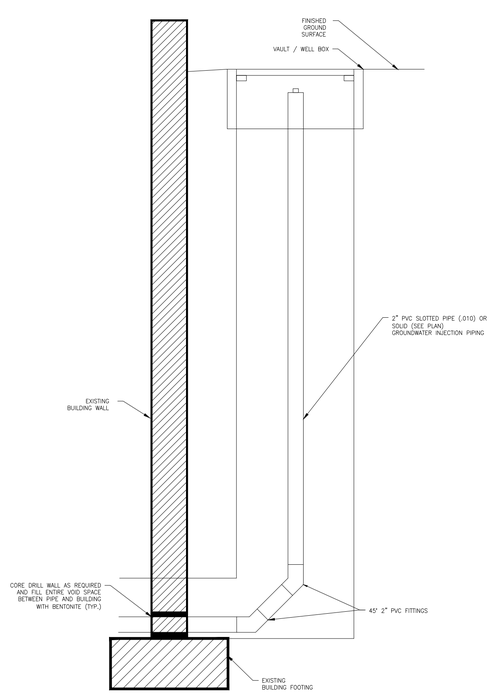


ELEVATION (10 PIPES)

ELEVATION (3 PIPES)

5 / 6A BENTONITE SEAL THROUGH BUILDING WALL (TYP.)

N.T.S.



SECTION

8 / 6A SECTION AT FOOTING (TYP.)

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ALTERNATIVES ANALYSIS REPORT AND REMEDIAL ACTION WORK PLAN

67 - 89 CANAL STREET, ROCHESTER, NY

Title

EISB APPLICATION SYSTEM DETAILS

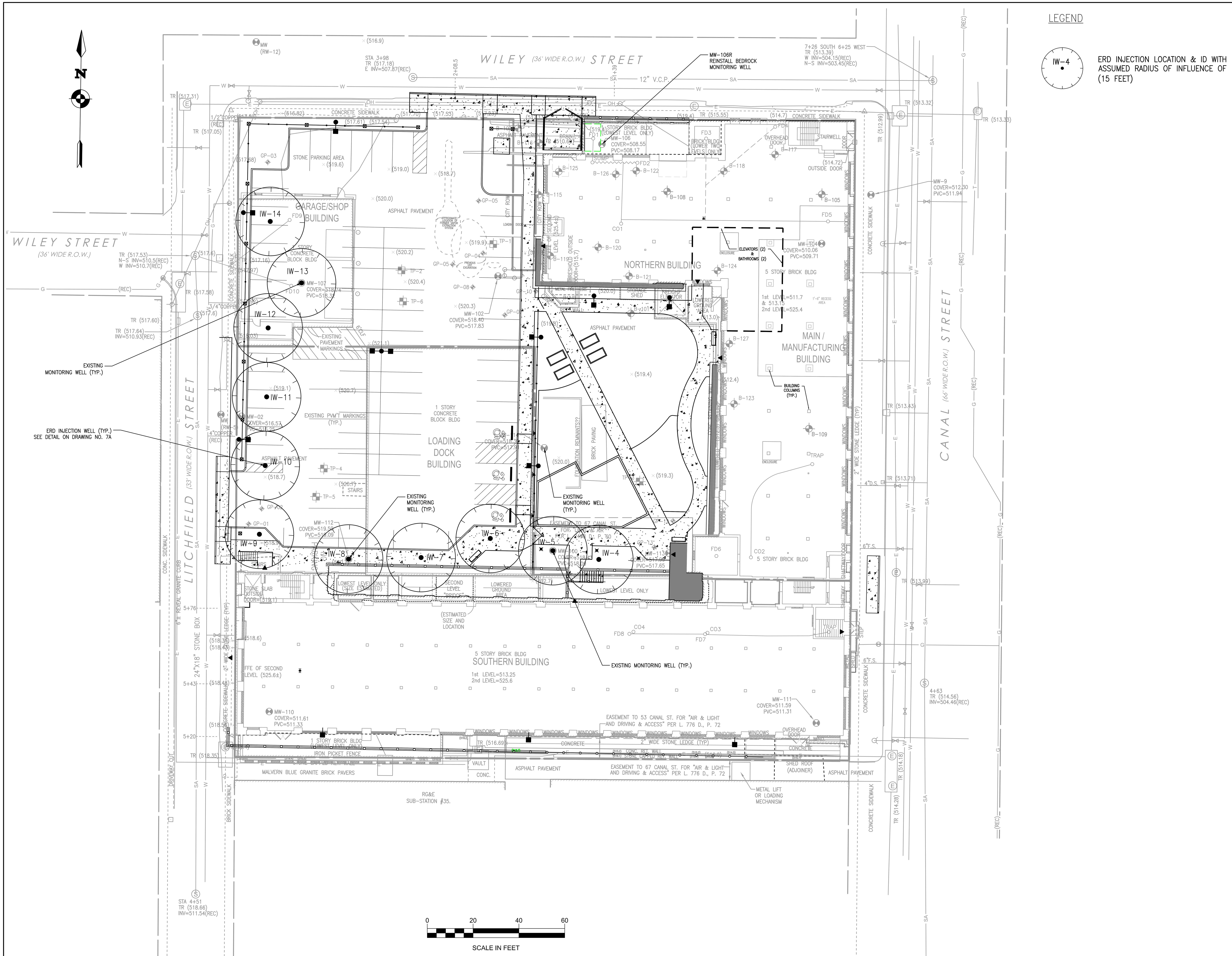
Project No. 190500965

Scale AS SHOWN

Drawing No.

FIGURE 6A

ORIGINAL SHEET - ANSI D


LEGEND
IW-4
ERD INJECTION LOCATION & ID WITH ASSUMED RADIUS OF INFLUENCE OF (15 FEET)
N
WILEY STREET (36' WIDE R.O.W.)
WILEY STREET (36' WIDE R.O.W.)
LITCHFIELD (33' WIDE R.O.W.) STREET
CANAL (66' WIDE R.O.W.) STREET
MW-106R REINSTALL BEDROCK MONITORING WELL
GARAGE/SHOP BUILDING
STONE PARKING AREA
ASPHALT PAVEMENT
NORTHERN BUILDING
MAIN / MANUFACTURING BUILDING
LOADING DOCK BUILDING
1 STORY CONCRETE BLOCK BLDG
SOUTHERN BUILDING
5 STORY BRICK BLDG
1st LEVEL=513.25
2nd LEVEL=525.6
EXISTING MONITORING WELL (TYP.)
ERD INJECTION WELL (TYP.) SEE DETAIL ON DRAWING NO. 7A
EXISTING MONITORING WELL (TYP.)
IW-4
IW-5
IW-6
IW-7
IW-8
IW-9
IW-10
IW-11
IW-12
IW-13
IW-14
EASEMENT TO 53 CANAL ST. FOR "AIR & LIGHT AND DRIVING & ACCESS" PER L. 776 D., P. 72
EASEMENT TO 67 CANAL ST. FOR "AIR & LIGHT AND DRIVING & ACCESS" PER L. 776 D., P. 72
MALVERN BLUE GRANITE BRICK PAVERS
RG&E SUB-STATION #35.
METAL LIFT OR LOADING MECHANISM
0
20
40
60
SCALE IN FEET

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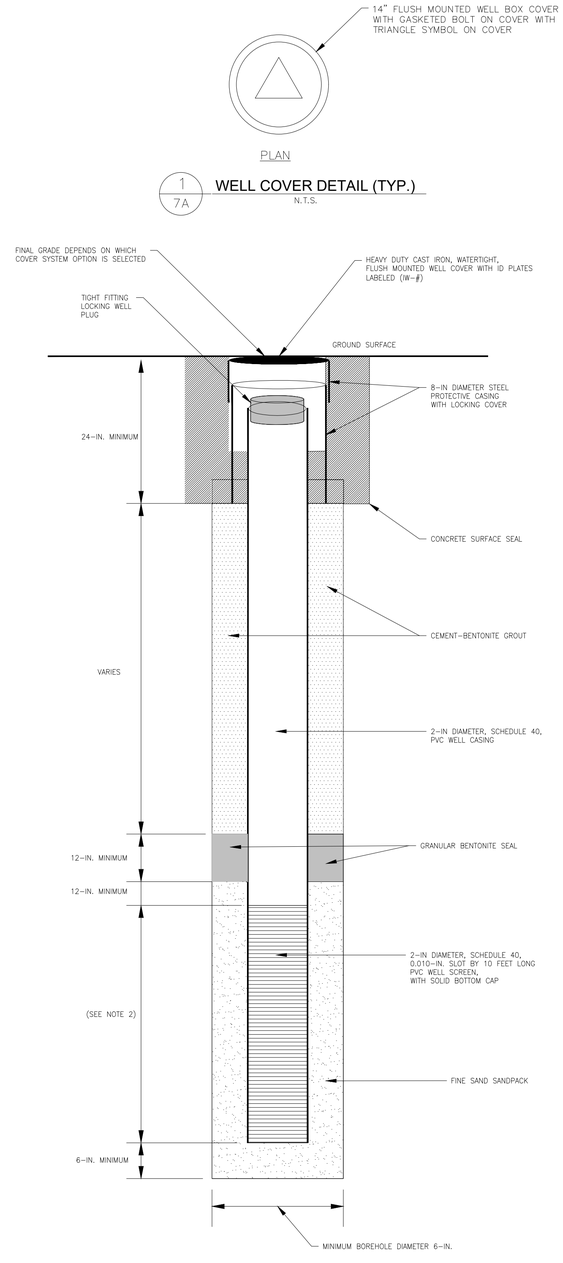
Title
PROPOSED ENHANCED REDUCTIVE DECHLORINATION (ERD) APPLICATION AREAS

Project No. 190500965
Scale AS SHOWN

Drawing No.
FIGURE 7

ORIGINAL SHEET - ANSI D



1 / 7A WELL COVER DETAIL (TYP.)
N.T.S.

NOTES:

1. ALL PIPING JOINTS TO BE THREADED, WITHOUT GLUE OR SEALERS.
2. BOTTOM OF WELL SCREEN LENGTH SHALL BE SET (5) FIVE FEET INTO BEDROCK.

2 / 7A REPLACEMENT MONITORING WELL / INJECTION WELL DETAIL
N.T.S.

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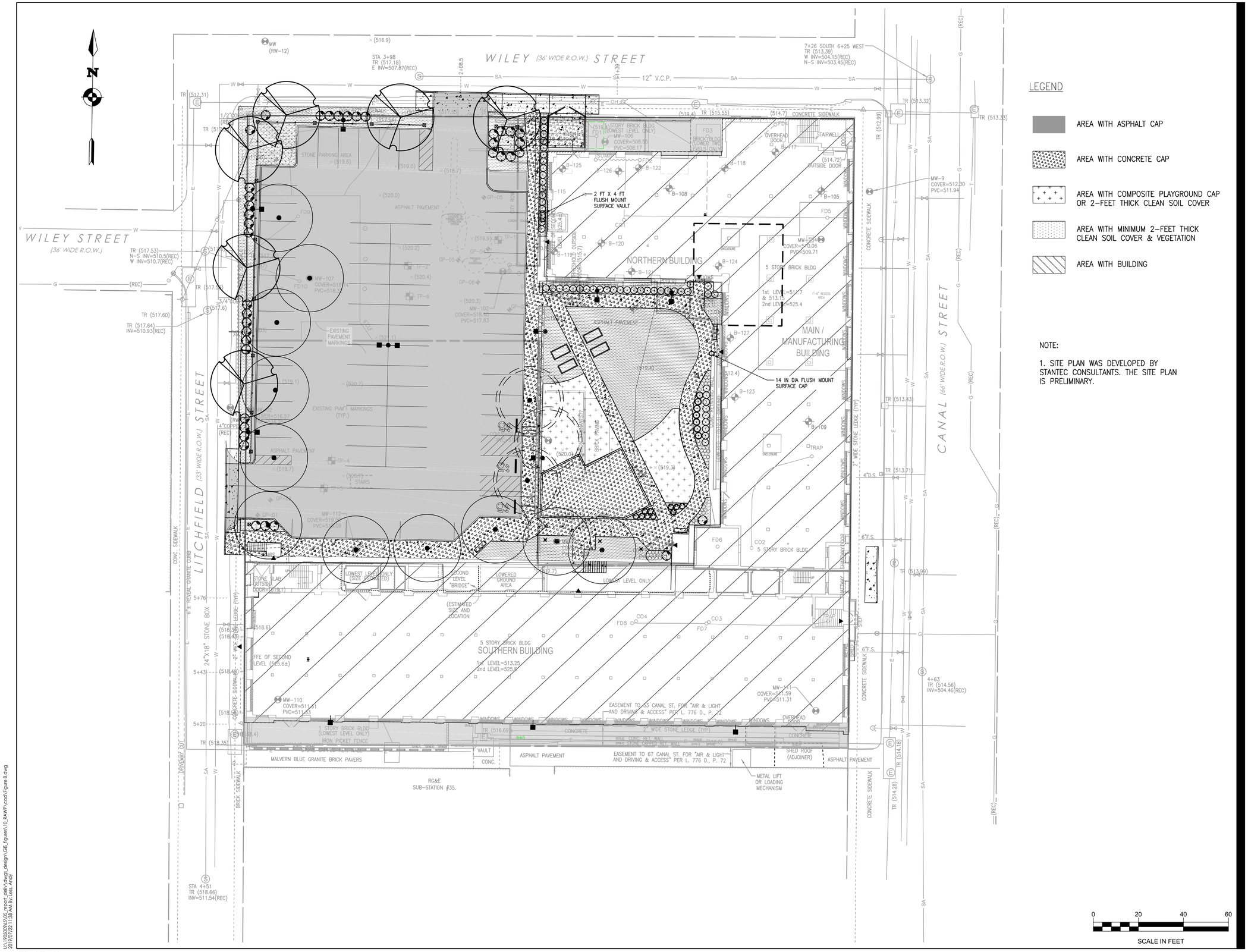
Title
ERD INJECTION SYSTEM DETAILS

Project No. 190500965
Scale AS SHOWN

Drawing No.
FIGURE 7A



LEGEND

- AREA WITH ASPHALT CAP
- AREA WITH CONCRETE CAP
- AREA WITH COMPOSITE PLAYGROUND CAP OR 2-FEET THICK CLEAN SOIL COVER
- AREA WITH MINIMUM 2-FEET THICK CLEAN SOIL COVER & VEGETATION
- AREA WITH BUILDING

NOTE:

1. SITE PLAN WAS DEVELOPED BY STANTEC CONSULTANTS. THE SITE PLAN IS PRELIMINARY.

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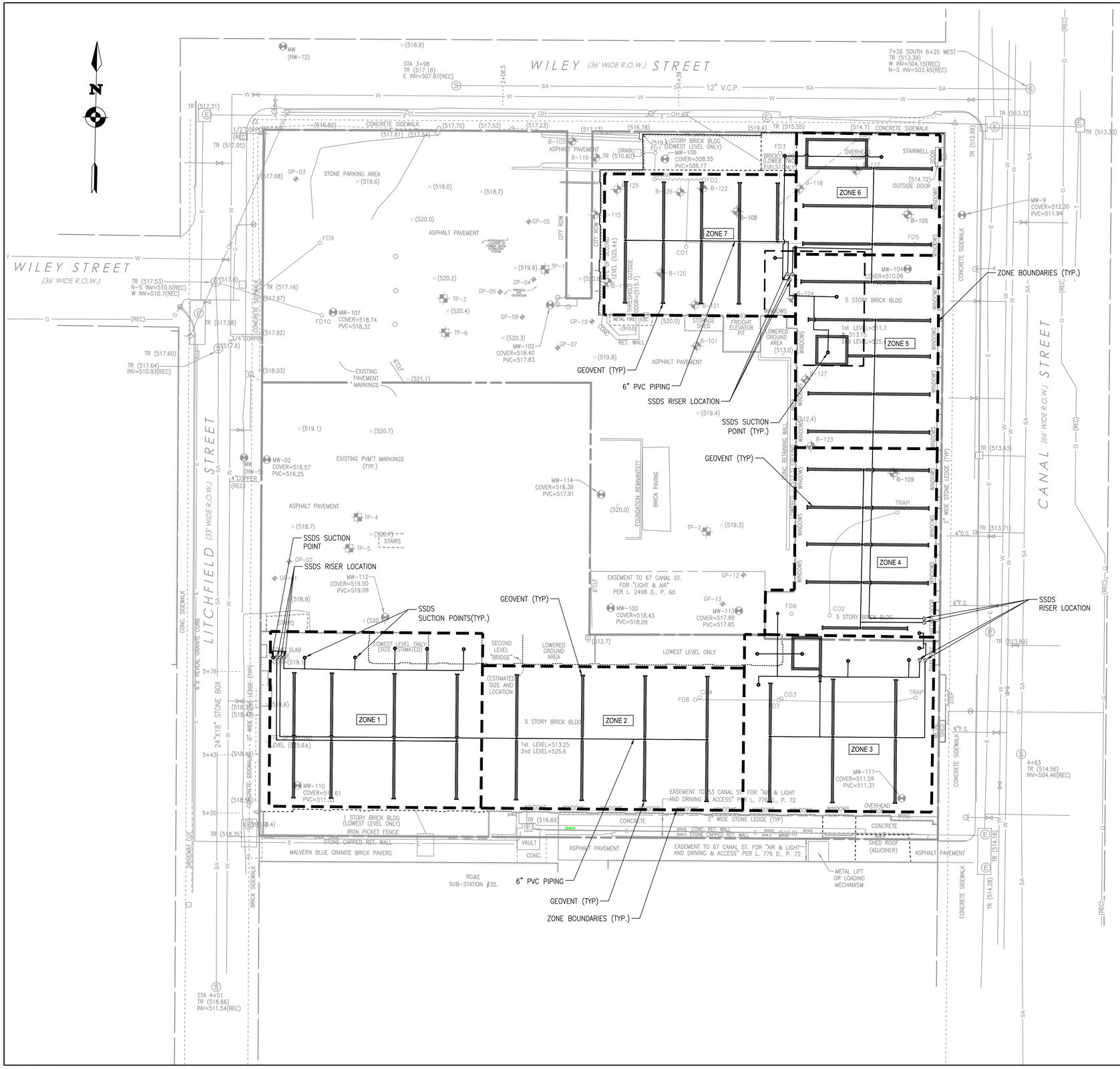
FINAL SITE PLAN
WITH COVER TYPES

Project No.	Scale
190500965	AS SHOWN

Drawing No.

FIGURE 8



GENERAL NOTES

1. ALL SSDS COMPONENT LOCATIONS ON DRAWINGS ARE APPROXIMATE AND THEIR LOCATIONS MUST BE CONFIRMED WITH FINAL BUILDING REDEVELOPMENT PLANS AND IN THE FIELD PRIOR TO ANY WORK ON THE SSDS INSTALLATION.
2. ALL POLYVINYL CHLORIDE (PVC) PIPING SHALL BE SOLID WALL, PRESSURE RATED PIPING, MEETING THE REQUIREMENTS OF ASTM D 2241, ASTM D 1785 OR ASTM F 480. ALL PVC PIPING IS SUBJECT TO FINAL APPROVAL BY THE ENGINEER.
3. ALL PIPING SHALL MAINTAIN A MINIMUM OF 1% SLOPE DRAINING TOWARDS SUCTION CAVITIES WHICH WILL BE LOCATED DURING PREPARATION OF THE CONTRACT DOCUMENTS TO ENSURE THAT CONDENSATE FLOWS DOWN THE RISERS TO THE SUBSURFACE.
4. LOCATION OF VACUUM MONITORING POINTS WILL BE IDENTIFIED DURING THE PREPARATION OF CONTRACT DOCUMENTS. FIFTEEN POINTS ARE ESTIMATED.

Legend

- GEOVENT
- SSDS SOLID PVC PIPING
- SSDS RISER PVC PIPING
- SUCTION POINT
- GEOVENT TO PVC CONNECTOR
- SSDS COLLECTION SYSTEM ZONE BOUNDARIES

Notes

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File Name: Figure 9 – SSDS Piping Layout.dwg APL | Dwn. DH | Chkd. AK | Dsgn. 19.07 YY.MM.DD

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Title
SUB SLAB DEPRESSURIZATION SYSTEM COVERAGE PLAN

Project No. 190500965
Scale AS SHOWN

Drawing No.
FIGURE 9

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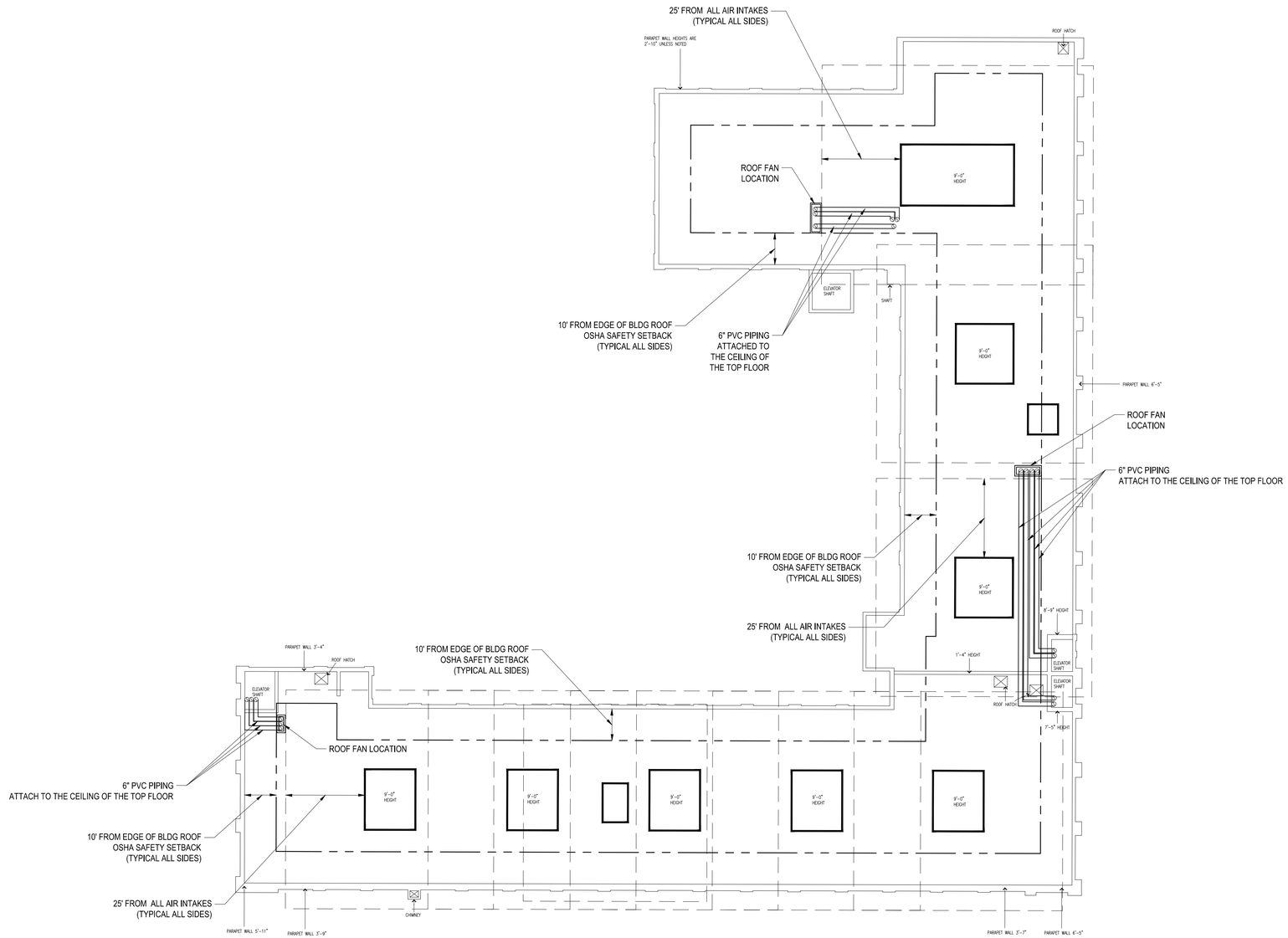

ROOF FLOOR PLAN

SCALE : 1" = 20'

0 20 40 60

SCALE IN FEET

N

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Legend

SSDS SOLID PIPING

SSDS RISER PIPING

OSHA 10 FOOT ROOF OFFSET

AIR INTAKE 25 FOOT OFFSET

Notes

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Figure 10- SSDS Roof Piping Layout.dwg	Dwn.	Chkd.	Dsgn.	YY.MM.DD

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SUB SLAB DEPRESSURIZATION SYSTEM
DISCHARGE & EXHAUST ROOF LOCATION

Project No.
190500965

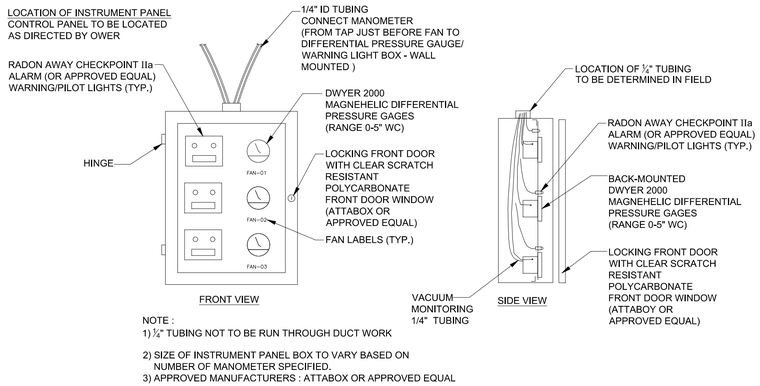
Scale
AS SHOWN

Drawing No.

FIGURE 10

I:\1905009\65\05_report_delliv_dwgs_design\CAD_figures\10_RAWP\cad\Figure 10-SSDS Roof Piping Layout.dwg
2019/07/22 12:24 PM By: Lass, Andy

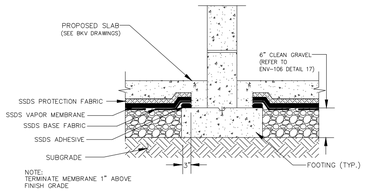
ORIGINAL SHEET - ANSI D



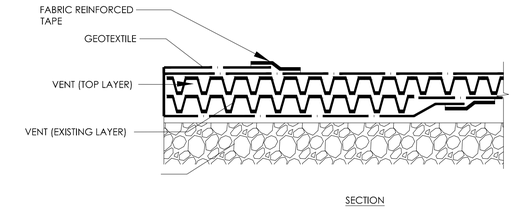
NOTE :
1) ¼" TUBING NOT TO BE RUN THROUGH DUCT WORK

2) SIZE OF INSTRUMENT PANEL BOX TO VARY BASED ON NUMBER OF MANOMETER SPECIFIED.
3) APPROVED MANUFACTURERS : ATTABOX OR APPROVED EQUAL

1 FIG 11 TYPICAL WALL-MOUNTED INSTRUMENT PANEL INSTALLATION DETAIL
NO SCALE

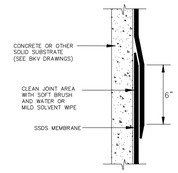


2 FIG 11 VAPOR MEMBRANE UNDERSLAB & FOOTINGS
NOT TO SCALE

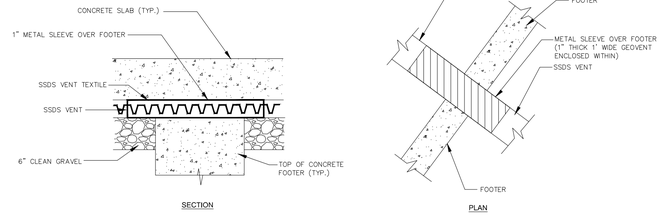


SECTION

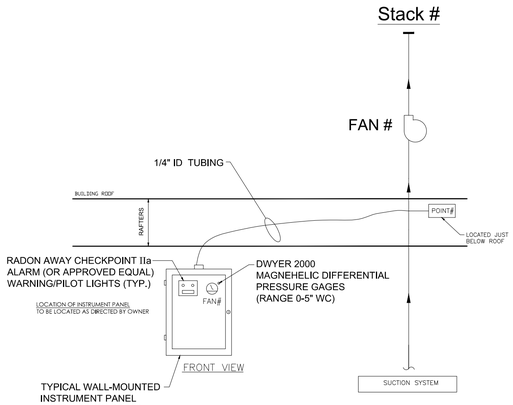
3 FIG 11 VAPOR MEMBRANE VENT INTERLOCKING CONNECTIONS
NO SCALE



4 FIG 11 VAPOR BARRIER MEMBRANE LAP JOINTS ON SOLID SUBSTRATE
NOT TO SCALE



5 FIG 11 VAPOR MEMBRANE SSDS VENT THROUGH METAL SLEEVE TO CROSS OVER FOOTERS
NOT TO SCALE



LEGEND

F-1 IN-LINE EXHAUST FAN

P-01 POINT OF MEASUREMENT FOR THE MAGNEHELIC MODEL 2000 DIFFERENTIAL PRESSURE GAUGE (MOUNTED INSIDE DIFFERENTIAL PRESSURE GAUGE/ WARNING LIGHT BOX)

AIR FLOW

NOTES:

1.) ¼" TUBING SHALL NOT BE RUN THROUGH DUCT WORK.

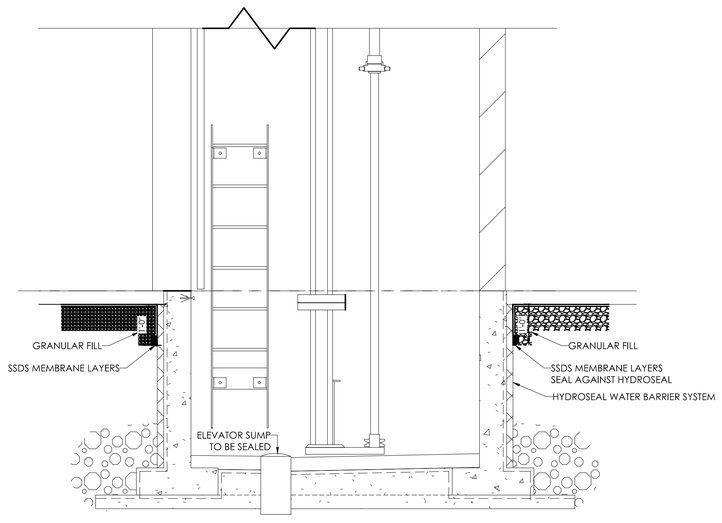
2.) REFER TO DRAWINGS FOR CONNECTION OF ¼" TUBING TO DIFFERENTIAL PRESSURE GAUGE.

3.) ¼" TUBING TO BE EATON SYNFLEX 1219FR (OR APPROVED EQUAL).

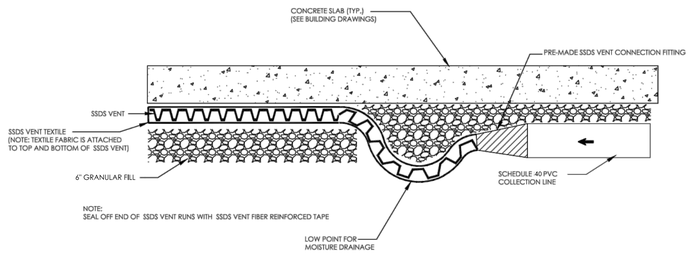
4.) PROVIDE 1" SCH 80 PVC ELECTRICAL CONDUIT ON VERTICAL WALLS TO RUN TUBING IN TO CONNECT TO PANEL BOX.

5.) SEE ELECTRICAL DRAWINGS FOR LOCATION OF OUTLETS RELATED TO LOW-PRESSURE VACUUM SWITCHES.

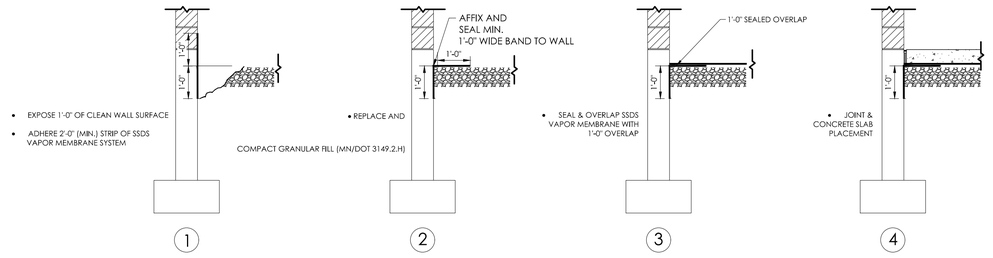
7 FIG 11 SSDS VACUUM MONITORING PANEL (TYP.)
NO SCALE



8 FIG 11 TYPICAL SSDS MEMBRANE AT ELEVATOR SHAFT
NO SCALE



6 FIG 11 SSDS VENT LOW POINTS
NOT TO SCALE



9 FIG 11 TYPICAL SSDS MEMBRANE SEQUENCE OF INSTALLATION
SSDS EDGE DETAIL AT VERTICAL WALLS
NO SCALE

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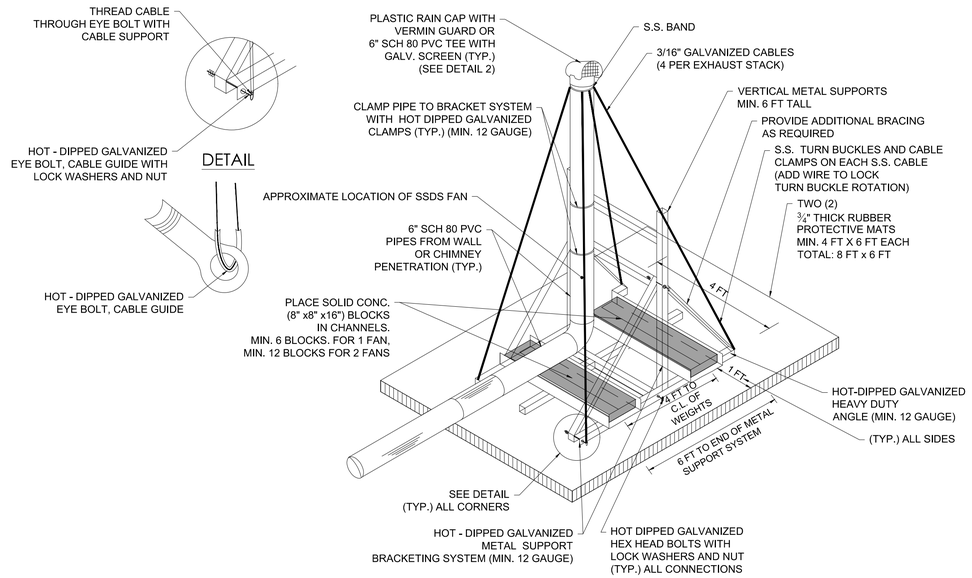
Title
SUB SLAB DEPRESSURIZATION SYSTEM INTERIOR DETAILS

Project No. 190500965

Scale AS SHOWN

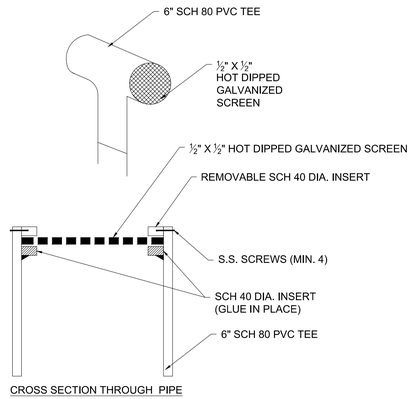
Drawing No.
FIGURE 11

ORIGINAL SHEET - ANSI D



1 FIG 12 SSDS ROOF EXHAUST STACK SUPPORT SYSTEM (TYP.)

NO SCALE



2 FIG 12 RAIN CAP SCREEN DETAIL

NO SCALE

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Title
SUB SLAB DEPRESSURIZATION SYSTEM EXTERIOR DETAILS

Project No. 190500965
Scale AS SHOWN

Drawing No.
FIGURE 12

ORIGINAL SHEET - ANSI D

APPENDIX A

Site Redevelopment Concept Plans

GENERAL NOTES

1. UNLESS SPECIFICALLY STATED HEREIN, THESE PLANS ARE NOT SUITABLE FOR MACHINE GUIDANCE USE OR PURPOSES DURING CONSTRUCTION. NO GUARANTEE IS MADE THAT THE ELECTRONIC DATA SYSTEMS OR FILE STRUCTURE USED BY STANTEC WILL BE COMPATIBLE WITH THE ELECTRONIC SYSTEMS USED BY THE CONTRACTOR. INFORMATION SHOWN ON THE DRAWINGS SHALL TAKE PRECEDENCE OVER THE ELECTRONIC FILES DATA.
2. ALL IMPROVEMENTS SHALL BE IN ACCORDANCE WITH THE MOST RECENT STANDARDS AND SPECIFICATIONS OF THE CITY OF ROCHESTER AND/OR THE APPROPRIATE WATER, SEWER AND/OR DRAINAGE DISTRICTS, UNLESS OTHERWISE NOTED.
3. THE CONTRACTOR SHALL BE RESPONSIBLE TO SECURE ALL PERMITS AND PROVIDE ALL BONDS REQUIRED FOR THIS WORK INCLUDING, BUT NOT LIMITED TO, UTILITY CONNECTIONS AND BUILDING AND SITE CONSTRUCTION.
4. THE CONTRACTOR SHALL BE RESPONSIBLE THAT ALL NECESSARY INSPECTIONS AND/OR CERTIFICATIONS REQUIRED BY CODES AND/OR UTILITY SERVICE COMPANIES SHALL BE PERFORMED PRIOR TO ANNOUNCED BUILDING POSSESSION AND THE FINAL CONNECTION OF SERVICES.
5. MAINTENANCE AND PROTECTION OF TRAFFIC ALONG WITH SECURING THE WORK AREA SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR.
6. ALL CONES, DRUMS, CONCRETE BARRIERS AND MARKERS ARE TO BE PLACED SO AS TO PROVIDE A MINIMUM 2' CLEARANCE TO THE TRAVELED WAY UNLESS OTHERWISE SHOWN ON THE PLANS AND/OR DIRECTED BY THE OWNER'S REPRESENTATIVE. THE CONTRACTOR SHALL MAKE CERTAIN PLACEMENT OF CONES, DRUMS AND MARKERS OR BARRICADES SHALL NOT INTERFERE WITH SIGHT DISTANCE.
7. ALL DEBRIS AND SOILS DERIVED FROM THE CONTRACTOR'S OPERATIONS FOUND IN THE PUBLIC RIGHT-OF-WAY OR CAUSING NUISANCE TO OPERATIONS SHALL BE CLEANED AND REMOVED ON A DAILY BASIS OR WHEN NOTIFIED BY THE OWNER'S REPRESENTATIVE.
8. THE CONTRACTOR SHALL LOCATE, MARK, SAFEGUARD AND PRESERVE ALL SURVEY CONTROL MONUMENTS AND R.O.W. MONUMENTS IN THE AREAS OF CONSTRUCTION. FOR DESCRIPTIVE AND SURVEY DATA ON THE CONTROL MONUMENTS, CALL THE MONROE COUNTY GEODETIC SURVEY OFFICE. THE DEVELOPER'S AND CONTRACTOR'S ATTENTION IS DIRECTED TO LOCAL LAW NO. 6 OF 1971 REGARDING LIABILITY INCURRED THROUGH DISTURBANCE OF DESTRUCTION OF GEODETIC SURVEY MONUMENTS.
9. CAUTION - NOTICE TO CONTRACTOR: THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AS SHOWN ON THESE PLANS IS BASED ON RECORDS OF THE VARIOUS UTILITY COMPANIES AND, WHERE POSSIBLE, MEASUREMENTS TAKEN IN THE FIELD. THE INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. THE CONTRACTOR MUST CALL THE APPROPRIATE UTILITY COMPANY AT LEAST 48 HOURS BEFORE ANY EXCAVATION TO REQUEST EXACT FIELD LOCATION OF UTILITIES. THE CONTRACTOR SHALL MAKE EXPLORATION EXCAVATIONS TO LOCATE EXISTING UNDERGROUND UTILITIES SUFFICIENTLY AHEAD OF CONSTRUCTION TO PERMIT REVISIONS AS REQUIRED TO MEET EXISTING CONDITIONS. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS.
10. THE CONTRACTOR SHALL REFER TO ARCHITECTURAL PLANS FOR EXACT BUILDING DIMENSIONS AND BUILDING UTILITY LOCATIONS.
11. THE CONTRACTOR IS HEREBY NOTIFIED THAT THE BUILDING FINISH FLOOR ELEVATION SHOWN ON GRADING PLANS EQUATES TO ELEVATION 0.0' ON THE BUILDING PLANS.
12. THE DRAWINGS ARE INTENDED TO REQUIRE AND TO INCLUDE ALL LABOR, MATERIAL AND EQUIPMENT PROPER FOR THE WORK.
13. THE CONTRACTOR SHALL BE HELD RESPONSIBLE FOR CONSTRUCTION MEANS, METHODS, TECHNIQUES, SEQUENCES AND SAFETY PROCEDURES. THE OWNER AND/OR ARCHITECT/ENGINEER SHALL NOT BE RESPONSIBLE FOR THE ACTS OR OMISSIONS OF THE CONTRACTOR, SUBCONTRACTORS OR THEIR AGENTS, EMPLOYEES OR ANY OTHER PERSONS PERFORMING ANY OF THE WORK.
14. OBSERVE ALL OSHA AND OTHER APPLICABLE SAFETY REQUIREMENTS INCLUDING THE USE OF SAFETY GLASSES, HARD HATS AND PROTECTION OF AREA WHEN WORKING OVERHEAD. THE CONTRACTOR SHALL ASSUME RESPONSIBILITY FOR CONSTRUCTION SAFETY AT ALL TIMES.
15. COORDINATE WORK WITH ALL DISCIPLINES (ARCH., STRUCT., ELECT., ETC.) WITH EXISTING CONDITIONS, SPECIAL REQUIREMENTS, CONSTRUCTION SCHEDULE AND OTHER CONTRACTORS PERFORMING WORK AT THE SAME TIME.
16. THE CONTRACTOR SHALL BE RESPONSIBLE FOR ALL DAMAGE TO EXISTING PAVEMENT, CURBS, SIDEWALKS, LAWN AREAS, TREES AND OTHER EXISTING FEATURES CAUSED BY HIS/HER OPERATION. ALL SUCH DAMAGE SHALL BE REPAIRED OR REPLACED IN KIND BY THE CONTRACTOR AT HIS/HER EXPENSE.
17. ANY WORK IN THE CITY RIGHT-OF-WAY WILL REQUIRE SEPARATE PERMITS FROM THE ENGINEERING BUREAU PERMIT OFFICE, ROOM 121B.
18. SEE SPECIFICATIONS FOR THE FULL SCOPE OF REQUIREMENTS APPLICABLE TO THIS PROJECT.
19. SHOP DRAWINGS: REPRODUCTION OF DESIGN DRAWINGS SHALL NOT BE PERMITTED. MANAGER SHALL REVIEW AND PROVIDE REVIEW STAMP ON SHOP DRAWING SUBMISSION PRIOR TO SUBMITTAL TO ARCHITECT/ENGINEER INDICATING UNDERSTANDING AND ACCEPTANCE OF SUBMITTAL AND CONFIRMING CONFORMANCE TO PROJECT PLANS/SPECIFICATIONS.
20. IT IS THE RESPONSIBILITY OF THE CONTRACTOR TO REVIEW ALL OF THE DRAWINGS AND SPECIFICATIONS ASSOCIATED WITH THIS PROJECT WORK SCOPE PRIOR TO THE INITIATION OF CONSTRUCTION. SHOULD THE CONTRACTOR FIND A CONFLICT WITH THE DOCUMENTS RELATIVE TO THE SPECIFICATIONS OR APPLICABLE CODES, IT IS THE CONTRACTOR'S RESPONSIBILITY TO NOTIFY THE OWNER'S REPRESENTATIVE IN WRITING PRIOR TO THE START OF CONSTRUCTION. FAILURE BY THE CONTRACTOR TO NOTIFY THE OWNER'S REPRESENTATIVE SHALL CONSTITUTE ACCEPTANCE OF FULL RESPONSIBILITY BY THE CONTRACTOR TO COMPLETE THE SCOPE OF WORK AS DEFINED BY THE DRAWINGS AND IN FULL CONFORMANCE WITH LOCAL REGULATIONS AND CODES.
21. CONTRACTOR TO PREVENT SURFACE WATER AND SUBSURFACE WATER FLOW FROM ENTERING INTO EXCAVATIONS. PROVIDE AND MAINTAIN PUMPS, WELL POINTS, SUMPS, SUCTION AND DISCHARGE LINES, AND OTHER DEWATERING SYSTEM COMPONENTS NECESSARY TO CONVEY WATER AWAY FROM EXCAVATIONS. DISCHARGE WATER THROUGH A SEDIMENT CONTROL DEVICE (I.E. DEWATERING BAG) INTO THE COMBINED SEWER SYSTEM
22. ALL SIMPLE SLOPE EXCAVATIONS 20' OR LESS IN DEPTH SHALL HAVE A MAXIMUM ALLOWABLE SLOPE OF $1\frac{1}{2}$':1'. ALL EXCAVATIONS 20' OR LESS IN DEPTH WHICH HAVE VERTICALLY SIDED LOWER PORTIONS SHALL BE SHIELDED OR SUPPORTED TO A HEIGHT AT LEAST 18" ABOVE THE TOP OF THE VERTICAL SIDE. ALL SUCH EXCAVATIONS SHALL HAVE A MAXIMUM ALLOWABLE SLOPE OF $1\frac{1}{2}$':1'. ALL OTHER SLOPE EXCAVATIONS SHALL BE IN ACCORDANCE WITH THE OTHER OPTIONS PERMITTED IN THE OSHA REGULATIONS.
23. STAIRS: RISER COUNT SHALL BE BASED ON FIELD CONDITIONS AND MEET ALL APPROPRIATE CODES.
24. THIS PROJECT WILL REQUIRE A SITE PREPARATION PERMIT. CONTACT TOM MANN AT THE CITY OF ROCHESTER PERMIT OFFICE (585)428-6562.

DEMOLITION NOTES

1. ALL FOUNDATIONS, SLABS, STRUCTURAL STEEL, MASONRY, SIDEWALKS, RETAINING WALLS, CURB, ETC., WITHIN THE DESIGNATED DEMOLITION LINES SHALL BE DEMOLISHED ACCORDING TO SPECIFICATIONS.
2. ALL SIDEWALKS, SLABS, FOUNDATIONS AND MISCELLANEOUS DEMOLITION SHALL BE REMOVED FROM THE SITE UNLESS OTHERWISE DIRECTED BY THE OWNER'S REPRESENTATIVE. NO BURNING OF DEBRIS SHALL BE ALLOWED. PAVEMENT REMOVED WILL BE ALLOWED AS FILL OR FOR REUSE AS SUBBASE ONLY AFTER REVIEW BY THE OWNER'S REPRESENTATIVE.
3. THE CONTRACTOR SHALL BE PERMITTED TO SALVAGE ANY EQUIPMENT OR MATERIALS HE DEEMS FEASIBLE FOR THAT PURPOSE. ALL SALVAGED MATERIAL OR ITEMS SHALL BE REMOVED FROM THE SITE IMMEDIATELY UPON REMOVAL. NO SUCH MATERIALS SHALL BE STORED ON THE SITE. ABSOLUTELY NO SALES OF SALVAGED MATERIALS WILL BE ALLOWED ON THE PROJECT SITE.
4. ALL EXISTING ON-SITE UTILITIES SHALL REMAIN UNLESS DESIGNATED FOR REMOVAL OR ABANDONMENT. PROTECT ALL EXISTING UTILITIES TO REMAIN.

DEMOLITION NOTES (CONT.)

5. MANHOLES, CATCH BASINS, CLEANOUTS, VALVE BOXES, FRAMES, COVERS AND GRATES REMAINING IN USE SHALL BE PROTECTED.
6. ABANDON EXISTING UTILITIES ONLY AFTER CRITICAL NEW SYSTEMS ARE IN PLACE AND OPERATIONAL (I.E. STORM DRAINAGE OR LIGHTING SERVICES TO EXISTING PROPERTIES). IT IS THE CONTRACTOR'S RESPONSIBILITY TO PROVIDE FOR PROPER AND SAFE SEQUENCING OF ABANDONMENT OF UTILITIES.
7. FOR ALL UTILITY LINES DESIGNATED TO BE REMOVED, PLACE AND COMPACT STRUCTURAL BACKFILL WITHIN TRENCH. FOLLOW CITY REQUIREMENTS WITHIN RIGHT-OF-WAY.
8. THE CONTRACTOR SHALL OBTAIN AND PAY ALL FEES ASSOCIATED WITH ALL PERMITS NECESSARY TO COMPLETE THE WORK.
9. CONTRACTOR IS RESPONSIBLE TO VERIFY GRADES AND UTILITIES SHOWN ON EXISTING CONDITIONS PLAN PRIOR TO START OF ANY WORK. ANY AND ALL DISCREPANCIES ARE TO BE DOCUMENTED AND SUBMITTED TO THE OWNER'S REPRESENTATIVE AT THE TIME OF DISCOVERY.

GRADING NOTES

1. ALL PROPOSED ELEVATIONS SHOWN HEREON ARE FINISHED GRADE ELEVATIONS.
2. CONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING RIM ELEVATIONS IN RELATION TO PROPOSED GRADE PRIOR TO INSTALLATION.
3. STRIPPED TOPSOIL SHALL BE STOCKPILED IN AREAS SHOWN ON PLANS OR AS DIRECTED BY OWNER'S REPRESENTATIVE. THE PILE(S) SHALL BE SEEDED.
4. TOPSOIL SHALL BE IMPORTED AND SPREAD TO A 4" THICKNESS TO BRING THE SITE TO FINISHED GRADE ELEVATIONS IN ALL AREAS TO BE SEEDED.
5. THE CONTRACTOR SHALL FOLLOW THE REQUIREMENTS OF THE GEOTECHNICAL AND ENVIRONMENTAL AND REPORTS.
6. SEQUENCE OF CONSTRUCTION
   - A. CLEARLY IDENTIFY PROJECT WORK LIMITS IDENTIFYING ALL AREAS WHERE CONSTRUCTION DISTURBANCE SHALL NOT BE PERMITTED INCLUDING, BUT NOT LIMITED TO SELECT TREES AND ADJOINING PROPERTIES.
   - B. INSTALL PERIMETER EROSION CONTROL MEASURES. CONSTRUCT TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES AS NECESSARY TO DIVERT RUNOFF FROM ENTERING AREAS OF PLANNED DISTURBANCE.
   - C. INSTALL A STABILIZED CONSTRUCTION ENTRANCE AS SHOWN ON PLANS OR AS DIRECTED BY OWNER'S REPRESENTATIVE.
   - D. ESTABLISH EROSION AND SEDIMENT CONTROL MEASURES PRIOR TO COMMENCING EARTHWORK OPERATIONS.
   - E. DISPOSE OF ALL REMOVED VEGETATION AND DEMOLITION DEBRIS OFF-SITE.
   - F. ESTABLISH MASS GRADE ELEVATIONS.
   - G. REMOVE UTILITIES, ETC. DESIGNATED FOR REMOVAL.
   - H. ALL TEMPORARY EROSION AND SEDIMENT CONTROL MEASURES AS WELL AS STOCK PILES ARE TO BE SEEDED FOR TEMPORARY VEGETATIVE COVER IMMEDIATELY FOLLOWING GRADING.
   - I. CONSTRUCT UTILITIES AND INFRASTRUCTURE IMPROVEMENTS.
   - J. FINE GRADE, INSTALL LANDSCAPING, SITE AMENITIES AND PERMANENT SEEDING.
   - K. REMOVE TEMPORARY EROSION AND SEDIMENT CONTROL FEATURES UPON ESTABLISHMENT OF PERMANENT GROUND COVER.
   - L. NOTIFY OWNER'S REPRESENTATIVE OF COMPLETION OF FINAL SITE STABILIZATION.

EROSION CONTROL NOTES

1. ALL SITE WORK SHALL CONFORM TO THE CLEARING, STRIPPING AND EROSION CONTROL REQUIREMENTS OF THE CITY OF ROCHESTER.
2. THE CONTRACTOR SHALL NOTIFY THE CITY OF HIS TIME SCHEDULE IN REGARD TO CLEARING, STRIPPING AND EROSION CONTROL TO PROVIDE FOR PROPER CITY INSPECTION.
3. CONTRACTOR TO PROVIDE, INSTALL AND MAINTAIN ALL REQUIRED EROSION CONTROL MEASURES THROUGHOUT CONSTRUCTION.
4. EROSION CONTROL DEVICES TO BE ESTABLISHED PRIOR TO COMMENCING EARTHWORK. EROSION CONTROL DEVICES TO BE MAINTAINED BY THE CONTRACTOR UNTIL UPSTREAM GROUNDCOVER HAS BEEN ESTABLISHED AND REMOVAL IS APPROVED BY THE CITY.
5. DISTURBED AREAS SHALL BE AS SMALL AS PRACTICAL, AND SHALL BE RESTORED, IMPROVED OR TEMPORARILY STABILIZED AS SOON AS POSSIBLE.
6. CONTRACTOR SHALL TAKE THE NECESSARY MEASURES, INCLUDING WATER SPRINKLING, TO PROVIDE DUST CONTROL DURING CONSTRUCTION.
7. CONTRACTOR SHALL PREVENT SEDIMENTS FROM ENTERING UTILITIES. ALL MANHOLES, CURB INLETS, FIELD INLETS, END SECTIONS OR OTHER SIMILAR DRAINAGE INLET STRUCTURES SHALL BE PROTECTED FROM SILTATION BY INSTALLING FILTER FABRIC (IF NECESSARY) OR OTHER CITY APPROVED EROSION CONTROL MEASURES.
8. SEDIMENT BARRIERS (SILT FENCE) SHALL BE INSTALLED PRIOR TO ANY GRADING WORK ALONG THE LIMITS OF DISTURBANCE AND SHALL BE MAINTAINED FOR THE DURATION OF THE WORK. NO SEDIMENT FROM THE SITE SHALL BE PERMITTED TO WASH ONTO ADJACENT PROPERTIES, WETLANDS OR ROADS.
9. THE CONTRACTOR SHALL BE RESPONSIBLE FOR THE MAINTENANCE OF ALL TEMPORARY AND PERMANENT EROSION CONTROL FEATURES THROUGHOUT THE DURATION OF CONSTRUCTION.
   - A. ALL SEDIMENT TRAPPING DEVICES SHALL BE CLEANED OF ACCUMULATED SILT WHEN STORAGE CAPACITY HAS BEEN REDUCED BY APPROXIMATELY 50% OF THEIR DESIGN CAPACITY.
   - B. ALL SEDIMENT SHALL BE REMOVED FROM BEHIND SILT FENCE WHEN IT ACCUMULATES TO A MAXIMUM HEIGHT OF 6" DEEP AT THE FENCE UNLESS OTHERWISE DIRECTED.
   - C. SEDIMENT COLLECTED BY EROSION CONTROL MEASURES SHALL BE DISPOSED OF BY SPREADING ON-SITE OR HAULED AWAY IF DETERMINED TO BE UNSUITABLE FOR FILL

UTILITY PLAN NOTES

1. MINIMUM VERTICAL SEPARATION BETWEEN WATERMAINS AND SEWER LINES SHALL BE 18 INCHES MEASURED FROM THE OUTSIDE OF THE PIPE AT THE POINT OF CROSSING. MINIMUM HORIZONTAL SEPARATION BETWEEN PARALLEL WATERMAINS AND SEWER PIPES (INCLUDING MANHOLES AND VAULTS) SHALL BE 10 FEET MEASURED FROM THE OUTSIDE OF THE PIPES, MANHOLES OR VAULTS. ONE FULL STANDARD LAYING LENGTH OF WATER MAIN SHALL BE CENTERED UNDER OR OVER THE SEWER SO THAT BOTH JOINTS WILL BE AS FAR FROM THE SEWER AS POSSIBLE. IN ADDITION, WHEN THE WATERMAIN PASSES UNDER A SEWER, ADEQUATE STRUCTURAL SUPPORT (COMPACTED SELECTED FILL) SHALL BE PROVIDED FOR THE SEWER TO PREVENT EXCESSIVE DEFLECTION OF JOINTS AND SETTLING OF THE SEWER ON THE WATERMAIN.
2. DEFLECTION TESTS SHALL BE PERFORMED ON ALL FLEXIBLE PIPE. THE TEST SHALL BE CONDUCTED AFTER ALL FINAL BACKFILL HAS BEEN IN PLACE AT LEAST THIRTY (30) DAYS. NO PIPE SHALL EXCEED A DEFLECTION OF FIVE PERCENT (5%). IF THE DEFLECTION TEST IS TO BE RUN USING A RIGID BALL OR MANDREL, IT SHALL HAVE A MINIMUM DIAMETER EQUAL TO NINETY-FIVE PERCENT (95%) OF THE INSIDE DIAMETER OF THE PIPE. THE TEST SHALL BE PERFORMED WITHOUT MECHANICAL PULLING DEVICES.

UTILITY PLAN NOTES (CONT.)

1. CAUTION - NOTICE TO CONTRACTOR
   THE CONTRACTOR IS SPECIFICALLY CAUTIONED THAT THE LOCATION AND/OR ELEVATION OF EXISTING UTILITIES AS SHOWN ON THESE PLANS IS BASED ON RECORDS OF THE VARIOUS UTILITY COMPANIES AND WHERE POSSIBLE MEASUREMENTS TAKEN IN THE FIELD. THE INFORMATION IS NOT TO BE RELIED ON AS BEING EXACT OR COMPLETE. THE CONTRACTOR MUST CALL THE APPROPRIATE UTILITY COMPANY AT LEAST 48 HOURS BEFORE ANY EXCAVATION TO REQUEST EXACT FIELD LOCATION OF UTILITIES. IT SHALL BE THE RESPONSIBILITY OF THE CONTRACTOR TO RELOCATE ALL EXISTING UTILITIES WHICH CONFLICT WITH THE PROPOSED IMPROVEMENTS SHOWN ON THE PLANS. THE CONTRACTOR SHALL NOTIFY THE UNDERGROUND FACILITIES PROTECTIVE ORGANIZATION AT LEAST 48 HOURS IN ADVANCE OF COMMENCING ANY WORK (TEL NO. 1-800-962-7962).

   STANTEC ACCEPTS NO RESPONSIBILITY FOR ANY AND ALL DAMAGE WHICH MAY BE OCCASIONED BY THE CONTRACTOR'S FAILURE TO EXACTLY LOCATE AND PRESERVE ANY AND ALL UNDERGROUND UTILITIES.
2. INTERIOR PLUMBING PLANS MUST BE SUBMITTED FOR FUTURE TENANTS WHO DISCHARGE SEWAGE, OTHER THAN DOMESTIC WASTE, TO THE ROCHESTER PLUMBING DEPARTMENT AND THE ROCHESTER PURE WATERS DISTRICT.
3. THE WATERMAINS SHALL BE DUCTILE IRON PIPE, CLASS 52 OR TYPE "K" COPPER UNLESS OTHERWISE NOTED ON PLANS.
4. THE STORM SEWER MAINS SHALL BE P.V.C., CLASS SDR-35 OR SDR-21 AS INDICATED ON THE PLANS.
5. HYDRANT FLOW TEST DATA:
   LOCATION: UHLEN PLACE
   STATIC PRESSURE: 47.0 PSI
   RESIDUAL PRESSURE: 41.0 PSI
   FLOW AT 20 PSI: 3,236 GPM
6. ALL EXPOSED BOLTS, RODS OR METALS TO BE BURIED SHALL BE COATED WITH COAL TAR TO PREVENT CORROSION.
7. IF THE SUPPLIER OF WATER REQUIRES BACKFLOW PROTECTION, THEN PLANS MUST BE SUBMITTED TO AND APPROVED BY THE SUPPLIER WHO WILL FORWARD THE PLANS TO THE MONROE COUNTY DEPARTMENT OF HEALTH FOR THEIR APPROVAL. THE APPROVAL PROCESS MUST BE COMPLETED PRIOR TO INSTALLATION. THE DETERMINATION AND PLAN APPROVAL PROCESS SHOULD BE STARTED EARLY TO AVOID UNNECESSARY DELAYS OR CONFLICTS WITH OTHER APPROVALS SUCH AS WATERMAIN EXTENSIONS, IF DEPARTMENT OF HEALTH APPROVALS ARE NEEDED FOR THE PROJECT. THESE APPROVALS WILL NOT BE GRANTED UNTIL THE BACKFLOW PREVENTION PLANS HAVE BEEN APPROVED.
8. CONTRACTOR TO COORDINATE WITH APPROPRIATE SERVICE PROVIDERS FOR RELOCATION OF ELECTRIC, TELEPHONE, AND CABLE SERVICES.

STANDARD WATER MAIN EXTENSION NOTES (MCDPH)

1. THE WATER MAIN AND TEMPORARY BYPASS PIPE SHALL BE DISINFECTED EQUAL TO AWWA STANDARD FOR DISINFECTING WATER MAINS, DESIGNATION C651, BY USING THE CONTINUOUS EED METHOD. FOLLOWING DISINFECTION, THE WATER MAIN AND BYPASS PIPE SHALL BE FLUSHED UNTIL THE CHLORINE CONCENTRATION IN THE WATER LEAVING THE MAIN IS NO HIGHER THAN THAT GENERALLY PREVAILING IN THE SYSTEM. THE INTERIOR OF ALL WATER MAIN PIPE, VALVES, FITTINGS AND SERVICES FOUR (4) INCHES AND LARGER, INCLUDING NEW HYDRANT BRANCHES CONNECTED TO EXISTING WATER MAINS, NOT RECEIVING 24-HOUR CHLORINE DISINFECTION CONTACT TIME MUST BE SPRAY OR SWAB DISINFECTED WITH A MINIMUM 1% - 5% SOLUTION OF CHLORINE NO MORE THAN 30-MINUTES PRIOR TO INSTALLATION. ADDITIONALLY, THE EXTERIOR SURFACES OF EXISTING PIPE AND FITTINGS THAT NEW PIPE AND FITTINGS WILL BE CONNECTED TO MUST BE THOROUGHLY CLEANED AND DISINFECTED. THE MAXIMUM DISTANCE BETWEEN DISINFECTION/SAMPLING TAPS ON NEW WATER MAIN AND BYPASS PIPE SHALL BE 1,000 FEET. THE SAMPLING POINT(S) MUST BE DECONTAMINATED BY FLAMING. FIRE HYDRANTS ARE NOT ACCEPTABLE SAMPLING POINTS. THE MONROE COUNTY DEPARTMENT OF PUBLIC HEALTH MUST RECEIVE AT LEAST 48-HOUR ADVANCE NOTIFICATION REQUESTING SAMPLING SERVICES. THE CONTRACTOR SHALL CALL 585-753-5057 TO ARRANGE FOR SAMPLING SERVICES AND IS RESPONSIBLE FOR PAYING ALL MCDPH SAMPLING FEES. SAMPLING WILL NOT BE PERFORMED PRIOR TO RECEIPT FROM A NEW YORK STATE LICENSED OR REGISTERED DESIGN PROFESSIONAL (ENGINEER, ARCHITECT OR LAND SURVEYOR WITH A SPECIAL EXEMPTION UNDER SECTION 7208(N) OF THE EDUCATION LAW) CERTIFYING THAT THE WATER SUPPLY IMPROVEMENTS, TESTING AND DISINFECTION PROCEDURES WERE COMPLETED IN ACCORDANCE WITH THE APPROVED PLANS, REPORTS, SPECIFICATIONS AND ANY APPROVED AMENDMENTS. THE DEPARTMENT WILL COLLECT SAMPLES FOR FREE CHLORINE RESIDUAL .TOTAL COLIFORM, ESCHERICHIA COLI (E. COLI) AND TURBIDITY. THE WATER MAIN AND BYPASS PIPE SHALL NOT BE PLACED INTO SERVICE UNTIL SO AUTHORIZED BY THE MONROE COUNTY DEPARTMENT OF PUBLIC HEALTH.
2. UNLESS OTHERWISE NOTED OR SHOWN ON THE APPROVED PLANS, THE MINIMUM VERTICAL SEPARATION BETWEEN WATER MAINS AND SEWER PIPE LINES SHALL BE 18-INCHES MEASURED FROM THE OUTSIDE OF THE PIPES AT THE POINT OF CROSSING. ONE FULL STANDARD LAYING LENGTH OF WATER MAIN SHALL BE CENTERED UNDER OR OVER THE SEWER SO THAT BOTH JOINTS WILL BE AS FAR FROM THE SEWER AS POSSIBLE. IN ADDITION, WHEN THE WATER MAIN PASSES UNDER A SEWER, ADEQUATE STRUCTURAL SUPPORT (COMPACTED SELECTED FILL) SHALL BE PROVIDED FOR THE SEWER TO PREVENT EXCESSIVE DEFLECTION OF JOINTS AND SETTLING OF THE SEWER ON THE WATER MAIN. UNLESS OTHERWISE NOTED OR SHOWN ON THE APPROVED PLANS, THE MINIMUM HORIZONTAL SEPARATION BETWEEN PARALLEL WATER MAINS AND SEWER PIPES (INCLUDING MANHOLES AND VAULTS) SHALL BE 10-FEET MEASURED FROM THE OUTSIDE OF THE PIPES, MANHOLES OR VAULTS.
3. WHEN INSTALLING FIRE HYDRANTS, SHOULD GROUND WATER BE ENCOUNTERED WITHIN SEVEN (7) FEET OF FINISHED GRADE, FIRE HYDRANT WEEP HOLES (DRAINS) SHALL BE PLUGGED.
4. THE NEW WATER MAINS AND SERVICES 4-INCH AND GREATER SHALL BE PRESSURE/LEAKAGE TESTED IN ACCORDANCE WITH THE MINIMUM REQUIREMENTS OF THE AWWA STANDARD C600 (LATEST REVISION) OR IN ACCORDANCE WITH MORE STRINGENT REQUIREMENTS IMPOSED BY THE SUPPLIER OF WATER. FOR CITY OF ROCHESTER WATER MAINS, PRESSURE/LEAKAGE TESTING SHALL BE PERFORMED IN ACCORDANCE WITH SUBSECTION 3.05 OF CITY OF ROCHESTER WATER BUREAU SPECIFICATION S900 -GENERAL WATER PROVISIONS.

ROCHESTER WATER BUREAU (RWB) WATER MAIN AND SERVICE NOTES

1. WATER MAINS AND APPURTENANCES TO BE CONSTRUCTED IN ACCORDANCE WITH THE REGULATIONS AND SPECIFICATIONS OF THE ROCHESTER WATER BUREAU. ALL PIPE PRODUCTS, FITTINGS AND ACCESSORIES SHALL CONFORM TO THE LATEST ROCHESTER WATER BUREAU (RWB) APPROVED PRODUCTS LIST WHICH CAN BE FOUND ON THE CITY WEB SITE: HTTP://WWW.CITYOFROCHESTER.GOV/WATERDOCUMENTS/.
2. ALL NEW WATER MAINS AND SERVICES SHALL BE INSTALLED WITH A MINIMUM COVER DEPTH FROM PROPOSED FINISHED GRADE OF 4.5 FEET FOR DOMESTIC MAINS AND 5.0 FEET FOR HOLLY MAINS.
3. THE ROCHESTER WATER BUREAU REQUIRES THAT A HYDRANT USE PERMIT BE OBTAINED BY THE CONTRACTOR PRIOR TO USING ANY HYDRANT AS A SOURCE OF WATER SUPPLY. THE PERMIT REQUIRES THE USE OF A WATER METER AND A BACKFLOW PREVENTER. THE WATER BUREAU WILL SUPPLY A WATER METER AND BACKFLOW PREVENTER WITH THE PERMIT. THE PERMIT FEE INCLUDES A REFUNDABLE DEPOSIT FOR THE USE OF THE WATER METER AND BACKFLOW PREVENTER.
4. FOR EXISTING VALVES AND CURB STOPS THAT ARE LOCATED ON WATER MAINS AND WATER SERVICES WHICH ARE TO BE RETAINED, THE EXISTING VALVE AND CURB BOXES SHALL BE ADJUSTED TO GRADE OR REPLACED AS SHOWN ON THE PLANS OR DIRECTED BY THE PROJECT MANAGER.
5. THE CONTRACTOR SHALL EXERCISE CAUTION WHEN WORKING NEAR WATER MAINS WHICH ARE TO BE RETAINED. NO VIBRATORY EQUIPMENT IS TO BE USED OVER OR ADJACENT TO EXISTING WATER MAINS.
6. APPROPRIATE MEASURES SHALL BE TAKEN TO PREVENT DIRT, DEBRIS, SURFACE AND GROUND WATER FROM CONTAMINATING THE WATER MAIN AND WATER SERVICE. THE WATER LEVEL IN THE EXCAVATION AT OPEN PIPE ENDS SHALL NEVER BE LESS THAN 12 INCHES BELOW THE INVERT OF THE WATER MAIN. WHENEVER AN OPEN PIPE END IS LEFT UNATTENDED, IT SHALL BE COVERED IN A WATER TIGHT MANNER.
7. A PRECONSTRUCTION MEETING IS REQUIRED WITH THE ROCHESTER WATER BUREAU AFTER THE ISSUING OF A PERMIT, BUT BEFORE CONSTRUCTION OF THE WATER MAIN OR SERVICE BEGIN. CONTACT THE ROCHESTER WATER BUREAU AT (585) 428-7500 AND REQUEST TO SPEAK TO WATER ENGINEERING TO SCHEDULE THE MEETING.

ROCHESTER PURE WATERS DISTRICT SEWER NOTES

1. THIS PLAN REQUIRES APPROVAL AND ISSUANCE OF A PLUMBING PERMIT FROM THE CITY OF ROCHESTER PLUMBING DEPARTMENT.
2. PRIOR TO CONSTRUCTION, A SEWER CONNECTION PERMIT MUST BE OBTAINED FROM THE MONROE COUNTY PURE WATERS (MCPW) PERMIT OFFICE AT 145 PAUL ROAD, BUILDING 11, ROCHESTER. NEW YORK 14624, PHONE # 753-7600 (OPT. 5).
3. SEWER CONNECTION PERMIT(S) CAN ONLY BE ISSUED TO A PLUMBER LICENSED IN THE CITY OF ROCHESTER AND WHO IS FULLY INSURED AND BONDED IN THE ROCHESTER PURE WATERS DISTRICT (RPWD). PAYMENT (CHECK OR MONEY ORDER TO “RPWD”) OF ALL APPLICABLE PERMIT FEES MUST BE PAID PRIOR TO PERMIT ISSUANCE.
4. THE RPWD SHALL BE NOTIFIED **FORTY-EIGHT HOURS** IN ADVANCE OF A CONNECTION OR TAP. [753-7600 (OPT. 5)]. THE CONTRACTOR SHALL MAKE ALL REQUIRED TAPS TO THE RPWD SEWERS. ALL TAPS AND CONNECTIONS TO DISTRICT UTILITIES MUST BE WITNESSED BY A DISTRICT INSPECTOR.
5. SANITARY/STORM/COMBINATION SEWER LATERAL(S) AND APPURTENANCES SHALL BE CONSTRUCTED IN CONFORMANCE WITH THE *REQUIREMENTS OF THE ROCHESTER PURE WATERS DISTRICT*.
6. CLEANOUTS SHALL BE INSTALLED ON ALL 4” AND 6” DIAMETER SEWER LATERALS AT THE RIGHT-OF-WAY (ROW) LINE, OR THE SEWER EASEMENT LINE WHERE APPLICABLE. (THE SEWER EASEMENT, RIGHT-OF-WAY AND/OR PROPERTY LINE MUST BE STAKED OUT PRIOR TO INSTALLATION OF LOT LINE CLEANOUTS TO ENSURE PROPER LOCATION OF THE CLEANOUTS. [REFER TO CLEANOUT DETAIL FOR PROPER INSTALLATION]).
7. IF AN EXISTING LATERAL IS TO BE UTILIZED, THE PLUMBER/CONTRACTOR MUST ENSURE THAT THE LATERAL IS IN GOOD CONDITION AND IS FREE OF DEBRIS (DIRT, MUD, STONE, ROOTS, ETC.) VIA A VIDEO TAPED INSPECTION PERFORMED BY THE PLUMBER/CONTRACTOR OR HIS/HER/THEIR AGENT. PRIOR TO CONNECTION, THE VIDEO TAPED INSPECTION OF THE EXISTING LATERAL MUST BE PRESENTED TO THE DISTRICT FOR REVIEW AND APPROVAL TO UTILIZE AN EXISTING LATERAL. IT IS THE RESPONSIBILITY OF THE BUILDER OR THEIR AGENT TO CLEAN AND/OR REPLACE THE PIPE/LATERAL AS NEEDED.
8. ANY NEW PORTION OF A SEWER LATERAL INSTALLED WITHIN THE PUBLIC RIGHT-OF-WAY AND SEWER EASEMENT MUST BE SDR-21 PVC.
9. ANY EXISTING LATERALS NOT UTILIZED MUST BE ABANDONED TO MONROE COUNTY PURE WATERS (MCPW) STANDARDS AT THE PROPERTY LINE OR, WHERE APPLICABLE, THE SEWER EASEMENT LINE.
10. FLOOR DRAINS IF CONSTRUCTED, SHALL BE CONNECTED TO THE SANITARY/COMBINATION SEWER. FLOOR DRAINS DO NOT INCLUDE FOUNDATION/FOOTER DRAINS. NOTE: ALL DISCHARGES TO THE SANITARY/COMBINATION SEWER MUST COMPLY WITH THE EFFLUENT LIMITS OF THE LOCAL AND/OR MONROE COUNTY SEWER USE LAW.
11. ANY PORTION OF A SEWER/LATERAL WITH LESS THAN FOUR-FEET (4') OF COVER WILL REQUIRE CONCRETE ENCASEMENT. SEWERS/LATERALS WITH LESS THAN THREE-FEET (3') OF COVER ARE NOT ALLOWED.
12. THE REQUIREMENTS OF THE HIGHWAY/PROPERTY OWNER SHALL BE ADHERED TO FOR ITEMS ABOVE THE PIPE BEDDING, INCLUDING, BUT NOT LIMITED TO, MAINTENANCE AND PROTECTION OF TRAFFIC, BACKFILL MATERIAL AND SURFACE RESTORATION.

SURVEY NOTES

1. THE SURVEY IS REFERENCED TO THE NEW YORK STATE PLANE COORDINATE SYSTEM, TRANSVERSE MERCATOR PROJECTION, WESTERN ZONE, NAD83, AND THE ROCHESTER CITY VERTICAL DATUM.
2. UNDERGROUND UTILITIES SHOWN HEREON WERE DRAWN FROM FIELD LOCATIONS AND/OR UTILITY COMPANY RECORD MAPPING. THE LOCATION OF ALL UTILITIES SHOULD BE STAKED BY THE RESPECTIVE UTILITY COMPANY PRIOR TO ANY CONSTRUCTION.
3. FIELDWORK COMPLETED JULY 13, 2017.

LANDSCAPING NOTES

1. THE QUANTITIES INDICATED ON THE DRAWINGS AND ON THE PLANT MATERIAL SCHEDULE ARE PROVIDED FOR THE BENEFIT OF THE LANDSCAPE SUBCONTRACTOR BUT SHOULD NOT BE ASSUMED TO BE CORRECT. THE LANDSCAPE SUBCONTRACTOR SHALL BE RESPONSIBLE FOR VERIFYING THE QUANTITIES INDICATED. ANY DISCREPANCIES NOTED SHALL BE BROUGHT TO THE ATTENTION OF THE OWNER PRIOR TO INSTALLATION. IN THE EVENT OF A DISCREPANCY, THE GRAPHIC REPRESENTATIONS SHOWN ON THE DRAWINGS SHALL GOVERN.
2. NO SUBSTITUTIONS AS TO SIZE, TYPE, SPACING, QUANTITY OR QUALITY OF PLANT MATERIAL SHALL BE MADE WITHOUT THE WRITTEN APPROVAL OF BOTH THE OWNER AND THE PROJECT LANDSCAPE ARCHITECT. CHANGES IN PLANT MATERIAL MAY CONSTITUTE PLAN RE-APPROVAL.
3. PLANTS SHALL BE SUPPLIED AT THE SIZES SPECIFIED ON THE DRAWINGS. THE SIZES SHOWN ARE THE MINIMUMS FOR EACH CATEGORY (HEIGHT, SPREAD, CALIPER, CONTAINER SIZE, ETC.) WHEN A RANGE OF SIZE IS GIVEN, 75% OF THE PLANTS SUPPLIED SHALL MEET THE MAXIMUM RANGE SIZE, AND 25% OF THE PLANTS SUPPLIED SHALL BE THE MINIMUM RANGE SIZE SPECIFIED. THE PLANTS SUPPLIED SHALL CONFORM TO ALL OF THE MINIMUM DIMENSIONS INDICATED. PLANTS OF LARGER SIZE MAY BE USED IF ACCEPTABLE TO THE D/B CONTRACTOR AT NO ADDITIONAL COST AND IF SIZES OF CONTAINER OR ROOT BALLS, HEIGHT, AND SPREAD ARE INCREASED PROPORTIONATELY IN ACCORDANCE WITH ANSI Z-60.1. ALL OTHER QUALITY REQUIREMENTS OF THE PLANT MATERIAL MUST ALSO BE ADHERED.
4. ALL PLANTS SHALL BE NURSERY GROWN, BALL AND BURLAP (B&B) OR CONTAINER GROWN AS-SPECIFIED IN THE MATERIALS SCHEDULE. CONTAINER GROWN MATERIAL MAY BE SUBSTITUTED FOR B&B MATERIAL WITH WRITTEN APPROVAL BY THE OWNER PRIOR TO INSTALLATION. ALL PLANT MATERIALS SHALL CONFORM TO THE AMERICAN STANDARD FOR NURSERY STOCK ANSI Z-60.1, LATEST EDITION. ALL TREES SHALL COMPLY WITH ANSI Z-60.1 AND THE URBAN TREE FOUNDATION GUIDELINE FOR NURSERY TREE QUALITY, 2009 EDITION. ALL PLANTS SHALL BE HIGHEST QUALITY, FIRST CLASS REPRESENTATIVES OF THEIR SPECIES. SECONDS, CULLS, OR PARK GRADE MATERIAL WILL BE REJECTED.
5. CALIPER SIZE IS NOT TO BE REDUCED. CALIPER MEASUREMENTS SHALL BE TAKEN IN ACCORDANCE WITH ANSI STANDARDS.
6. ALL TREES MUST BE STRAIGHT TRUNKED, HAVE A STRONG CENTRAL LEADER, FULL HEADED, AND MEET THE MINIMUM REQUIREMENTS. TREES WITH A “Y” SHAPE ARE NOT ACCEPTABLE. TREES THAT HAVE BEEN FRESHLY PRUNED TO MEET THESE SPECIFICATIONS SHALL BE REJECTED.
7. THE PLANT'S VEGETATIVE CANOPY SHALL BE SYMMETRICAL AND FREE OF LARGE VOIDS OR FLAT SURFACE AREAS ON ONE SIDE.
8. TREES AND SHRUBS MOVED DURING PERIODS OF HIGH TRANSPIRATION SHALL BE SPRAYED WITH AN ANTI-DESSICANT PRIOR TO MOVING. APPLY AND REMOVE ANTI-DESSICANTS PER THE MANUFACTURER'S RECOMMENDATIONS.
10. TREES SHALL BE STAKED AND GUYED AS DETAILED AND SPECIFIED ONLY IF THE TREE CANNOT STAND ON ITS OWN AS DETERMINED BY THE PROJECT LANDSCAPE ARCHITECT. STAKE AND GUYED MATERIALS SHALL BE REMOVED BY THE CONTRACTOR SIX (6) MONTHS AFTER FINAL ACCEPTANCE.
11. ALL PLANTS ARE SUBJECT TO REVIEW AND APPROVAL BY THE OWNER AT ANY TIME PRIOR TO FINAL ACCEPTANCE. REJECTED PLANTS SHALL BE REPLACED IMMEDIATELY AT NO ADDITIONAL COST TO THE OWNER.
12. THE CONTRACTOR SHALL FIELD STAKE ALL PLANTS PRIOR TO INSTALLATION. THE OWNER'S REPRESENTATIVE SHALL APPROVE ALL STAKED LOCATIONS PRIOR TO INSTALLATION. PLANTS INSTALLED PRIOR TO APPROVAL BY THE OWNER'S REPRESENTATIVE ARE SUBJECT TO REJECTION AND REPLACEMENT AT NO ADDITIONAL COST TO THE OWNER.
13. PRIOR TO COMMENCEMENT OF INSTALLATION, THE CONTRACTOR SHALL BE RESPONSIBLE FOR LOCATING ALL EXISTING UTILITIES AND SHALL AVOID DAMAGING UTILITIES DURING INSTALLATION. ANY UTILITIES DAMAGED DURING INSTALLATION SHALL BE REPAIRED BY THE CONTRACTOR TO THE SATISFACTION OF THE APPROPRIATE UTILITY COMPANY AND THE OWNER. ALL REPAIRS SHALL BE AT NO COST TO THE OWNER.

LANDSCAPING NOTES (CONT.)

14. NO TREES SHALL BE PLANTED WITHIN 5' OF SITE UTILITY LINES. TREE LOCATIONS PROPOSED WITHIN 10' SHALL BE BROUGHT TO THE ATTENTION OF THE PROJECT LANDSCAPE ARCHITECT PRIOR TO EXCAVATING. FIELD ADJUSTMENT OF TREE LOCATIONS SHALL BE DETERMINED BY THE PROJECT LANDSCAPE ARCHITECT. PLANTS RELOCATED AND INSTALLED WITHOUT APPROVAL OF THE PROJECT LANDSCAPE ARCHITECT WILL BE REMOVED, REPLACED, AND RELOCATED AT NO ADDITIONAL COST.
15. SHOULD LOCATION OF TREES BE WITHIN 15' OF A LIGHT POLE, RELOCATE SAID TREE TO A MIN. 15' FROM THE LIGHT POLE.
16. SHOULD LOCATION OF LARGE DECIDUOUS TREES BE WITHIN 15' OF OVERHEAD WIRES, RELOCATE SAID TREES TO A MINIMUM OF 15' TO WIRES.
17. ALL PLANT BEDS SHALL BE THOROUGHLY ROTO-TILLED A MINIMUM OF TWELVE INCHES (12”), UNLESS OTHERWISE NOTED, PRIOR TO PLANT PLACEMENT. AMENDMENTS, IF REQUIRED BASED ON SITE-SPECIFIC SOIL TEST RESULTS, SHALL BE THOROUGHLY TILLED INTO THE SOIL BASED ON THE TEST RESULT RECOMMENDATIONS.
18. THE CONTRACTOR SHALL UTILIZE ON-SITE TOPSOIL AS AVAILABLE FROM THE CONTRACTOR. ALL TOPSOIL SHALL BE APPROVED BY THE OWNER'S REPRESENTATIVE.
19. NO PLANTS SHALL BE INSTALLED IN POOR DRAINAGE CONDITIONS. CONTRACTOR IS RESPONSIBLE FOR TESTING SUSPECT PLANT PITS PRIOR TO PLANT INSTALLATION. REFER TO THE LANDSCAPE SPECIFICATIONS FOR PLANT PIT TESTING PROCEDURES.
20. ALL PLANTS SHALL BE PLACED WITH THE BEST FACE FORWARD.
21. ALL PLANTS SHALL BE PRUNED AS NECESSARY PRIOR TO INSTALLATION.
22. PRE-EMERGENT HERBICIDES, TREFLAN, PREEN, OR APPROVED EQUAL, SHALL BE APPLIED TO ALL PLANTING BEDS PRIOR TO MULCHING. APPLY AT MANUFACTURERS RECOMMENDATIONS. HERBICIDES SHALL BE INCORPORATED INTO THE SOIL AT THE RECOMMENDATION OF THE MANUFACTURER.
23. APPLY ORGANIC ROOT STIMULATOR, CONTINUING MYCORRHIZAE, TO ALL PLANTS PRIOR TO BACKFILLING. APPLY PER MANUFACTURER'S RECOMMENDATIONS. CONTRACTOR TO SUBMIT SAMPLES OF ROOT STIMULATOR TO THE OWNER'S REPRESENTATIVE FOR APPROVAL PRIOR TO USE.
24. THE CONTRACTOR IS RESPONSIBLE FOR MAINTAINING THE PLANT INSTALLATIONS UNTIL ACCEPTED BY THE OWNER. MAINTENANCE SHALL INCLUDE RE-MULCHING, WATERING, APPLICATIONS OF HERBICIDES, FUNGICIDES, INSECTICIDES AND PESTICIDES AS NECESSARY. MAINTENANCE SHALL INCLUDE ALL PLANTINGS, TREES, SHRUBS, GROUNDCOVERS, ANNUALS, PERENNIALS AND SEEDED AREAS.
25. THE CONTRACTOR SHALL GUARANTEE THAT ALL PLANTS SHALL BE IN A HEALTHY AND THRIVING CONDITION ACCORDING TO THE NATURAL GROWTH HABITS OF THE INDIVIDUAL SPECIES AT THE TIME OF FINAL ACCEPTANCE BY THE OWNER.
26. MULCH ALL BEDS WITH 3" DEPTH, SHREDDED HARDWOOD BARK MIXTURE. IN GROUPINGS OF SHRUBS, MULCH ENTIRE BED.
27. ONE YEAR GUARANTEE SHALL BE PROVIDED ON ALL PLANT MATERIALS FROM DATE OF FINAL ACCEPTANCE OF PLANT MATERIAL BY OWNER.
28. SEED MIXTURES (APPLY TO AREAS NOT PAVED OR PLANTED OR OTHERWISE NOTED):

    SEED MIX:
    25% R2 PERENNIAL RYEGRASS
    25% TOP HAT PERENNIAL RYEGRASS
    30% CINDY CREEPING RED FESCUE
    20% KENTUCKY BLUEGRASS
    SEEDING RATE: 5 LBS / 1,000 SF
29. LAWN FERTILIZER TO BE APPLIED AT A RATE OF 25 LB. / 1,000 SF. APPLY WOOD FIBER CELLULOSE MULCH AT A RATE OF 1,200 LBS. PER ACRE.
32. FINE GRADE, SEED, MULCH AND WATER UNTIL A HEALTHY STAND OF GRASS IS OBTAINED.
33. SCARIFY, LOOSEN, FLOAT AND DRAG THE UPPER FOUR INCHES (4”) OF SOIL TO BRING IT TO PROPER CONDITION AND GRADE PRIOR TO SEEDING. REMOVE STONES LARGER THAN ONE INCH (1”), STICKS, ROOTS, RUBBISH, ETC. FINISHED GRADE SHALL BE LOOSE AND FREE DRAINING PRIOR TO SEEDING.
34. STRIP EXISTING GRASS AND WEEDS, INCLUDING ROOTS, PRIOR TO SEEDING OPERATIONS. APPLY HERBICIDES AS NECESSARY TO SPOT TREAT UNWANTED SPECIES.
35. INSTALL SEED PER THE WRITTEN SPECIFICATIONS. CONTRACTOR MUST ADJUST APPLICATION RATES TO PURE LIVE SEED RATES AS INDICATED.
36. ALL SEEDED AREAS MUST BE MAINTAINED BY THE CONTRACTOR UNTIL ACCEPTANCE BY THE OWNER.
37. PROTECT ALL TREES TO REMAIN.
38. CONTRACTOR TO EMPLOY A CERTIFIED ARBORIST TO CHECK THE HEALTH OF ALL TREES AND PRUNE AS NECESSARY IN ORDER TO ENSURE VITALITY BEFORE CONSTRUCTION HAS BEGUN AND AFTER THE CONSTRUCTION IS COMPLETE.

SPECIAL NOTES

1 (revision)

1. NYSDEC DER-10 GUIDANCE AND FOLLOW THE REMEDIAL ACTION WORK PLAN (RAWP) APPROVED BY NYSDEC.
2. ENGINEER OR ENVIRONMENTAL PROFESSIONAL UNDER HIS OR HER SUPERVISION WILL OVERSEE INVASIVE WORK AND THE EXCAVATION AND LOAD-OUT OF EXCAVATED MATERIAL. VISUAL, OLFACTORY, AND PID SOIL SCREENING AND ASSESSMENT WILL BE PERFORMED BY AN ENVIRONMENTAL PROFESSIONAL DURING REMEDIAL AND DEVELOPMENT EXCAVATIONS INTO KNOWN OR POTENTIALLY-CONTAMINATED MATERIAL.
3. STOCKPILES WILL BE KEPT COVERED WITH APPROPRIATELY ANCHORED TARPS.
4. WATER WILL BE AVAILABLE ON-SITE AT SUITABLE SUPPLY AND PRESSURE FOR USE IN DUST CONTROL. THE AMOUNT OF WATER UTILIZED WILL BE MINIMIZED TO PREVENT RUNOFF.
5. OIL, FILL, AND SOLID WASTE REMOVED FROM THE SITE WILL BE TREATED AS CONTAMINATED AND REGULATED MATERIAL AND WILL BE DISPOSED IN ACCORDANCE WITH LOCAL, STATE (INCLUDING 6 NYCRR PART 360) AND FEDERAL REGULATIONS.
6. MATERIAL ANTICIPATED TO BE REUSED OR RELOCATED ON-SITE WILL BE SAMPLED IN ACCORDANCE WITH DER-10 AND MEET RESTRICTED RESIDENTIAL SOIL CLEANUP OBJECTIVES.
7. EXCAVATION-RELATED STORMWATER AND/OR GROUNDWATER, AND OTHER REMEDIAL RELATED LIQUIDS WILL BE CONTAINERIZED AND TESTED IN ACCORDANCE WITH MONROE COUNTY'S REQUIREMENTS. CONTINGENT ON MONROE COUNTY'S APPROVAL, IT IS ANTICIPATED THAT THESE FLUIDS WILL BE DISCHARGED TO THE COMBINED SANITARY SEWER.
8. ALL SOIL AND STONE THAT WILL BE IMPORTED TO THE SITE MUST BE SAMPLED UNLESS THESE MATERIALS MEET THE SPECIFICATIONS IN DER-10 SECTION 5.4(E)5. ALL IMPORTED STONE AND SOILS (EXCLUDING NEW CONCRETE AND ASPHALT PAVEMENT) MUST BE APPROVED BY NYSDEC.

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NOTES

	REVISION
1	REVISED SPECIAL NOTES PER NYSDEC LAD 2020.06.01

HCR SUBMISSION

PLAN PROJECT No.
081.18.01.01
SHARS ID No.

DATE
November 15, 2019

gi002

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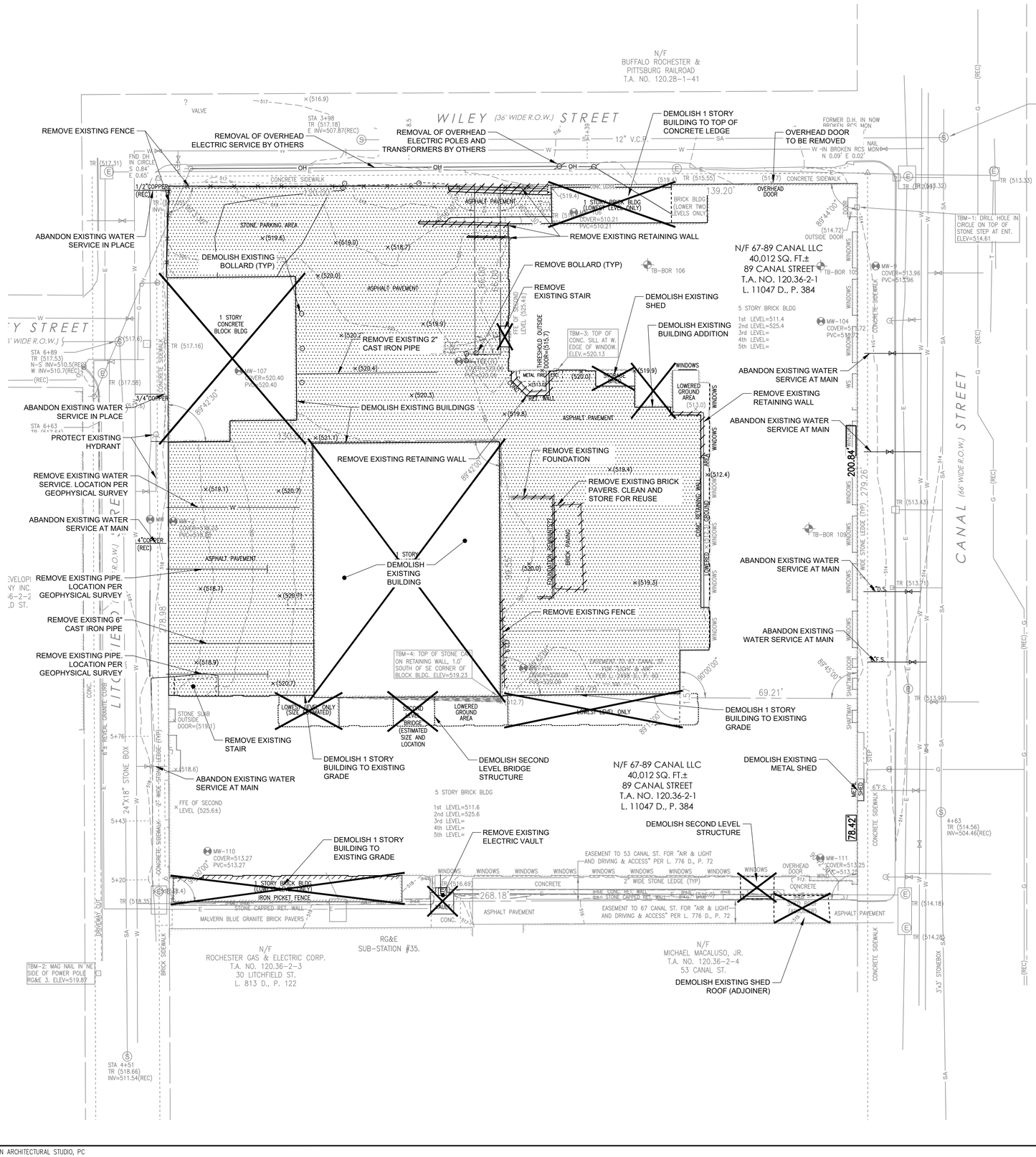
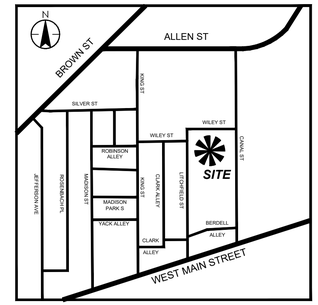


NOTES:

1. WATER SERVICE "TEE" SHALL BE REMOVED FROM EXISTING MAIN.

ASPHALT REMOVAL



LOCATION MAP

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DEMOLITION AND REMOVAL PLAN

REVISION	
1	ADDED PURPOSED REMOVALS

PRESERVATION BOARD REVIEW

PLAN PROJECT No.
081.18.01.01
SHARS ID No.

DATE
June 4, 2019

rc100

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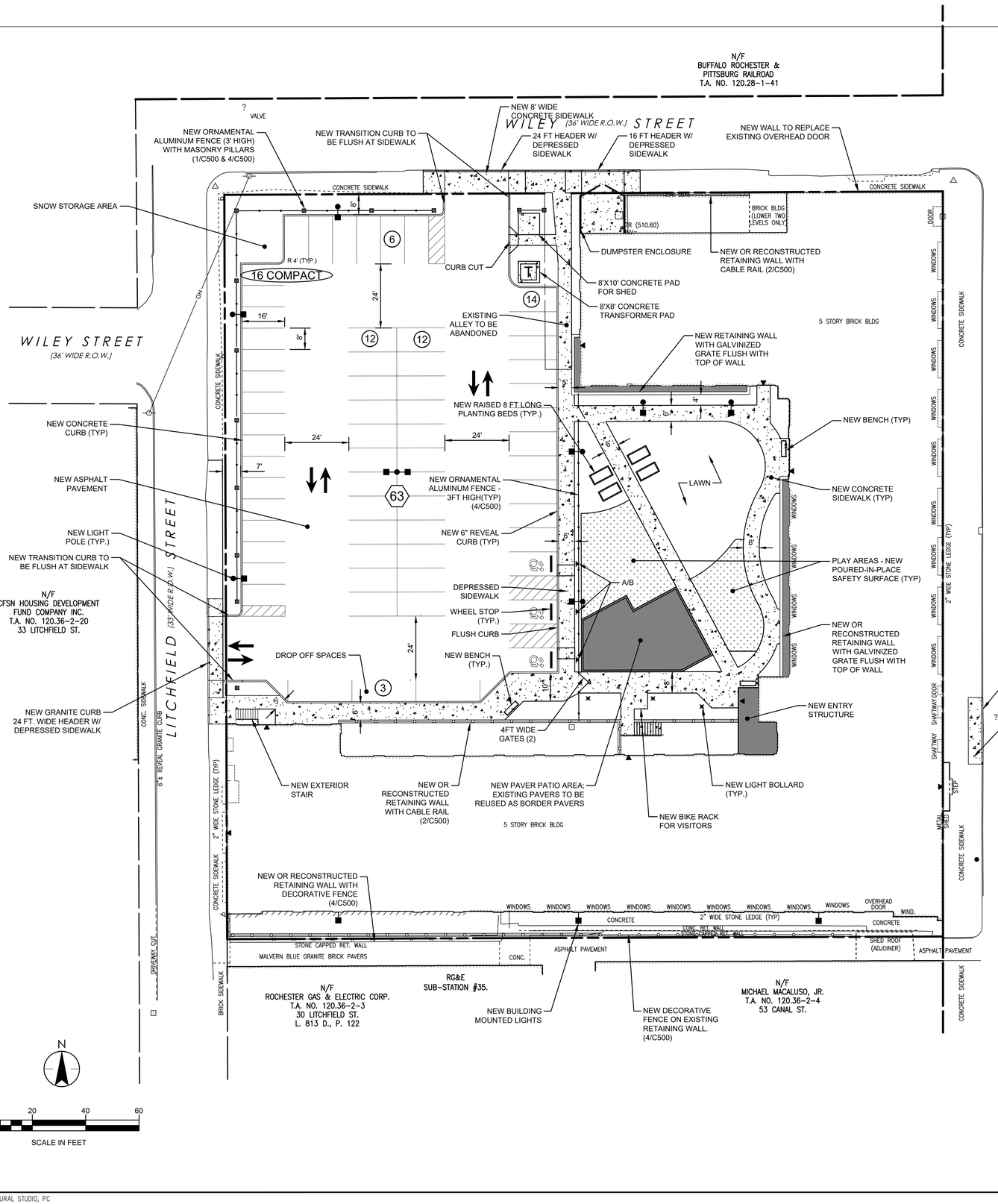

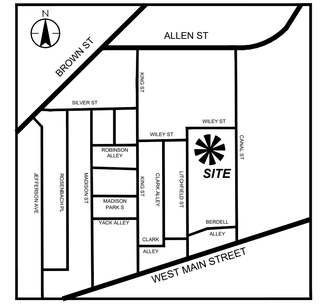

LOCATION MAP

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PROJECT NOTES:

1. TOTAL PARCEL AREA: 1.71 ACRES
2. ZONING:
   - EXISTING ZONING: CCD-C CENTER CITY CASCADE - CANAL PRESERVATION DISTRICT
3. PROPOSED USE: 113 UNITS AFFORDABLE & SUPPORTIVE HOUSING; 8300 SF - COMMERCIAL TENANT SPACE
4. TAX ACCOUNT NUMBERS: 120.36-2-2 = 0.78 ACRES; 120.36-2-1 = 0.92 ACRES; ALLEY ABANDONMENT = 0.01 ACRES
5. BUILDING HEIGHT: 5 STORIES EXISTING
6. BUILDING SET BACK REQUIREMENTS: EXISTING
7. PARKING SET BACK REQUIREMENTS:

	PROVIDED
FRONT YARD:	N/A
SIDE YARD:	7 TO 4 FT.
BACK YARD:	7 TO 4 FT.

8. PARKING REQUIREMENTS:
   - TOTAL PROVIDED: 63 SPACES (INCLUDES 3 HANDICAP & 16 COMPACT)
9. BICYCLE SPACES: 20 SPACES LOCATED IN BUILDING; 2 LOCATED OUTSIDE
10. EXISTING BUILDING AREA: ±176,300 SF (TO BE RETAINED)

NOTES:

1. ALLEY TO BE ABANDONED AND PARCELS SHALL BE COMBINED
2. AREAWAYS/LIGHTWELLS TO RECEIVE GEOTEXTILE SEPARATION FABRIC AND 4" OF CLEAN PEASTONE

SIGN SCHEDULE

KEY	TEXT	MUTCD NO.	SIZE	TYPE OF MOUNT	HEIGHT	NOTES
A	RESERVED PARKING	R7-8 (MOD.)	12"x18"	POST MOUNT	-	MOUNTED ABOVE R7-1 AND/OR R7-8b
B	NO PARKING	R7-1 (MOD.)	6" x 12"	POST MOUNT	7'-0" MIN.	LEFT OR RIGHT ARROW AS REQUIRED

SIGN NOTES:
1. SIGNS TAKEN FROM "MANUAL ON UNIFORM TRAFFIC CONTROL DEVICES" (MUTCD) DATED 2009.

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REVISION

SITE PLAN

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SHARS ID No.

DATE
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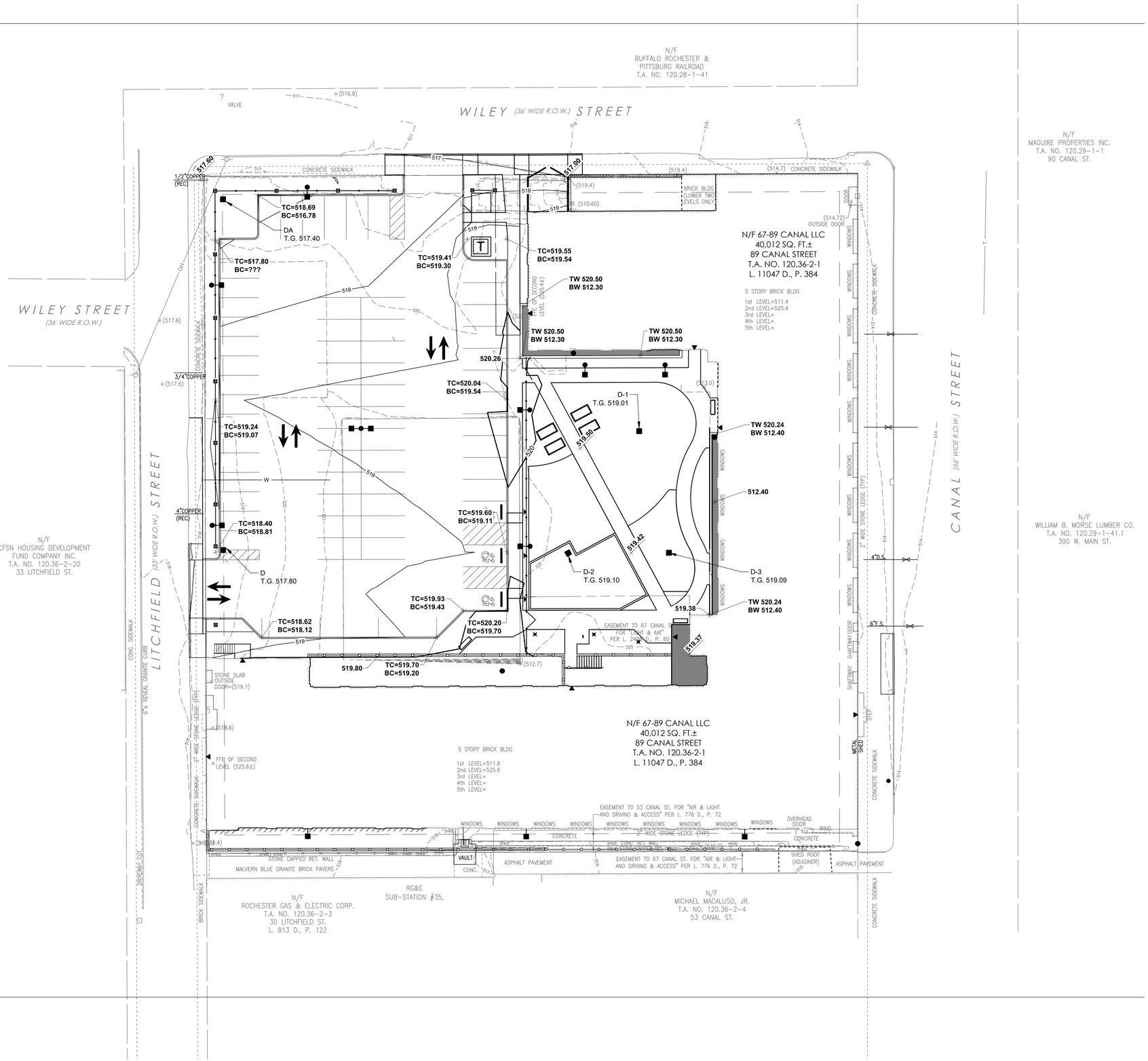

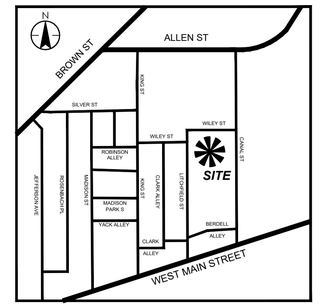

LOCATION MAP

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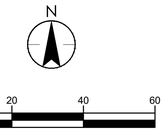

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GRADING PLAN

REVISION

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DATE
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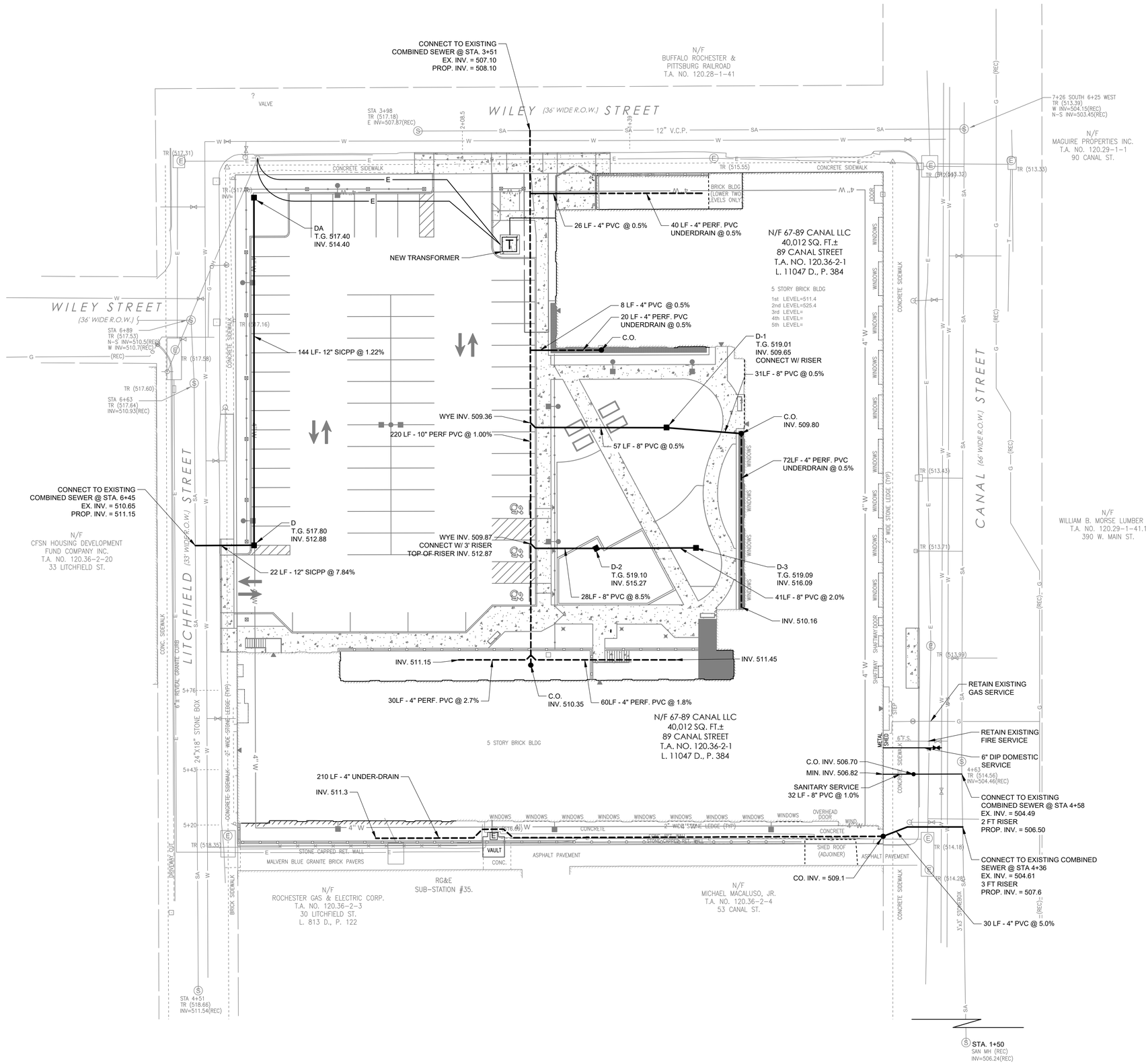

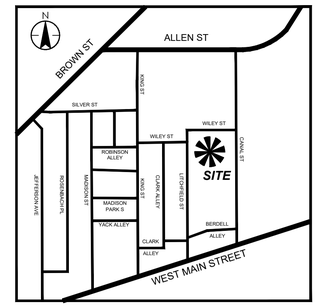

LOCATION MAP

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UTILITY PLAN

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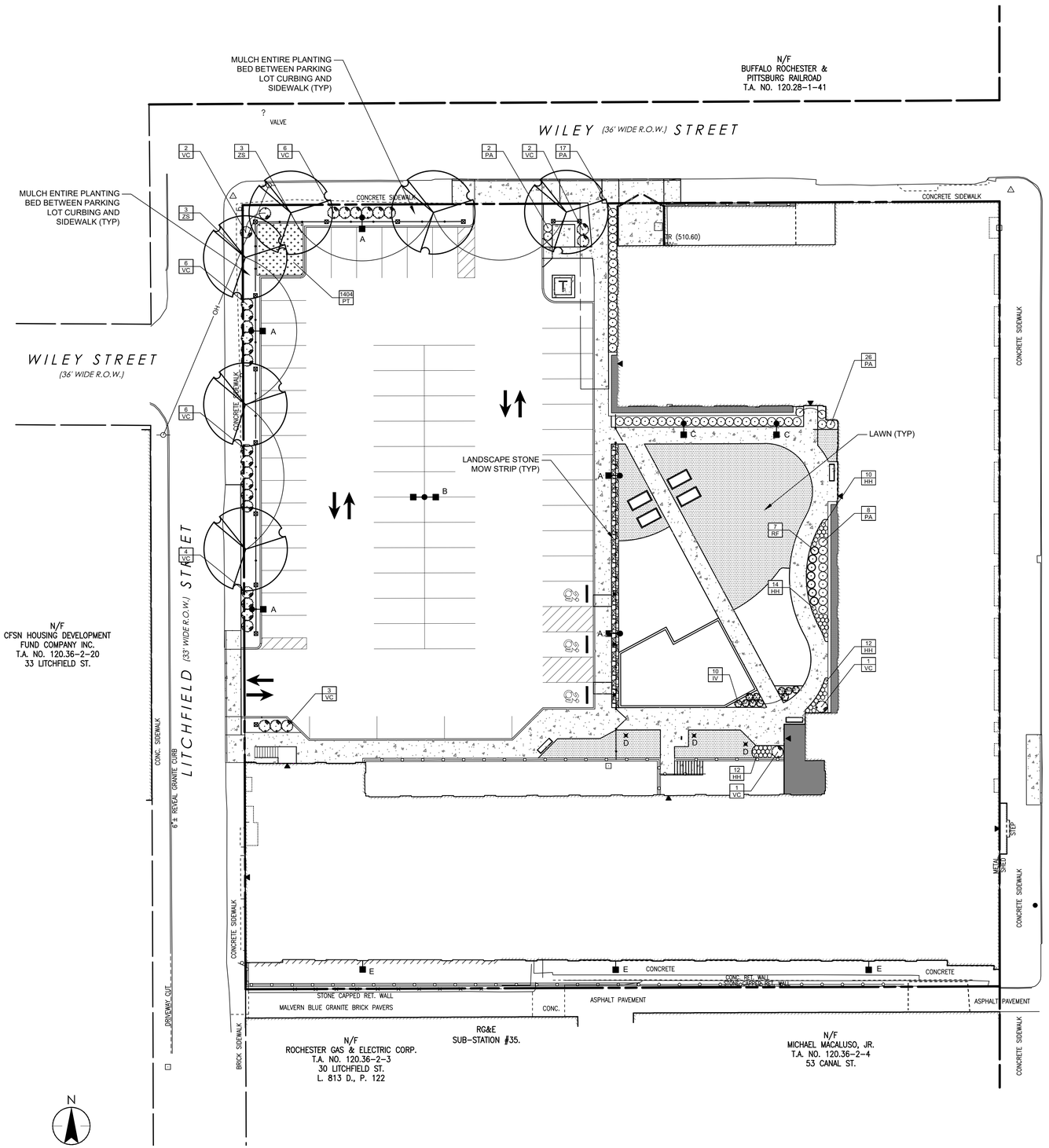

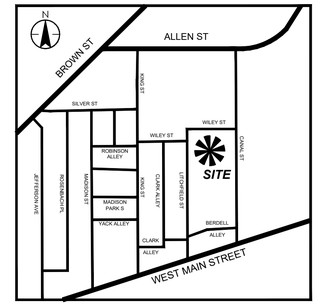

LOCATION MAP

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PLANT MATERIAL LIST

QUAN.	KEY	LATIN NAME	COMMON NAME	CAL.	ROOT	SPREAD OR HEIGHT	REMARKS
26	HH	HEMEROCALLIS 'HAPPY RETURNS'	HAPPY RETURNS DAYLILY	-	#2 CONT.	12-18" HT	-
10	IV	ITEA VIRGINICA 'SPRICH'	LITTLE HENRY SWEETSPIRE	-	#3 CONT.	15-18" HT	-
51	PA	PENNISETUM ALOPEUROIDES 'MOUDRY'	MOUDRY BLACK FOUNTAIN GRASS	-	#3 CONT.	-	CLUMP
1,404	PT	PACHYSANDRA TERMINALIS	PACHYSANDRA	-	2-1/4" PEAT POT	-	6" O.C.
7	RF	ROSA VAR. 'FLOWER CARPET SCARLET'	SCARLET CARPET ROSE	-	#2 CONT.	18"-24" HT	-
32	VC	VIBURNUM CARLESII ' COMPACTUM'	COMPACT KOREAN SPICE VIBURNUM	-	#5 CONT.	18"-24" HT	-
6	ZS	ZELKOVA SERRATA 'GREEN VASE'	GREEN VASE ZELKOVA	2.5"-3"	B&B	-	-

LUMINAIRE SCHEDULE

Symbol	Qty	Luminaire	Pole	Description	Lamp	Lumens	LLF	Watts
A	5	McGRAW-EDISON	14'	GLEON-AF-02-LED-E1-SL2-T3/SL3	LED	N/A	0.90	XXX
B	1	McGRAW-EDISON	14'	DOUBLE GLEON-AF-02-LED-E1-SL2-T3/SL3	LED	N/A	0.90	XXX
C	2	McGRAW-EDISON	10'	GLEON-AF-02-LED-E1-SL2-T3/SL3	LED	N/A	0.90	XXX
D	3	US ARCHITECTURAL	42"	RZRB1-PLED-111-M-20LED-350MA-TRA	LED	N/A	0.90	XX
E	3	McGRAW-EDISON	12' MOUNT	GWC-AF-02-LED-E1-SL2	LED	N/A	0.90	XXX

*COORDINATE LIGHTING WITH ELECTRIC SITE PLAN

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LANDSCAPE AND LIGHTING PLAN

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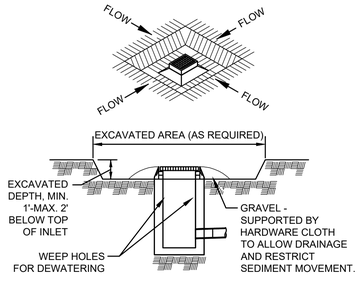

CONSTRUCTION SPECIFICATIONS

NOTES:
1. CLEAR THE AREA OF ALL DEBRIS THAT WILL HINDER EXCAVATION.
2. GRADE APPROACH TO THE INLET UNIFORMLY AROUND THE BASIN.
3. WEEP HOLES SHALL BE PROTECTED BY GRAVEL.
4. UPON STABILIZATION OF CONTRIBUTING DRAINAGE AREA, SEAL WEEP HOLES. FILL BASIN WITH STABLE SOIL TO FINAL GRADE. COMPACT IT PROPERLY AND STABILIZE WITH PERMANENT SEEDING.
5. MAXIMUM DRAINAGE AREA 1 ACRE.

1 C500 EXCAVATED INLET PROTECTION DETAIL

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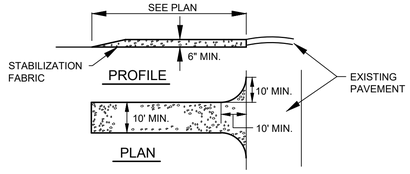
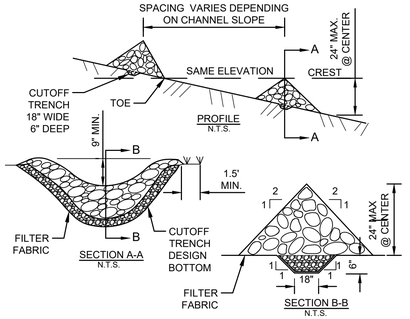


CONSTRUCTION NOTES:
1. STONE SIZE - USE 2" STONE, OR RECLAIMED CONCRETE EQUIVALENT.
2. LENGTH - AS REQUIRED, BUT NOT LESS THAN 50 FEET (EXCEPT ON A SINGLE RESIDENCE LOT WHERE A 30 FOOT MINIMUM LENGTH WOULD APPLY).
3. THICKNESS - NOT LESS THAN SIX (6) INCHES.
4. WIDTH - TEN (10) FOOT MINIMUM, BUT NOT LESS THAN THE FULL WIDTH AT POINTS WHERE INGRESS OR EGRESS OCCURS.
5. STABILIZATION FABRIC - WILL BE PLACED OVER THE ENTIRE AREA PRIOR TO PLACING STONE.
6. SURFACE WATER - ALL SURFACE WATER FLOWING OR DIVERTED TOWARD CONSTRUCTION ENTRANCES SHALL BE PIPED ACROSS THE ENTRANCE. IF PIPING IS IMPRACTICAL, A MOUNTABLE BERM WITH 5:1 SIDE SLOPES WILL BE PERMITTED.
7. MAINTENANCE - THE ENTRANCE SHALL BE MAINTAINED IN A CONDITION WHICH WILL PREVENT TRACKING OR FLOWING OF SEDIMENT ONTO PUBLIC RIGHTS-OF-WAY. THIS MAY REQUIRE PERIODIC TOP DRESSING WITH ADDITIONAL STONE AS CONDITIONS DEMAND AND REPAIR AND/OR CLEANOUT OF ANY MEASURES USED TO TRAP SEDIMENT. ALL SEDIMENT SPILLED DROPPED, WASHED OR TRACKED ONTO PUBLIC RIGHTS-OF-WAY MUST BE REMOVED IMMEDIATELY.
8. WASHING - WHEELS SHALL BE CLEANED TO REMOVE SEDIMENT PRIOR TO ENTRANCE ONTO PUBLIC RIGHTS-OF-WAY. WHEN WASHING IS REQUIRED, IT SHALL BE DONE ON AN AREA STABILIZED WITH STONE AND WHICH DRAINS TO AN APPROVED SEDIMENT TRAPPING DEVICE.
9. PERIODIC INSPECTION AND NEEDED MAINTENANCE SHALL BE PROVIDED AFTER EACH RAIN.

2 C500 STABILIZED CONSTRUCTION ENTRANCE

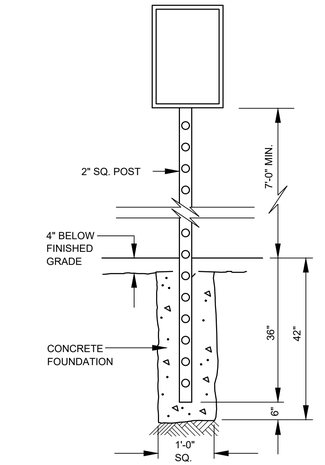
N.T.S.



NOTES:
1. STONE WILL BE PLACED ON A FILTER FABRIC FOUNDATION TO THE LINES, GRADES AND LOCATIONS SHOWN IN THE PLAN.
2. SET SPACING OF CHECK DAMS TO ASSUME THAT THE ELEVATIONS OF THE CREST OF THE DOWNSTREAM DAM IS AT THE SAME ELEVATION OF THE TOE OF THE UPSTREAM DAM.
3. EXTEND THE STONE A MINIMUM OF 1.5 FEET BEYOND THE DITCH BANKS TO PREVENT CUTTING AROUND THE DAM.
4. PROTECT THE CHANNEL DOWNSTREAM OF THE LOWEST CHECK DAM FROM SCOUR AND EROSION WITH STONE OR LINER AS APPROPRIATE.
5. ENSURE THAT CHANNEL APPURTENANCES SUCH AS CULVERT ENTRANCES BELOW CHECK DAMS ARE NOT SUBJECT TO DAMAGE OR BLOCKAGE FROM DISPLACED STONE.

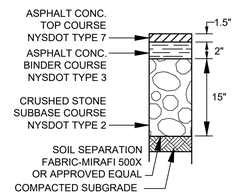
3 C500 STONE CHECK DAM

N.T.S.



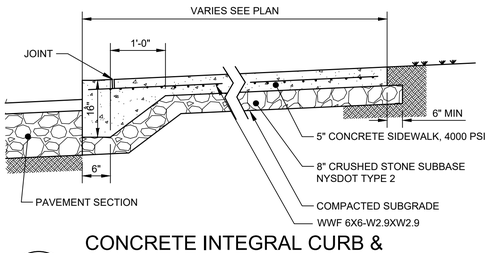
4 C500 TYPICAL SIGN POST INSTALLATION DETAIL

N.T.S.



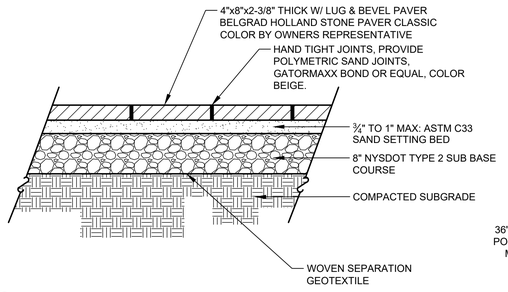
5 C500 ASPHALT PAVING SECTION

N.T.S.



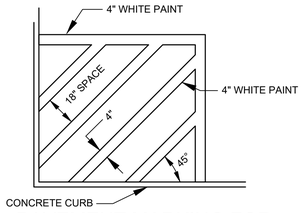
6 C500 CONCRETE INTEGRAL CURB & SIDEWALK ON PRIVATE PROPERTY

N.T.S.



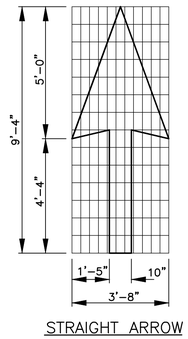
7 C500 PAVER DETAIL

N.T.S.



9 C500 PAVEMENT MARKING FOR NO PARKING DETAIL

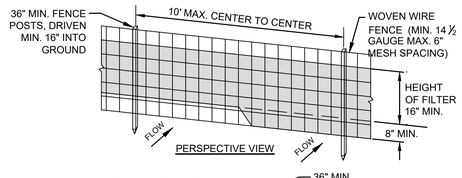
N.T.S.



STRAIGHT ARROW

10 C500 PAVEMENT ARROW PAINTING DETAIL

N.T.S.



CONSTRUCTION NOTES FOR FABRICATED FENCE:

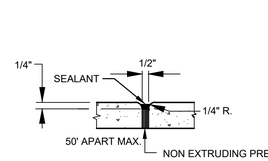
1. WOVEN WIRE FENCE TO BE FASTENED SECURELY TO FENCE WITH WIRE TIES OR STAPLES.
2. FILTER CLOTH TO BE FASTENED SECURELY TO WOVEN WIRE FENCE WITH TIES SPACED EVERY 24" AT TOP AND MID SECTION.
3. WHEN TWO SECTIONS OF FILTER CLOTH ADJOIN EACH OTHER, THEY SHALL BE OVER-LAPPED BY SIX INCHES AND FOLDED.
4. MAINTENANCE SHALL BE PERFORMED AS NEEDED AND MATERIAL REMOVED WHEN "BULGES" DEVELOP IN THE SILT FENCE.

POSTS: STEEL EITHER T OR U TYPE 2" HARDWOOD
FENCE: WOVEN WIRE, 14 GA. 6" MAX. MESH OPENING FILTER
CLOTH: FILTER X, MIRAFI 100X, STABILINKA T140N OR APPROVED EQUAL

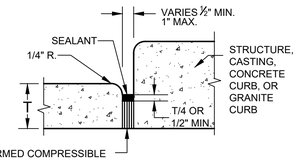
PREFABRICATED UNIT: GEOFAB, ENVIROFENCE, OR APPROVED EQUAL

11 C500 SILT FENCE

N.T.S.

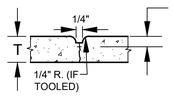


EXPANSION JOINT



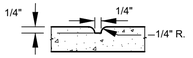
ISOLATION JOINT

NON EXTRUDING PREFORMED COMPRESSIBLE JOINT FILLER EXTEND JOINT FILLER FULL WIDTH AND DEPTH OF JOINT AND NOT LESS THAN 1" OR MORE THAN 1-½" BELOW FINISHED SURFACE. PROVIDE IN ONE PIECE LENGTHS WHEREVER POSSIBLE.

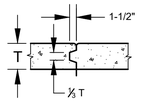


5' APART MAX.

CONTRACTION JOINT



DUMMY JOINT
(IF REQUIRED)

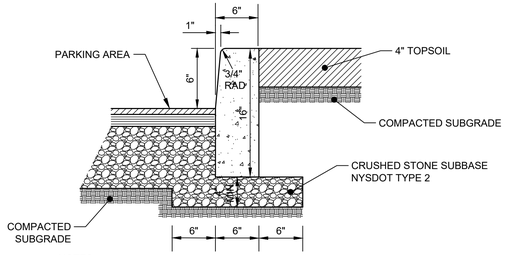


CONSTRUCTION JOINT

NOTES:
1. SIDEWALK SHOULD BE SAW CUT IN CONSISTENTLY SIZED SQUARES OR RECTANGLES
2. JOINT PATTERN SHOULD HAVE NO ANGLE LESS THAN 60 DEGREES AND BE CONSISTENT WITH SURFACE PATTERN.
3. EXPANSION JOINTS SHALL BE USED ONCE EVERY 50 FEET FOR SIDEWALK LENGTHS EXCEEDING 50' IN LENGTH.
4. REINFORCEMENT TO BE DISCONTINOUS THROUGH CONTRACTION, EXPANSION AND CONSTRUCTION JOINTS.

8 C500 CONCRETE JOINT DETAILS

N.T.S.



NOTES:
1. CONTRACTION JOINTS 10 FEET ON CENTER TO DEPTH OF , THE CURB THICKNESS.
2. EXPANSION JOINTS WITH PREMOLDED FILLER 50 FEET ON CENTER
3. EXPOSED CONCRETE SURFACE TO HAVE A LIGHT BROOM FINISH

12 C500 CONCRETE CURB DETAIL

N.T.S.

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RENOVATIONS TO 67-89 CANAL STREET
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REVISION

HCR SUBMISSION

PLAN PROJECT No.
081.18.01.01
SHARS ID No.

DATE
November 15, 2019

c500

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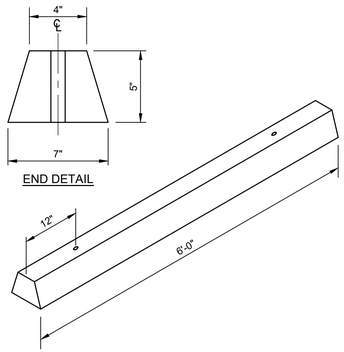
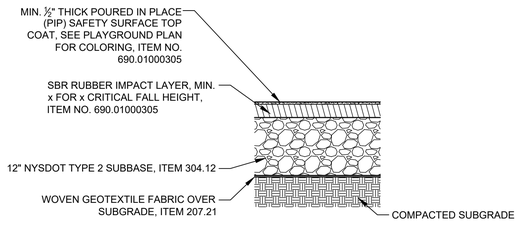
2019-11-19 2:02 PM By:Dornich, Michael

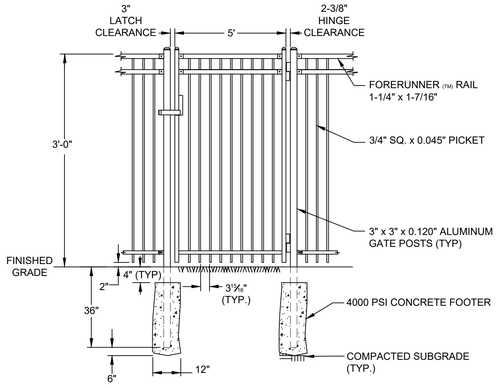


SPECIFICATIONS:
CONCRETE: 4000 P.S.I. @ 28 DAYS
ENTRAINED AIR: 5% - 9%
STEEL: A.S.T.M. 496-A615 GRADE 60-60 KSI.
WEIGHT: 168

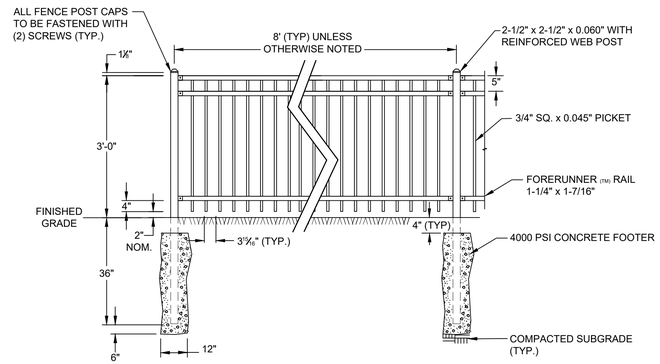
1 C501 WHEEL STOP
N.T.S.



12 C501 PLAYGROUND SURFACING
N.T.S.

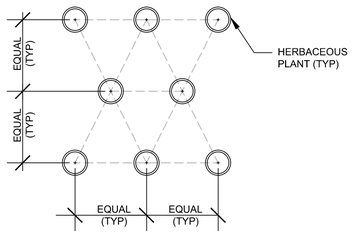


GATE

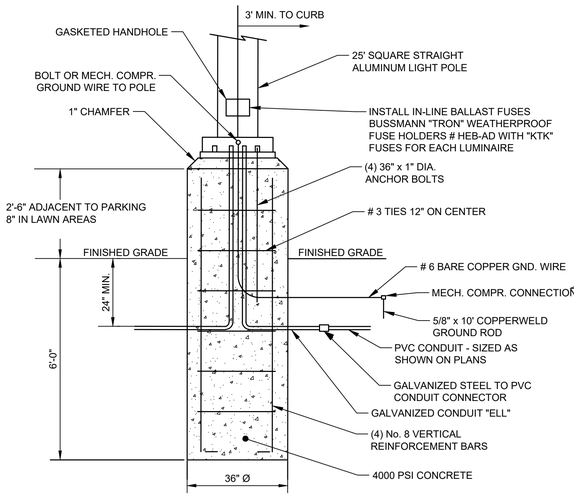


FENCE

NOTES:
1. FENCE AND GATES SHALL BE BLACK, ECHELON PLUS MAJESTIC 3-RAIL COMMERCIAL STRENGTH ALUMINUM FENCE AS MANUFACTURED BY AMERISTAR FENCING OR APPROVED EQUAL.

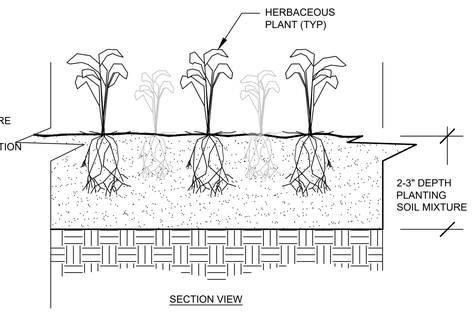


PLAN VIEW



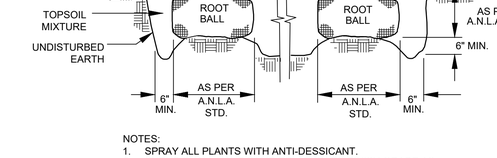
NOTE: VERIFY BASE DIMENSIONS WITH POLE BASE REQUIREMENTS

3 C501 LIGHT POLE BASE DETAIL
N.T.S.



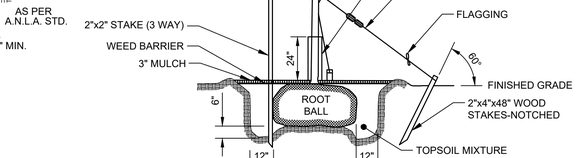
SECTION VIEW

4 C501 GROUNDCOVER PLANTING
N.T.S.



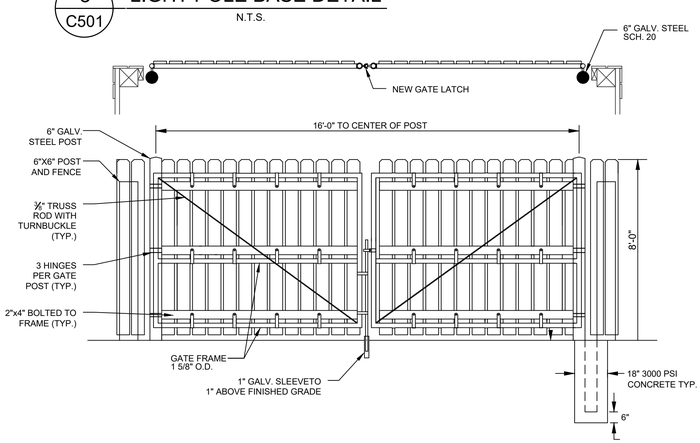
NOTES:
1. SPRAY ALL PLANTS WITH ANTI-DESSICANT.
2. SHRUB SHALL HAVE SAME RELATION TO FINISH GRADE AS EXISTED AT NURSERY.
3. IF BALLED & BURLAPPED, REMOVE TOP 1/3 OF BURLAP.

5 C501 SHRUB PLANTING
N.T.S.



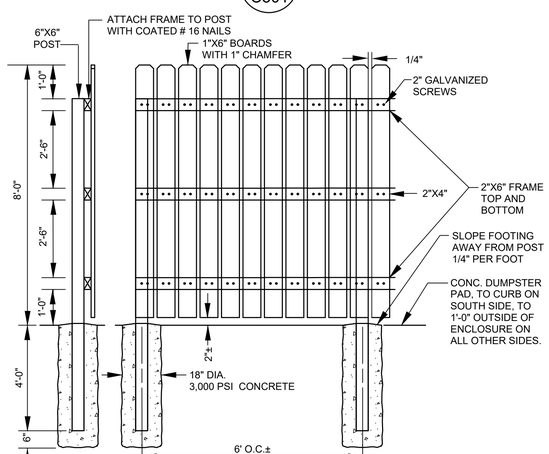
NOTES:
1. USE 8' STAKES DRIVE 48" BELOW GROUND.
2. ROOT COLLAR TO BE SLIGHTLY ABOVE SURROUNDING GRADE.

6 C501 TREE PLANTING
N.T.S.



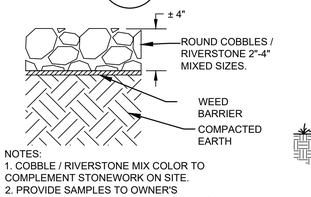
NOTE:
1. ALL WOOD TO MATCH DUMPSTER ENCLOSURE DETAIL.

7 C501 DUMPSTER ENCLOSURE GATE DETAIL
N.T.S.



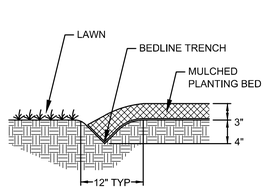
NOTES: 1. ALL WOOD TO BE PRESSURE TREATED.

8 C501 DUMPSTER ENCLOSURE DETAIL
N.T.S.

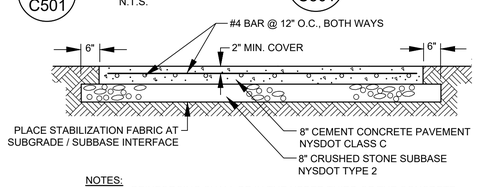


NOTES:
1. COBBLE / RIVERSTONE MIX COLOR TO COMPLEMENT STONEWORK ON SITE.
2. PROVIDE SAMPLES TO OWNER'S REPRESENTATIVE FOR FINAL COLOR AND SIZE APPROVAL.

9 C501 LANDSCAPE STONE
N.T.S.



10 C501 PLANTING BED EDGE TREATMENT
N.T.S.



NOTES:
1. STEEL REINFORCING SHALL BE IN THE UPPER THIRD OF THE CONCRETE.
2. CONTROL JOINTS SHALL BE SPACED EVERY 10'.

11 C501 CONCRETE DUMPSTER PAD DETAIL
N.T.S.

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PLAN PROJECT No.
081.18.01.01
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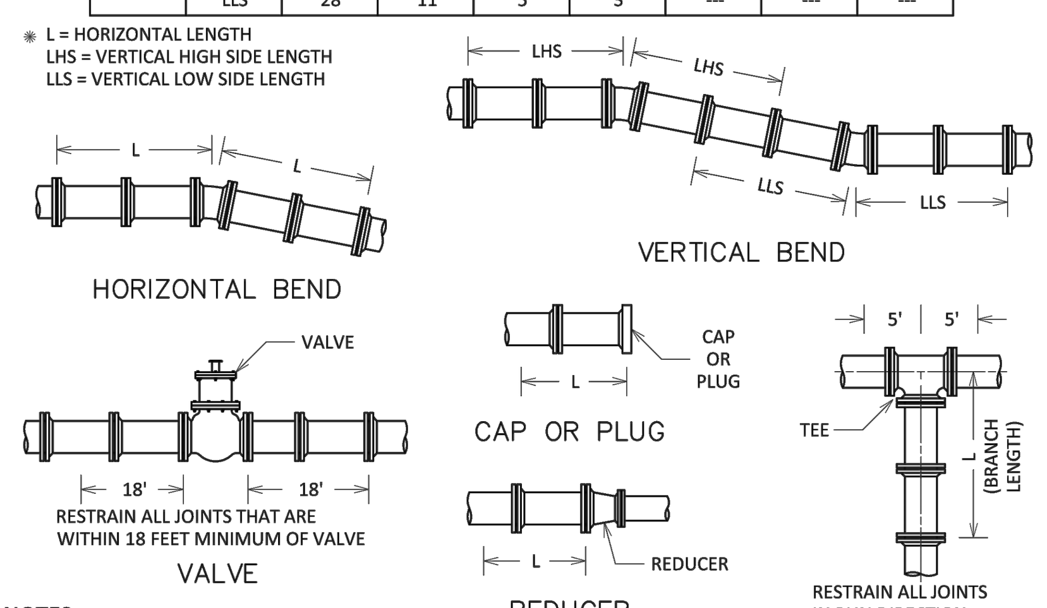
MINIMUM RESTRAINED LENGTH FOR WATER MAIN PIPE ADJACENT TO FITTINGS (IN FEET) (BASED ON INTERNAL PRESSURE OF 150 PSI) (SEE NOTE 1)								
PIPE SIZE (INCHES)	MINIMUM LENGTH ⁕	90°	45°	22-1/2°	11-1/4°	REDUCER	TEE	CAP PLUG
4" - 6"	L	16	7	3	2	29	16	56
	LHS	49	24	12	6	---	---	---
	LLS	16	6	3	2	---	---	---
8"	L	20	9	4	2	31	33	74
	LHS	64	31	15	8	---	---	---
	LLS	20	8	4	2	---	---	---
12"	L	28	12	6	3	56	64	105
	LHS	91	44	21	11	---	---	---
	LLS	28	11	5	3	---	---	---

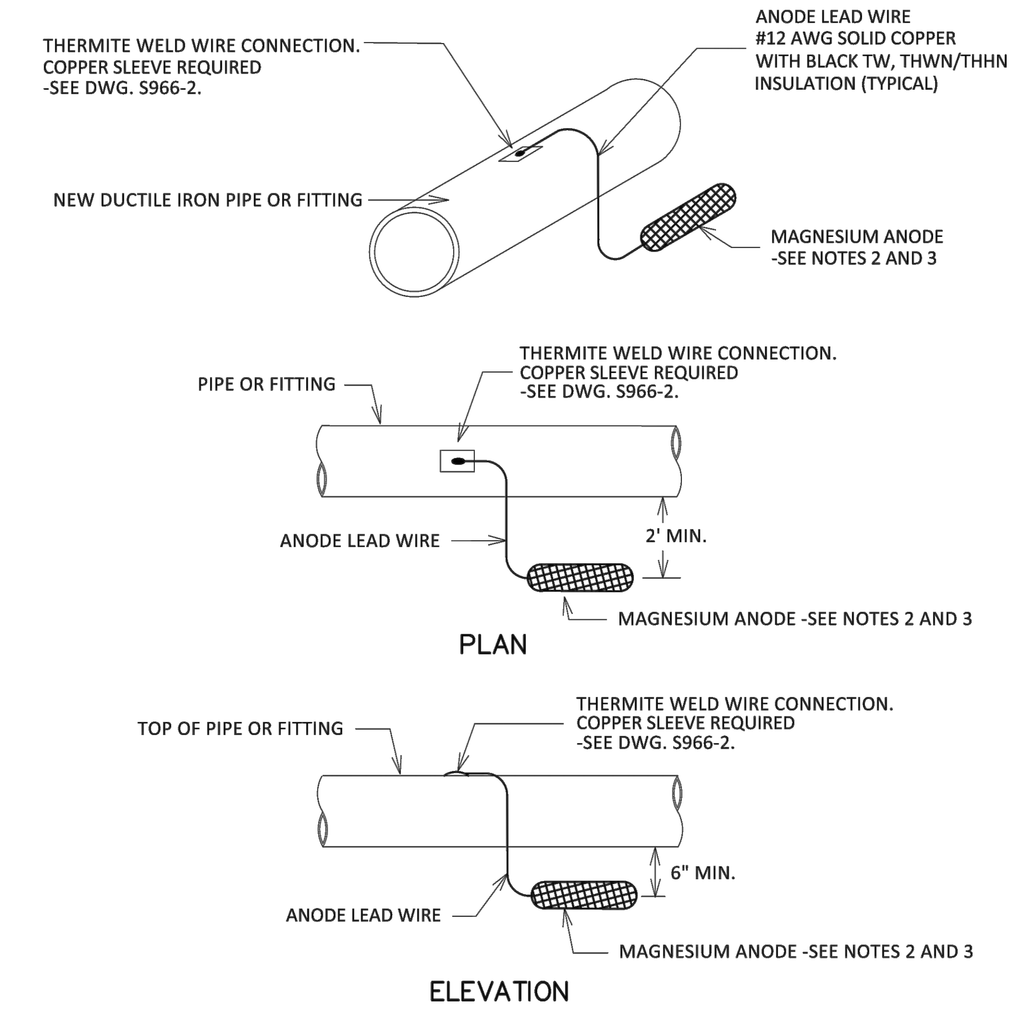
⁕ L = HORIZONTAL LENGTH
LHS = VERTICAL HIGH SIDE LENGTH
LLS = VERTICAL LOW SIDE LENGTH



NOTES:

1. SPECIAL DESIGN IS REQUIRED FOR FITTINGS ON DOMESTIC WATER MAIN PIPE LARGER THAN 12 INCHES AND FOR REDUCERS HAVING MORE THAN ONE PIPE SIZE DIFFERENCE.
2. CONCRETE THRUST BLOCK IS TO BE USED IN ADDITION TO MECHANICAL RESTRAINT DEVICES, SEE DETAILS S900-4 AND S900-5.
3. ALL PLASTIC AND POLYETHYLENE WRAPPED DUCTILE IRON DOMESTIC WATER MAIN PIPE AND FITTING JOINTS WITHIN L-LHS-LLS DIMENSIONS MUST BE RESTRAINED USING APPROVED MECHANICAL RESTRAINT DEVICE.
4. ASSUMPTION: SP SOILS, 4.50 FEET COVER, AND TYPE 4 LAYING CONDITION.

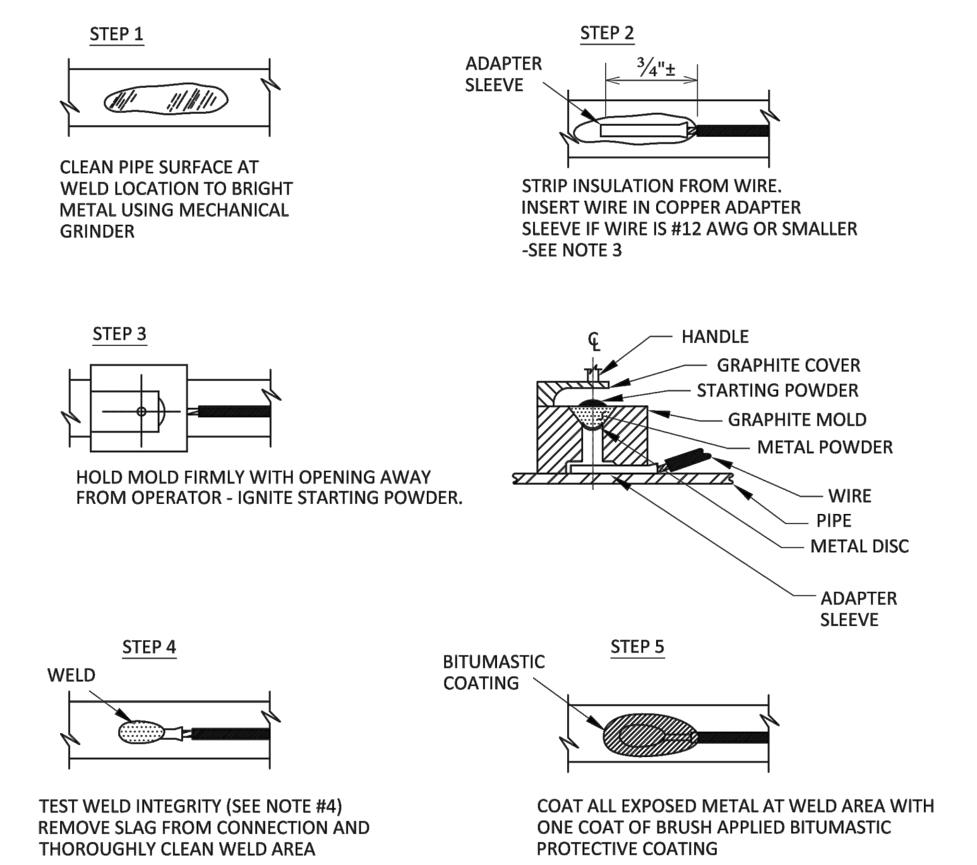
CITY OF ROCHESTER
WATER MAIN PIPE RESTRAINT DOMESTIC SYSTEM
ISSUED 5-8-08 NON-STANDARD
REVISED 9-1-09 DWG.NO.S900-7



NOTES:

1. PIPE/FITTING PROTECTIVE WRAP IS NOT SHOWN FOR CLARITY. UNLESS OTHERWISE NOTED, DUTILE IRON WATER MAIN SHALL BE WRAPPED WITH POLYETHYLENE WRAP AND NON-EPOXY COATED DUCTILE IRON FITTINGS ON PLASTIC WATER MAINS SHALL BE COATED WITH PRIMER AND WAX TAPE.
2. USE HIGH POTENTIAL MAGNESIUM ANODE IN PREPACKAGED CLOTH BAG WITH BACKFILL. WEIGHT OF ANODE INGOT (EXCLUDING BACKFILL) AND SPACING OF ANODES ALONG DUCTILE IRON WATER MAIN AS NOTED ON PLANS OR AS DIRECTED BY PROJECT MANAGER.
3. ANODE IS TO BE PLACED IN TRENCH WITH ANODE CENTERLINE 6 INCHES MINIMUM BELOW BOTTOM OF PIPE OR FITTING AND 2 FEET MINIMUM FROM SIDE WALL OF PIPE OR FITTING. ANODE TO BE SURROUNDED WITH NATIVE BACKFILL.

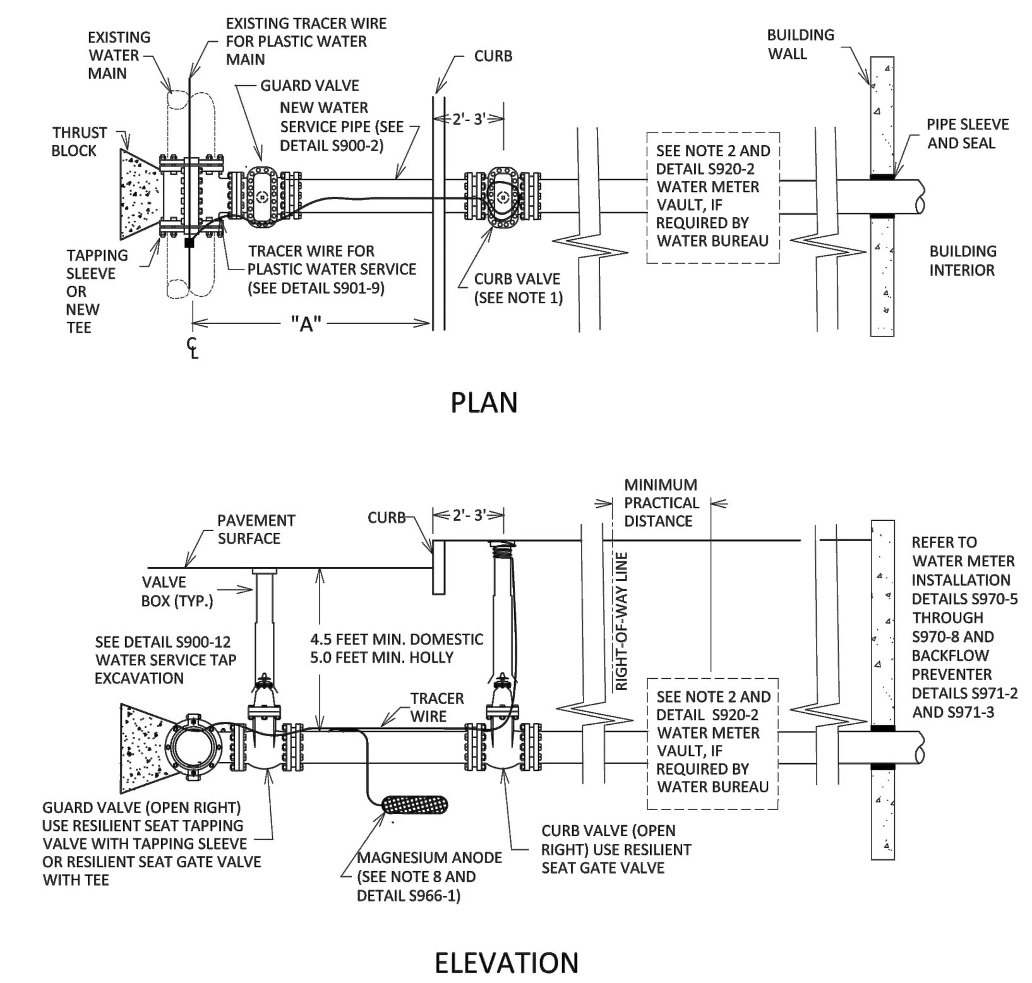
CITY OF ROCHESTER
ANODE AT NEW DUCTILE IRON WATER MAIN OR DUCTILE IRON FITTING ON NEW PLASTIC WATER MAIN
ISSUED 3-21-02 NON-STANDARD
REVISED 12-28-10 DWG.NO.S966-1



NOTES:

1. FOLLOW MANUFACTURER'S PROCEDURES AND RECOMMENDATIONS WHEN THERMITE WELDING.
2. USE APPROPRIATE WELD MOLDS AND WELD METALS FOR SPECIFIC SIZE AND MATERIAL OF PIPE THAT WIRE IS BEING ATTACHED TO.
3. WHEN THERMITE WELDING #12 AWG WIRES OR SMALLER, INSERT END OF WIRE INTO AN APPROVED COPPER SLEEVE PRIOR TO THERMITE WELDING AND CRIMP SLEEVE ON WIRE.
4. TEST WELD INTEGRITY BY STRIKING WELD WITH A HAMMER AFTER WELD HAS COOLED. AVOID STRIKING WIRE.

CITY OF ROCHESTER
THERMITE WELD DETAILS
ISSUED 10-17-08 NON-STANDARD
REVISED 12-28-10 DWG.NO.S966-2



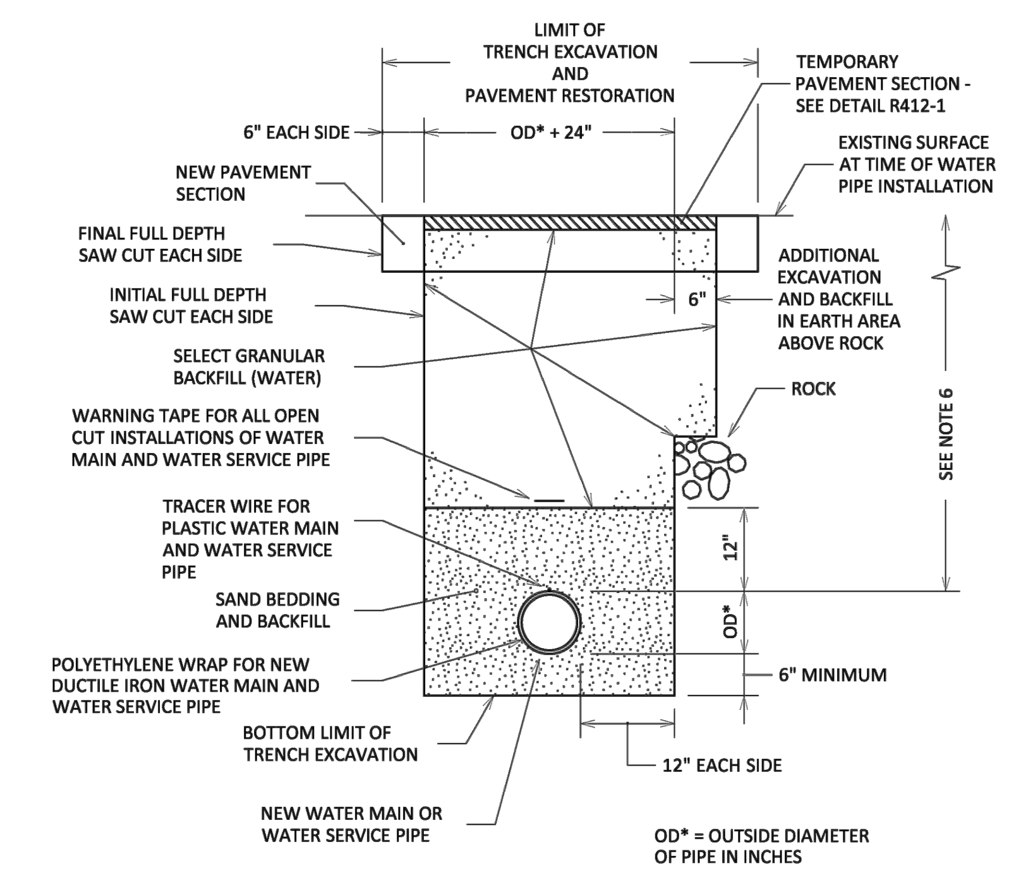
NOTE:
FOR NEW WATER SERVICE NOTES, SEE DETAIL S970-5

CITY OF ROCHESTER
NEW WATER SERVICE 4 INCH AND LARGER ON EXISTING WATER MAIN
ISSUED 8-8-11 NON-STANDARD
REVISED DWG.NO.S970-4

NOTES:

1. IF DIMENSION "A" BETWEEN THE CENTERLINE OF THE WATER MAIN AND THE FACE OF CURB IS 6 FEET OR LESS, THE CURB VALVE IS NOT REQUIRED. CURB VALVE IS REQUIRED WHEN DIMENSION "A" EXCEEDS 6 FEET.
2. A METER VAULT MAY BE REQUIRED FOR A DOMESTIC SERVICE, WHEN THE WATER SERVICE LENGTH, AS MEASURED FROM THE STREET RIGHT-OF-WAY LINE TO THE BUILDING WALL, EXCEEDS 100 FEET. WHEN THE WATER SERVICE LENGTH EXCEEDS 100 FEET, THE WATER BUREAU WILL REVIEW EACH NEW WATER SERVICE PLAN TO DETERMINE IF THE METER SHOULD EITHER BE PLACED; INSIDE OF THE HEATED BUILDING; IN A METER VAULT OUTSIDE OF THE BUILDING NEAR THE RIGHT-OF-WAY LINE OR IN A HEATED ABOVE GROUND ENCLOSURE NEAR THE RIGHT-OF-WAY LINE.
3. ALL JOINTS ON NEW WATER SERVICE PIPE, FITTINGS AND VALVES SHALL BE MECHANICALLY RESTRAINED. CONCRETE THRUST BLOCKS ARE ALSO REQUIRED AT FITTINGS PER DETAIL DRAWINGS S900-4, S900-5, S900-9 AND S900-10.
4. A BACKFLOW PREVENTION DEVICE IS REQUIRED ON ALL DOMESTIC WATER SERVICES 1½ AND LARGER.
5. NEW WATER SERVICE SHALL BE PRESSURE TESTED FROM GUARD VALVE TO WITHIN 5 FEET OF EXTERIOR BUILDING WALL. PRESSURE TESTING SHALL BE PERFORMED IN ACCORDANCE WITH SPECIFICATION S900-3.05. PIPE, FITTING AND VALVE JOINTS ON PORTION OF SERVICE NOT SUBJECT TO PRESSURE TEST SHALL BE LEAK TESTED AT NORMAL OPERATING PRESSURE.
6. WHEN THE LENGTH OF THE NEW WATER SERVICE EXCEEDS 50 FEET, WATER SERVICE SHALL BE DISINFECTED USING THE CONTINUOUS FEED METHOD IN ACCORDANCE WITH SPECIFICATION S900-3.06. FOR WATER SERVICES LESS THAN 50 FEET, ALL WATER SERVICE PIPE, FITTINGS AND VALVES SHALL BE SPRAY OR SWAB DISINFECTED WITH 1%-5% CHLORINE SOLUTION.
7. ON PLASTIC WATER SERVICES, WHEN DIMENSION "A" IS 6 FEET OR LESS AND THE CURB VALVE IS NOT REQUIRED, EXTEND TRACER WIRE ALONG SERVICE TO RIGHT-OF-WAY LINE AND INSTALL TRACER WIRE TERMINATION BOX AT RIGHT-OF-WAY.
8. ONE MAGNESIUM ANODE IS TO BE INSTALLED ON EACH PIECE OF NEW DUCTILE IRON WATER SERVICE PIPE BETWEEN THE WATER MAIN AND RIGHT-OF-WAY LINE. SEE DETAIL S966-2. USE 17 POUND ANODE ON 4 INCH AND 6 INCH PIPE, 32 POUND ANODE ON 8 INCH AND 10 INCH PIPE AND 48 POUND ANODE ON 12 INCH PIPE.
9. ALL DUCTILE IRON WATER SERVICE PIPE, FITTINGS AND VALVES LOCATED WITHIN THE STREET RIGHT-OF-WAY ARE TO BE INSTALLED IN POLYETHYLENE ENCASEMENT.
10. IF PLANS CALL FOR THE INSTALLATION OF A TAPPING SLEEVE AND VALVE, BUT THE WATER MAIN CAN NOT BE TAPPED DUE TO SPATIAL LIMITATIONS , A NEW SERVICE TEE WITH A SERVICE VALVE MAY NEED TO BE CUT INTO THE EXISTING WATER MAIN.
11. PROPOSED DEVIATIONS TO THE APPROVED PLANS REQUIRE WATER BUREAU AUTHORIZATION BEFORE BEGINNING THE WORK.

CITY OF ROCHESTER
NEW WATER SERVICE 4 INCH AND LARGER ON EXISTING WATER MAIN – NOTES
ISSUED NON-STANDARD
REVISED DWG.NO.S970-5

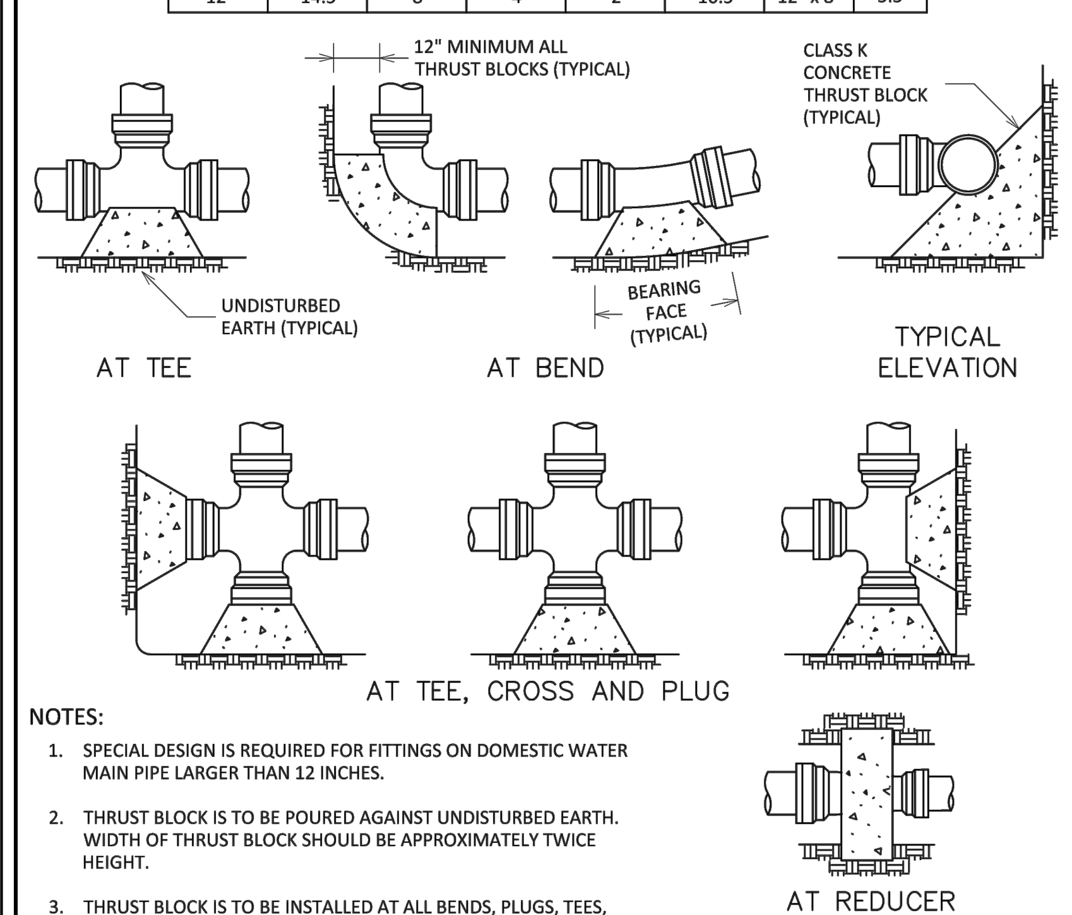


NOTES:

1. LIMITS SHOWN ARE MAXIMUM ALLOWED AND MINIMUM REQUIRED FOR EXCAVATION AND BACKFILL.
2. UPPER LIMIT FOR TRENCH EXCAVATION IS TOP OF EXISTING SURFACE AT TIME OF TRENCH EXCAVATION.
3. UPPER LIMIT FOR ROCK EXCAVATION IS TOP SURFACE OF ROCK.
4. UPPER LIMIT FOR SELECT GRANULAR BACKFILL (WATER) IS BOTTOM OF TEMPORARY PAVEMENT, IF USED, OTHERWISE TOP OF SURFACE.
5. TEMPORARY OR PERMANENT BLOCKS OR ANY OTHER TYPE OF PIPE SUPPORT IS NOT TO BE USED DURING PIPE INSTALLATION.
6. MINIMUM DEPTH OF COVER FOR WATER PIPE FROM TOP OF PROPOSED GRADE IS 4.50 FEET FOR DOMESTIC WATER PIPE, AND 5 FEET FOR HOLLY WATER PIPE, UNLESS OTHERWISE NOTED ON PLANS OR AS DIRECTED BY PROJECT MANAGER.

CITY OF ROCHESTER
WATER TRENCH PAVEMENT REHABILITATION
ISSUED 1-13-06 NON-STANDARD
REVISED 11-22-10 DWG.NO.S900-2

AREA OF BEARING FACE OF THRUST BLOCK IN SQUARE FEET (AREA BASED ON INTERNAL PRESSURE OF 150 PSIG AND SOIL BEARING PRESSURE OF 2000 PSF) (SEE NOTE 1)							
PIPE SIZE	BEND				TEE PLUG	REDUCER	
	90°	45°	22-1/2°	11-1/4°		SIZE	AREA
4" - 6"	4	2.5	1.5	1	3	6" x 4"	2
8"	7	4	2	1	5	8" x 6"	2.5
12"	14.5	8	4	2	10.5	12" x 8"	5.5

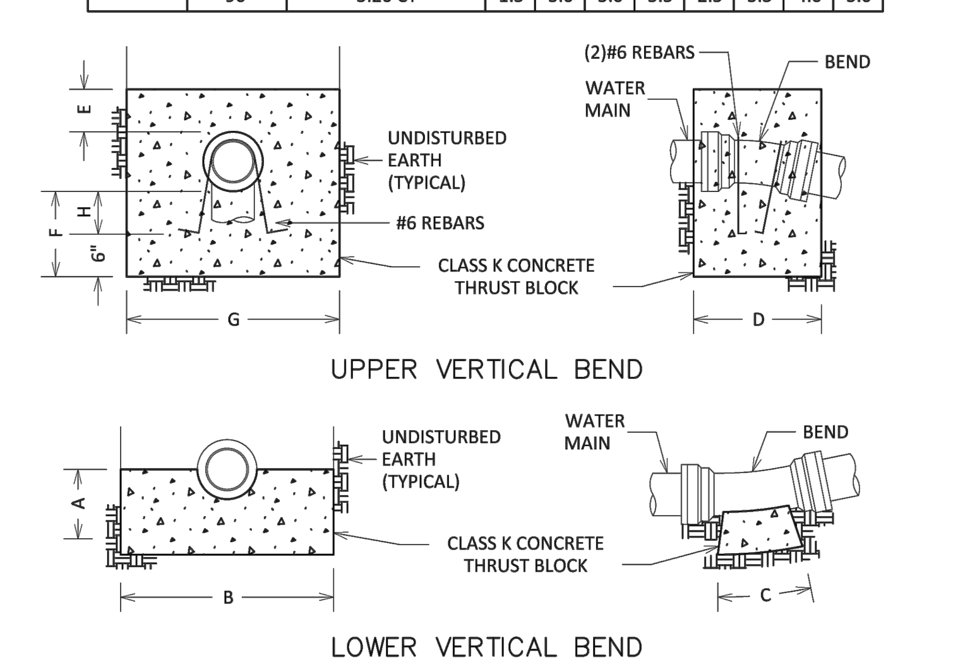


NOTES:

1. SPECIAL DESIGN IS REQUIRED FOR FITTINGS ON DOMESTIC WATER MAIN PIPE LARGER THAN 12 INCHES.
2. THRUST BLOCK IS TO BE POURED AGAINST UNDISTURBED EARTH. WIDTH OF THRUST BLOCK SHOULD BE APPROXIMATELY TWICE HEIGHT.
3. THRUST BLOCK IS TO BE INSTALLED AT ALL BENDS, PLUGS, TEES, AND TAPPING SLEEVE AND VALVE CONNECTIONS.
4. FACTORY CAST OFFSETS ARE TO BE TREATED AS (2) 45 DEGREE BENDS.
5. FOR REDUCERS, THRUST BLOCK IS TO BE KEYED INTO WALLS AND BOTTOM OF TRENCH.
6. MECHANICAL RESTRAINT IS REQUIRED IN ADDITION TO THRUST BLOCK, SEE DETAIL S900-7.
7. WOOD BLOCKING IS NOT PERMITTED.

CITY OF ROCHESTER
HORIZONTAL THRUST BLOCK DOMESTIC SYSTEM
ISSUED 1-13-06 NON-STANDARD
REVISED 8-7-13 DWG.NO.S900-4

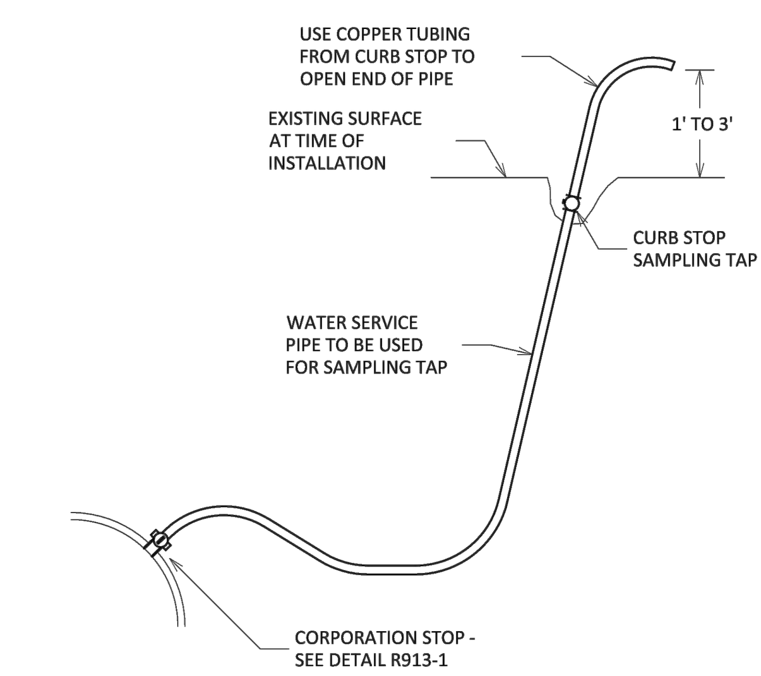
PIPE SIZE (INCHES)	BEND	TOP SECTION MINIMUM VOLUME CONCRETE	A	B	C	D	E	F	G	H
			MINIMUM DIMENSIONS (IN FEET)							
6"	11-1/4°	0.25 CY	1.0	2.5	1.0	1.5	0.5	1.0	2.5	0.5
	22-1/2°	0.50 CY	1.0	2.5	1.0	1.5	1.0	2.0	2.5	1.5
	45°	0.95 CY	1.0	2.5	1.0	3.0	1.5	2.0	2.5	1.5
	90°	1.30 CY	1.0	2.5	2.0	3.5	1.5	2.0	2.5	1.5
8"	11-1/4°	0.45 CY	1.0	2.7	1.0	1.5	1.0	1.5	2.7	1.0
	22-1/2°	0.90 CY	1.0	2.7	1.0	2.5	1.0	2.0	2.7	1.5
	45°	1.65 CY	1.0	2.7	1.5	3.5	1.5	2.0	3.0	1.5
	90°	2.35 CY	1.5	2.7	3.0	4.0	2.0	3.0	3.0	2.5
12"	11-1/4°	1.05 CY	1.0	3.0	1.5	2.5	1.5	2.0	3.0	1.5
	22-1/2°	2.00 CY	1.0	3.0	1.5	4.0	2.0	2.0	3.0	1.5
	45°	3.70 CY	1.5	3.0	3.0	5.0	2.0	3.0	3.5	2.5
	90°	5.20 CY	1.5	3.0	5.0	5.5	2.5	3.5	4.0	3.0



NOTES:

1. SPECIAL DESIGN IS REQUIRED FOR FITTINGS ON DOMESTIC WATER MAIN PIPE LARGER THAN 12 INCHES.
2. MECHANICAL RESTRAINT IS REQUIRED IN ADDITION TO THRUST BLOCK, SEE DETAIL S900-7.

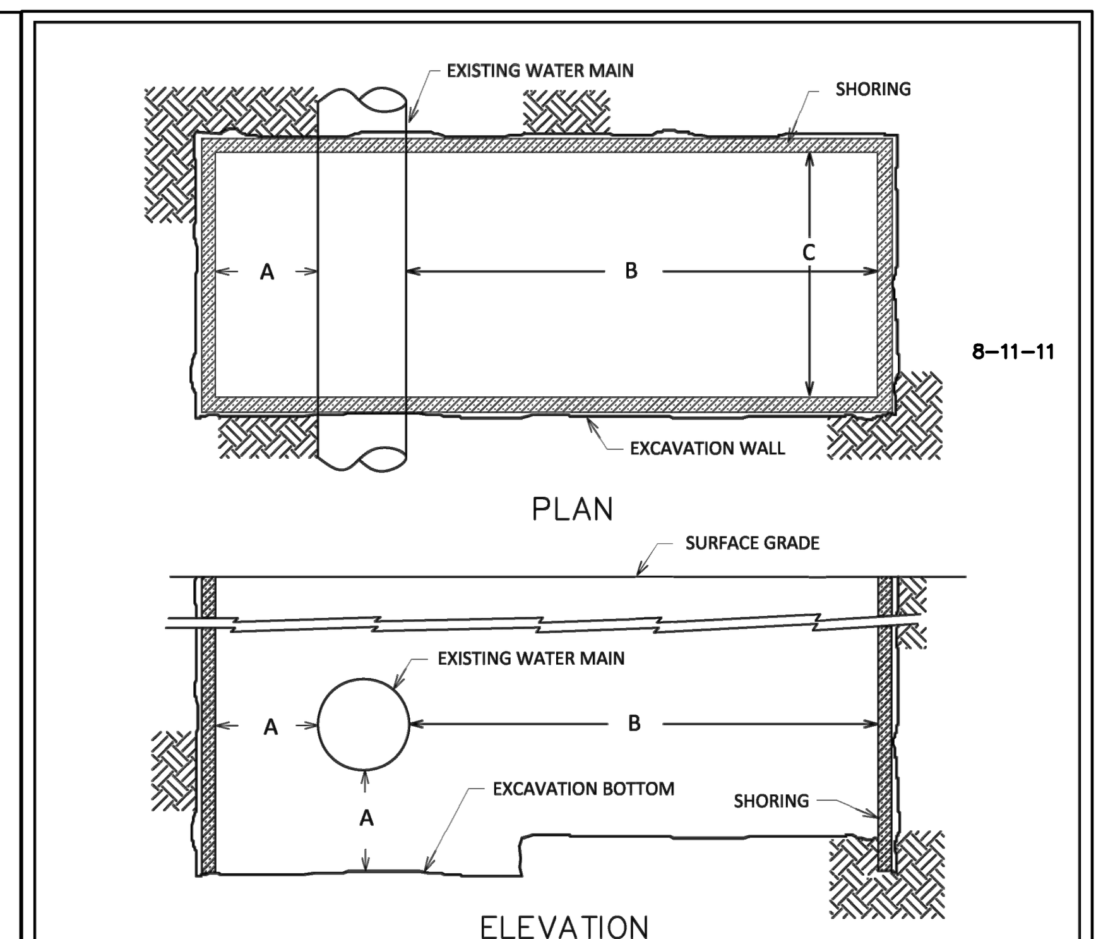
CITY OF ROCHESTER
VERTICAL THRUST BLOCK DOMESTIC SYSTEM
ISSUED 1-13-06 NON-STANDARD
REVISED 6-1-09 DWG.NO.S900-5



NOTES:

1. LOCATION OF SAMPLING TAPS ARE SUBJECT TO PRIOR APPROVAL BY CITY AND MONROE COUNTY DEPARTMENT OF PUBLIC HEALTH.
2. IF SAMPLING TAP IS LOCATED IN PAVED AREA, SAMPLING TAP IS TO BE KEPT BELOW GROUND EXCEPT WHEN IN USE.
3. IF APPROVED BY CITY, SAMPLING TAP MAY BE LOCATED AT SAME LOCATION AS NEW WATER SERVICE.
4. IF SAMPLING TAP IS NOT TO BE USED AS NEW WATER SERVICE, UPON NOTIFICATION OF ACCEPTABLE SAMPLE RESULTS, CORPORATION STOP IS TO BE REMOVED AND REPLACED WITH A BRASS PLUG OR CORPORATION STOP IS TO BE CLOSED, WATER SERVICE PIPE DISCONNECTED FROM CORPORATION AND BRASS CAP INSTALLED ON OUTLET OF CORPORATION STOP.
5. MAXIMUM DISTANCE BETWEEN SAMPLING TAPS ON NEW WATER MAIN INSTALLATION IS 1,000 FEET.

CITY OF ROCHESTER
DISINFECTION SAMPLING TAP
ISSUED 1-13-06 NON-STANDARD
REVISED 2-19-15 DWG.NO.S900-6

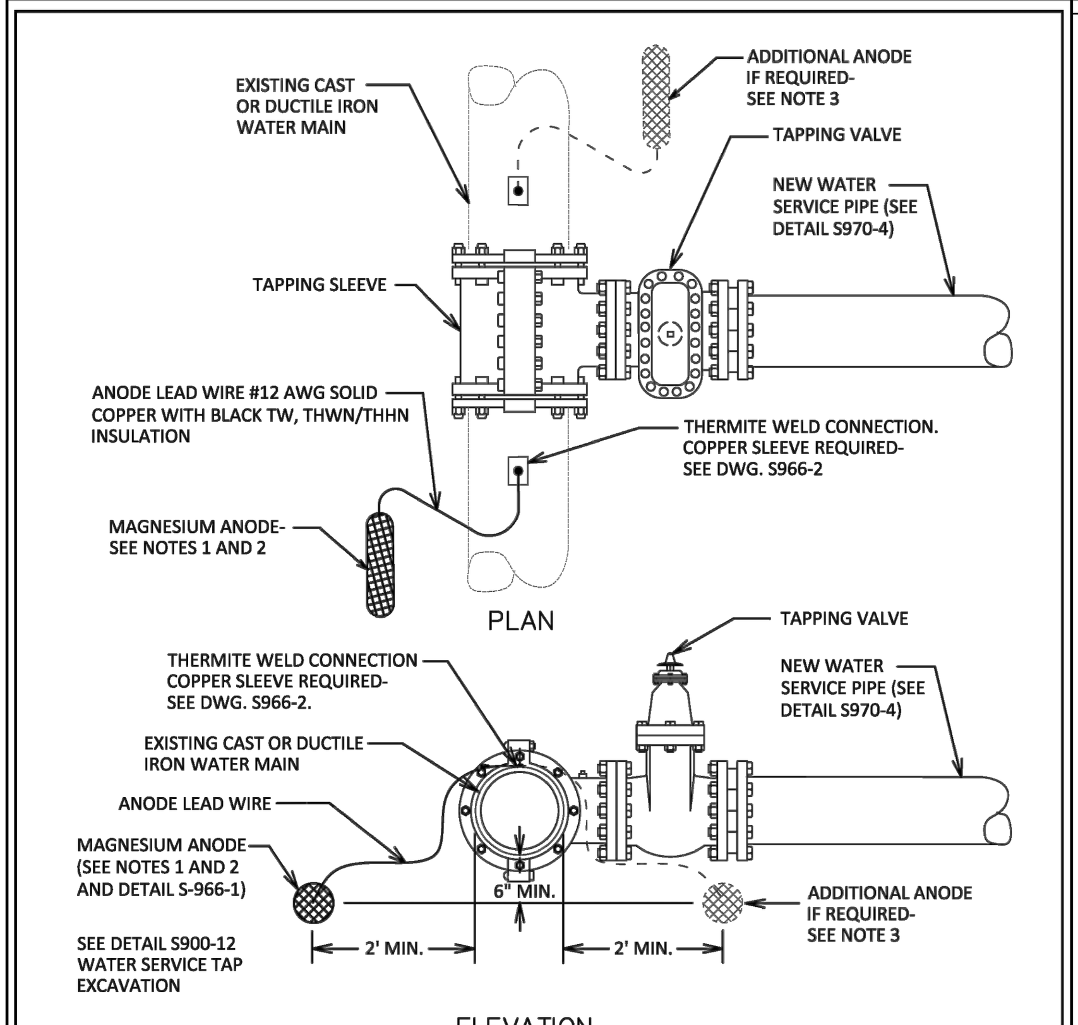


NOTES:

1. THE CONTRACTOR IS RESPONSIBLE FOR ENSURING THAT ALL EXCAVATIONS ARE ADEQUATELY PROTECTED IN ACCORDANCE WITH OCCUPATIONAL SAFETY AND HEALTH ADMINISTRATION (OSHA) REGULATIONS.
2. SHORING MUST BE FURNISHED BY THE CONTRACTOR IN ACCORDANCE WITH OSHA REGULATIONS, AND ADEQUATE CLEARANCES PROVIDED, WHEREVER WATER BUREAU PERSONNEL MUST ENTER AN EXCAVATION. EXCEPTIONS TO THIS POLICY CAN ONLY BE MADE BY THE DIRECTOR OF WATER OR HIS REPRESENTATIVE.
3. THE CONTRACTOR SHALL MAKE AND SHORE THE EXCAVATION, CLEAN THE AREA OF THE WATER MAIN FOR THE TAP, ATTACH THE TAPPING SLEEVE AND VALVE TO THE MAIN FOR SERVICES 4-INCH DIAMETER AND LARGER OR ATTACH THE TAPPING SADDLE (WHERE REQUIRED) TO THE MAIN FOR SERVICES 2-INCH DIAMETER AND SMALLER AND INSURE THAT THE WORK AREA IS READY FOR INSPECTION BY BUREAU PERSONNEL PRIOR TO MAKING THE TAP.

MINIMUM CLEARANCE DIMENSIONS			
EXCAVATION FOR	A	B	C
SMALL SERVICE TAP (2-INCH AND SMALLER)	0'-6"	5'-0"	4'-0"
LARGE SERVICE TAP (4-INCH AND LARGER)	1'-0"	7'-0"	4'-0"

CITY OF ROCHESTER
WATER SERVICE TAP EXCAVATION
ISSUED 4-29-11 NON-STANDARD
REVISED DWG.NO.S900-12



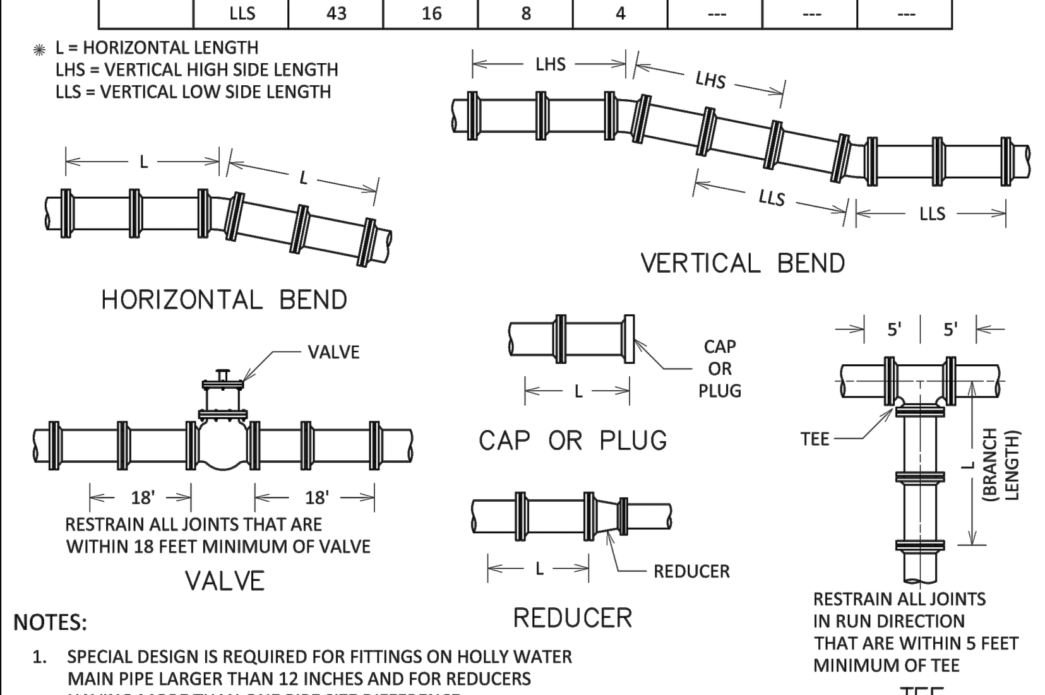
NOTES:

1. USE HIGH POTENTIAL MAGNESIUM ANODE IN PREPACKAGED CLOTH BAG WITH BACKFILL. BARE WEIGHT OF ANODE INGOT (EXCLUDING BACKFILL) AND NUMBER OF ANODES AS NOTED ON PLANS OR AS DIRECTED BY PROJECT MANAGER.
2. ANODE IS TO BE PLACED IN TRENCH, WITH ANODE CENTERLINE 6 INCHES MINIMUM BELOW BOTTOM OF MAIN AND 2 FEET MINIMUM FROM SIDE WALL OF MAIN. ANODE TO BE SURROUNDED WITH NATIVE BACKFILL.
3. WHEN TWO ANODES ARE REQUIRED AT NEW WATER SERVICE, THE SECOND ANODE SHALL BE LOCATED ON OPPOSITE SIDE OF THE TAPPING SLEEVE AND VALVE.

CITY OF ROCHESTER
ANODE AT TAPPING SLEEVE AND VALVE ON EXISTING CAST/ DUCTILE IRON WATER MAIN
ISSUED 7-7-16 NON-STANDARD
REVISED DWG.NO.S966-9

MINIMUM RESTRAINED LENGTH FOR WATER MAIN PIPE ADJACENT TO FITTINGS (IN FEET) (BASED ON INTERNAL PRESSURE OF 250 PSI) (SEE NOTE 1)								
PIPE SIZE (INCHES)	MINIMUM LENGTH ⁕	90°	45°	22-1/2°	11-1/4°	REDUCER	TEE	CAP PLUG
4" - 6"	L	23	10	5	3	44	44	85
	LHS	74	35	17	9	---	---	---
	LLS	23	9	5	3	---	---	---
8"	L	30	13	6	3	47	70	111
	LHS	96	46	23	11	---	---	---
	LLS	30	12	6	3	---	---	---
12"	L	43	18	9	5	84	117	159
	LHS	138	66	32	16	---	---	---
	LLS	43	16	8	4	---	---	---

⁕ L = HORIZONTAL LENGTH
LHS = VERTICAL HIGH SIDE LENGTH
LLS = VERTICAL LOW SIDE LENGTH

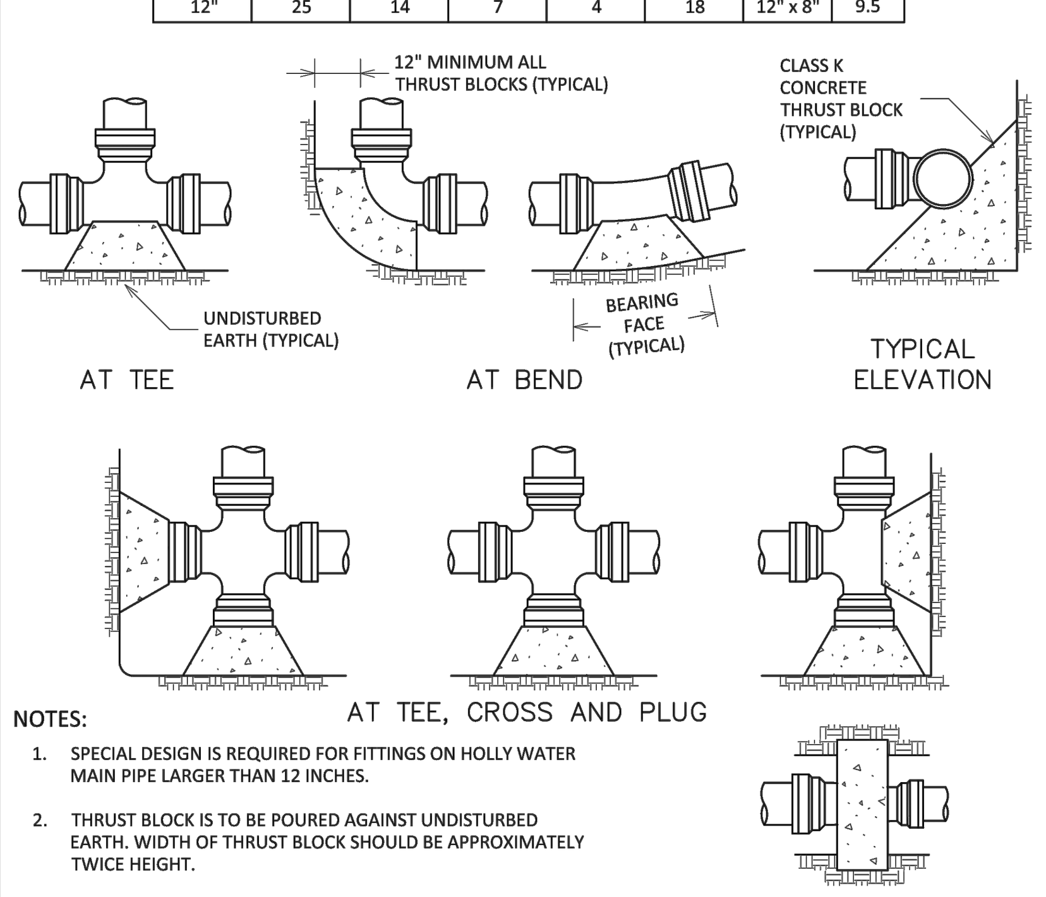


NOTES:

1. SPECIAL DESIGN IS REQUIRED FOR FITTINGS ON HOLLY WATER MAIN PIPE LARGER THAN 12 INCHES AND FOR REDUCERS HAVING MORE THAN ONE PIPE SIZE DIFFERENCE.
2. CONCRETE THRUST BLOCK IS TO BE USED IN ADDITION TO MECHANICAL RESTRAINT DEVICES, SEE DETAILS S900-9 AND S900-10.
3. ALL POLYETHYLENE WRAPPED DUCTILE IRON HOLLY WATER MAIN PIPE AND FITTING JOINTS WITHIN L-LHS-LLS DIMENSIONS MUST BE RESTRAINED USING APPROVED MECHANICAL RESTRAINT DEVICE.
4. ASSUMPTION: SP SOILS, 5 FEET COVER, AND TYPE 4 LAYING CONDITION.

CITY OF ROCHESTER
WATER MAIN PIPE RESTRAINT HOLLY SYSTEM
ISSUED 5-8-08 NON-STANDARD
REVISED 9-1-09 DWG.NO.S900-8

AREA OF BEARING FACE OF THRUST BLOCK IN SQUARE FEET (AREA BASED ON INTERNAL PRESSURE OF 250 PSIG AND SOIL BEARING PRESSURE OF 2000 PSF) (SEE NOTE 1)							
PIPE SIZE	BEND				TEE PLUG	REDUCER	
	90°	45°	22-1/2°	11-1/4°		SIZE	AREA
4" - 6"	7	4	2	1	5	6" x 4"	3
8"	12	7	4	2	8	8" x 6"	3.5
12"	25	14	7	4	18	12" x 8"	9.5

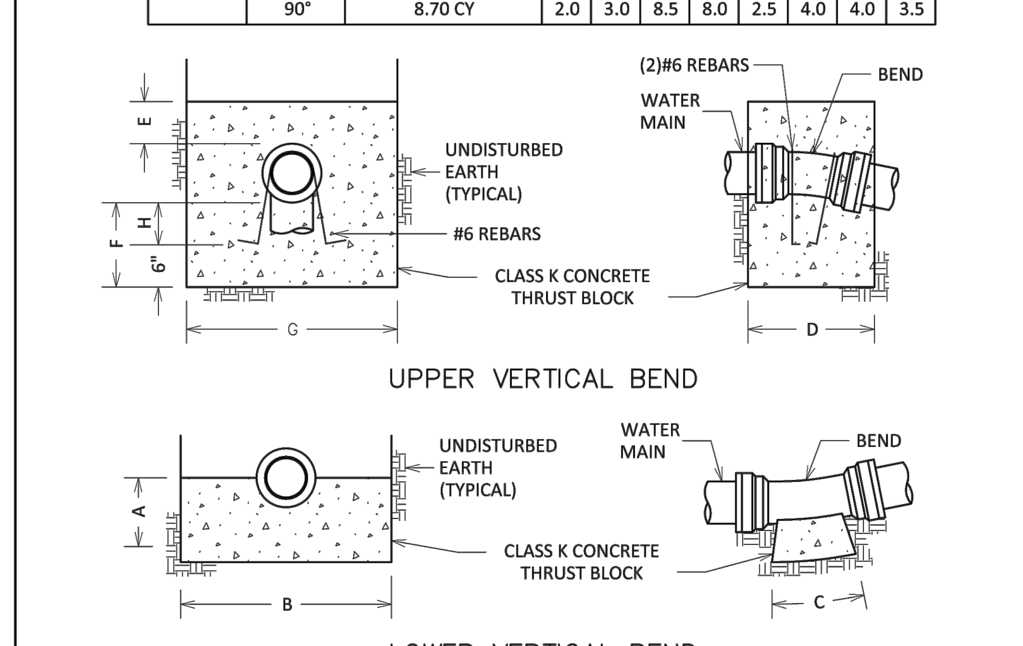


NOTES:

1. SPECIAL DESIGN IS REQUIRED FOR FITTINGS ON HOLLY WATER MAIN PIPE LARGER THAN 12 INCHES.
2. THRUST BLOCK IS TO BE POURED AGAINST UNDISTURBED EARTH. WIDTH OF THRUST BLOCK SHOULD BE APPROXIMATELY TWICE HEIGHT.
3. THRUST BLOCK IS TO BE INSTALLED AT ALL BENDS, TEES, AND TAPPING SLEEVE AND VALVE CONNECTIONS.
4. FACTORY CAST OFFSETS ARE TO BE TREATED AS (2) 45 DEGREE BENDS.
5. FOR REDUCERS, THRUST BLOCK IS TO BE KEYED INTO WALLS AND BOTTOM OF TRENCH.
6. MECHANICAL RESTRAINT IS REQUIRED IN ADDITION TO THRUST BLOCK, SEE DETAIL S900-8.
7. WOOD BLOCKING IS NOT PERMITTED.

CITY OF ROCHESTER
HORIZONTAL THRUST BLOCK HOLLY SYSTEM
ISSUED 6-1-09 NON-STANDARD
REVISED 8-7-13 DWG.NO.S900-9

PIPE SIZE	BEND	TOP SECTION MINIMUM VOLUME CONCRETE	A	B	C	D	E	F	G	H
			MINIMUM DIMENSIONS (IN FEET)							
6"	11-1/4°	0.45 CY	1.0	2.5	1.0	2.0	1.0	1.0	2.5	0.5
	22-1/2°	0.85 CY	1.0	2.5	1.0	2.5	1.5	2.0	2.5	1.5
	45°	1.55 CY	1.0	2.5	1.5	4.0	1.5	2.0	2.5	1.5
	90°	2.20 CY	1.0	2.5	3.0	5.0	2.0	2.5	2.5	2.0
8"	11-1/4°	0.75 CY	1.0	2.7	1.0	2.0	1.0	2.0	3.0	1.5
	22-1/2°	1.50 CY	1.0	2.7	1.5	3.5	1.0	2.5	3.0	2.0
	45°	2.75 CY	1.0	2.7	2.5	5.0	1.5	2.5	3.5	2.0
	90°	3.85 CY	1.5	2.7	4.5	5.0	2.0	3.5	3.5	3.0
12"	11-1/4°	1.70 CY	1.0	3.0	1.5	3.5	1.5	2.0	3.0	1.5
	22-1/2°	3.35 CY	1.0	3.0	2.5	5.0	2.0	2.5	3.0	2.0
	45°	6.15 CY	1.5	3.0	4.5	6.5	2.5	4.0	3.5	3.5
	90°	8.70 CY	2.0	3.0	8.5	8.0	2.5	4.0	4.0	3.5



NOTES:

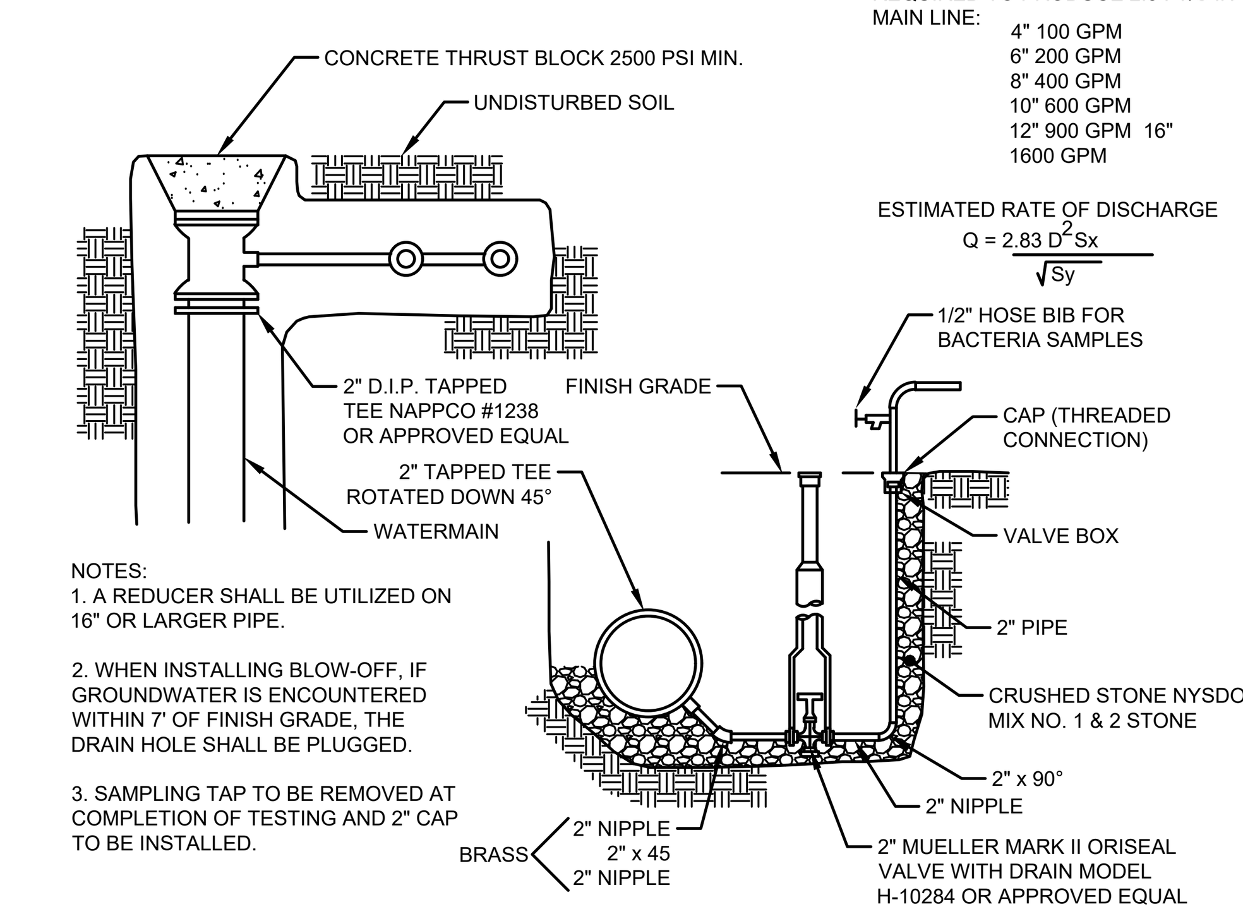
1. SPECIAL DESIGN IS REQUIRED FOR FITTINGS ON HOLLY WATER MAIN PIPE LARGER THAN 12 INCHES.
2. MECHANICAL RESTRAINT IS REQUIRED IN ADDITION TO THRUST BLOCK, SEE DETAIL S900-8.

CITY OF ROCHESTER
VERTICAL THRUST BLOCK HOLLY SYSTEM
ISSUED 6-1-09 NON-STANDARD
REVISED DWG.NO.S900-10

FLUSHING RATES: FLOW RATE REQUIRED TO PRODUCE 2.5 FT/S IN MAIN LINE:
4" 100 GPM
6" 200 GPM
8" 400 GPM
10" 600 GPM
12" 900 GPM 16" 1600 GPM

ESTIMATED RATE OF DISCHARGE

$$Q = \frac{2.83\,D^2 Sx}{\sqrt{Sy}}$$



NOTES:
1. A REDUCER SHALL BE UTILIZED ON 16" OR LARGER PIPE.
2. WHEN INSTALLING BLOW-OFF, IF GROUNDWATER IS ENCOUNTERED WITHIN 7' OF FINISH GRADE, THE DRAIN HOLE SHALL BE PLUGGED.
3. SAMPLING TAP TO BE REMOVED AT COMPLETION OF TESTING AND 2" CAP TO BE INSTALLED.

1 / C502 BLOW-OFF/SAMPLING TAP
N.T.S.

NOT FOR CONSTRUCTION

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REVISION

DETAILS

HCR SUBMISSION

PLAN PROJECT No.
081.18.01.01
SHARS ID No.

DATE
November 15, 2019

c502

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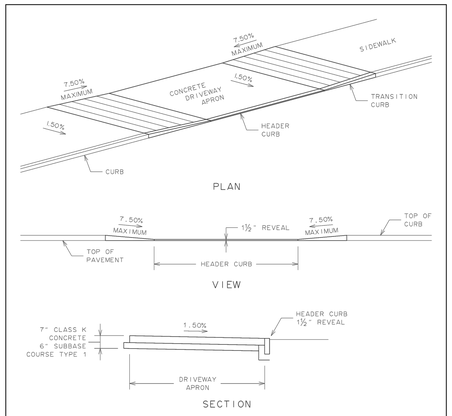


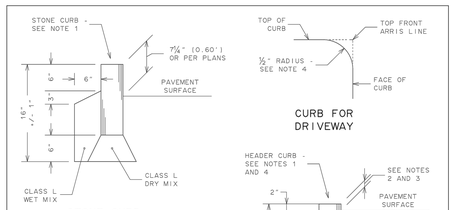
NOTES:

1. NOMINAL HEADER CURB LENGTH IS BETWEEN 10 AND 15 FEET FOR RESIDENTIAL DRIVEWAY, 24 FEET MAXIMUM FOR TWO-WAY COMMERCIAL DRIVEWAY, 16 FEET MAXIMUM FOR ONE-WAY COMMERCIAL DRIVEWAY. ACTUAL WIDTH WILL BE AS APPROVED BY CITY.
2. SURFACE OF DRIVEWAY APRON AND SIDE FLARES TO BE FIRM, STABLE AND SLIP-RESISTANT. TEXTURE SURFACE WITH COARSE BROOM RUNNING TRANSVERSE TO SLOPE OF DRIVEWAY APRON.
3. FULL DEPTH ½ INCH WIDE EXPANSION JOINT ACROSS SIDEWALK AT BOTH ENDS AND AROUND OUTER LIMITS OF DRIVEWAY APRON WHERE ABUTS OTHER PAVED SURFACES.
4. CROSS SLOPE OF DRIVEWAY APRON IS 1.50%.

CITY OF ROCHESTER

DEPRESSED SIDEWALK AND DRIVEWAY APRON ATTACHED SIDEWALK

ISSUED	2-10-00	NON-STANDARD
REVISED	7-1-17	DWG.NO.S608-22



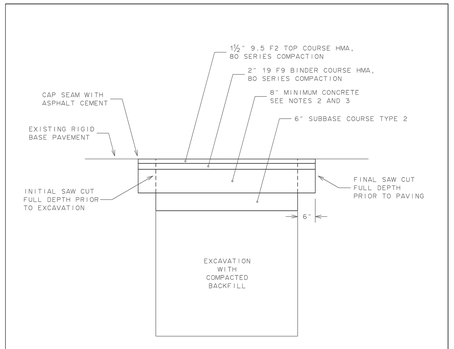
NOTES:

1. WIDTH OF CURB IS TO BE AS REQUIRED IN CONTRACT DOCUMENTS.
2. SIDEWALK ACCESS RAMP HEADER CURB IS TO BE FLUSH WITH PAVEMENT SURFACE.
3. DRIVEWAY HEADER CURB IS TO HAVE CURB REVEAL OF 1½ INCHES.
4. ONLY TRANSITION AND HEADER CURB PIECES USED FOR DRIVEWAYS ARE TO BE ROUNDED.
5. TACK COAT UNEXPOSED SURFACE OF CURB.

CITY OF ROCHESTER

STONE CURB

ISSUED	9-2-91	STANDARD
REVISED	3-1-18	DWG.NO.R609-1



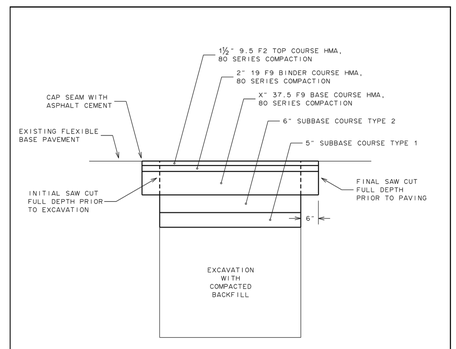
NOTES:

1. FINAL SAW CUT IS TO BE FULL DEPTH TO OBTAIN STRAIGHT AND NEAT EDGE FOR PAVING. SAW CUT IS TO BE MADE AFTER TRENCH HAS BEEN BACKFILLED AND BEFORE CONSTRUCTING PAVEMENT SECTION.
2. CONCRETE IS TO BE CLASS C OR F IN ACCORDANCE WITH NYSDOT SECTION 503 PORTLAND CEMENT CONCRETE FOUNDATION FOR PAVEMENT.
3. TOP OF NEW CONCRETE BASE IS TO BE AT OR BELOW TOP OF EXISTING CONCRETE BASE TO PROVIDE FOR MINIMUM 8 INCHES OF CONCRETE AND MINIMUM THICKNESSES OF ASPHALT TOP AND BINDER COURSES.
4. TACK COAT IS TO BE APPLIED BETWEEN ALL LIFTS OF HMA PAVEMENT COURSES AND ON TOP OF CONCRETE BASE.
5. SEAMS BETWEEN EXISTING AND NEW PAVEMENT ARE TO BE SEALED WITH AN ASPHALT CEMENT (FILLER) THAT IS IN ACCORDANCE WITH NYSDOT MATERIAL DESIGNATION 702-0700.

CITY OF ROCHESTER

TRENCH RESTORATION CONCRETE BASE

ISSUED	9-2-91	STANDARD
REVISED	2-8-13	DWG.NO.R206-2



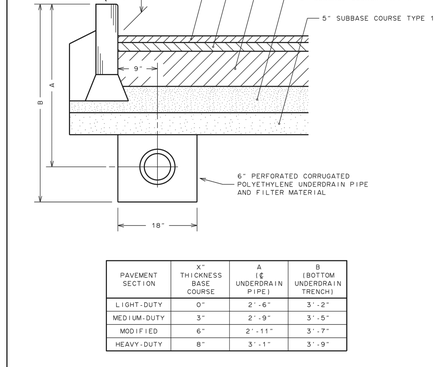
NOTES:

1. FINAL SAW CUT IS TO BE FULL DEPTH TO OBTAIN STRAIGHT AND NEAT EDGE FOR PAVING. SAW CUT IS TO BE MADE AFTER TRENCH IS BACKFILLED.
2. BOTTOM OF ASPHALT BASE COURSE IS TO BE AT OR BELOW BOTTOM OF EXISTING ASPHALT PAVEMENT SECTION TO PROVIDE FOR REQUIRED MINIMUM THICKNESSES OF ASPHALT COURSES. MINIMUM THICKNESS OF ASPHALT BASE COURSE IS:
   HEAVY-DUTY PAVEMENT - 8 INCHES
   MEDIUM-DUTY PAVEMENT - 3 INCHES
   LIGHT-DUTY PAVEMENT - 0 INCHES
3. TACK COAT IS TO BE APPLIED BETWEEN ALL LIFTS OF HMA PAVEMENT COURSES.
4. SEAMS BETWEEN EXISTING AND NEW PAVEMENT ARE TO BE SEALED WITH ASPHALT CEMENT 702-0700 IN ACCORDANCE WITH NYSDOT SECTION 702 BITUMINOUS MATERIALS.

CITY OF ROCHESTER

TRENCH RESTORATION ASPHALT BASE

ISSUED	9-2-91	STANDARD
REVISED	7-31-12	DWG.NO.R206-1



PAVEMENT SECTION	X" THICKNESS BASE COURSE	A (℄ UNDERDRAIN PIPE)	B (BOTTOM UNDERDRAIN TRENCH)
LIGHT-DUTY	0"	2'-6"	3'-2"
MEDIUM-DUTY	3"	2'-9"	3'-5"
MODIFIED	6"	2'-11"	3'-7"
HEAVY-DUTY	8"	3'-1"	3'-9"

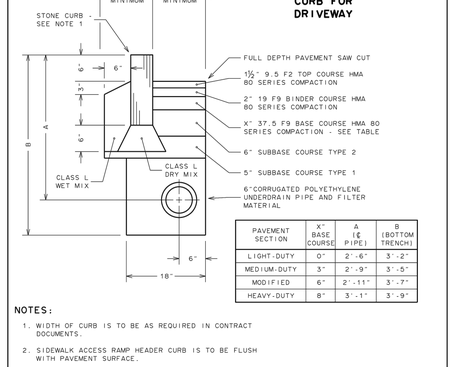
NOTE:

TACK COAT IS TO BE APPLIED BETWEEN ALL LIFTS OF HMA PAVEMENT COURSES AND ON FACE OF CURB BETWEEN CURB AND ASPHALT PAVEMENT.

CITY OF ROCHESTER

ASPHALT PAVEMENT SECTION WITH CURB

ISSUED	9-2-91	STANDARD
REVISED	7-31-12	DWG.NO.R400-1



PAVEMENT SECTION	X" BASE COURSE	A (℄ PIPE)	B (BOTTOM TRENCH)
LIGHT-DUTY	0"	2'-6"	3'-2"
MEDIUM-DUTY	3"	2'-9"	3'-5"
MODIFIED	6"	2'-11"	3'-7"
HEAVY-DUTY	8"	3'-1"	3'-9"

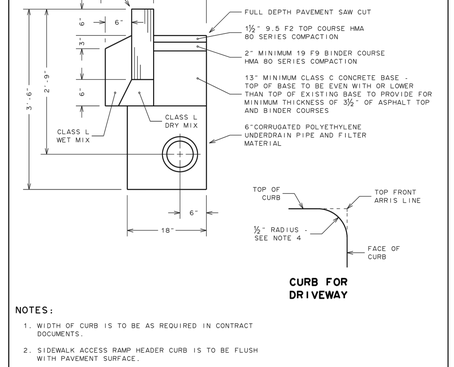
NOTES:

1. WIDTH OF CURB IS TO BE AS REQUIRED IN CONTRACT DOCUMENTS.
2. SIDEWALK ACCESS RAMP HEADER CURB IS TO BE FLUSH WITH PAVEMENT SURFACE.
3. DRIVEWAY HEADER CURB IS TO HAVE CURB REVEAL OF 1½ INCHES.
4. ONLY TRANSITION AND HEADER CURB PIECES USED FOR DRIVEWAYS ARE TO BE ROUNDED.
5. TACK COAT TO BE APPLIED BETWEEN ALL LIFTS OF HMA COURSES.
6. PAVEMENT SEAMS TO BE SEALED WITH BITUMINOUS SEALER IN ACCORDANCE WITH NYSDOT MATERIAL DESIGNATION 702-0700.

CITY OF ROCHESTER

STONE CURB REPLACEMENT - ASPHALT BASE

ISSUED	12-30-11	NON-STANDARD
REVISED	12-1-16	DWG.NO.S609-16



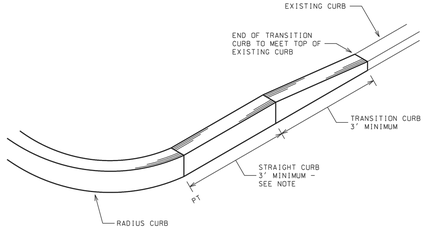
NOTES:

1. WIDTH OF CURB IS TO BE AS REQUIRED IN CONTRACT DOCUMENTS.
2. SIDEWALK ACCESS RAMP HEADER CURB IS TO BE FLUSH WITH PAVEMENT SURFACE.
3. DRIVEWAY HEADER CURB IS TO HAVE CURB REVEAL OF 1½ INCHES.
4. ONLY TRANSITION AND HEADER CURB PIECES USED FOR DRIVEWAYS ARE TO BE ROUNDED.
5. TACK COAT TO BE APPLIED BETWEEN ALL LIFTS OF HMA COURSES.
6. PAVEMENT SEAMS TO BE SEALED WITH BITUMINOUS SEALER IN ACCORDANCE WITH NYSDOT MATERIAL DESIGNATION 702-0700.

CITY OF ROCHESTER

STONE CURB REPLACEMENT - CONCRETE BASE

ISSUED	12-30-11	NON-STANDARD
REVISED	12-1-15	DWG.NO.S609-17



NOTE:

LENGTH OF STRAIGHT CURB WILL BE AS REQUIRED IN CONTRACT DOCUMENTS. WITH 3 FEET MINIMUM.

CITY OF ROCHESTER

NEW CURB TRANSITION TO EXISTING CURB

ISSUED	9-2-91	STANDARD
REVISED	12-30-11	DWG.NO.R609-7

NOT FOR CONSTRUCTION

plan ARCHITECTURAL STUDIO
plan Architectural Studio, PC
250 South Avenue, Suite 100
Rochester, New York 14604
t. 585.454.4230
f. 585.454.4237
www.planpc.com

Stantec
Stantec Consulting Services Inc.
61 Commercial Street, Suite 100
Rochester NY U.S.A.
14614-1009
Tel. 585.475.1440
Fax. 585.272.1814
www.stantec.com

EAST HOUSE
RENOVATIONS TO 67-89 CANAL STREET
ROCHESTER, NY

67-89 CANAL STREET
ROCHESTER, NEW YORK 14608

DETAILS

REVISION

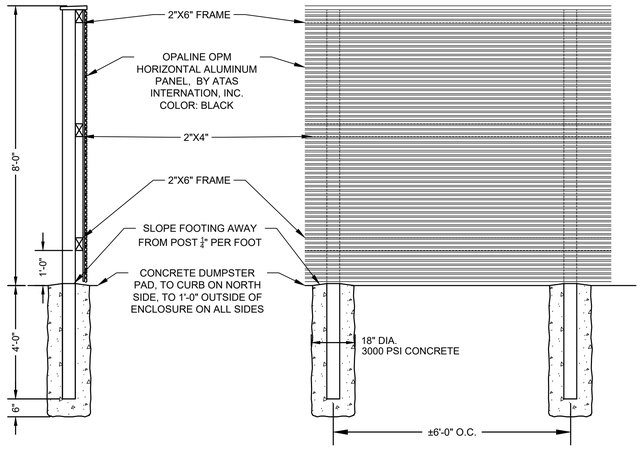
HCR SUBMISSION

PLAN PROJECT No.
081.18.01.01
SHARS ID No.

DATE
November 15, 2019

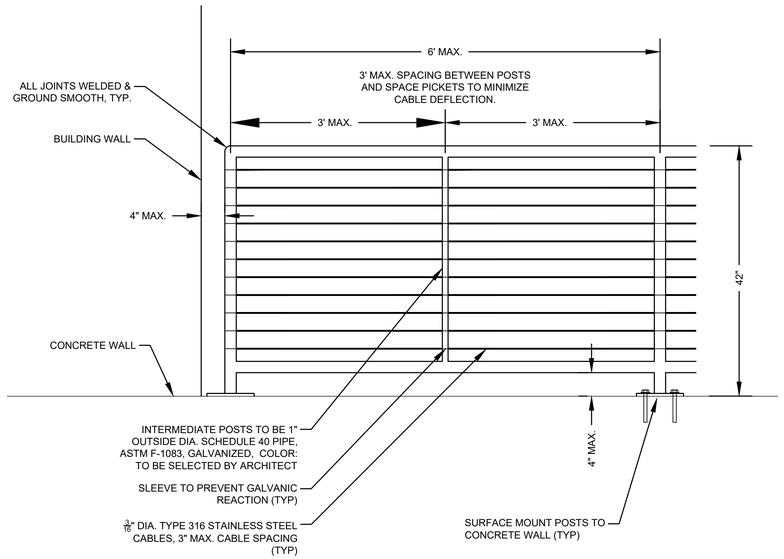
c503

Dig Safely. Call 811 before you dig



1 C504 DUMPSTER ENCLOSURE DETAIL

N.T.S.



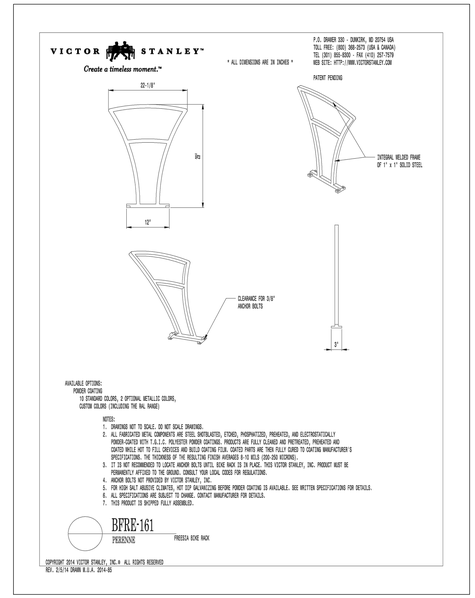
NOTES:

ALL POSTS AND RAILS TO BE 2" OUTSIDE DIA. SCHEDULE 40 PIPE, ASTM F-1083, GALVANIZED, PAINTED BLACK.

1. CONTRACTOR TO PROVIDE RAILING SHOP DRAWINGS FOR REVIEW AND APPROVAL PRIOR TO FABRICATION.

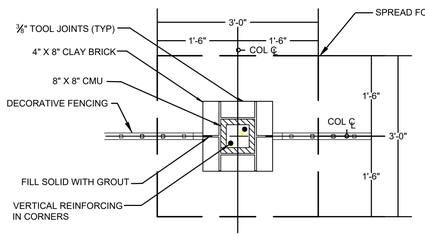
2 C504 CABLE RAIL FENCE

N.T.S



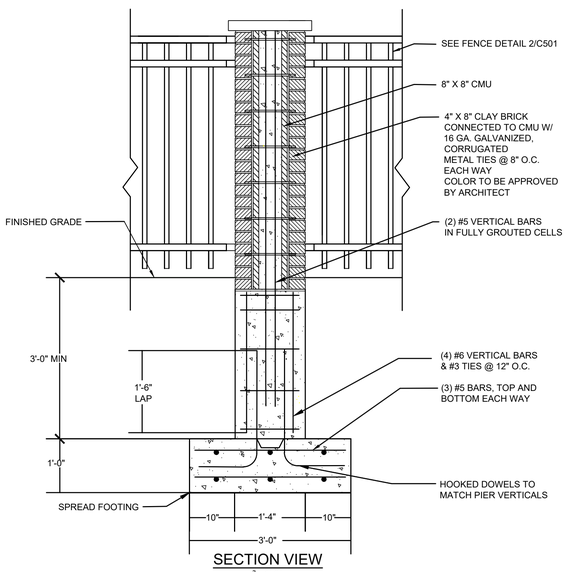
3 C504 BIKE RACK DETAIL

N.T.S



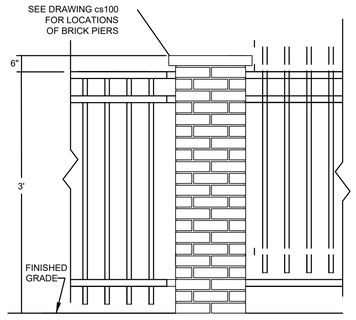
PLAN VIEW AT BRICK VENEER

¾"=1'-0"



SECTION VIEW

¾"=1'-0"



ELEVATION VIEW

SCALE: ¾"=1'-0"

NOTES:

1. POST TO POST DIMENSIONS VARY, BUT NOT MORE THAN 7'-8 3/4".
2. INTERMEDIATE POSTS SHALL BE EVENLY DISTRIBUTED BETWEEN BRICK PIERS.

4 C504 SQUARE DECORATIVE BRICK FENCE PIER

SCALE: ¾"=1'-0"

NOTE:

SHED TO BE SHOP PREPPED AND PAINTED SATIN BLACK

5 C504 VESTIL STOR-96-G-1RH GALVANIZED STORAGE SHED

POLE MOUNTED AREA LIGHT
MCGRAW-EDISON GLEON GALLEON LED

WALL MOUNTED AREA LIGHT
MCGRAW-EDISON GWC GALLEON WALL

LIGHT BOLLARD
US ARCHITECTURAL LIGHTING
RAZAR BOLLARD-LED

6 C504 SITE LIGHTING

N.T.S.

NOT FOR CONSTRUCTION

plan ARCHITECTURAL STUDIO
plan Architectural Studio, PC
250 South Avenue, Suite 100
Rochester, New York 14604
t. 585.454.4230
f. 585.454.4237
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EAST HOUSE
RENOVATIONS TO 67-89 CANAL STREET
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67-89 CANAL STREET
ROCHESTER, NEW YORK 14608

DETAILS

REVISION

HCR SUBMISSION

PLAN PROJECT No.
081.18.01.01
SHARS ID No.

DATE
November 15, 2019

c504

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APPENDIX B

Remedial Technologies and Alternatives Cost Summary and Analysis

Appendix B
Remedial Alternatives Cost Summary and Analysis
AAR/RAWP
Canal Street Manufacturing Site
67 - 89 Canal Street, Rochester, New York
BCP Site #C828206

	Remedial Alternative		Description of Alternative	Capital	OM&M	Total
	1.1/2.1	No Action / Monitored Natural Attenuation (MNA)	- Assume 30 years of annual groundwater monitoring and installation and maintenance of fence around the site.	$35,000	$459,130	**$494,130**
SOIL	**1.2**	All Impacted Soil Removal and Offsite Disposal (Track 1).	- Excavate/dispose of all VOC-, Petroleum-, and Urban-Fill-contaminated soils and backfill and restore to design grades (5,376 cy).	$1,687,782	$0	**$1,687,782**
	1.3	Impacted Source Area Soil Removal and Offsite Disposal, Plus Reuse on Site.	- Excavate/dispose of source area VOC-, Petroleum-, and Urban-Fill-contaminated soils (2,493 cy), test and reuse (2,883 cy).	$816,660	$0	**$816,660**
	1.4	Engineering Controls: Placement of a clean soil cover and pavement cap	- Place impervious cap and clean soil over an area of approx. 35,000 sq. ft - Cap to consist of 12" of crushed stone and 4" of asphalt, or concrete sidewalks, brick pavers or composite playground cap. Also includes 24 inches of clean soil in landscape areas.	$313,000	$35,500	**$348,500**
GROUNDWATER	**2.2**	In-situ Chemical Oxidation (ISCO) of Impacted Groundwater (Track 1)	- Introducing strong chemical oxidizers directly into groundwater to break down chemical contaminants in place.	$843,750	$244,900	**$1,088,650**
	2.3	Ex-situ Treatment/Disposal of Source-area Groundwater.	- Removal of limited volumes of source-area groundwater from excavations, elevator pits and building perimeter foundation drain; - On-site discharge to sewer; and - Quarterly sampling of elevator discharge to sewer.	$28,350	$47,400	**$75,750**
	2.4A and 2.4B	In-situ Biological Treatment of Impacted Groundwater.	- Installation of groundwater remediation lactate and gypsum injection piping under the building; - Injection of electron donor material (sodium lactate solution for ERD of CVOCs) and agricultural gypsum and epsom salt (for EISB of petroleum constituents) into source-area excavation and groundwater plume areas; -2 yrs. of quarterly groundwater quality monitoring subsequent to injections; - Includes two subsequent injections; and -Design and installation of sub-slab depressurization system.	$208,609	$101,650	**$310,259**
SOIL VAPOR	**3.0**	Engineering Control: VOC Vapor Intrusion Mitigation using Vapor Barrier and Sub-slab Depressurization System	-Design and installation of sub-slab depressurization system; -Liquid Boot (or equal) vapor membrane and Sub-slab Depressurization System under entire occupied building.	$297,300	$101,590	**$398,890**

Notes:

1. See attached cost summary sheets for more detailed breakdown of costs for each alternative.
2. Groundwater monitoring included for each individual alternative. Combining alternatives will result in reduced monitoring costs.

\\us1275-f02\shared_projects\190500965\05_report_deliv\deliverables\reports\AAR_RAWP\02_Appendices\App A - Alternatives Analysis - Estimated Cost Details

Canal Street Manufacturing Site
Brownfield Cleanup Program
Alternatives Analysis Report

Remedial Alternative Cost Estimate Detail

Technology 1.1/2.1: No Action / Monitored Natural Attenuation

	Cost Totals
I. Capital Costs	
Assumptions:	
- Monitoring wells already in place from Phase II and RI	
Costs:	
- Fence needed to keep trespassers off the site	$35,000
Capital Costs Subtotal	***$35,000***
II. Operation, Monitoring and Maintenance (OM&M)	
Assumptions:	
- Groundwater monitoring (up to 30 years)	
- Periodic review reporting (30 years)	
Costs:	
- Fence repair	$13,500
- Well Maintenance and Repair (3 repair events x $4,000 per event)	$9,000
- Sampling Events and Reporting:	$436,630
OM&M Costs Subtotal	***$459,130***
Remedial Technology 1.1/2.1 Total	***$494,130***

Remedial Alternative Cost Estimate Detail

Technology 1.2: All Impacted Soil Removal / Offsite Disposal (Track 1)

Cost Totals

I. Capital Costs

Assumptions:

- 8,600 tons (5,376 cy) of impacted soil (VOCs, Petroleum, Urban Fill)
- Non-hazardous material; meets CID
- Backfill with imported clean soil as needed
- Used in conjunction with other groundwater remediation technologies

Costs:

- Contractor Costs	$1,333,670
- Oversight and Reporting Costs	$250,000
- Laboratory Costs and Contained-In Demonstration Work Plan	$104,112
Capital Costs Subtotal	***$1,687,782***

II. Operation, Monitoring and Maintenance (OM&M)

Assumptions:

None required

Costs:

OM&M Costs Subtotal	***$0***

Remedial Technology 1.2 Total	***$1,687,782***

Remedial Alternative Cost Estimate Detail

Technology 1.3: Impacted Source Area Soil Removal / Offsite Disposal In Conjunction with Reuse

Cost Totals

I. Capital Costs

Assumptions:

- 4,000 tons (2,493 cy) of impacted soil (VOCs, Petroleum, Urban Fill with SVOCs and Metals)
-Non-hazardous material; meets CID
- Reuse of 2,883 cy of soil and urban fill for general site grading
- Used in conjunction with other groundwater remediation technologies

Costs:

- Contractor Costs	$618,460
- Oversight and Reporting Costs	$150,000
- Laboratory Costs, Contained-In Demonstration Work Plan	$48,200
Capital Costs Subtotal	***$816,660***

II. Operation, Monitoring and Maintenance (OM&M)

Assumptions:

None included here. (Would require placement of a clean soil cover and impervious pavement cap and OM&M costs set forth in Alt. 1.4)

Costs:

OM&M Costs Subtotal	***$0***

Remedial Technology 1.3 Total	***$816,660***

Remedial Alternative Cost Estimate Detail

Technology 1.4: Placement of a Clean Soil Cover and Impervious Cap

Cost Totals

I. Capital Costs

Assumptions:

- Clean soil or Impervious cap placed over an area of approx. 35,000 sq ft.

- Cap to consist of 12" of crushed stone and 4" of asphalt or concrete, and a combination of concrete sidewalks, brick pavers or composite playground cap. Also includes 24 inches of clean soil in landscape areas.

- Cost does not include concrete basement floor slab cap.

Costs:

- Site Concrete	$80,000
- Site Asphalt Pavement	$185,000
- Brick Paver Area	$23,000
- Playground Base	$17,000
- Oversight and reporting costs	$8,000
Capital Costs Subtotal	***$313,000***

II. Operation, Monitoring and Maintenance (OM&M)

Assumptions:

- Annual inspections for 10 years
- Quarterly/Annual Reporting
- Periodic asphalt cover repair/seeding/mulching required

Costs:

- Periodic Inspections and reporting (10 events x $2,700 per event)	$27,000
- Periodic Maintenance	$8,500
OM&M Costs Subtotal	***$35,500***

Remedial Technology 1.4 Total ***$348,500***

Remedial Alternative Cost Estimate Detail

Technology 2.2: InSitu Chemical Oxidation in Groundwater (Track 1)

Cost Totals

I. Capital Costs

Assumptions:

- Application of Permanganate or other appropriate oxidizer
- Combined with removal of all impacted soil for Track 1 Cleanup
- Need for supplemental oxidizer application is likely

Costs:

- Contractor costs	$594,000
- Oversight and reporting costs	$216,000
- Laboratory Costs	$33,750
Capital Costs Subtotal	***$843,750***

II. Operation, Monitoring and Maintenance (OM&M)

Assumptions:

- Bench-scale testing and baseline GW sampling needed to determine appropriate chemical applications
- Quarterly monitoring for one year, followed by 2 years of semi-annual monitoring
- Analyses include VOCs, SVOCs, MNA parameters, field parameters.
- low-flow sampling methodology
- quarterly/semi-annual report preparation

Costs:

- Baseline sampling and bench testing	$108,000
- Sampling and reporting costs (8 events x $8,000 per event)	$64,000
- Laboratory Costs	$72,900
OM&M Costs Subtotal	***$244,900***

Remedial Technology 2.2 Total $1,088,650

Remedial Alternative Cost Estimate Detail

Technology 2.3: Groundwater Ex-Situ Disposal

Cost Totals

I. Capital Costs

Assumptions:

- Impacted groundwater pumped to on-site storage tanks or directly to sewer
- Impacted water disposed offsite
- No pre-treatment required.

Costs:

- Tank Rental	$9,450
- Pumping Equipment	$2,700
- Design/oversight, obtain permits to discharge	$16,200
Capital Costs Subtotal	***$28,350***

II. Operation, Monitoring and Maintenance (OM&M)

Assumptions:

- Quarterly monitoring of elevator sump pump and reporting of data for 30 years.

Costs:

- Labor, Laboratory and Permits	$47,400
OM&M Costs Subtotal	***$47,400***
Remedial Technology 2.3 Total	***$75,750***

Remedial Alternative Cost Estimate Detail

Technology 2.4A.: Groundwater In-Situ Bioremediation-ERD

Cost Totals

I. Capital Costs

Assumptions:

- Install 10 injection wells, reuse three existing monitoring wells.
- Enhanced Reductive Dechlorination (using sodium lactate) for CVOCs
- Lactate injected into10 injection wells, and three monitoring wells
- Two or possibly three injections may be necessary
- Combined with contaminated soil removal.

Costs:

- Install injection wells (Driller costs)	$40,997
- Sodium Lactate material (~ 10,890 lbs., 3 applications)	$27,000
- Tank/pump/mixing equipment	$925
- Material Application	$21,724
- Design, Oversight & Reporting	$42,645
Capital Costs Subtotal	***$133,291***

II. Operation, Monitoring and Maintenance (OM&M)

Assumptions:

- 2 yrs. of quarterly groundwater quality monitoring for each RAOC.
- Low-flow sampling methodology
- Includes two subsequent injections

Costs:

- Groundwater Monitoring	$21,500
- Supplemental ERD injection event	$29,325
OM&M Costs Subtotal	***$50,825***

Remedial Technology 2.4 Total	***$184,116***

Remedial Alternative Cost Estimate Detail

Technology 2.4B.: Groundwater In-Situ Bioremediation - EISB

Cost Totals

I. Capital Costs

Assumptions:

- Install perforated piping beneath building basement floor slab
- Install two injection wells, reuse one existing monitoring well
- Combine gypsum with backfill material prior to backfilling pipes
- Enhanced In-Situ Biodegradation (using pelleted gypsum) for VOCs
- Epsom salt injected into sub-slab injection piping runs, 2 injection wells and 1 monitoring well.
- Combined with contaminated soil removal.

Costs:

- Install injection piping (Contractor excavation and installation costs)	$71,500
- Granual Gypsum material (~ 9,000 lbs.)	$2,443
- Epsom Salt material (~ 250 lbs.)	$450
- Tank/pump/mixing equipment	$925
- Material Application	$21,724
-Design, Oversight & Reporting	$42,645
Capital Costs Subtotal	***$75,318***

II. Operation, Monitoring and Maintenance (OM&M)

Assumptions:

- 2 yrs. of quarterly groundwater quality monitoring for each RAOC.
- Low-flow sampling methodology
- Includes two subsequent injections

Costs:

- Groundwater Monitoring	$21,500
- Supplemental EISB injection events	$29,325
OM&M Costs Subtotal	***$50,825***

Remedial Technology 2.4b Total ***$126,143***

Remedial Alternative Cost Estimate Detail

Technology 3.0: Sub-slab Depressurization System (SSDS)

Cost Totals

I. Capital Costs

Assumptions:

- Install SSDS including vapor retarding membrane and negative pressure system
- Requires applying waterproofing material to sub-grade basement and elevator shaft walls as well as the building basement floor
- Install piping to (estimated) five fans on roof with monitoring panel at (a suggested) floor

Costs:

- Design, installation and oversight of vapor barrier and SSDS system and components	$297,300
Capital Costs Subtotal	***$297,300***

II. Operation, Monitoring and Maintenance (OM&M)

Assumptions:

- continual running of fans for 30 years
- quarterly monitoring and reporting
- periodic maintenance of fans and components

Costs:

- electric costs (5 fans x 24hrs/day x 30 years)	$25,570
- monitoring and reporting	$43,200
- periodic maintenance	$32,820
OM&M Costs Subtotal	***$101,590***

Remedial Technology 3. Total	***$398,890***

APPENDIX C

Health and Safety Plan

Appendix C

Health and Safety Plan
Remedial Action Work Plan/ Alternatives Analysis Report (RAWP/AAR)

Canal Street Manufacturing Site
67 & 89 Canal Street
Rochester, Monroe County, New York

Prepared for:
New York State Department of Environmental Conservation
6724 East Avon-Lima Road
Avon, New York 14414-9519

Prepared on behalf of:
East House Canal Street, LLC
259 Monroe Avenue, Suite 200
Rochester, New York 14607

Prepared by:
Consulting Services Inc.
61 Commercial Street Suite 100
Rochester, New York 14614

Stantec

July 2019

Appendix C

Health and Safety Plan
RAWP/AAR
Canal Street Manufacturing Site

Emergency Information

Ambulance: 911	
Hospital: Highland Hospital **1000 South Ave** **Rochester, NY 14620** **(585) 473-2200**	
Fire Department: **911**	Poison Control Center: **800-222-1222**
Police: **911**	Utility Emergency: **911**

Project Contacts

Name	Company	Email	Office Phone	Cell Phone
Kim Brumber	East House Canal Street, LLC	kbrumber@easthouse.org	**(585) 238-4823**	**N/A**
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Kevin Ignaszak		kevin.ignaszak@stantec.com	**(585)-413-5355**	**(585)-284-6713**
Katherine Nelson		katie.nelson@stantec.com	**(585) 413-5310**	**(585) 754-7104**
General Contractor	Hamilton Stern	cstern@hamiltonstern.com	**(585) 586-8101**	**N/A**
Todd Caffoe	NYSDEC	todd.caffoe@dec.ny.gov	**(585) 226-5315**	**N/A**

Revision History

Revision Number	Date	Modifications
Original	August 2019	N/A
Revision 1		

Appendix C

Health and Safety Plan
RAWP/AAR
Canal Street Manufacturing Site

Health and Safety Plan Acknowledgement

The undersigned acknowledge they have read and understand this Health and Safety Plan and agree to abide by the requirements included in this document.

Print Name	Signature	Date
Print Name	Signature	Date
Print Name	Signature	Date
Print Name	Signature	Date
Print Name	Signature	Date
Print Name	Signature	Date
Print Name	Signature	Date
Print Name	Signature	Date
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Print Name	Signature	Date
Print Name	Signature	Date
Print Name	Signature	Date

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LIST OF TABLES

Appendix C

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RAWP/AAR
Canal Street Manufacturing Site

LIST OF APPENDICES

Appendix C

Health and Safety Plan
RAWP/AAR
Canal Street Manufacturing Site

1.0 INTRODUCTION

The following Health and Safety Plan (HASP) describes personal safety protection standards and procedures to be followed by Stantec staff during planned Remedial Action activities for the Canal Street Site located at 67 and 89 Canal Street in Rochester, New York (Figure 1).

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 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

This HASP was developed as an appendix to the Remedial Action Work Plan/ Alternatives Analysis Report (Work Plan, or RAWP/AAR) that is being submitted to the New York State Department of Environmental Conservation (NYSDEC) for the Canal Street Site ("Site") located at 67 and 89 Canal Street in the City of Rochester, Monroe County, New York. Based on the information presented in the Work Plan, the remedial action objectives (RAOs) for the Site include:

- Soil
    - Prevent ingestion, or contact with Site contaminants of concern (COCs) that exceed Standards, Criteria and Guidance (SCGs) in impacted areas identified;
    - Prevent ingestion, or contact with "nuisance characteristics" (i.e. petroleum odors) in soils; and
    - Prevent exposure to post-remediation residual COCs via ECs and ICs, including execution of a NYSDEC Environmental Easement (EE) and Site Management Plan (SMP) limiting the Site usage to Restricted Residential, Commercial or Industrial. Unrestricted and Residential Use will not be allowed.
- Soil Vapor
    - Prevent inhalation with Site COCs that exceed SCGs in impacted areas identified;
    - Prevent inhalation with "nuisance characteristics" (i.e. petroleum odors) in soils; and

- Prevent exposure to post-remediation residual COCs via ECs and ICs, including execution of a NYSDEC EE and SMP limiting the Site usage to Restricted Residential, Commercial or Industrial. Unrestricted and Residential Use will not be allowed.

- Groundwater

  - Prevent ingestion, inhalation, or contact with COCs that exceed SCGs; and

  - Prevent exposure to post-remediation residual COCs via institutional controls, including execution of a NYSDEC EE and SMP limiting the Site usage to Restricted Residential, Commercial or Industrial. Unrestricted and Residential Use will not be allowed.

The Site consists of two tax parcels totaling 1.7± acres in the City of Rochester, Monroe County, New York (see Figure 1). The Site is currently improved with a five-story vacant manufacturing building which was constructed in two phases and totals 170,000± gross sq. ft. with a 7,100± sq. ft. concrete block structure single story addition to the manufacturing building that contains loading docks and a 3,030± sq. ft. garage/shop building.

The main manufacturing building and addition with loading docks are currently vacant. The garage is currently used to store vehicles and property maintenance equipment/materials by Buckingham Properties (current owner). The building has recently been used for storage, woodworking, a graphics company, and general contracting. Historically the Site has been used as a shoe, paper box, and a macaroni factory.

Adjacent land use is predominantly industrial, commercial, and residential. The City of Rochester currently owns a Right-Of-Way (former Hyland Alley) that interjects into the Site approximately 60 ft from the north, off Wiley Street.

1.2 HAZARD RECOGNITION

Several health and safety hazards associated with this Site and the anticipated job tasks to be performed as part of the RA have been identified and are listed below in Sections 1.2.1 and 1.2.2. The previous on-Site or adjacent environmental investigations that were reviewed to identify Site-specific hazards for the development this HASP are described in the RAWP.

While in the field, new hazards may be identified as part of the field level risk assessment. This HASP should be updated to reflect new hazards as they are identified during the various investigation stages.

1.2.1 Health Hazards

The following are lists of the potential health hazards identified for the Site.

Chemical/biological hazards include:

- Asbestos;
- Halogenated organic compounds;

- Lead-based paint (LBP);
- Mold;
- Polychlorinated biphenyls (PCBs);
- Petroleum hydrocarbons;
- Pesticides/herbicides; and
- Solvents/flammables.

Physical hazards include:

- Cold stress/frostbite;
- Heat stress/sunburn;
- Dust/dusty environment;
- Flora or fauna;
- Noise; and
- Working at heights.

1.2.2 Safety Hazards

The following are lists of the potential safety hazards identified for the Site.

Machine-related hazards include:

- Heavy equipment;
- Moving parts;
- Excavations (test pits);
- Hydraulic systems;
- Moving parts;
- Pinch points; and
- Rotating parts.

Material handling hazards include:

- Load < 50 lbs; and
- Sharp/rough surface (drums).

Building/Energy-related hazards include:

- Structural integrity concerns;
- Slip, Trip and Fall hazards;
- Poor lighting; and
- Rochester Gas & Electric (RG&E) high voltage equipment stored on-Site.

1.3 HAZARD ASSESSMENT

At the minimum, Stantec personnel will review the following Stantec Safe Work Practices (SWPs) identified as being relevant to the Site and project tasks prior to implementation of the RI.

- SWP 104 – Hazard Communication
- SWP 105 – Personal Protective Equipment (PPE)
- SWP 107 – First Aid

- SWP 111 – Medical Surveillance
- SWP 113 – Heat Stress
- SWP 114 – Working in Cold Environments
- SWP 115 – Material Handling and Safe Lifting
- SWP 124 – Safe Driving
- SWP 201 – Fall Protection/Working from Heights
- SWP 202 – Ladder Safety
- SWP 213 – Utility Clearance
- SWP 214 – Entering Excavation and Trenches
- SWP 216 – Working Near Mobile Equipment
- SWP 304 – Asbestos Safety
- SWP 305 – Benzene Safety
- SWP 314 – Working Around Hazardous Waste and Wastewater
- SWP 407 – Traffic Control and Protection Planning
- SWP 409 – Respiratory Protection
- SWP 416 – Supervision of Contracted Drilling Activities
- SWP-E&R Operational Draft – Ticks and Lyme Disease

This process should occur prior to the commencement of field work and throughout the stages of the RA activities. If new hazards are identified throughout the scope of work, additional SWPs should be reviewed, if available.

1.4 SITE-SPECIFIC CHEMICALS OF CONCERN

Volatile Organic Compounds (VOCs)

Based on the investigation conducted to date (see summary provided in the Work Plan) the following is a petroleum and chlorinated related VOCs have been detected in on-Site soil vapor, soil and groundwater.

Table 1 summarizes health and safety data for the VOCs of primary concern. Safety Data Sheets (SDSs) for these compounds are presented in HASP Appendix A. The air monitoring action levels will be based on the OSHA Short-Term Exposure Limit (STEL) for benzene (5 parts per million [ppm]) 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. Action levels are discussed in Section 6.2.

Semi-Volatile Organic Compounds (SVOCs)

Based on the available on-Site investigation results, naphthalene and polycyclic aromatic hydrocarbons (PAHs) are the primary SVOCs of concern. Table 1 summarizes health and safety data for naphthalene and the SDS is included in HASP Appendix A. Naphthalene is included in a group of SVOCs known as polycyclic aromatic hydrocarbons (PAHs) based on the compound's chemical structure. Due to its vapor pressure, naphthalene is classified as an SVOC, but given its propensity to volatilize at room temperature, naphthalene is also considered a volatile PAH (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2922736/). Therefore, naphthalene is listed also as a volatile COC for this Site HASP.

Appendix C

Health and Safety Plan
RAWP/AAR
Canal Street Manufacturing Site

Metals and Pesticides

Metals have been detected in on-Site soils and pesticides were detected in flooring and water located in the freight elevator pit. Table 1 summarizes health and safety data for the metals and pesticides of primary concern.

Building Materials (asbestos, lead, mold)

The on-Site building materials have been confirmed to contain asbestos and has the potential to contain lead and mold (see Section 7.3.1). It is anticipated that asbestos will be abated prior to implementation of remedial measures within the building.

2.0 STANTEC PERSONNEL ORGANIZATION

Below is a list of **Project Contact** information, including non-Stantec personnel:

Title	Name	Company	Phone Number
Stantec Office	Rochester, NY	Stantec	(585) 475-1440
Project Manager	Mike Storonsky	Stantec	(585) 413-5266 c. (585) 298-2386
Site Safety Officer/Field Team Leader	Katie Nelson	Stantec	(585) 413-5310 c. (585) 754-7104
After-Hours Project Contact	Mike Storonsky	Stantec	c. (585) 298-2386
After-Hours Project Contact [alternate]	Katie Nelson	Stantec	c. (585) 754-7104
Client	Kim Brumber	67 & 89 Canal Street LLC	(585) 238-4823
Primary Facility Contact	Michael Palumbo	Buckingham Properties	(585) 295-9500
Office Safety Environment Coordinator	Sarah Carroll	Stantec	(585) 413-5206
Local HR Representative	Keith Kiss	Stantec	(585) 413-5228 c. (585) 287-4502
Stantec Corporate HSE Representative (US Northeast)	Fred Miller	Stantec	(610) 235-7315
Stantec Public Relations/Media Contact (US Midwest/Mid-Atlantic and Northeast)	Marti Mueller	Stantec	(585) 319-3052

The following describes the Stantec personnel involved in health and safety operations at the Canal Street Site located at 67 & 89 Canal Street in Rochester, NY.

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/FIELD TEAM LEADER

The Site Safety Officer (SSO) and Field Team Leader (FTL) 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 and general coordination of field activities. The FTL/SSO will keep a log book of all calibration data and instrument readings for the Site that will be utilized by the field team on-Site during the various Remedial Action activities.

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

Stantec personnel and contractors working within the exclusion zone will be required to 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 can often experience high 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 chemical hazard on-Site is expected to be potential exposure to the VOCs and SVOC detailed in Table 1. SDSs for the primary Site COCs presenting potential chemical exposure hazards are provided in Appendix A.

Additionally, there is the potential for building materials to contain asbestos, PCBs, mold, and LBP. Building material-related hazards are discussed further in Section 4.3.

The soil and groundwater contaminants 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 including VOCs. 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 (PELs) (see Table 1).

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 with work gloves (as appropriate) when handling soil, groundwater equipment, samples, or building materials. Real time, breathing zone levels of total VOCs will be monitored using a portable photoionization detector (PID). If ambient levels exceed action levels, affected Site activities will be performed using Level C PPE until ambient concentrations dissipate. Where levels exceed 50 parts per million (ppm), work will cease, and the Project Manager will be notified immediately. Intrusive work may also be halted where required by action levels detailed in the Community Air Monitoring Plan (CAMP), Appendix C of the RAWP/AAR.

Depending on seasonal conditions, disturbance of the Site soils may cause the particulate contaminants to become airborne as dust. Therefore, particulates will be monitored as discussed in Section 6.1 and dust-suppression methods used where appropriate as discussed in Section 6.2, or in the CAMP. Additionally, aeration of the groundwater may cause volatilization of chemicals into the air, particularly VOCs.

Table 2 summarizes first aid instructions for exposure pathways for the Site COCs.

4.2 PHYSICAL HAZARDS

The following sub-sections describe the physical hazards anticipated to be encountered at this Site. Field team members will wear the basic Level D safety apparel including steel-toed shoes, hard hat, safety vest, safety glasses, and task-appropriate gloves during applicable activities. Hearing protection may be required for certain tasks. See Section 7, Personal Protective Equipment for additional information.

4.2.1 Drilling and Excavation Activities

Hazards typically encountered at construction sites with ground-intrusive work such as drilling and excavation programs will be a concern at this Site. These hazards include rough or slippery ground surfaces, holes, exposure to chemical vapors, and operation of heavy and mobile machinery and equipment.

Excavations

The general contractor shall make all necessary contacts with the DIGSafelyNY underground utility locater hotline prior to digging.

The potential exists for falling into the excavation due to a slip or trip and also due to potential caving of the test pit 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 pit. If it is necessary to make observations from a point along the long side of the pit, they will maintain adequate distance between themselves and the test pit walls, and be mindful of signs that caving may be likely. These could include raveling of sidewall material into the pit, or the development of cracks in the ground surface.

Field personnel will not enter excavations deeper than four feet. Field personnel will not approach within six feet of any excavation that is ten feet or greater in depth without the presence of a fall prevention of fall arrest system in place and functioning.

Drilling

Under no circumstances will Stantec personnel approach the borehole during active drilling operation. All field personnel working around the equipment will be shown the location and operation of kill switches, which are to be tested daily.

The driller shall make all necessary contacts with the DIGSafelyNY utility locater hotline 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 has not been stabilized and leveled and the rig is not to be moved between locations with its boom in a vertical position.

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% Lower Explosive Limit [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.

As with any soil disturbance, monitoring for VOCs with a photoionization detector (PID) will be performed continuously during excavation activities, including in worker's breathing zone and upwind and downwind locations in accordance with the Community Air Monitoring Program (CAMP). 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 Working near Mobile Equipment

Stantec staff will not operate mobile equipment in any capacity without the proper training. Equipment operators shall not use, or attempt to use any vehicle for any purpose other than for which it is designated.

Controls to mitigate hazards include: discussing unfamiliar machinery, barricade an area if a safe zone is required, never walk under a suspended load, extended boom or bucket, do not approach equipment until operator shuts down the machine, establish eye contact with equipment operator and communicate intentions, and be aware of equipment blind spots.

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

4.2.4 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.

4.2.5 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. Wind chill is the combined effect of wind and air temperature on exposed skin, and is a common metric for evaluating potential for cold stress. Refer to Stantec SWP 114 for relevant charts depicting the relationship between air temperature, wind speed, and potential danger. Symptoms of cold stress include, 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

4.2.6 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.

4.2.7 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.
4	Support the ladder by:

	• 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: • 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: • 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.

4.2.8 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.

4.2.9 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.

4.2.10 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).

4.2.11 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 each 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 above.

4.2.12 Ticks and Lyme Disease

Lyme disease is typically transferred by 'hard ticks". Early symptoms of Lyme Disease include fever, headache, fatigue, depression, and a characteristic "bulls-eye" rash on 30% of cases. Ticks bites are often painless an in partially protected areas on the body (underarms, back of knee, behind the ear). Reports of ticks carrying Lyme Disease have been confirmed in every Canadian province and most U.S. states. Preventative measures for ticks include:

- Spraying clothing with insect repellant as a barrier
- Wearing protective clothing including: a hat, long sleeved shirt tucked into pants, and pants tucked into socks or boots. At regular intervals throughout the day, check to ensure clothes remain tucked in.
- Checking for ticks on or under clothing after working in a tick infested area. Use a mirror if needed, as ticks may feed on hard to see areas of the body.
- If you discover a tick, remove it by using a bank card or Tick Key to scrape slowly and remove the entire tick. You can also use fine tipped tweezers to grasp the tick as close to the skins surface as possible. Try not to squeeze the body as this may increase the chance of bacteria entering the bloodstream. Wash the affected area with soap and water or disinfectant.

4.3 BUILDING-RELATED HAZARDS

This section describes the potential Site-specific health and safety hazards associated with the on-Site building, based on observations made by Stantec during Site reconnaissance for the 2018 Phase I ESA as well as potential hazards generally associated with working in vacant or abandoned buildings.

4.3.1 Encounters with Strangers or Squatters

Field staff are not to enter the building if they suspect that unauthorized personnel are present in the building. The field staff are to wait in a safe place and inform the Project Manager immediately. If someone is encountered once inside the building, field staff shall speak reasonably to them, explain why (s)he is there, and back slowly away from the building possibly using an excuse such as going to the car to retrieve a forgotten tool or supply. Once outside, field staff should leave the Site and contact the Project Manager when it is safe to do so.

4.3.2 Structural Integrity

Based on building conditions observed by Stantec, portions of the Site buildings may have compromised structural integrity. Prior to implementing the RI, a structural engineer must be consulted to determine if a building inspection is recommended to assess for structural integrity and confirm it is safe to enter. Field staff must remain vigilant in observing any changing building conditions such as collapses or cave-ins. If field staff believe the structural integrity of the building is compromised, they must leave the building and notify the Project Manager immediately. Structural assessments by competent persons must be performed prior to building re-entrance.

4.3.3 Poor Lighting

Poor lighting conditions in the building impair visibility and increase the risks of previously identified hazards such as slip/trip/fall. When working indoors, field staff must be prepared with flashlights,

lanterns, and headlamps. Hands-free lighting options are preferable. For contracted work occurring indoors, the contractor should be aware of this condition and may provide lighting as part of the scope.

4.3.4 High-Voltage Room

There is a room on the bottom floor of the main building that is labelled as “high voltage” and reportedly stores RG&E-owned electrical equipment. Field staff are not permitted to enter this room without prior approval of the Project Manager, and after a job safety analysis has been performed.

4.3.5 Asbestos Exposure

Asbestos can be found in many applications, including sprayed-on or blanket-type insulation, pipe wraps, mastics, floor and ceiling tiles, wallboard, mortar, roofing materials, and a variety of other materials commonly used in construction. As defined in New York State Code Rule 56 (CR56) presumed Asbestos Containing Materials (PACM) is all thermal system insulations and surface materials found in building constructed no later than 1980. Suspect Asbestos Containing Material (SACM) is any suspect material that is not a PACM such as floor tiles, ceiling tiles, mastics/adhesives, sealants, roofing material etc. All PACMs and SACMs must be assumed to contain asbestos unless proven otherwise by bulk sampling and laboratory analysis.

An asbestos survey was conducted (see Section 7.3) and asbestos abatement is scheduled to be completed prior to remedial actions.

4.3.6 PCB Exposure

The United States Environmental Protection Agency (EPA) has stated that there is potential for widespread use of polychlorinated biphenyls (PCBs) in building materials, such as caulks and paints, used between 1950 and 1979. Given the age of the manufacturing material there is potential for PCBs to be present; however, none were identified during a hazardous building material survey.

4.3.7 Lead-Based Paint Exposure

The risk of lead toxicity in LBP varies based upon the condition of the paint and the year of its application. The U.S. Department of Housing and Urban Development (HUD) has identified the following risk factors:

- The age of the dwelling as follows: maximum risk is from paint applied before 1950.
- There is severe risk from paint applied before 1960.
- There is moderate risk from deteriorated paint applied before 1970.
- There is slight risk from the paint that is intact but applied before 1977.
- The condition of the painted surfaces.
- The presence of children and certain types of households in the building.
- Previously reported cases of lead poisoning in the building or area.

The Site building was reportedly constructed in the early 1900s. Due to the age of the structure and the observed interior building conditions, the potential for exposure to LBP through inhalation is considered a hazard for this Site, specifically for activities inside the building that will create airborne dust through the destruction or disturbance of painted building materials. Additionally, workers may be exposed through dermal contact or ingestion. Controls to minimize potential exposure to LBP include the following:

- Dust control measures, such as local exhaust ventilation; and
- Proper use and maintenance of PPE including eye protection, impermeable gloves (latex/nitrile), and respiratory protection (half-face-piece air-purifying respirator fitted with replaceable particulate filters (P100 minimum); and
- Good hygiene practices, such as washing hands frequently (particularly before eating) or taking shower/changing clothes prior to leaving the Site (if feasible) or before going home.

The above-listed controls should be practiced by field personnel while working inside the building during dust-generating activities or when handling building materials. Respiratory protection is only required during indoor dust-generating activities.

4.3.8 Mold Exposure

The following PPE should be worn if the disturbance of suspected mold-impacted or water-damaged building materials is anticipated and cannot be avoided:

- Half-face-piece air-purifying respirator fitted with replaceable filters or use disposal dust mask with valve (i.e. 3M 8210V N95 Industrial Respirator with Valve);
- Impermeable gloves (latex or nitrile);
- Eye protection; and
- Light-weight disposal coveralls (i.e. KleenGuard).

Good hygiene practices should be followed including washing face/hands, cleaning/maintaining the respirator, storing contaminated clothing/footwear/outerwear until disinfected.

4.3.9 Exposure to Bird, Bat, or Rodent Droppings

If evidence of significant animal droppings is observed, field staff must exit the building and put on appropriate PPE which includes at a minimum:

- A full-face-piece respirator fitted with a P100 filter;
- Impermeable gloves (latex or nitrile);
- Disposable dust-impervious coveralls, with attached hoods, tightly secured with tape at the ankles and wrists; and
- Disposable boot covers or separate work boots.

Disturbance of accumulations of droppings should be avoided to minimize exposure to airborne dust. Good hygiene practices should be followed including washing face/hands, cleaning/maintain the respirator, storing contaminated clothing/footwear/outerwear until disinfected.

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 Field Team Leader 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 (PPE) 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. Personnel leaving the exclusion zone will be required to adhere to proper decontamination procedures.

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, slambar, 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 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 and particulates will be performed as needed to ensure appropriate personal protective measures are employed during site activities.

A separate Community Air Monitoring Plan (CAMP) has also been developed (Appendix D of the RAWP) to protect the surrounding neighborhood. It is assumed that continuous downwind particulate and VOC monitoring will not be required during drilling and that air monitoring will not be required during groundwater monitoring events.

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 and excavation activities, 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.

Atmospheric Monitoring – During ground-intrusive work performed indoors, it is anticipated that Stantec will perform work area monitoring using a portable gas monitor (such as a MultiRAE meter) to monitor the following breathing zone conditions:

- Oxygen Levels (O2): acceptable oxygen content is **between 19.5% and 23.5%**. If oxygen levels fall below 19.5% or exceed 21.5%, work must be stopped until appropriate controls can be implemented.
- Lower Explosive Limit (LEL): indicative of flammable/explosive gases present. The LEL must remain **below 10%.**
- Toxicity: evaluate concentrations [ppm] of toxic gases using carbon monoxide (CO) and hydrogen sulfide (H2S) meters.

	OSHA PEL[1]	NIOSH REL[2]	ACGIH TLV[3]
Carbon Monoxide	50 ppm	35 ppm C 200 ppm	25 ppm
Hydrogen Sulfide	C 20 ppm	C 10 ppm (10 minutes)	1 ppm 5 ppm STEL

Notes:

1. 1. Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL), based on an 8-hour time-weighted average
2. 2. National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL), based on a 10-hour work day.
3. 3. American Conference of Governmental Hygienists (ACGIH) Threshold Limit Value (TLV), based on an 8-hour time-weighted average

Abbreviations:

- C: ceiling limit (exposure shall not exceed this limit at any time)
- ppm: parts per million
- STEL: short term exposure limit (acceptable average exposure for a short time period [usually 15 minutes unless otherwise noted], assuming the 8-hour TWA is not exceeded)

Particulates – Stantec will perform work zone particulate monitoring during indoor work activities given likely presences of hazardous building materials (see Sections 4.3.5 to 4.3.9). An aerosol monitor (such as the TSI 8530 DustTrak II or SidePak) will be used to monitor the work area personal exposures to particulates. The first readings of the day will be obtained prior to the commencement of work to obtain a daily background reading, and the instrument will be zeroed daily and calibrated to manufacturer's specifications. Readings will be manually recorded approximately every 30 minutes thereafter. If visible dust is present in the area and/or the work area particulate levels exceed 5 mg/m^3 dust control measures and/or use of respiratory protection by workers will be required. Should dust levels exceed the background level by more than 0.1 mg/m^3 at the perimeter of the site 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 exceed 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 or excavation 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/m^3 above background, then the Contractor will be directed to implement fugitive dust control measures which may include use of engineering controls such as water spray.

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.

Stantec employees are expected to wear long sleeves when doing so would not pose an additional hazard (i.e. heat stress). Steel-toed boots should be approximately 6" to provide sufficient ankle protection. Safety vests should be worn for visibility; alternatively, bright colored shirts (safety yellow, for example) can be utilized when reflective properties of the safety vests are not necessary.

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;
- High visibility clothing;
- Steel-toed boots; and
- Disposable booties or chemical resistant boots are required.

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

Level D

- Safety glasses;
- High visibility clothing;
- 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 and containerized 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. First aid kits (included eyewash) and fire extinguishers should be located in the Stantec work vehicle. It is anticipated that at least one certified First Aider will be on-Site during the RA activities.

9.1 LIST OF EMERGENCY CONTACTS

Ambulance: 911
Hospital: **Highland Hospital: (585) 473-2200**

Fire Department: 911
Police: 911
Poison Control Center: 1-800-222-1222
Utility Emergency: 911

9.2 DIRECTIONS TO HOSPITAL

Maps presenting directions to the nearest hospital (Highland Hospital) and urgent care center (Xpress Care Medical) are provided in Figure 2. The routes shall be reviewed at the initial Site safety meeting on-Site and as needed for Site orientation if new personnel are added to the field team.

9.3 ACCIDENT INVESTIGATION AND REPORTING

A. 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.

B. For any injury, the employee shall:

- Initiate necessary first aid or medical treatment.
- Immediately notify their supervisor.

WorkCare (1-888-449-7787) should be contacted to discuss non-emergency signs or symptoms of work-related injury or illness. The incident reporting form and protocol is included in Appendix C.

C. 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:

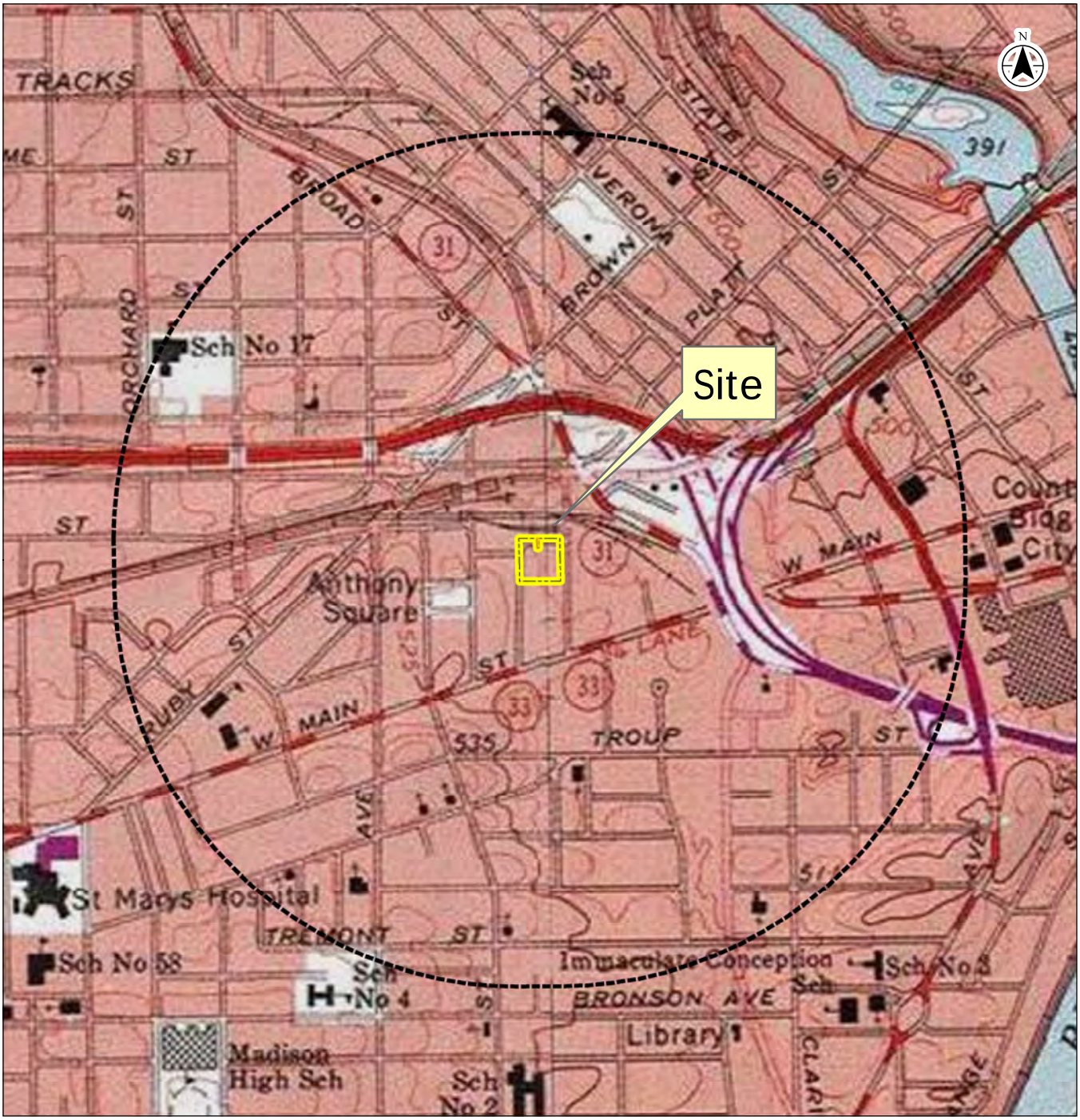
- Name of injured;
- Name and title of person(s) reporting;
- Date and time of accident/incident;
- Location of accident/incident, building number, facility name;
- Brief summary of accident/incident giving pertinent details including type of operation ongoing at the time of the accident/incident;
- Cause of accident/incident;
- Casualties (fatalities, disabling injuries), hospitalizations;
- Details of any existing chemical hazard or contamination;
- Estimated property damage, if applicable;
- Nature of damage; effect on contract schedule;
- Action taken to insure 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.

FIGURES

U:\190500965\05_report_deliv\dwgs_design\GIS_figures\3_HASP.mxd\Fig1_site_loc_map.mxd Revised: 2018-03-21 By: tbest



Legend

- Property Outline
- City of Rochester ROW*
- 1/2-mile Site Buffer

0 400 800 1,200 Feet

1:12,000 (at original document size of 8.5x11)

Stantec

Project Location 190500965

67 & 89 Canal Street
C. of Rochester, Monroe Co., NY

Prepared by LB on 2017-12-13
Technical Review by KN on 2018-01-19
Independent Review by MPS on 2018-01-30

Client/Project

Canal Street Manufacturing Site
Remedial Action Work Plan
Health and Safety Plan

Figure No.

1

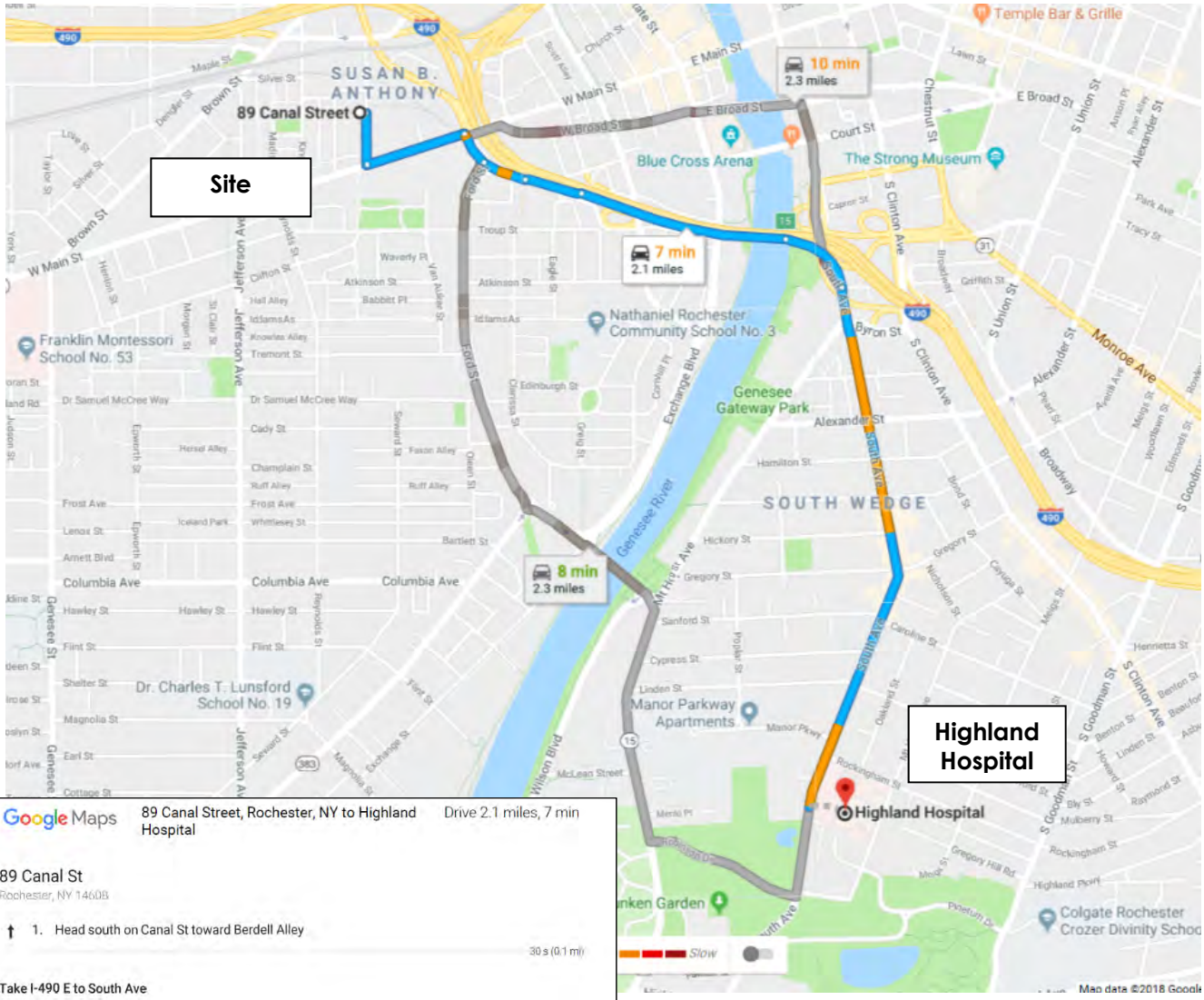
Title

Site Location Map

Notes
1. Coordinate System: NAD 1983 StatePlane New York West FIPS 3103 Feet
2. ArcGIS Basemaps: USA Topo Maps (main frame) and World Street Map (key map).
3. *The City of Rochester ROW is anticipated to become part of the Canal Street Site upon abandonment by the City of Rochester.

Figure 2
Map and Driving Directions to Medical Facilities

Hospital:
Highland Hospital
1000 South Ave
Rochester, NY 14620
Phone: (585) 473-2200



Google Maps 89 Canal Street, Rochester, NY to Highland Hospital — Drive 2.1 miles, 7 min

89 Canal St
Rochester, NY 14608

1. Head south on Canal St toward Berdell Alley — 30 s (0.1 mi)

Take I-490 E to South Ave — 6 min (2.0 mi)

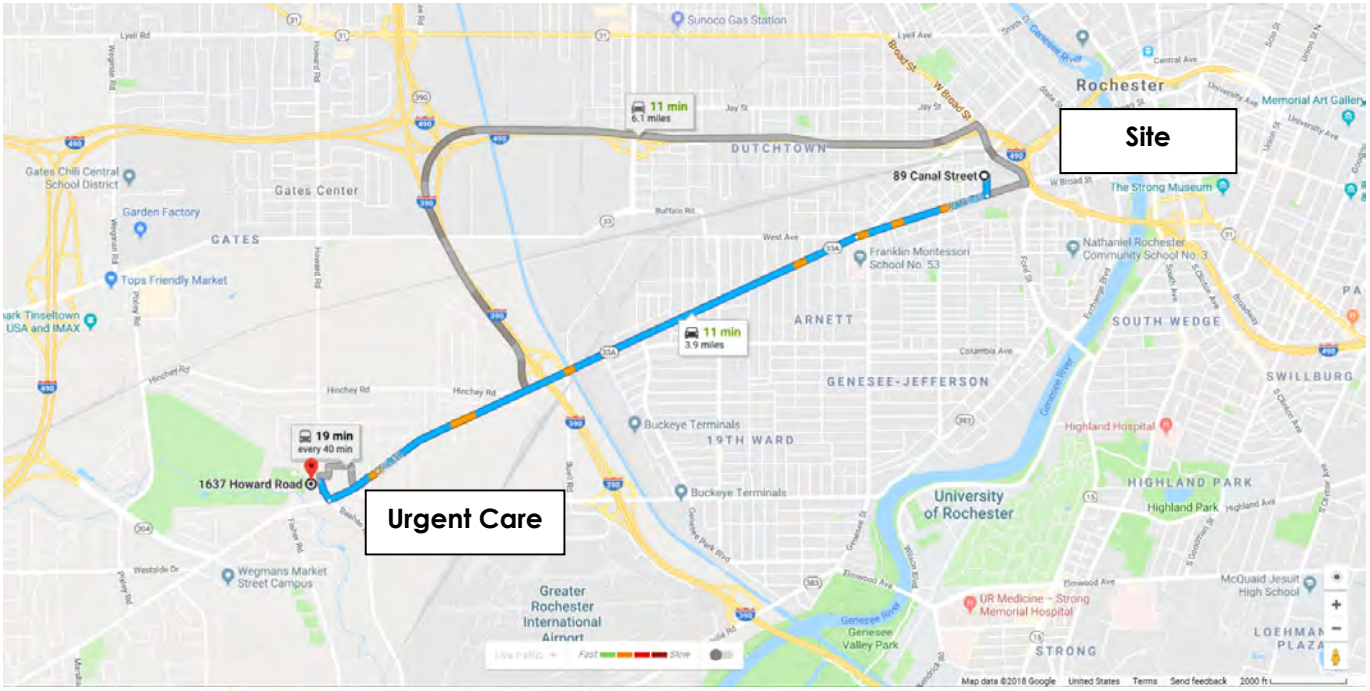
2. Turn left onto W Main St — 0.2 mi
3. Turn right onto Ford St — 351 ft
4. Continue straight onto Boys Club Pl — 449 ft
5. Use the left lane to take the Interstate 490 E ramp — 0.1 mi
6. Merge onto I-490 E — 0.4 mi
7. Take exit 15 for NY-15 — 0.2 mi
8. Merge onto South Ave — 1.0 mi

Highland Hospital
1000 South Ave, Rochester, NY 14620

Figure 2
Map and Driving Directions to Medical Facilities

Urgent Care:

Xpress Care Medical
1637 Howard Rd
Rochester, NY, 14624
Phone: (585) 429-9777



Google Maps 89 Canal St, Rochester, NY 14608 to 1637 Howard Rd, Rochester, NY Drive 3.9 miles, 11 min

89 Canal St
Rochester, NY 14608

1. Head south on Canal St toward Berdell Alley — 0.1 mi
2. Turn right onto W Main St — 0.7 mi
3. Continue straight onto NY-33A W/Chili Ave — 3.0 mi
4. Turn right onto Howard Rd — 0.1 mi
   Destination will be on the left

1637 Howard Rd
Rochester, NY 14624

Appendix B

Health and Safety Plan
RAWP/AAR
Canal Street Manufacturing Site

TABLES

Table 1
Health and Safety Data for COCs
Health and Safety Plan
Canal Street Manufacturing Site
67 & 89 Canal Street, Rochester, NY

Compound	OSHA PEL[1]	NIOSH REL[2]	ACGIH TLV[3]	Physical Description	Odor Threshold in Air	Route of Exposure	Symptoms	Target Organs
Volatile Organic Compounds (VOCs)								
Acetone	1000 ppm	250 ppm	250 ppm 500 ppm STEL	Colorless liquid with a fragrant, mint-like odor	20 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, nose, throat; headache, dizziness, central nervous system depression; dermatitis	Eyes, skin, respiratory system, central nervous system
Benzene	1 ppm 5 ppm STEL	0.1 ppm	0.5 ppm 2.5 ppm STEL	Colorless to light-yellow liquid with an aromatic odor (NOTE: solid below 42°F)	1.5 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation 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; target cancer site: leukemia
Butylbenzene, n-	NE			Colorless liquid	-	Inhalation, dermal contact	Skin/eye irritation	Eyes, skin
Chloromethane	100 ppm 200 ppm C [5 min. in any 3 hrs.]	NE	50 ppm 100 ppm STEL	Colorless gas with a faint, sweet odor which is not noticeable at dangerous concentrations. [Note: Shipped as a liquefied compressed gas.]	10 ppm	Inhalation, skin and/or eye contact (liquid)	Dizziness, nausea, vomiting; visual disturbance, stagger, slurred speech, convulsions, coma; liver, kidney damage; liquid: frostbite; reproductive, teratogenic effects; [potential occupational carcinogen]	Central nervous system, liver, kidneys, reproductive system; target cancer site: in animals - lung, kidney, and forestomach tumors
1,2-dichloroethane (1,2-DCA)	50 ppm 100 ppm C [5 min. in any 3 hrs.]	1 ppm 2 ppm STEL	10 ppm	Colorless liquid with a pleasant, chloroform-like odor. [Note: Decomposes slowly, becomes acidic & darkens in color.]	6-10 ppm	Inhalation, ingestion, skin absorption, skin and/or eye contact	Irritation eyes, corneal opacity; central nervous system depression; nausea, vomiting; dermatitis; liver, kidney, cardiovascular system damage; [potential occupational carcinogen]	Eyes, skin, kidneys, liver, central nervous system, cardiovascular systemtarget cancer site: in animals - forestomach, mammary gland, and circulatory sys. Cancer
cis-1,2- dichloroethene (cis-1,2-DCE)	200 ppm	200 ppm	200 ppm	Colorless liquid (usually a mixture of the cis & trans isomers) with a slightly acrid, chloroform-like odor	17 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation eyes, respiratory system; central nervous system depression	Eyes, respiratory system, central nervous system
Ethylbenzene	100 ppm	100 ppm 125 ppm STEL	20 ppm	Colorless liquid with an aromatic odor	2.3 ppm	inhalation, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; headache; dermatitis; narcosis, coma	Eyes, skin, respiratory system, central nervous system
Isopropylbenzene (cumene)	50 ppm	50 ppm	50 ppm	Colorless liquid with a sharp, penetrating, aromatic odor	0.088 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, mucous membrane; dermatitis; headache, narcosis, coma	Eyes, skin, respiratory system, central nervous system
Isopropyltoluene	NE			Colorless liquid	-	Inhalation, ingestion, skin and/or eye contact	Dizziness, drowsines, vomiting, dry skin, skin/eye redness; diarrhea, headache, nausea, unconsciousness	Eyes, skin
Methyl tert-butyl ether (MTBE)	NE		50 ppm	Colorless, synthetically produced liquid with a sweet, solvent-like, alcohol, or turpentine-like odor	20-40 ppb	Inhalation, ingestion, skin and/or eye contact	Drowsiness, dizziness, headache, weakness, unconsciousness; redness of skin and eyes; Acute ingestion: Nausea, vomiting, abdominal pain; chemical pneumonitis (by aspiration); irritation -eyes/skin; nervous system disturbances	Eyes, skin, central nervous system

Table 1
Health and Safety Data for COCs
Health and Safety Plan
Canal Street Manufacturing Site
67 & 89 Canal Street, Rochester, NY

Compound	OSHA PEL[1]	NIOSH REL[2]	ACGIH TLV[3]	Physical Description	Odor Threshold in Air	Route of Exposure	Symptoms	Target Organs
Naphthalene[4]	10 ppm	10 ppm 15 ppm STEL	10 ppm	Colorless to brown solid with an odor of mothballs	0.084 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-	NE			Clear, colorless liquid	-	Inhalation, dermal contact	Irritating to mucous membranes, eyes, nose, throat, and skin; systemic: central nervous system depression, headache, anorexia, muscular weakness, incoordination, nausea, vertigo, mental confusion, and unconsciousness	Eyes, respiratory system, central nervous system
Tetrachloroethene (aka Perchloroethene [PCE])	100 ppm 200 ppm C	NE	25 ppm 100 ppm STEL	Colorless liquid with a mild chloroform-like odor	1 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]	Eyes, skin, respiratory system, liver, kidneys, central nervous system
Toluene	200 ppm 300 ppm C	100 ppm TWA 150 ppm STEL	20 ppm	Colorless liquid with a sweet, pungent, benzene-like odor	2.9 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation 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
Trichloroethene (TCE)	100 ppm 200 ppm C	25 ppm	10 ppm 25 ppm STEL	Colorless liquid with a chloroform-like odor	28 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation eyes, skin; headache, visual disturbance, lassitude (weakness, exhaustion), dizziness, tremor, drowsiness, nausea, vomiting; dermatitis; cardiac arrhythmias, paresthesia; liver injury; [potential occupational carcinogen]	Eyes, skin, respiratory system, heart, liver, kidneys, central nervous system
1,2,4-Trimethylbenzene	NE	25 ppm	25 ppm	Clear, colorless liquid with a distinctive, aromatic odor.	2.4 ppm	Inhalation, ingestion, skin and/or eye contact	Irritation 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
1,3,5-Trimethylbenzene					2.2 ppm			
Xylene	100 ppm	100 ppm	100 ppm	Colorless liquid with an aromatic odor.	1 ppm	Inhalation, skin absorption, ingestion, skin and/or eye contact	Irritation 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
Hazardous Building Materials								
Asbestos	0.1 f/cc	Lowest feasible concentration; 0.1 f/cc	0.1 R f/cc	White or greenish (chrysotile), blue (crocidolite), or gray-green (amosite) fibrous, odorless solids. Fibrous silicate minerals: long, flexible crystalline fibers (serpentine) or brittle fibers (amphibole); not volatile and not soluble (but may be suspended)	-	Inhalation, ingestion, skin and/or eye contact	Asbestosis (chronic exposure): dyspnea (breathing difficulty), interstitial fibrosis, restricted pulmonary function, finger clubbing; irritation eyes; [potential occupational carcinogen]	Respiratory system, eyes; target cancer site - lung cancer

Table 1
Health and Safety Data for COCs
Health and Safety Plan
Canal Street Manufacturing Site
67 & 89 Canal Street, Rochester, NY

Compound	OSHA PEL[1]	NIOSH REL[2]	ACGIH TLV[3]	Physical Description	Odor Threshold in Air	Route of Exposure	Symptoms	Target Organs
Lead	0.05 mg/m^3 0.03 mg/m^3 AL	0.05 mg/m^3	0.05 mg/m^3	A heavy, ductile, soft, gray solid	-	Inhalation, ingestion, skin and/or eye contact	Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypertension	Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue
Polychlorinated biphenyls (PCBs)	0.5 µg/m3 (Aroclor 1254) 1 µg/m^3 (Aroclor 1260)	1 µg/m^3	-	Range in color from clear to pale yellow with a mild petroleum odor	-	Inhalation, skin/eye contact, ingestion	Irritation to eyes, skin; headaches; chloracne; liver damage; reproductive effects; [potential occupational carcinogen]	Skin, eyes, liver, reproductive system

Abbreviations:

f/cc	fibers per cubic centimeter
NE	not established
ppm	parts per million
R	respirable
STEL	Short-Term Exposure Limit is a 15-min TWA
TWA	Time-weighted average
-	could not be identified

Notes:

1. Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit (PEL) for general industry. The OSHA PELs are 8-hour TWAs, unless otherwise noted.
2. National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL) are based on 10-hour workdays during a 40-hour workweek.
3. American Conference for Governmental Industrial Hygenists (ACGIH) Threshold Limit Value (TLV). The ACGIH TLVs are 8-hr TWAs, unless otherwise noted.
4. Naphthalene is included in a group of SVOCs known as polycyclic aromatic hydrocarbons (PAHs) based on the compound's chemical structure. Due to its vapor pressure, naphthalene is classified as an SVOC, but given its propensity to volatilize at room temperature, naphthalene is also considered a volatile PAH (https://www.ncbi.nlm.nih.gov/pmc/articles/PMC2922736/). Therefore, naphthalene is listed also as a volatile COC for this Site HASP.

Table 2
Exposure Pathways and First Aid Response for COCs
Health and Safety Plan
Canal Street Manufacturing Site
67 & 89 Canal Street, Rochester, NY

Substsance	Exposure Pathways	First Aid Instructions
VOCs listed in Table 1	Eye	Irrigate immediately
	Dermal	Soap wash promptly; or Soap wash (trimethylbenzenes, butylbenzene); or Soap wash immediately (acetone, benzene); or Soap flush immediately (1,1-DCE); or Water wash promptly (ethylbenzene;isopropylbenzene); or Solid-liquid soap wash promptly (naphthalene) *Chloromethane: flush with water; if contact with liquid, warm frozen tissues slowly with lukewarm water and get medical attention (do not rub affected area)*
	Inhalation	Respiratory support
	Ingestion	Medical attention immediately
Hazardous Building Materials listed in Table 1	Eye	Irrigate immediately
	Dermal	Asbestos: Soap wash, then flush with water for 15 minutes Lead: Soap flush promptly PCBs: Soap wash immediately
	Inhalation	Respiratory support; or fresh air (asbestos)
	Ingestion	Medical attention immediately

Table 3
Exposure Symptoms and First Aid for Heat Exposure
Health and Safety Plan
Canal Street Manufacturing Site
67 & 89 Canal Street, Rochester, NY

Heat Disorder	Symptoms	First Aid Instructions
Heat Rash	Red skin	Remove victim from sun; allow skin to dry; washing skin may further cool the victim.
Heat Cramps	Muscle cramps	Move victim to cooler environment and lay down if possible; remove or lighten tight clothing; cool victim by sponging and fanning (do not cool worker too much); administer fluids (juice, non-caffeinated soft drinks or sports drinks are preferable) if victim is alert and not nauseated.
Heat Exhaustion	Heavy sweating; weakness; cool to cold skin; pale and clammy; thready pulse; possible confusion; fainting; vomiting.	Stop work immediately; remove victim from sun to cooler environment; lie down and loosen clothing; apply cool, wet cloths; fan or move to location with AC; sips of water; if nausea occurs, discontinue fluids; if vomiting continues, seek immediate medical attention.
Heat Stroke	High body temperature; hot, dry skin (red mottled or bluish); rapid and strong pulse; confusion/disorientation; dizziness; possible loss of consciousness.	Stop work immediately; call 911; move victim to cooler place and remove heavy clothing; cool the victim by available means (ice packs, wet towels) with extreme caution; do not administer fluids or medication.

Appendix B

Health and Safety Plan
RAWP/AAR
Canal Street Manufacturing Site

TABLE 4
ACCIDENT REPORT

Project Canal Street Manufacturing Site Date of Occurrence_____

Location __67 & 89 Canal Street Rochester, NY_____
_____

Type of Occurrence: (check all that Apply)

☐Disabling Injury ☐Other Injury
☐Property Damage ☐Equip. Failure
☐Chemical Exposure ☐Fire
☐Explosion ☐Vehicle Accident
☐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 _____
_____
_____

HEALTH & SAFETY PLAN

APPENDIX A

MATERIAL SAFETY DATA SHEETS

SAFETY DATA SHEET

Creation Date 04-Feb-2010 **Revision Date** 18-Jan-2018 **Revision Number** 6

1. Identification

Product Name **1,2-Dichloroethane**

Cat No. : **E175-4; E175-20; E175-500; E175RS-19; E175RS-50; E190-4**

CAS-No 107-06-2
Synonyms Ethylene dichloride; Ethylene chloride (Certified ACS/Spectranalyzed)

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
Acute oral toxicity	Category 4
Acute Inhalation Toxicity - Vapors	Category 3
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 - Respiratory system, Central nervous system (CNS).	
Specific target organ toxicity - (repeated exposure)	Category 2
Target Organs - Kidney, Liver, Heart, Blood.	

Label Elements

Signal Word
Danger

Hazard Statements
Highly flammable liquid and vapor
Harmful if swallowed
Causes skin irritation
Causes serious eye irritation

Toxic if inhaled
May cause respiratory irritation
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
Do not eat, drink or smoke when using this product
Use only outdoors or in a well-ventilated area
Wear eye/face protection
Do not breathe dust/fume/gas/mist/vapors/spray
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Keep cool
Response
IF exposed or concerned: Get medical attention/advice
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician
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: Call a POISON CENTER or doctor/physician if you feel unwell
Rinse mouth
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. Cancer - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Ethylene dichloride	107-06-2	>95

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. Immediate medical attention is required.

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

Inhalation Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Immediate medical attention is required.

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

Most important symptoms and effects Breathing difficulties. May cause cardiac arrhythmia. May cause central nervous system depression: Symptoms may include tightness in the chest, flushing, headache, nausea, vomiting, respiratory depression, weakness, irregular heartbeat, abdominal pain, convulsions, and shock

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 Water may be ineffective

Flash Point 13 °C / 55.4 °F

Method - No information available

Autoignition Temperature 440 °C / 824 °F

Explosion Limits

Upper 15.9 vol %

Lower 6.2 vol %

Sensitivity to Mechanical Impact No information available

Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical

Flammable. Containers may explode when heated. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back. Keep product and empty container away from heat and sources of ignition. Thermal decomposition can lead to release of irritating gases and vapors.

Hazardous Combustion Products

Carbon monoxide (CO) Carbon dioxide (CO_2) 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. Thermal decomposition can lead to release of irritating gases and vapors.

NFPA

Health	Flammability	Instability	Physical hazards
3	3	0	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment. Evacuate personnel to safe areas. Keep people away from and upwind of spill/leak. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges.

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

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. Do not ingest. Use only under a chemical fume hood. Do not breathe vapors or spray mist. 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. 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)
Ethylene dichloride	TWA: 10 ppm	(Vacated) TWA: 1 ppm (Vacated) TWA: 4 mg/m³ Ceiling: 100 ppm (Vacated) STEL: 2 ppm (Vacated) STEL: 8 mg/m³ TWA: 50 ppm	IDLH: 50 ppm TWA: 1 ppm TWA: 4 mg/m³ STEL: 2 ppm STEL: 8 mg/m³	TWA: 10 ppm TWA: 40 mg/m³

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

Personal Protective Equipment

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

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

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

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	400 ppm
pH	No information available
Melting Point/Range	-35 °C / -31 °F
Boiling Point/Range	81 - 85 °C / 177.8 - 185 °F
Flash Point	13 °C / 55.4 °F
Evaporation Rate	6.5 (Butyl Acetate = 1.0)
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	15.9 vol %
Lower	6.2 vol %
Vapor Pressure	65 mmHg @ 29 °C
Vapor Density	3.4
Specific Gravity	1.250
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	440 °C / 824 °F
Decomposition Temperature	No information available
Viscosity	0.8 mPa s at 20 °C
Molecular Formula	C2 H4 Cl2
Molecular Weight	98.96

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, Bases, Alkali metals

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2), 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
Ethylene dichloride	625 mg/kg (Rat) 413 mg/kg (Mouse)	2800 mg/kg (Rabbit)	28.79 mg/L (Rat) 1h 7.8 mg/l (Rat) 4h

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
Ethylene dichloride	107-06-2	Group 2B	Reasonably Anticipated	Not listed	X	Not listed

IARC: (International Agency for Research on Cancer)

NTP: (National Toxicity Program)

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

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

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

Aspiration hazard No information available

Symptoms / effects,both acute and delayed May cause central nervous system depression: Symptoms may include tightness in the chest, flushing, headache, nausea, vomiting, respiratory depression, weakness, irregular heartbeat, abdominal pain, convulsions, and shock

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity
Do not empty into drains.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Ethylene dichloride	EC50: = 166 mg/L, 96h static (Desmodesmus subspicatus) EC50: > 433 mg/L, 96h (Pseudokirchneriella subcapitata)	LC50: 110 - 123 mg/L, 96h flow-through (Pimephales promelas) LC50: 230 - 710 mg/L, 96h flow-through (Lepomis macrochirus) LC50: = 225 mg/L, 96h static (Oncorhynchus mykiss)	Not listed	EC50: 140 - 190 mg/L, 48h Static (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
Ethylene dichloride	1.45

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
Ethylene dichloride - 107-06-2	U077	-

14. Transport information

DOT

UN-No	UN1184
Proper Shipping Name	ETHYLENE DICHLORIDE
Hazard Class	3
Subsidiary Hazard Class	6.1
Packing Group	II

TDG

UN-No	UN1184
Proper Shipping Name	ETHYLENE DICHLORIDE
Hazard Class	3
Subsidiary Hazard Class	6.1
Packing Group	II

IATA

UN-No	UN1184
Proper Shipping Name	ETHYLENE DICHLORIDE
Hazard Class	3
Subsidiary Hazard Class	6.1
Packing Group	II

IMDG/IMO

UN-No	UN1184
Proper Shipping Name	ETHYLENE DICHLORIDE
Hazard Class	3
Subsidiary Hazard Class	6.1
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
Ethylene dichloride	X	X	-	203-458-1	-		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)

Component	TSCA 12(b)
Ethylene dichloride	Section 4

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Ethylene dichloride	107-06-2	>95	0.1

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Ethylene dichloride	X	100 lb	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Ethylene dichloride	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
Ethylene dichloride	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
Ethylene dichloride	107-06-2	Carcinogen	10 µg/day	Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
Ethylene dichloride	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 04-Feb-2010
Revision Date 18-Jan-2018
Print Date 18-Jan-2018
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

Material Safety Data Sheet
1,2,4-Trimethylbenzene

MSDS# 73581

Section 1 - Chemical Product and Company Identification

MSDS Name:	1,2,4-Trimethylbenzene
Catalog Numbers:	AC140090000, AC140090010, AC140090025, AC140090100, AC140095000
Synonyms:	Pseudocumene.

Company Identification:	Acros Organics BVBA Janssen Pharmaceuticalaan 3a 2440 Geel, Belgium
Company Identification: (USA)	Acros Organics One Reagent Lane Fair Lawn, NJ 07410
For information in the US, call:	800-ACROS-01
For information in Europe, call:	+32 14 57 52 11
Emergency Number, Europe:	+32 14 57 52 99
Emergency Number US:	201-796-7100
CHEMTREC Phone Number, US:	800-424-9300
CHEMTREC Phone Number, Europe:	703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#:	95-63-6
Chemical Name:	1,2,4-Trimethylbenzene
%:	98
EINECS#:	202-436-9

Hazard Symbols: XN N

Risk Phrases: 10 20 36/37/38 51/53

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Warning! Flammable liquid and vapor. Harmful if inhaled. Causes eye, skin, and respiratory tract irritation. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Target Organs: Blood, central nervous system, respiratory system, eyes, skin.

Potential Health Effects

Eye:	Causes eye irritation. Causes redness and pain.
Skin:	Causes skin irritation. Causes redness and pain. May be harmful if absorbed through the skin.
Ingestion:	May cause irritation of the digestive tract. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal. May be harmful if swallowed. May cause central nervous system depression.
Inhalation:	Harmful if inhaled. Causes respiratory tract irritation. May cause drowsiness, unconsciousness, and central nervous system depression.
Chronic:	Prolonged or repeated skin contact may cause dermatitis. May cause anemia and other blood cell abnormalities. Prolonged exposure may produce a narcotic effect. Prolonged or repeated exposure may cause nausea,

dizziness, and headache.

Section 4 - First Aid Measures

Eyes: Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.

Skin: Get medical aid. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes.

Ingestion: Do not induce vomiting. Possible aspiration hazard. Get medical aid immediately. Call a poison control center.

Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If breathing is difficult, give oxygen. Possible aspiration hazard. Do not use mouth-to-mouth resuscitation if victim ingested or inhaled the substance; induce artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device.

Notes to Physician:

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. Will burn if involved in a fire. Containers may explode in the heat of a fire. Flammable liquid and vapor.

Extinguishing Media: Use water spray to cool fire-exposed containers. Use water spray, dry chemical, carbon dioxide, or chemical foam.

Autoignition Temperature: 500 deg C (932.00 deg F)

Flash Point: 48 deg C (118.40 deg F)

Explosion Limits: Lower: 0.9 vol %

Explosion Limits: Upper: 6.4 vol %

NFPA Rating: health: 2; flammability: 2; instability: 0;

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section). Remove all sources of ignition. Use a spark-proof tool. Do not let this chemical enter the environment.

Section 7 - Handling and Storage

Handling: Use spark-proof tools and explosion proof equipment. Do not get in eyes, on skin, or on clothing. Do not ingest or inhale. Use only in a chemical fume hood. Keep away from heat, sparks and flame.

Storage: Keep away from sources of ignition. Store in a cool, dry place. Store in a tightly closed container. Flammables-area.

Section 8 - Exposure Controls, Personal Protection

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
1,2,4-Trimethylbenzene	25 ppm TWA (listed under Trimethyl benzene).	25 ppm TWA; 125 mg/m3 TWA	none listed

OSHA Vacated PELs: 1,2,4-Trimethylbenzene: 25 ppm TWA; 125 mg/m3 TWA (listed under Trimethyl benzene)

Engineering Controls:

Use explosion-proof ventilation equipment. Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use only under a chemical fume hood.

Exposure Limits

Personal Protective Equipment

Eyes:	Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.
Skin:	Wear appropriate protective gloves to prevent skin exposure.
Clothing:	Wear appropriate protective clothing to prevent skin exposure.
Respirators:	A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State:	Clear liquid
Color:	colorless
Odor:	aromatic odor
pH:	Not available
Vapor Pressure:	7 mm Hg @ 44.4 deg C
Vapor Density:	4.15 (air=1)
Evaporation Rate:	Not available
Viscosity:	Not available
Boiling Point:	168 deg C @ 760 mmHg (334.40°F)
Freezing/Melting Point:	-44 deg C (-47.20°F)
Decomposition Temperature:	Not available
Solubility in water:	Insoluble
Specific Gravity/Density:	0.880 g/cm3
Molecular Formula:	C9H12
Molecular Weight:	120.19

Section 10 - Stability and Reactivity

Chemical Stability:	Stable under normal temperatures and pressures.
Conditions to Avoid:	Incompatible materials, ignition sources, excess heat.
Incompatibilities with Other Materials	Strong oxidizing agents.
Hazardous Decomposition Products	Carbon monoxide, carbon dioxide.
Hazardous Polymerization	Will not occur.

Section 11 - Toxicological Information

RTECS#:	CAS# 95-63-6: DC3325000
LD50/LC50:	RTECS: **CAS# 95-63-6:** Inhalation, rat: LC50 = 18000 mg/m3/4H; Oral, mouse: LD50 = 6900 mg/kg; Oral, rat: LD50 = 5 gm/kg; .
Carcinogenicity:	1,2,4-Trimethylbenzene - Not listed as a carcinogen by ACGIH, IARC, NTP, or CA Prop 65.
Other:	See actual entry in RTECS for complete information.

Section 12 - Ecological Information

Ecotoxicity:	Fish: Fathead Minnow: LC50 = 77.2 mg/L; 96 Hr; Flow-through at 25 C (pH 7.24)
Other:	Do not empty into drains.

Section 13 - Disposal Considerations

Dispose of in a manner consistent with federal, state, and local regulations.

Section 14 - Transport Information

US DOT
Shipping Name: FLAMMABLE LIQUIDS, N.O.S. (1,2,4-Trimethylbenzene)
Hazard Class: 3
UN Number: UN1993
Packing Group: III
Canada TDG

Shipping Name: Not available
Hazard Class:
UN Number:
Packing Group:

Section 15 - Regulatory Information

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: XN N

Risk Phrases:

R 10 Flammable.

R 20 Harmful by inhalation.

R 36/37/38 Irritating to eyes, respiratory system and skin.

R 51/53 Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 26 In case of contact with eyes, rinse immediately with plenty of water and seek medical advice.

S 61 Avoid release to the environment. Refer to special instructions/safety data sheets.

WGK (Water Danger/Protection)

CAS# 95-63-6: 3

Canada

CAS# 95-63-6 is listed on Canada's DSL List

Canadian WHMIS Classifications: B3, D1B, D2B

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

CAS# 95-63-6 is listed on Canada's Ingredient Disclosure List

US Federal

TSCA

CAS# 95-63-6 is listed on the TSCA Inventory.

Section 16 - Other Information

MSDS Creation Date: 5/19/1999

Revision #6 Date 7/20/2009

SAFETY DATA SHEET

Creation Date 26-Sep-2009 **Revision Date** 18-Jan-2018 **Revision Number** 4

1. Identification

Product Name **Mesitylene**

Cat No. : **AC161320000; AC161320010; AC161320025; AC161320050; AC161322500**

CAS-No 108-67-8
Synonyms 1,3,5-Trimethylbenzene

Recommended Use Laboratory chemicals.
Uses advised against 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 3
Skin Corrosion/irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system, Central nervous system (CNS).	
Aspiration Toxicity	Category 1

Label Elements

Signal Word
Danger

Hazard Statements
Flammable liquid and vapor
May be fatal if swallowed and enters airways
Causes skin irritation
Causes serious eye irritation
May cause respiratory irritation
May cause drowsiness or dizziness

Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
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
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 skin irritation occurs: Get medical advice/attention
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Ingestion
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Do NOT induce vomiting
Fire
In case of fire: Use CO2, dry chemical, or foam for extinction
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Toxic to aquatic life with long lasting effects

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
1,3,5-Trimethylbenzene	108-67-8	97-99

4. First-aid measures

General Advice If symptoms persist, call a physician.

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get

	medical attention.
Skin Contact	Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Obtain medical attention.
Inhalation	Move to fresh air. If breathing is difficult, give oxygen. Obtain medical attention. 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 and effects	. Breathing difficulties. Vapors may cause drowsiness and dizziness: Symptoms may be delayed: Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting
Notes to Physician	Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media	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	44 °C / 111.2 °F
Method -	No information available
Autoignition Temperature	550 °C / 1022 °F
Explosion Limits	
Upper	6.00%
Lower	1.00%
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
Flammable. Containers may explode when heated. Vapors may form explosive mixtures with air. Vapors may travel to source of ignition and flash back.

Hazardous Combustion Products
Carbon monoxide (CO) Carbon dioxide (CO_2)
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
3	2	0	N/A

6. Accidental release measures

Personal Precautions	Ensure adequate ventilation. Use personal protective equipment. Remove all sources of ignition. Take precautionary measures against static discharges.
Environmental Precautions	Do not flush into surface water or sanitary sewer system. See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage.
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. Take precautionary measures against static discharges.

7. Handling and storage

Handling

Wear personal protective equipment. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. Take precautionary measures against static discharges. Use explosion-proof equipment.

Storage

Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition. Flammables area.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
1,3,5-Trimethylbenzene			TWA: 25 ppm TWA: 125 mg/m^3	

Legend

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

Tightly fitting safety goggles. Face-shield.

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	No information available
pH	No information available
Melting Point/Range	-45 °C / -49 °F
Boiling Point/Range	163 - 166 °C / 325.4 - 330.8 °F @ 760 mmHg
Flash Point	44 °C / 111.2 °F
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	6.00%
Lower	1.00%
Vapor Pressure	2.5 mbar @ 20 °C
Vapor Density	4.1 (Air = 1.0)
Specific Gravity	0.868
Solubility	slightly soluble
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	550 °C / 1022 °F
Decomposition Temperature	No information available

Viscosity	No information available
Molecular Formula	C9 H12
Molecular Weight	120.19

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat. Keep away from open flames, hot surfaces and sources of ignition.

Incompatible Materials Strong oxidizing agents, Nitric acid

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2)

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information No acute toxicity information is available for this product

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
1,3,5-Trimethylbenzene	LD50 = 5000 mg/kg (Rat)	Not listed	LC50 = 24 g/m³ (Rat) 4 h

Toxicologically Synergistic Products No information available

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

Irritation Irritating to eyes, respiratory system and skin

Sensitization No information available

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

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
1,3,5-Trimethylbenzene	108-67-8	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects Not mutagenic in AMES Test

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system Central nervous system (CNS)

STOT - repeated exposure None known

Aspiration hazard Category 1

Symptoms / effects,both acute and delayed Vapors may cause drowsiness and dizziness: Symptoms may be delayed: Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

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

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
1,3,5-Trimethylbenzene	Not listed	LC50: = 3.48 mg/L, 96h (Pimephales promelas)	Not listed	EC50: = 50 mg/L, 24h (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.

13. Disposal considerations

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

14. Transport information

DOT

UN-No UN2325
Proper Shipping Name 1,3,5-TRIMETHYLBENZENE
Hazard Class 3
Packing Group III

TDG

UN-No UN2325
Proper Shipping Name 1,3,5-TRIMETHYLBENZENE
Hazard Class 3
Packing Group III

IATA

UN-No UN2325
Proper Shipping Name 1,3,5-TRIMETHYLBENZENE
Hazard Class 3
Packing Group III

IMDG/IMO

UN-No UN2325
Proper Shipping Name 1,3,5-TRIMETHYLBENZENE
Hazard Class 3
Packing Group III

15. Regulatory information

All of the components in the product are on the following Inventory lists: Australia Complete Regulatory Information contained in following SDS's X = listed China Canada The product is classified and labeled according to EC directives or corresponding national laws The product is classified and labeled in accordance with Directive 1999/45/EC Europe TSCA Korea Philippines Japan U.S.A. (TSCA) Canada (DSL/NDSL) Europe (EINECS/ELINCS/NLP) Australia (AICS) Korea (ECL) China (IECSC) Japan (ENCS) Philippines (PICCS)

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
1,3,5-Trimethylbenzene	X	X	-	203-604-4	-		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

SARA 313 Not applicable

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act) Not applicable

Clean Air Act Not applicable

OSHA Occupational Safety and Health Administration
Not applicable

CERCLA Not applicable

California Proposition 65 This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island
1,3,5-Trimethylbenzene	X	-	-	-	-

U.S. Department of Transportation

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

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade Moderate risk, Grade 2

16. Other information

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

Creation Date 26-Sep-2009
Revision Date 18-Jan-2018
Print Date 18-Jan-2018
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 28-Apr-2009 **Revision Date** 25-Apr-2019 **Revision Number** 7

1. Identification

Product Name **Acetone**

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

CAS-No 67-64-1
Synonyms 2-Propanone

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company
Fisher Scientific
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

General Advice If symptoms persist, call a physician.

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

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

Inhalation 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 and effects None reasonably foreseeable. Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting: May cause pulmonary edema: 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 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 (CO_2) 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.

NFPA

Health	Flammability	Instability	Physical hazards
2	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.

Environmental Precautions Should not be released into the environment.

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 Do not get in eyes, on skin, or on clothing. Wear personal protective equipment. Ensure adequate ventilation. Avoid ingestion and inhalation. 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 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: 500 ppm STEL: 750 ppm

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 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	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: 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

.

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

United States of America Inventory

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
Acetone	67-64-1	X	ACTIVE	-

Legend:
TSCA - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
Acetone	67-64-1	X	-	200-662-2	X	X	X	X	KE-29367

U.S. Federal Regulations

SARA 313 Not applicable

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act) Not applicable

Clean Air Act Not applicable

OSHA - Occupational Safety and Health Administration Not applicable

CERCLA 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 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	28-Apr-2009
Revision Date	25-Apr-2019
Print Date	25-Apr-2019
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-May-2012 **Revision Date** 19-Jan-2018 **Revision Number** 4

1. Identification

Product Name **Anthracene**

Cat No. : **AC104860000; AC104860025; AC104860050; AC104860100; AC104861000; AC104865000**

CAS-No 120-12-7
Synonyms Green oil; Paranaphtalene

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
Combustible dust	Yes

Label Elements

Signal Word
Warning

Hazard Statements
May form combustible dust concentrations in air
Causes skin irritation
Causes serious eye irritation

Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
Wear protective gloves/protective clothing/eye protection/face protection
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 in a well-ventilated place. Keep container tightly closed
Hazards not otherwise classified (HNOC)
Very toxic to aquatic life with long lasting effects

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Anthracene	120-12-7	>95

4. First-aid measures

General Advice If symptoms persist, call a physician.

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

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

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

Ingestion Do not induce vomiting. Obtain medical attention.

Most important symptoms and effects None reasonably foreseeable.

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 121 °C / 249.8 °F

Method - No information available

Autoignition Temperature 540 °C / 1004 °F

Explosion Limits

Upper	No data available
Lower	0.6 vol %
Sensitivity to Mechanical Impact	No information available
Sensitivity to Static Discharge	No information available

Specific Hazards Arising from the Chemical
Fine dust dispersed in air may ignite. Dust can form an explosive mixture in air. Thermal decomposition can lead to release of irritating gases and vapors. Keep product and empty container away from heat and sources of ignition. Do not allow run-off from fire fighting to enter drains or water courses.

Hazardous Combustion Products
Carbon monoxide (CO) Carbon dioxide (CO_2)
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
2	1	1	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment. Ensure adequate ventilation. Avoid dust formation. Avoid contact with skin, eyes and clothing.

Environmental Precautions Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained.

Methods for Containment and Clean Up Sweep up or vacuum up spillage and collect in suitable container for disposal. Avoid dust formation.

7. Handling and storage

Handling Wear personal protective equipment. Ensure adequate ventilation. Avoid dust formation. Avoid contact with skin, eyes and clothing. Avoid ingestion and inhalation.

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

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Anthracene		TWA: 0.2 mg/m^3		

Legend

OSHA - Occupational Safety and Health Administration

Engineering Measures Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

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

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

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

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

9. Physical and chemical properties

Physical State	Powder Solid
Appearance	Yellow
Odor	aromatic
Odor Threshold	No information available
pH	No information available
Melting Point/Range	215 - 218 °C / 419 - 424.4 °F
Boiling Point/Range	340 °C / 644 °F @ 760 mmHg
Flash Point	121 °C / 249.8 °F
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	0.6 vol %
Vapor Pressure	1.3 mbar @ 145 °C
Vapor Density	Not applicable
Specific Gravity	No information available
Solubility	insoluble
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	540 °C / 1004 °F
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	C14 H10
Molecular Weight	178.23

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions. Sensitivity to light.

Conditions to Avoid Avoid dust formation. Incompatible products. Excess heat. Exposure to light.

Incompatible Materials Acids, Strong oxidizing agents, Fluorine

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
Anthracene	LD50 > 16000 mg/kg (Rat)	>1320 mg/kg (Rat)	Not listed

Toxicologically Synergistic No information available

Products

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
Anthracene	120-12-7	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known

STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed No information available

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

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

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Anthracene	EC50: 0.0039 - 0.0374 mg/L, 22h (Pseudokirchneriella subcapitata)	LC50: = 0.00278 mg/L, 96h static (Lepomis macrochirus) LC50: 0 - 0.00318 mg/L, 96h flow-through (Lepomis macrochirus)	Not listed	EC50: 0.081 - 0.112 mg/L, 48h (Daphnia magna)

Persistence and Degradability Insoluble in water May persist

Bioaccumulation/ Accumulation No information available.

Mobility . Is not likely mobile in the environment due its low water solubility.

Component	log Pow
Anthracene	4.54

13. Disposal considerations

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

14. Transport information

DOT

UN-No	UN3077
Proper Shipping Name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Proper technical name	Anthracene
Hazard Class	9
Packing Group	III

TDG

UN-No	UN3077
Proper Shipping Name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Hazard Class	9
Packing Group	III

IATA

UN-No	UN3077
Proper Shipping Name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Hazard Class	9
Packing Group	III

IMDG/IMO

UN-No	UN3077
Proper Shipping Name	ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Hazard Class	9
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
Anthracene	X	X	-	204-371-1	-		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 %
Anthracene	120-12-7	>95	1.0 0.1

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

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

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
Anthracene	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
Anthracene	X	X	X	-	-

U.S. Department of Transportation

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

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade Slight risk, Grade 1

16. Other information

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

Creation Date 03-May-2012
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End of SDS

Antimony

Print

SAFETY DATA SHEET

1 PRODUCT AND SUPPLIER IDENTIFICATION

Product Name: Antimony - shot, pieces, rod, target

Formula: Sb

Supplier: ESPI Metals

1050 Benson Way

Ashland, OR 97520

Telephone: 800-638-2581

Fax: 541-488-8313

Email: sales@espimetals.com

Emergency: Infotrac 800-535-5053 (US) or 352-323-3500 (24 hour)

Recommended Uses: Scientific Research

2 HAZARDS IDENTIFICATION

GHS Classification (29 CFR 1910.1200): Not classified as hazardous

GHS Label Elements:

Signal Word: N/A

Hazard Statements: N/A

Precautionary Statements: N/A

3 COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient: Antimony

CAS#: 7440-36-0

%: 100

EC#: 231-146-5

4 FIRST AID MEASURES

General Measures: No special requirements.

INHALATION: Remove to fresh air, keep warm and quiet, give oxygen if breathing is difficult. Seek medical attention.

INGESTION: Rinse mouth with water. Do not induce vomiting. Seek medical attention. Never induce vomiting or give anything by mouth to an unconscious person.

SKIN: Remove contaminated clothing, brush material off skin, wash affected area with soap and water. Seek medical attention if symptoms persist.

EYES: Flush eyes with lukewarm water, including under upper and lower eyelids, for at least 15 minutes. Seek medical attention if symptoms persist.

Most Important Symptoms/Effects, Acute and Delayed: May cause irritation and metal fume fever with flu-like symptoms. See section 11 for more information.

Indication of Immediate Medical Attention and Special Treatment: No other information available.

5 FIREFIGHTING MEASURES

Extinguishing Media: Use suitable extinguishing agent for surrounding materials and type of fire.

Unsuitable Extinguishing Media: No information available.

Specific Hazards Arising from the Material: This product does not present fire or explosion hazards as shipped. Small chips, fine turnings and dust from processing may be ignitable at high temperature. May release toxic fumes of antimony oxide or stibine gas under fire conditions.

Special Protective Equipment and Precautions for Firefighters: Full face, self-contained breathing apparatus and full protective clothing when necessary.

6 ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment, and Emergency Procedures: Wear appropriate respiratory and protective equipment specified in section 8. Isolate spill area and provide ventilation. Avoid breathing dust or fume. Avoid contact with skin and eyes. Eliminate all sources of ignition.

Methods and Materials for Containment and Cleaning Up: For larger pieces - pick up mechanically. For chips or dust - vacuum using a HEPA filter. Place in properly labeled closed containers. Avoid creating dusts.

Environmental Precautions: Do not allow to enter drains or to be released to the environment.

7 HANDLING AND STORAGE

Precautions for Safe Handling: Avoid creating dust. Avoid breathing dust or fumes. Provide adequate ventilation if dusts are created. Avoid exposure to high temperature. Avoid contact with skin and eyes. Wash thoroughly before eating or smoking. See section 8 for information on personal protection equipment.

Conditions for Safe Storage, Including Any Incompatibilities: Store in a sealed container. Store in a cool, dry area. . Do not store together with oxidizers, acids or halogens. See section 10 for more information on incompatible materials.

8 EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits: Antimony

OSHA/PEL: 0.5 mg/m^3

ACGIH/TLV: 0.5 mg/m^3

Appropriate Engineering Controls: Ensure adequate ventilation to maintain exposures below occupational limits. Whenever possible the use of local exhaust ventilation or other engineering controls is the preferred method of controlling exposure to airborne dust and fume to meet established occupational exposure limits. Use good housekeeping and sanitation practices. Do not use tobacco or food in work area. Wash thoroughly before eating or smoking. Do not blow dust off clothing or skin with compressed air.

Individual Protection Measures, Such as Personal Protective Equipment:

Respiratory Protection: If permissible levels are exceeded, use NIOSH approved dust respirator.

Eye Protection: Safety glasses

Skin Protection: Impermeable gloves

9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance:

Form: Solid in various forms

Color: Silver gray, metallic

Odor: Odorless

Odor Threshold: Not determined

pH: N/A

Melting Point: 630.5 ^oC

Boiling Point: 1750 ^oC

Flash Point: N/A

Evaporation Rate: N/A

Flammability: N/A

Upper Flammable Limit: N/A

Lower Flammable Limit: N/A

Vapor Pressure: 1 mm Hg @ 886

Vapor Density: N/A

Relative Density (Specific Gravity): 6.684 g/cc @ 25

Solubility in H_2O: Insoluble

Partition Coefficient (n-octanol/water): Not determined

Autoignition Temperature: No data

Decomposition Temperature: No data

Viscosity: N/A

10 STABILITY AND REACTIVITY

Reactivity: No data

Chemical Stability: Stable under recommended storage conditions.

Possibility of Hazardous Reactions: Antimony may react violently with halogens such as fluorine, chlorine, or bromine. Antimony will react with nascent (freshly formed) hydrogen to form stibine (SbH_3) which is extremely toxic.

Conditions to Avoid: Avoid creating or accumulating fines or dusts.

Incompatible Materials: Acids, strong oxidizing agents, halogens, halogenated acids, halogenated compounds, ammonium salts.

Hazardous Decomposition Products: Antimony oxide fume, stibine (SbH_3).

11 TOXICOLOGICAL INFORMATION

Likely Routes of Exposure: Inhalation, skin, eyes.

Symptoms of Exposure: May cause irritation and possibly systemic effects including a metallic taste in the mouth, vomiting, colic, loss of appetite and weight, and diarrhea.

Acute and Chronic Effects: Acute systemic exposure to antimony compounds may cause loss of hair, dry scaly skin, and weight loss. Damage to the heart, liver, and kidneys can occur, and death from myocardial failure may follow. Fatalities from antimony poisoning are rare. The toxicity of elemental antimony has not been well studied, however, due to insolubility most elements in their metallic state are not considered to be serious health hazards.

Acute Toxicity: LD50 oral - rat - 7500mg/kg

Carcinogenicity: **NTP**: Not identified as carcinogenic **IARC**: Not identified as carcinogenic

To the best of our knowledge the chemical, physical and toxicological characteristics of the substance are not fully known.

12 ECOLOGICAL INFORMATION

Ecotoxicity: No data

Persistence and Degradability: No data

Bioaccumulative Potential: No data

Mobility in Soil: No data

Other Adverse Effects: Do not allow material to be released to the environment. No further relevant information available.

13 DISPOSAL CONSIDERATIONS

Waste Disposal Method:

Product: Dispose of in accordance with Federal, State and Local regulations.

Packaging: Dispose of in accordance with Federal, State and Local regulations.

14 TRANSPORT INFORMATION

Shipping Regulations: Not regulated

UN Number: N/A

UN Proper Shipping Name: N/A

Transport Hazard Class: N/A

Packing Group: N/A

Marine Pollutant: No

15 REGULATORY INFORMATION

TSCA Listed: All components are listed.

Regulation (EC) No 1272/2008 (CLP): N/A

Canada WHMIS Classification (CPR, SOR/88-66): Not controlled

HMIS Ratings: **Health**: 1 **Flammability**: 0 **Physical**: 0

NFPA Ratings: **Health**: 1 **Flammability**: 0 **Instability**: 0

Chemical Safety Assessment: A chemical safety assessment has not been carried out.

16 OTHER INFORMATION

The information contained in this document is based on the state of our knowledge at the time of publication and is believed to be correct, but does not purport to be all inclusive and shall be used only as a guide. ESPI Metals makes no representation, warranty, or

guarantee of any kind with respect to the information contained in this document or any use of the product based on this information. ESPI Metals shall not be held liable for any damages resulting from handling or from contact with the above product. Users should satisfy themselves that they have all current data relevant to their particular use.

Prepared by: ESPI Metals

Revised/Reviewed: August 2015

Arsenic

Print

SAFETY DATA SHEET

1 PRODUCT AND SUPPLIER IDENTIFICATION

Product Name: Arsenic - lump or powder

Formula: As

Supplier: ESPI Metals

1050 Benson Way

Ashland, OR 97520

Telephone: 800-638-2581

Fax: 541-488-8313

Email: sales@espimetals.com

Emergency: Infotrac 800-535-5053 (US) or 352-323-3500 (24 hour)

Recommended Uses: Scientific Research

2 HAZARDS IDENTIFICATION

GHS Classification (29 CFR 1910.1200): Acute toxicity - oral, category 4, Acute toxicity - inhalation, category 4.

GHS Label Elements:

Signal Word: Warning

Hazard Statements: H302 Harmful if swallowed, H332 Harmful if inhaled.

Precautionary Statements: P261 Avoid breathing dust or fume, P264 Wash hands thoroughly after handling, P270 Do not eat, drink or smoke when using this product, P271 Use only outdoors or in a well-ventilated area, P281 Use personal protective equipment as required, P301+P304+P312 IF SWALLOWED OR INHALED: Call a POISON CENTER or doctor/physician if you feel unwell, P330 Rinse mouth, P501 Dispose of contents/container in accordance with local, state or federal regulations.

3 COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient: Arsenic

CAS#: 7440-38-2

%: 100

EC#: 231-148-6

4 FIRST AID MEASURES

General Measures: Remove patient from area of exposure.

INHALATION: Remove to fresh air, keep warm and quiet, give oxygen if breathing is difficult. Seek immediate medical attention.

INGESTION: Rinse mouth with water. Do not induce vomiting. Seek immediate medical attention. Never induce vomiting or give anything by mouth to an unconscious person.

SKIN: Remove contaminated clothing, brush material off skin, wash affected area with soap and water. Seek medical attention.

EYES: Flush eyes with lukewarm water, including under upper and lower eyelids, for at least 15 minutes. Seek medical attention.

Most Important Symptoms/Effects, Acute and Delayed: May cause vomiting, abdominal pain, diarrhea. See section 11 for more information.

Indication of Immediate Medical Attention and Special Treatment: No other information available.

5 FIREFIGHTING MEASURES

Extinguishing Media: Use suitable extinguishing agent for surrounding materials and type of fire. Smother small fires involving arsenic powder or dust with Class D or other metal extinguishing agent.

Unsuitable Extinguishing Media: No information available.

Specific Hazards Arising from the Material: Emits toxic fumes under fire conditions.

Special Protective Equipment and Precautions for Firefighters: Full face, self-contained breathing apparatus and full protective clothing when necessary.

6 ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment, and Emergency Procedures: Wear appropriate respiratory and protective equipment specified in section 8. Isolate spill area and provide ventilation. Avoid breathing dust or fume. Avoid contact with skin and eyes. Eliminate all sources of ignition.

Methods and Materials for Containment and Cleaning Up: Avoid creating dust. Wet sweep or vacuum up spill so as not to create more dust. Place in properly labeled closed containers.

Environmental Precautions: Do not allow to enter drains or to be released to the environment.

7 HANDLING AND STORAGE

Precautions for Safe Handling: Handle in an enclosed, controlled process. Transfer material in closed systems or within a completely hooded containment with local exhaust ventilation. Prevent spillage. Avoid creating dusts. Avoid exposure to high temperature. Avoid breathing dust or fumes. Avoid contact with skin and eyes. Wash thoroughly before eating or smoking. See section 8 for information on personal protection equipment.

Conditions for Safe Storage, Including Any Incompatibilities: Store in a cool, dry area. Store material tightly sealed in properly labeled containers. Do not store together with oxidizers, acids or halogens. See section 10 for more information on incompatible materials.

8 EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits: Arsenic

OSHA/PEL: 0.01 mg/m^3

ACGIH/TLV: 0.01 mg/m^3

Appropriate Engineering Controls: Handle in a controlled, enclosed environment. Ensure adequate ventilation to maintain exposures below occupational limits. Whenever possible the use of local exhaust ventilation or other engineering controls is the preferred method of controlling exposure to airborne dust and fume to meet established occupational exposure limits. Use good housekeeping and sanitation practices. Do not use tobacco or food in work area. Wash thoroughly before eating or smoking. Do not blow dust off clothing or skin with compressed air. Clothing worn in areas of exposure to arsenic dust or fume should be restricted to the workplace and laundered regularly.

Individual Protection Measures, Such as Personal Protective Equipment:

Respiratory Protection: Where airborne exposures may exceed OSHA/ACGIH permissible air concentrations, the minimum respiratory protection recommended is negative pressure air purifying respirator with cartridges that are NIOSH/MSHA approved against dusts, fumes and mists having a TWA less than 0.05 mg/m^3.

Eye Protection: Safety glasses or goggles.

Skin Protection: Wear impermeable gloves, protective work clothing. Protective overgarments or work clothing must be worn by persons who may become contaminated with particulate during work activities.

9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance:

Form: Lump (pieces)

Color: Gray metallic

Odor: Odorless

Odor Threshold: Not determined

pH: N/A

Melting Point: 817 ^oC (28 atm.)

Boiling Point: 613 ^oC (sublimes)

Flash Point: N/A

Evaporation Rate: N/A

Flammability: N/A

Upper Flammable Limit: N/A

Lower Flammable Limit: N/A

Vapor Pressure: 1 mm Hg @ 372 ^oC (solid)

Vapor Density: N/A

Relative Density (Specific Gravity): 5.727 g/cc @ 14 ^oC

Solubility in H_2O: Insoluble

Partition Coefficient (n-octanol/water): Not determined

Autoignition Temperature: No data

Decomposition Temperature: No data

Viscosity: N/A

10 STABILITY AND REACTIVITY

Reactivity: No data

Chemical Stability: Stable under recommended storage conditions.

Possibility of Hazardous Reactions: Hydrogen gas can react with inorganic arsenic to form the highly toxic gas arsine.

Conditions to Avoid: Avoid creating dusts. Avoid high temperatures.

Incompatible Materials: Moist air, strong oxidizing agents, oxidizing acids, halogen and halogen compounds, sulfur, platinum, palladium, zinc, lithium, hydrogen gas.

Hazardous Decomposition Products: Arsenic oxide fume, arsine.

11 TOXICOLOGICAL INFORMATION

Likely Routes of Exposure: Inhalation, skin and eyes

Symptoms of Exposure: May cause irritation and systemic poisoning with symptoms including abdominal pain, nausea, vomiting, diarrhea, and encephalopathy and peripheral neuropathy.

Acute and Chronic Effects: Acute effects of inorganic arsenic compounds include vomiting, abdominal pain and diarrhea, followed by numbness and tingling of the extremities, muscle cramping, and death, in extreme cases. The first signs of long-term exposure to high levels of inorganic arsenic are usually observed in the skin, and include pigmentation changes, skin lesions, and hard patches on the palms and soles of the feet (hyperkeratosis). Other adverse health effects that may be associated with long-term ingestion of inorganic arsenic include developmental effects, neurotoxicity, diabetes and cardiovascular disease.

Acute Toxicity: LD50 oral - rat - 763mg/kg

Carcinogenicity: **NTP**: Known to be human carcinogen **IARC**: Group 1 - Carcinogenic to humans

To the best of our knowledge the chemical, physical and toxicological characteristics of the substance are not fully known.

12 ECOLOGICAL INFORMATION

Ecotoxicity: No data

Persistence and Degradability: No data

Bioaccumulative Potential: No data

Mobility in Soil: No data

Other Adverse Effects: Danger to drinking water and to aquatic organisms. Do not allow material to be released to the environment. No further relevant information available.

13 DISPOSAL CONSIDERATIONS

Waste Disposal Method:

Product: Dispose of in accordance with Federal, State and Local regulations.

Packaging: Dispose of in accordance with Federal, State and Local regulations.

14 TRANSPORT INFORMATION

UN Number: UN1558

UN Proper Shipping Name: Arsenic

Transport Hazard Class: 6.1

Packing Group: II

Marine Pollutant: No

Special Precautions: Warning: Toxic substances

15 REGULATORY INFORMATION

TSCA Listed: All components are listed.

Regulation (EC) No 1272/2008 (CLP): Acute toxicity - oral, category 4, Acute toxicity - inhalation, category 4, Hazardous to the aquatic environment - acute hazard, category 1, Hazardous to the aquatic environment - chronic hazard, category 1.

Canada WHMIS Classification (CPR, SOR/88-66): Acute toxicity.

HMIS Ratings: **Health**: 2 **Flammability**: 1 **Physical**: 0

NFPA Ratings: **Health**: 2 **Flammability**: 1 **Instability**: 0

Chemical Safety Assessment: A chemical safety assessment has not been carried out.

16 OTHER INFORMATION

The information contained in this document is based on the state of our knowledge at the time of publication and is believed to be correct, but does not purport to be all inclusive and shall be used only as a guide. ESPI Metals makes no representation, warranty, or guarantee of any kind with respect to the information contained in this document or any use of the product based on this information. ESPI Metals shall not be held liable for any damages resulting from handling or from contact with the above product. Users should satisfy themselves that they have all current data relevant to their particular use.

Prepared by: ESPI Metals

Revised/Reviewed: July 2015

MATERIAL SAFETY DATA SHEET PACKET

National Institute of Standards and Technology
Standard Reference Materials Program
100 Bureau Drive, Stop 2300
Gaithersburg, Maryland 20899-2300

SRM Number: 1866b
SRM Name: Common Commercial Asbestos

Date of Issue: 09 January 2007

MSDS Coordinator: Mario Cellarosi
Telephone: 301-975-6776
FAX: 301-926-4751
E-mail: SRMMSDS@nist.gov

Emergency Telephone Chem Trec:
1-800-424-9300 (North America)
+1-703-527-3887 (International)

Description: Standard Reference Material (SRM) 1866b is comprised of three commercial-grade asbestos materials that were, or are, commonly used in commerce. These asbestos materials are typical of the asbestos found in bulk samples during routine asbestos inspections of building materials. The optical properties serve as a primary calibration standard in the identification of asbestos with polarized light microscopy (PLM). A unit of SRM 1866b consists of a set of three bottles: one bottle containing chrysotile, one bottle containing asbestiform grunerite (amosite), and one bottle containing asbestiform riebeckite (crocidolite). Each bottle contains between 1 gram and 3 grams of material.

Chrysotile

Asbestiform Grunerite (Amosite)

Asbestiform Riebeckite (Crocidolite)

An MSDS is provided for each of the three asbestos materials listed above, which contain hazardous components 1 % or greater and/or carcinogens 0.1 % or greater, in compliance with OSHA 29 CFR 1910.1200.

MATERIAL SAFETY DATA SHEET

1. SUBSTANCE AND SOURCE IDENTIFICATION

National Institute of Standards and Technology
Standard Reference Materials Program
100 Bureau Drive, Stop 2300
Gaithersburg, Maryland 20899-2300

SRM Number: 1866b
MSDS Number: 1866b
SRM Name: Common Commercial Asbestos

Date of Issue: 09 January 2007

MSDS Coordinator: Mario Cellarosi
Telephone: 301-975-6776
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E-mail: SRMMSDS@nist.gov

Emergency Telephone ChemTrec:
1-800-424-9300 (North America)
+1-703-527-3887 (International)

Description: Standard Reference Material (SRM) 1866b is a set of three individual commercial-grade asbestos materials: **chrysotile**, asbestiform grunerite (amosite), and asbestiform riebeckite (crocidolite). A unit of SRM 1866b consists of three bottles, each containing between 1 gram and 3 grams of individual material.

Substance: **Chrysotile**

2. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS[(a)]

Component:	**Chrysotile**
Other Designations:	**Chrysotile** (metaxite; serpentine chrysotile; asbestos; chrysotile asbestos)
CAS Number:	12001-29-5
EC Number (EINECS):	Not assigned.
SRM Nominal Concentration (% by weight or volume):	> 90
Component:	**Magnetite (as an impurity)**
Other Designation:	**Magnetite** (magnetic iron oxide; black iron oxide; magnetic iron ore; lodestone; black ferric oxide)
CAS Number:	1309-38-2
EC Number (EINECS):	215-169-8
SRM NominalConcentration (% by weight):	< 5
EC Classification:	T Carcinogen Category 1
EC Risk (R No.):	23, 45, 48
EC Safety (S No.):	45, 53

[(a)] Hazardous components 1 % or greater; carcinogens 0.1 % or greater are listed in compliance with OSHA 29 CFR 1910.1200.

3. HAZARDS IDENTIFICATION

NFPA Ratings (Scale 0–4): Health = 1 Fire = 0 Reactivity = 0

Major Health Hazards: Cancer hazard (in humans)

Potential Health Effects

Inhalation: Inhalation of chrysolite asbestos dust may be irritating. Symptoms include a cough and chest pain. Chronic exposure may cause asbestosis, interstitial fibrosis of the lung tissue, which may develop within 4 years to 9 years, but onset may be typically delayed 20 years to 40 years after first exposure. Death from asbestosis may be due to respiratory or cardiac failure. Secondary lung infections may also occur. Chronic exposure of asbestos to workers may also cause pleural effusion as early as 3 years to 4 years after initial exposure. Chronic exposure of asbestos to workers also increases the chance of pleural and peritoneal mesotheliomas, bronchogenic carcinoma, lung cancer, and cancers of the gastrointestinal tract and larynx. The latent period for mesothelioma is 3 years to 40 years; for lung cancer, 15 years to 30 years.

Skin Contact: Direct contact may cause irritation. Asbestos fibers may penetrate the skin and result in "asbestos corns", due to thickening of the skin around the implanted fiber. These corns usually occur on the hands and forearms, and they disappear on removal of the fibers.

Eye Contact: Direct contact may cause irritation with redness due to mechanical action.

Ingestion: Acute exposure by cause gastrointestinal irritation. Chronic exposure of asbestos fibers may be involved in cancers of the buccal cavity and pharynx, esophagus, stomach, colon, and rectum.

Listed as a Carcinogen/ Potential Carcinogen:

Yes	No	
X		In the National Toxicology Program (NTP) Report on Carcinogens.
X		In the International Agency for Research on Cancer (IARC) Monographs.
X		By the Occupational Safety and Health Administration (OSHA).

4. First Aid Measures

Inhalation: If adverse effects occur, remove to uncontaminated area. If not breathing, give artificial respiration by qualified personnel. Get immediate medical attention.

Skin Contact: Rinse affected area with copious amounts of water followed by washing with soap and water for at least 15 minutes while removing contaminated clothing. Get immediate medical attention.

Eye Contact: Flush eyes, including under the eyelids, with copious amounts of water for at least 15 minutes. Get immediate medical attention.

Ingestion: If a large amount is swallowed, get immediate medical attention.

5. Fire Fighting Measures

Fire and Explosion Hazards: Chrysotile is a negligible fire hazard.

Extinguishing Media: Regular dry chemical. Carbon dioxide. Water. Regular foam.

Fire Fighting: If material is involved in a fire, extinguish fire with a medium appropriate for the surrounding fire. Material itself does NOT burn or burns with difficulty. Keep run-off water out of sewers and water sources. Wear full protective clothing and NIOSH-approved self-contained breathing apparatus (SCBA).

Component: **Chrysotile**
Flash Point: Not applicable.
Method Used: Not applicable.

Autoignition Temp.: Not applicable.

Flammability Limits in Air
UPPER (Volume %): Not applicable.
LOWER (Volume %): Not applicable.

6. Accidental Release Measures

Occupational Release: Do NOT touch or walk through spilled material. Avoid inhalation of asbestos dust (see Section 8, "Exposure Controls and Personal Protection"). Collect small dry spills with a shovel and place material into an appropriate container for disposal. Prevent entry into waterways and sewers. Clean up residue with a HEPA filter vacuum.

Disposal: Refer to Section 13, "Disposal Considerations".

7. Handling and Storage

Storage: Store and handle in accordance with all current regulations and standards.

Safe Handling Precautions: See Section 8, "Exposure Controls and Personal Protection".

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits: **Chrysotile**
OSHA (PEL): 0.1 fibers/cc TWA
ACGIH (TLV): 0.1 fibers/cc TWA
NIOSH: 0.1 fibers/cc recommended TWA (10 h)

Ventilation: Provide local exhaust ventilation system equipped with a HEPA-filter dust collection system.

Respirator: If workplace conditions warrant a respirator's use, a NIOSH/MSHA approved respirator should be used under an implemented respiratory protection program in accordance with OSHA Standard 29 CFR 1910.134 (General Industry, Use of Respirators) and 29 CFR 1910.1001 for occupational exposure to asbestos.

Eye Protection: Wear safety goggles. An eye wash station should be readily available near areas of use.

Personal Protection: Wear appropriate protective clothing and gloves to prevent skin exposure. Refer to OSHA Regulated Substances: OSHA 29 CFR 1910.1001.

9. PHYSICAL AND CHEMICAL PROPERTIES

Component: **Chrysotile**
Appearance: Fibrous solid to dust-like powder. White to grey-brown. Odorless.
Relative Molecular Mass: Not applicable.
Molecular Formula: $Mg_3(Si_2O_5)(OH)_4$
Water Solubility: Insoluble.
Solvent Solubility: Insoluble in organic solvents.

10. STABILITY AND REACTIVITY

Stability: X Stable ____ Unstable

Stable at normal temperatures and pressure.

Conditions to Avoid: Avoid generating dust. Keep out of water supplies and sewers.

Incompatible Materials: May be attacked by strong acids.

Fire/Explosion Information: See Section 5, "Fire Fighting Measures".

Hazardous Decomposition: Completely decomposes at temperatures of 1 000 °C.

Hazardous Polymerization: ____ Will Occur X Will Not Occur

11. TOXICOLOGICAL INFORMATION

Route of Entry: X Inhalation X Skin X Ingestion

Toxicity Data: **Chrysotile**
Human, Inhalation TCL_O: 2.8 fibers/cc (5 years)
Rat, Inhalation-Intermittent TCL_O: 8 210 µg/m^3 (6 h to 20 d)
Rat, Oral-Continuous TDL_O: 10 867 mg/kg (78 weeks)

Tumorigenic, Reproductive, Mutagenic Data: Chrysotile has been investigated as a tumorigenic and mutagenic effector.

Health Effects (Acute and Chronic): See Section 3: "Hazards Identification" for potential health effects.

12. ECOLOGICAL INFORMATION

Ecotoxicity Data: Not available.

13. DISPOSAL CONSIDERATIONS

Waste Disposal: Dispose in accordance with all applicable federal, state, and local regulations.

14. TRANSPORTATION INFORMATION

U.S. DOT and IATA: Asbestos; UN2212; Hazard Class 9
NOTE: This material, as packaged for SRM 1866b, is not subject to the regulations per DOT Special Provision 156 and IATA special Provision A61.

15. REGULATORY INFORMATION

U.S. Regulations: CERCLA Sections 102a/103 (40 CFR 302.4): Asbestos: 1 lbs RQ

SARA Title III Section 302 (40 CFR 355.30): Not regulated.

SARA Title III Section 304 (40 CFR 355.40): Not regulated.

SARA Title III Section 313 (40 CFR 372.65): Asbestos.

OSHA Process Safety (29 CFR 1910.119): Not regulated.

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):

ACUTE:	No.
CHRONIC:	Yes.
FIRE:	No.
REACTIVE:	No.
SUDDEN RELEASE:	No.

State Regulations: California Proposition 65: Asbestos is known to the state of California to cause cancer (Feb. 17, 1987).

CANADIAN Regulations
WHMIS Classification: Not determined for this material.

EUROPEAN Regulations

EC Classification (assigned):	T	Toxic. Carcinogen Category 1.
EC Risk Phrases:	R45	May cause cancer.
	R23/48	Toxic: danger of serious damage to health by prolonged exposure through inhalation.
EC Safety Phrases:	S45	In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
	S53	Avoid exposure.

National Inventory Status

U.S. Inventory (TSCA):	Asbestos:	Not listed on inventory.
TSCA 12(b) Export Notification:	Asbestos:	CAS No.: 1332-21-4 Section 6

16. OTHER INFORMATION

Sources: MDL Information Systems, Inc., MSDS *Chrysotile*, 15 June 2006.

Disclaimer: Physical and chemical data contained in this MSDS are provided only for use as a guide in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data in the MSDS. The certified values for this material are given in the NIST Certificate of Analysis.

MATERIAL SAFETY DATA SHEET

1. SUBSTANCE AND SOURCE IDENTIFICATION

National Institute of Standards and Technology
Standard Reference Materials Program
100 Bureau Drive, Stop 2300
Gaithersburg, Maryland 20899-2300

SRM Number: 1866b
MSDS Number: 1866b
SRM Name: Common Commercial Asbestos

Date of Issue: 09 January 2007

MSDS Coordinator: Mario Cellarosi
Telephone: 301-975-6776
FAX: 301-926-4751
E-mail: SRMMSDS@nist.gov

Emergency Telephone ChemTrec:
1-800-424-9300 (North America)
+1-703-527-3887 (International)

Description: Standard Reference Material (SRM) 1866b is a set of three individual commercial-grade asbestos materials: chrysotile, **asbestiform grunerite (amosite)**, and asbestiform riebeckite (crocidolite). A unit of SRM 1866b consists of three bottles, each containing between 1 gram and 3 grams of individual material.

Substance: **Asbestiform Grunerite**

2. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS[(a)]

Component:	**Asbestiform Grunerite**
Other Designations:	**Asbestiform Grunerite** (grunerite; amosite; brown asbestos; amosite asbestos)
CAS Number:	12172-73-5
EC Number (EINECS):	Not assigned.
SRM Nominal Concentration (% by weight or volume):	> 90
Component:	**Magnetite (as an impurity)**
Other Designation:	**Magnetite** (magnetic iron oxide; black iron oxide; magnetic iron ore; lodestone; black ferric oxide)
CAS Number:	1309-38-2
EC Number (EINECS):	215-169-8
SRM NominalConcentration (% by weight):	< 5
Component:	**Quartz**
Other Designation:	Quartz (alpha quartz; silicon dioxide; silica; silicic anhydride; agate)
CAS Number:	14808-60-7
EC Number (EINESC):	238-878-4
SRM NominalConcentration (% by weight):	< 5
EC Classification:	T Carcinogen Category 1
EC Risk (R No.):	23, 45, 48
EC Safety (S No.):	45, 53

[(a)] Hazardous components 1 % or greater; carcinogens 0.1 % or greater are listed in compliance with OSHA 29 CFR 1910.1200.

3. HAZARDS IDENTIFICATION

NFPA Ratings (Scale 0–4): Health = 1 Fire = 0 Reactivity = 0

Major Health Hazards: Cancer hazard (in humans)

Potential Health Effects

Inhalation: Inhalation of grunerite asbestos dust may be irritating. Symptoms include a cough and chest pain. Chronic exposure may cause asbestosis, interstitial fibrosis of the lung tissue, which may develop within 4 years to 9 years, but onset may be typically delayed 20 years to 40 years after first exposure. Death from asbestosis may be due to respiratory or cardiac failure. Secondary lung infections may also occur. Chronic exposure of asbestos to workers may also cause pleural effusion as early as 3 years to 4 years after initial exposure. Chronic exposure of asbestos to workers also increases the chance of pleural and peritoneal mesotheliomas, bronchogenic carcinoma, lung cancer, and cancers of the gastrointestinal tract and larynx. The latent period for mesothelioma is 3 years to 40 years; for lung cancer, 15 years to 30 years.

Skin Contact: Direct contact may cause irritation. Asbestos fibers may penetrate the skin and result in "asbestos corns", due to thickening of the skin around the implanted fiber. These corns usually occur on the hands and forearms, and they disappear on removal of the fibers.

Eye Contact: Direct contact may cause irritation with redness due to mechanical action.

Ingestion: Acute exposure by cause gastrointestinal irritation. Chronic exposure of asbestos fibers may be involved in cancers of the buccal cavity and pharynx, esophagus, stomach, colon, and rectum.

Listed as a Carcinogen/ Potential Carcinogen:

Yes	No	
X		In the National Toxicology Program (NTP) Report on Carcinogens.
X		In the International Agency for Research on Cancer (IARC) Monographs.
X		By the Occupational Safety and Health Administration (OSHA).

4. FIRST AID MEASURES

Inhalation: If adverse effects occur, remove to uncontaminated area. If not breathing, give artificial respiration by qualified personnel. Get immediate medical attention.

Skin Contact: Rinse affected area with copious amounts of water followed by washing with soap and water for at least 15 minutes while removing contaminated clothing. Get medical attention, if needed.

Eye Contact: Flush eyes, including under the eyelids, with copious amounts of water for at least 15 minutes. Get immediate medical attention.

Ingestion: If a large amount is swallowed, get immediate medical attention.

5. FIRE FIGHTING MEASURES

Fire and Explosion Hazards: Asbestiform grunerite is a negligible fire hazard.

Extinguishing Media: Regular dry chemical. Carbon dioxide. Water. Regular foam.

Fire Fighting: If material is involved in a fire, extinguish fire with a medium appropriate for the surrounding fire. Material itself does NOT burn or burns with difficulty. Keep run-off water out of sewers and water sources. Wear full protective clothing and NIOSH-approved self-contained breathing apparatus (SCBA).

Component: **Asbestiform Grunerite**
Flash Point: Not applicable.
Method Used: Not applicable.

Autoignition Temp.: Not applicable.

Flammability Limits in Air
UPPER (Volume %): Not applicable.
LOWER (Volume %): Not applicable.

6. ACCIDENTAL RELEASE MEASURES

Occupational Release: Do NOT touch or walk through spilled material. Avoid inhalation of asbestos dust (see Section 8, "Exposure Controls and Personal Protection"). Collect small dry spills with a shovel and place material into an appropriate container for disposal. Prevent entry into waterways and sewers. Clean up residue with a HEPA filter vacuum.

Disposal: Refer to Section 13, "Disposal Considerations".

7. HANDLING AND STORAGE

Storage: Store and handle in accordance with all current regulations and standards.

Safe Handling Precautions: See Section 8, "Exposure Controls and Personal Protection".

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits:

Abestiform Grunerite
OSHA (PEL): 0.1 fibers/cc TWA
ACGIH (TLV): 0.1 fibers/cc TWA
NIOSH: 0.1 fibers/cc recommended TWA (10 h)

Quartz
OSHA (PEL): 0.3 mg/m^3 TWA (total dust) 30 mg/m^3/% SiO^2 + 2, based on size/aerodynamic characteristics)
OSHA (PEL): 0.1 mg/m^3 TWA (respirable dust) 10 mg/m^3/% SiO^2 + 2, based on size/aerodynamic characteristics)
ACGIH (TLV): 0.025 mg m^3 TWA (respirable dust)
NIOSH: 0.05 mg/m^3 recommended TWA (10 h) (respirable dust)

UK WEL: 0.3 mg/m^3 TWA (respirable particulate) (Chemical Hazard Alert Notice issued).

Ventilation: Provide local exhaust ventilation system equipped with a HEPA-filter dust collection system.

Respirator: If workplace conditions warrant a respirator's use, a NIOSH/MSHA approved respirator should be used under an implemented respiratory protection program in accordance with OSHA Standard 29 CFR 1910.134 (General Industry, Use of Respirators) and 29 CFR 1910.1001 for occupational exposure to asbestos.

Eye Protection: Wear safety goggles. An eye wash station should be readily available near areas of use.

Personal Protection: Wear appropriate protective clothing and gloves to prevent skin exposure. Refer to OSHA Regulated Substances: OSHA 29 CFR 1910.1001.

9. PHYSICAL AND CHEMICAL PROPERTIES

Component: **Asbestiform Grunerite**
Appearance: Fibrous solid to dust-like powder. Grey-brown to light brown. Odorless.
Relative Molecular Mass: Not applicable.
Molecular Formula: $Fe^{2+}_7(Si_8O_{22})(OH)_2$
Water Solubility: Insoluble

10. STABILITY AND REACTIVITY

Stability: X Stable _____ Unstable

Stable at normal temperatures and pressure.

Conditions to Avoid: Avoid generating dust. Keep out of water supplies and sewers.

Incompatible Materials: May be attacked by strong acids.

Fire/Explosion Information: See Section 5, "Fire Fighting Measures".

Hazardous Decomposition: Completely decomposes at temperatures of 1 000 °C.

Hazardous Polymerization: ____ Will Occur X Will Not Occur

11. TOXICOLOGICAL INFORMATION

Route of Entry: X Inhalation X Skin X Ingestion

Toxicity Data: **Asbestiform Grunerite**
Rat, Intrapleural TD_{LO}: 150 mg/kg

Tumorigenic, Reproductive, Mutagenic Data: Asbestiform grunerite has been investigated as a tumorigenic and mutagenic effector.

Health Effects (Acute and Chronic): See Section 3: "Hazards Identification" for potential health effects.

12. ECOLOGICAL INFORMATION

Ecotoxicity Data: Not available.

13. DISPOSAL CONSIDERATIONS

Waste Disposal: Dispose in accordance with all applicable federal, state, and local regulations.

14. TRANSPORTATION INFORMATION

U.S. DOT and IATA: **U.S. DOT and IATA:** Asbestos; UN2212; Hazard Class 9
NOTE: This material, as packaged for SRM 1866b, is not subject to the regulations per DOT Special Provision 156 and IATA special Provision A61.

15. REGULATORY INFORMATION

U.S. Regulations: CERCLA Sections 102a/103 (40 CFR 302.4): Asbestos: 1 lbs RQ.

SARA Title III Section 302 (40 CFR 355.30): Not regulated.

SARA Title III Section 304 (40 CFR 355.40): Not regulated.

SARA Title III Section 313 (40 CFR 372.65): Asbestos.

OSHA Process Safety (29 CFR 1910.119): Not regulated.

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):

ACUTE:	No.
CHRONIC:	Yes.
FIRE:	No.
REACTIVE:	No.
SUDDEN RELEASE:	No.

State Regulations: California Proposition 65: Asbestos is known to the state of California to cause cancer (Feb. 27, 1987).

CANADIAN Regulations
WHMIS Classification: Not determined for this material.

EUROPEAN Regulations

EC Classification (assigned):	T	Toxic. Carcinogen Category 1
EC Risk Phrases:	R45	May cause cancer.
	R23/48	Toxic: danger of serious damage to health by prolonged exposure through inhalation.
EC Safety Phrases:	S45	In case of accident of if you feel unwell, seek medical advice immediately (show the label where possible).
	S53	Avoid exposure.

National Inventory Status

U.S. Inventory (TSCA):	Asbestos:	Not listed on inventory.
TSCA 12(b) Export Notification:	Asbestos:	CAS No.: 1332-21-4 Section 6

16. OTHER INFORMATION

Sources: MDL Information Systems, Inc., MSDS *Amosite*, 16 June 2005.

Disclaimer: Physical and chemical data contained in this MSDS are provided only for use as a guide in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data in the MSDS. The certified values for this material are given in the NIST Certificate of Analysis.

MATERIAL SAFETY DATA SHEET

1. SUBSTANCE AND SOURCE IDENTIFICATION

National Institute of Standards and Technology
Standard Reference Materials Program
100 Bureau Drive, Stop 2300
Gaithersburg, Maryland 20899-2300

SRM Number: 1866b
MSDS Number: 1866b
SRM Name: Common Commercial Asbestos

Date of Issue: 09 January 2007

MSDS Coordinator: Mario Cellarosi
Telephone: 301-975-6776
FAX: 301-926-4751
E-mail: SRMMSDS@nist.gov

Emergency Telephone ChemTrec:
1-800-424-9300 (North America)
+1-703-527-3887 (International)

Description: Standard Reference Material (SRM) 1866b is a set of three individual commercial-grade asbestos materials: chrysotile, asbestiform grunerite (amosite), and **asbestiform riebeckite (crocidolite)**. A unit of SRM 1866b consists of three bottles, each containing between 1 gram and 3 grams of individual material.

Substance: **Asbestiform Riebeckite**

2. COMPOSITION AND INFORMATION ON HAZARDOUS INGREDIENTS[(a)]

Component:	**Asbestiform Riebeckite**
Other Designations:	**Asbestiform Riebeckite** (blue asbestos; crocidolite; asbestos; crocidolite asbestos)
CAS Number:	12001-28-4
EC Number (EINECS):	Not assigned.
SRM Nominal Concentration (% by weight or volume):	> 90
Component:	**Magnetite (as an impurity)**
Other Designation:	**Magnetite** (magnetic iron oxide; black iron oxide; magnetic iron ore; lodestone; black ferric oxide)
CAS Number:	1309-38-2
EC Number (EINECS):	215-169-8
SRM NominalConcentration (% by weight):	< 5
EC Classification:	T Carcinogen Category 1
EC Risk (R No.):	23, 45, 48
EC Safety (S No.):	45, 53

[(a)] Hazardous components 1 % or greater; carcinogens 0.1 % or greater are listed in compliance with OSHA 29 CFR 1910.1200.

3. HAZARDS IDENTIFICATION

NFPA Ratings (Scale 0–4): Health = 1 Fire = 0 Reactivity = 0

Major Health Hazards: Cancer hazard (in humans)

Potential Health Effects
Inhalation: Inhalation of riebeckite asbestos dust may be irritating. Symptoms include a cough and chest pain. Chronic exposure may cause asbestosis, interstitial fibrosis of the lung tissue, which may develop within 4 years to 9 years, but onset may be typically delayed 20 years to 40 years after first exposure. Death from asbestosis may be due to respiratory or cardiac failure. Secondary lung infections may also occur. Chronic exposure of asbestos to workers may also cause pleural effusion as early as 3 years to 4 years after initial exposure. Chronic exposure of asbestos to workers also increases the chance of pleural and peritoneal mesotheliomas, bronchogenic carcinoma, lung cancer, and cancers of the gastrointestinal tract and larynx. The latent period for mesothelioma is 3 years to 40 years; for lung cancer, 15 years to 30 years.

Skin Contact: Direct contact may cause irritation. Asbestos fibers may penetrate the skin and result in "asbestos corns", due to thickening of the skin around the implanted fiber. These corns usually occur on the hands and forearms, and they disappear on removal of the fibers.

Eye Contact: Direct contact may cause irritation with redness due to mechanical action.

Ingestion: Acute exposure by cause gastrointestinal irritation. Chronic exposure of asbestos fibers may be involved in cancers of the buccal cavity and pharynx, esophagus, stomach, colon, and rectum.

Listed as a Carcinogen/ Potential Carcinogen:

Yes	No	
X		In the National Toxicology Program (NTP) Report on Carcinogens.
X		In the International Agency for Research on Cancer (IARC) Monographs.
X		By the Occupational Safety and Health Administration (OSHA).

4. First Aid Measures

Inhalation: If adverse effects occur, remove to uncontaminated area. If not breathing, give artificial respiration by qualified personnel. Get immediate medical attention.

Skin Contact: Rinse affected area with copious amounts of water followed by washing with soap and water for at least 15 minutes while removing contaminated clothing. Get medical attention, if needed.

Eye Contact: Flush eyes, including under the eyelids, with copious amounts of water for at least 15 minutes. Get immediate medical attention.

Ingestion: Get immediate medical attention. If vomiting occurs, keep head lower than hips to prevent aspiration. Give artificial respiration, if not breathing, by qualified personnel.

5. Fire Fighting Measures

Fire and Explosion Hazards: Asbestiform Riebeckite

Extinguishing Media: Regular dry chemical. Carbon dioxide. Water. Regular foam.

Fire Fighting: If material is involved in a fire, extinguish fire with a medium appropriate for the surrounding fire. Material itself does NOT burn or burns with difficulty. Keep run-off water out of sewers and water sources. Wear full protective clothing and NIOSH-approved self-contained breathing apparatus (SCBA).

Component: **Asbestiform Riebeckite**
Flash Point: Not applicable.
Method Used: Not applicable.

Autoignition Temp.: Not applicable.

Flammability Limits in Air
UPPER (Volume %): Not applicable.
LOWER (Volume %): Not applicable.

6. Accidental Release Measures

Occupational Release: Do NOT touch or walk through spilled material. Avoid inhalation of asbestos dust (see Section 8, "Exposure Controls and Personal Protection"). Collect small dry spills with a shovel and place material into an appropriate container for disposal. Prevent entry into waterways and sewers. Clean up residue with a HEPA filter vacuum.

Disposal: Refer to Section 13, "Disposal Considerations".

7. HANDLING AND STORAGE

Storage: Store and handle in accordance with all current regulations and standards. Store in a cool, dry place.

Safe Handling Precautions: See Section 8, "Exposure Controls and Personal Protection".

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits: **Asbestiform Riebeckite**
OSHA (PEL): 0.1 fibers/cc TWA
ACGIH (TLV): 0.1 fibers/cc TWA
NIOSH: 0.1 fibers/cc recommended TWA (10 h)

Ventilation: Provide local exhaust ventilation system equipped with HEPA-filter dust collection system.

Respirator: If workplace conditions warrant a respirator's use, a NIOSH/MSHA approved respirator should be used under an implemented respiratory protection program in accordance with OSHA Standard 29 CFR 1910.134 (General Industry, Use of Respirators) and 29 CFR 1910.1001 for occupational exposure to asbestos.

Eye Protection: Wear safety goggles. An eye wash station should be readily available near areas of use.

Personal Protection: Wear appropriate protective clothing and gloves to prevent skin exposure. Refer to OSHA Regulated Substances: OSHA 29 CFR 1910.1001.

9. PHYSICAL AND CHEMICAL PROPERTIES

Component: **Asbestiform Riebeckite**
Appearance: Fibrous solid to dust-like powder. Blue to purple color. Odorless.
Molecular Formula: $Na_2(Fe^{2+}{}_3Fe^{3+}{}_2)(Si_8O_{22})(OH)_2$
Water Solubility: Insoluble.

10. STABILITY AND REACTIVITY

Stability: X Stable ____ Unstable

Stable at normal temperatures and pressure.

Conditions to Avoid: Avoid generating dust. Keep out of water supplies and sewers.

Incompatible Materials: May be attacked by strong acids.

Fire/Explosion Information: See Section 5, "Fire Fighting Measures".

Hazardous Decomposition: Completely decomposes at temperatures of 1 000 °C.

Hazardous Polymerization: ____ Will Occur X Will Not Occur

11. TOXICOLOGICAL INFORMATION

Route of Entry: X Inhalation X Skin X Ingestion

Toxicity Data: **Asbestiform Riebeckite**
Rat, Intraperitoneal LD_{LO}: 300 mg/kg
Rat, Inhalation-Intermittent TC_{LO}: 7 200 µg/m^3 (6 h – 20 days)
Rat, Inhalation-Intermittent TC_{LO}: 13 600 µg/m^3 (6 h – 5 days)

Tumorigenic, Reproductive, Mutagenic Data: Riebeckite asbestos has been investigated as a tumorigenic and mutagenic effector.

Health Effects (Acute and Chronic): See Section 3: "Hazards Identification" for potential health effects.

12. ECOLOGICAL INFORMATION

Ecotoxicity Data: Not available.

13. DISPOSAL CONSIDERATIONS

Waste Disposal: Dispose in accordance with all applicable federal, state, and local regulations.

14. TRANSPORTATION INFORMATION

U.S. DOT and IATA: **U.S. DOT and IATA:** Asbestos; UN2212; Hazard Class 9
NOTE: This material, as packaged for SRM 1866b, is not subject to the regulations per DOT Special Provision 156 and IATA special Provision A61.

15. REGULATORY INFORMATION

U.S. Regulations: CERCLA Sections 102a/103 (40 CFR 302.4): Asbestos: 1 lbs RQ.

SARA Title III Section 302 (40 CFR 355.30): Not regulated.

SARA Title III Section 304 (40 CFR 355.40): Not regulated.

SARA Title III Section 313 (40 CFR 372.65): Asbestos.

OSHA Process Safety (29 CFR 1910.119): Not regulated.

SARA Title III Sections 311/312 Hazardous Categories (40 CFR 370.21):

ACUTE:	No.
CHRONIC:	Yes.
FIRE:	No.
REACTIVE:	No.
SUDDEN RELEASE:	No.

State Regulations: California Proposition 65: Asbestos is known to the state of California to cause cancer (Feb. 27, 1987)

CANADIAN Regulations
WHMIS Classification: Not determined.

EUROPEAN Regulations

EC Classification (assigned):	T	Toxicity. Carcinogen Category 1.
EC Risk Phrases:	R45	May cause cancer.
	R23/48	Toxic: danger of serious damage to health by prolonged exposure through inhalation.
EC Safety Phrases:	S45	In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).
	S53	Avoid exposure.

National Inventory Status

U.S. Inventory (TSCA):	Asbestos:	Not listed on inventory.
TSCA 12(b) Export Notification:	Asbestos:	CAS No. 1332-21-4 Section 6

16. OTHER INFORMATION

Sources: MDL Information Systems, Inc., MSDS *Crocidolite*, 14 September 2006.

Disclaimer: Physical and chemical data contained in this MSDS are provided only for use as a guide in assessing the hazardous nature of the material. The MSDS was prepared carefully, using current references; however, NIST does not certify the data in the MSDS. The certified values for this material are given in the NIST Certificate of Analysis.

Barium

Print

SAFETY DATA SHEET

1 PRODUCT AND SUPPLIER IDENTIFICATION

Product Name: Barium

Formula: Ba

Supplier: ESPI Metals

1050 Benson Way

Ashland, OR 97520

Telephone: 800-638-2581

Fax: 541-488-8313

Email: sales@espimetals.com

Emergency: Infotrac 800-535-5053 (US) or 352-323-3500 (24 hour)

Recommended Uses: Scientific Research

2 HAZARDS IDENTIFICATION

GHS Classification (29 CFR 1910.1200): Substances and mixtures which, in contact with water, emit flammable gases, category 2, Skin corrosion/irritation, category 2, Eye damage/irritation, category 2A.

GHS Label Elements:

Signal Word: Danger

Hazard Statements: H261 In contact with water releases flammable gas, H315 Causes skin irritation, H319 Causes serious eye irritation.

Precautionary Statements: P223 Do not allow contact with water, P231+P232 Handle and store contents under inert gas, protect from moisture, P264 Wash skin thoroughly after handling, P280 Wear protective gloves/protective clothing/eye protection/face

protection, P302+P335+P334+352 IF ON SKIN: Brush off loose particles from skin, and immerse in cool water, wash with plenty of soap and water, P332+P313 IF SKIN irritation occurs: Get medical advice/attention, P305+P351+P338 IF IN EYES: rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing, P337+P313 IF eye irritation persists: Get medical advice/attention, P362+P364 Take off contaminated clothing and wash it before reuse, P370+P378 In case of fire: Use Class D dry powder for extinction, P402+P404 Store in a dry place. Store in a closed container, P501 Dispose of contents/container in accordance with local, state or federal regulations.

3 COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient: Barium

CAS#: 7440-39-3

%: 100

EC#: 231-149-1

4 FIRST AID MEASURES

General Measures: Remove patient from area of exposure.

INHALATION: Remove to fresh air, keep warm and quiet, give oxygen if breathing is difficult. Seek immediate medical attention.

INGESTION: Quickly wipe material from mouth and rinse with water. Do not induce vomiting. Seek medical attention immediately.

SKIN: Remove contaminated clothing if necessary. Brush off any visible solids. Wash the affected area with water for at least 15 minutes. Seek medical attention.

EYES: Immediately flush eyes with copious amounts of water, including under eyelids for at least 10-15 minutes. A victim may need assistance in keeping their eyelids open. Seek immediate medical attention.

Most Important Symptoms/Effects, Acute and Delayed: May cause severe irritation in contact with moist skin. See section 11 for more information.

Indication of Immediate Medical Attention and Special Treatment: No other relevant information available.

5 FIREFIGHTING MEASURES

Extinguishing Media: Use Class D dry powder extinguishing agent.

Unsuitable Extinguishing Media: Do not use water, carbon dioxide or halogenated extinguishers.

Specific Hazards Arising from the Material: Material readily reacts with water generating flammable hydrogen gas. May emit toxic fumes under fire conditions.

Special Protective Equipment and Precautions for Firefighters: Full face, self-contained breathing apparatus and full protective clothing to prevent contact with skin and eyes. Barium metal can reignite after fire is initially extinguished. Never leave extinguished fire unattended.

6 ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment, and Emergency Procedures: Wear appropriate respiratory and protective equipment specified in section 8. Isolate spill area and provide ventilation. Avoid breathing dust or fume. Avoid contact with skin and eyes. Eliminate all sources of ignition.

Methods and Materials for Containment and Cleaning Up: Sweep or scoop spilled product and place in a closed container for further handling and disposal. Do not use water for spill clean-up. Cover very small quantities in the open with powdered limestone and let decompose. Use only non-sparking tools and natural bristle brushes.

Environmental Precautions: Do not flush to sewer, stream, or other bodies of water. Do not allow to enter drains or to be released to the environment.

7 HANDLING AND STORAGE

Precautions for Safe Handling: Handle in an enclosed, controlled process under dry protective gas such as argon. Protect from water and moisture. Avoid breathing dust or fumes. Avoid contact with skin and eyes. Wash thoroughly before eating or smoking. See section 8 for information on personal protection equipment.

Conditions for Safe Storage, Including Any Incompatibilities: Store in tightly-sealed containers under argon or mineral oil. Storage containers should be properly labeled and kept in a cool, dry, well-ventilated area, protected from heat and direct sunlight. Do not allow contact with water. Storage area should be free of combustibles and ignition sources. Do not store together with acids or oxidizers. See section 10 for more information on incompatible materials.

8 EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits: Barium

OSHA/PEL: 0.5 mg/m^3

ACGIH/TLV: 0.5 mg/m^3

Appropriate Engineering Controls: Handle in an enclosed, controlled process under dry argon. Whenever possible the use of local exhaust ventilation or other engineering controls is the preferred method of controlling exposure to airborne dust and fume to meet established occupational exposure limits. Do not use tobacco or food in work area. Wash thoroughly before eating or smoking. Do not blow dust off clothing or skin with compressed air. Prepare for the possibility of a fire. Keep extinguishing agents, tools for handling and protective clothing readily available.

Individual Protection Measures, Such as Personal Protective Equipment:

Respiratory Protection: Wear a NIOSH/MSHA approved respirator when high concentrations are present.

Eye Protection: Always wear approved chemical splash proof goggles.

Skin Protection: Rubber gloves, flame retardant protective work clothing.

9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance:

Form: Solid in various forms

Color: Silver-gray metallic

Odor: Not determined

Odor Threshold: Not determined

pH: N/A

Melting Point: 725 ^{o}C

Boiling Point: 1640 ^{o}C

Flash Point: N/A

Evaporation Rate: N/A

Flammability: No data

Upper Flammable Limit: No data

Lower Flammable Limit: No data

Vapor Pressure: 10 mm at 1049 ^{o}C

Vapor Density: N/A

Relative Density (Specific Gravity): 3.51 g/cc at 20 ^{o}C

Solubility in H_2O: Decomposes

Partition Coefficient (n-octanol/water): Not determined

Autoignition Temperature: No data

Decomposition Temperature: No data

Viscosity: N/A

10 STABILITY AND REACTIVITY

Reactivity: No specific test data available.

Chemical Stability: Stable under recommended storage conditions.

Possibility of Hazardous Reactions: Reacts readily with water releasing flammable hydrogen gas.

Conditions to Avoid: Avoid contact with water or moist air and possible ignition sources such as sparks or flame.

Incompatible Materials: Water or moisture, oxidizing agents, oxygen, acids, alcohols, halocarbons, carbon dioxide, ammonia.

Hazardous Decomposition Products: Barium hydroxides, barium oxides, hydrogen gas.

11 TOXICOLOGICAL INFORMATION

Likely Routes of Exposure: Inhalation, skin, eyes.

Symptoms of Exposure: May cause severe irritation to the nose, throat, and upper respiratory tract, mouth, throat, and esophagus. Contact with skin can cause mild to moderate irritation. May cause chemical burns in eyes or on skin as it reacts with moisture on living tissue.

Acute and Chronic Effects: Barium compounds may cause severe gastroenteritis, including abdominal pain, vomiting and diarrhea, tremors, faintness, paralysis of the arms and legs, and slow or irregular heartbeat. Severe cases may produce collapse and death due to respiratory failure. Soluble barium compounds are more likely to cause these effects than insoluble compounds. Inhalation of fumes may cause sore throat, coughing, labored breathing, and irritation of the respiratory tract as well as the above symptoms. Chronic exposure to barium may cause sensitization, chronic barium poisoning, dermatitis, corneal opacity and blindness.

Acute Toxicity: No data

Carcinogenicity: **NTP**: Not identified as carcinogenic **IARC**: Not identified as carcinogenic

To the best of our knowledge the chemical, physical and toxicological characteristics of the substance are not fully known.

12 ECOLOGICAL INFORMATION

Ecotoxicity: No data

Persistence and Degradability: No data

Bioaccumulative Potential: No data

Mobility in Soil: No data

Other Adverse Effects: Do not allow material to be released to the environment. No further relevant information available.

13 DISPOSAL CONSIDERATIONS

Waste Disposal Method:

Product: Dispose of in accordance with Federal, State and Local regulations.

Packaging: Dispose of in accordance with Federal, State and Local regulations.

14 TRANSPORT INFORMATION

UN Number: UN1400

UN Proper Shipping Name: Barium

Transport Hazard Class: 4.3

Packing Group: II

Marine Pollutant: No

Special Precautions: Warning, substances which, in contact with water, emit flammable gases.

15 REGULATORY INFORMATION

TSCA Listed: Yes

DSL Listed: Yes

Regulation (EC) No 1272/2008 (CLP): Substances and mixtures which, in contact with water, emit flammable gases, category 2, Skin corrosion/irritation, category 2, Eye damage/irritation, category 2A.

WHMIS 2015 Classification: Substances and mixtures which, in contact with water, emit flammable gases, Skin corrosion/irritation, Eye damage/irritation.

HMIS Ratings: **Health**: 2 **Flammability**: 2 **Physical**: 2

NFPA Ratings: **Health**: 2 **Flammability**: 2 **Instability**: 2 **Special Hazard**: W

Chemical Safety Assessment: A chemical safety assessment has not been carried out.

16 OTHER INFORMATION

The information contained in this document is based on the state of our knowledge at the time of publication and is believed to be correct, but does not purport to be all inclusive and shall be used only as a guide. ESPI Metals makes no representation, warranty, or guarantee of any kind with respect to the information contained in this document or any use of the product based on this information. ESPI Metals shall not be held liable for any damages resulting from handling or from contact with the above product. Users should satisfy themselves that they have all current data relevant to their particular use.

Prepared by: ESPI Metals

Revised/Reviewed: July 2016

SAFETY DATA SHEET

Benzene

Section 1. Identification

GHS product identifier : Benzene

Chemical name : benzene

Other means of identification : benzene, purebenzol; cyclohexatriene; phenyl hydride; phene; coal naphtha; pyrobenzol

Product use : Synthetic/Analytical chemistry.

Synonym : benzene, purebenzol; cyclohexatriene; phenyl hydride; phene; coal naphtha; pyrobenzol

SDS # : 001062

Supplier's details : Airgas USA, LLC and its affiliates
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

Emergency telephone number (with hours of operation) : 1-866-734-3438

Section 2. Hazards identification

OSHA/HCS status : This material is considered hazardous by the OSHA Hazard Communication Standard (29 CFR 1910.1200).

Classification of the substance or mixture : FLAMMABLE LIQUIDS - Category 2
SKIN CORROSION/IRRITATION - Category 2
SERIOUS EYE DAMAGE/ EYE IRRITATION - Category 2
GERM CELL MUTAGENICITY - Category 1B
CARCINOGENICITY - Category 1
SPECIFIC TARGET ORGAN TOXICITY (REPEATED EXPOSURE) (bone marrow) - Category 1

GHS label elements

Hazard pictograms :

Signal word : Danger

Hazard statements : Highly flammable liquid and vapor.
May form explosive mixtures with air.
Causes serious eye irritation.
Causes skin irritation.
May cause genetic defects.
May cause cancer.
Causes damage to organs through prolonged or repeated exposure. (bone marrow)

Precautionary statements

General : Read label before use. Keep out of reach of children. If medical advice is needed, have product container or label at hand.

Section 2. Hazards identification

Prevention : Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Use personal protective equipment as required. Wear protective gloves. Wear eye or face protection. Keep away from heat, sparks, open flames and hot surfaces. - No smoking. Use explosion-proof electrical, ventilating, lighting and all material-handling equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Keep container tightly closed. Do not breathe vapor. Do not eat, drink or smoke when using this product. Wash hands thoroughly after handling.

Response : Get medical attention if you feel unwell. IF exposed or concerned: Get medical attention. IF SWALLOWED: Call a POISON CENTER or physician if you feel unwell. Rinse mouth. IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water or shower. IF ON SKIN: Wash with plenty of soap and water. Take off contaminated clothing. If skin irritation occurs: Get medical attention. 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 attention.

Storage : Store locked up. Store in a well-ventilated place. Keep cool.

Disposal : Dispose of contents and container in accordance with all local, regional, national and international regulations.

Hazards not otherwise classified : None known.

Section 3. Composition/information on ingredients

Substance/mixture : Substance

Chemical name : benzene

Other means of identification : benzene, purebenzol; cyclohexatriene; phenyl hydride; phene; coal naphtha; pyrobenzol

CAS number/other identifiers

CAS number : 71-43-2

Product code : 001062

Ingredient name	%	CAS number
benzene	100	71-43-2

There are no additional ingredients present which, within the current knowledge of the supplier and in the concentrations applicable, are classified as hazardous to health or the environment and hence require reporting in this section.

Occupational exposure limits, if available, are listed in Section 8.

Section 4. First aid measures

Description of necessary first aid measures

Eye contact : Immediately flush eyes with plenty of water, occasionally lifting the upper and lower eyelids. Check for and remove any contact lenses. Continue to rinse for at least 10 minutes. Get medical attention.

Inhalation : Remove victim to fresh air and keep at rest in a position comfortable for breathing. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Get medical attention. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Section 4. First aid measures

Skin contact : Flush contaminated skin with plenty of water. Remove contaminated clothing and shoes. Wash contaminated clothing thoroughly with water before removing it, or wear gloves. Continue to rinse for at least 10 minutes. Get medical attention. Wash clothing before reuse. Clean shoes thoroughly before reuse.

Ingestion : Wash out mouth with water. Remove dentures if any. Remove victim to fresh air and keep at rest in a position comfortable for breathing. If material has been swallowed and the exposed person is conscious, give small quantities of water to drink. Stop if the exposed person feels sick as vomiting may be dangerous. Do not induce vomiting unless directed to do so by medical personnel. If vomiting occurs, the head should be kept low so that vomit does not enter the lungs. Get medical attention. If necessary, call a poison center or physician. Never give anything by mouth to an unconscious person. If unconscious, place in recovery position and get medical attention immediately. Maintain an open airway. Loosen tight clothing such as a collar, tie, belt or waistband.

Most important symptoms/effects, acute and delayed

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : No known significant effects or critical hazards.

Skin contact : Causes skin irritation.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Ingestion : Harmful if swallowed. Irritating to mouth, throat and stomach.

Over-exposure signs/symptoms

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : No specific data.

Skin contact : Adverse symptoms may include the following:
irritation
redness

Ingestion : No specific data.

Indication of immediate medical attention and special treatment needed, if necessary

Notes to physician : Treat symptomatically. Contact poison treatment specialist immediately if large quantities have been ingested or inhaled.

Specific treatments : No specific treatment.

Protection of first-aiders : No action shall be taken involving any personal risk or without suitable training. If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus. It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation. Wash contaminated clothing thoroughly with water before removing it, or wear gloves.

See toxicological information (Section 11)

Section 5. Fire-fighting measures

Extinguishing media

Suitable extinguishing media : Use dry chemical, CO_2, water spray (fog) or foam.

Unsuitable extinguishing media : Do not use water jet.

Specific hazards arising from the chemical : Highly flammable liquid and vapor. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion. The vapor/gas is heavier than air and will spread along the ground. Vapors may accumulate in low or confined areas or travel a considerable distance to a source of ignition and flash back. Runoff to sewer may create fire or explosion hazard.

Hazardous thermal decomposition products : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide

Special protective actions for fire-fighters : Promptly isolate the scene by removing all persons from the vicinity of the incident if there is a fire. No action shall be taken involving any personal risk or without suitable training. Move containers from fire area if this can be done without risk. Use water spray to keep fire-exposed containers cool.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions, protective equipment and emergency procedures

For non-emergency personnel : No action shall be taken involving any personal risk or without suitable training. Evacuate surrounding areas. Keep unnecessary and unprotected personnel from entering. Do not touch or walk through spilled material. Shut off all ignition sources. No flares, smoking or flames in hazard area. Avoid breathing vapor or mist. Provide adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Put on appropriate personal protective equipment.

For emergency responders : If specialised clothing is required to deal with the spillage, take note of any information in Section 8 on suitable and unsuitable materials. See also the information in "For non-emergency personnel".

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers. Inform the relevant authorities if the product has caused environmental pollution (sewers, waterways, soil or air).

Methods and materials for containment and cleaning up

Small spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Dilute with water and mop up if water-soluble. Alternatively, or if water-insoluble, absorb with an inert dry material and place in an appropriate waste disposal container. Dispose of via a licensed waste disposal contractor.

Large spill : Stop leak if without risk. Move containers from spill area. Use spark-proof tools and explosion-proof equipment. Approach release from upwind. Prevent entry into sewers, water courses, basements or confined areas. Wash spillages into an effluent treatment plant or proceed as follows. Contain and collect spillage with non-combustible, absorbent material e.g. sand, earth, vermiculite or diatomaceous earth and place in container for disposal according to local regulations (see Section 13). Dispose of via a licensed waste disposal contractor. Contaminated absorbent material may pose the same hazard as the spilled product. Note: see Section 1 for emergency contact information and Section 13 for waste disposal.

Section 7. Handling and storage

Precautions for safe handling

Protective measures : Put on appropriate personal protective equipment (see Section 8). Avoid exposure - obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Do not get in eyes or on skin or clothing. Do not breathe vapor or mist. Do not ingest. Use only with adequate ventilation. Wear appropriate respirator when ventilation is inadequate. Do not enter storage areas and confined spaces unless adequately ventilated. Keep in the original container or an approved alternative made from a compatible material, kept tightly closed when not in use. Store and use away from heat, sparks, open flame or any other ignition source. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Use only non-sparking tools. Take precautionary measures against electrostatic discharges. Empty containers retain product residue and can be hazardous. Do not reuse container.

Advice on general occupational hygiene : Eating, drinking and smoking should be prohibited in areas where this material is handled, stored and processed. Workers should wash hands and face before eating, drinking and smoking. Remove contaminated clothing and protective equipment before entering eating areas. See also Section 8 for additional information on hygiene measures.

Conditions for safe storage, including any incompatibilities : Store in accordance with local regulations. Store in a segregated and approved area. Store in original container protected from direct sunlight in a dry, cool and well-ventilated area, away from incompatible materials (see Section 10) and food and drink. Store locked up. Eliminate all ignition sources. Separate from oxidizing materials. Keep container tightly closed and sealed until ready for use. Containers that have been opened must be carefully resealed and kept upright to prevent leakage. Do not store in unlabeled containers. Use appropriate containment to avoid environmental contamination.

Section 8. Exposure controls/personal protection

Control parameters

Occupational exposure limits

Ingredient name	Exposure limits
benzene	**ACGIH TLV (United States, 3/2012).** **Absorbed through skin.** STEL: 8 mg/m³ 15 minutes. STEL: 2.5 ppm 15 minutes. TWA: 1.6 mg/m³ 8 hours. TWA: 0.5 ppm 8 hours. **NIOSH REL (United States, 1/2013).** STEL: 1 ppm 15 minutes. TWA: 0.1 ppm 10 hours. **OSHA PEL (United States, 6/2010).** STEL: 5 ppm 15 minutes. TWA: 1 ppm 8 hours. **OSHA PEL 1989 (United States, 3/1989).** STEL: 5 ppm 15 minutes. TWA: 1 ppm 8 hours. **OSHA PEL Z2 (United States, 11/2006).** AMP: 50 ppm 10 minutes. CEIL: 25 ppm TWA: 10 ppm 8 hours.

Section 8. Exposure controls/personal protection

Appropriate engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Environmental exposure controls : Emissions from ventilation or work process equipment should be checked to ensure they comply with the requirements of environmental protection legislation. In some cases, fume scrubbers, filters or engineering modifications to the process equipment will be necessary to reduce emissions to acceptable levels.

Individual protection measures

Hygiene measures : Wash hands, forearms and face thoroughly after handling chemical products, before eating, smoking and using the lavatory and at the end of the working period. Appropriate techniques should be used to remove potentially contaminated clothing. Wash contaminated clothing before reusing. Ensure that eyewash stations and safety showers are close to the workstation location.

Eye/face protection : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists, gases or dusts. If contact is possible, the following protection should be worn, unless the assessment indicates a higher degree of protection: chemical splash goggles.

Skin protection

Hand protection : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary. Considering the parameters specified by the glove manufacturer, check during use that the gloves are still retaining their protective properties. It should be noted that the time to breakthrough for any glove material may be different for different glove manufacturers. In the case of mixtures, consisting of several substances, the protection time of the gloves cannot be accurately estimated.

Body protection : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product. When there is a risk of ignition from static electricity, wear anti-static protective clothing. For the greatest protection from static discharges, clothing should include anti-static overalls, boots and gloves.

Other skin protection : Appropriate footwear and any additional skin protection measures should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory protection : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

Section 9. Physical and chemical properties

Appearance

Physical state : Liquid. [Watery liquid.]

Color : Colorless. Yellowish.

Molecular weight : 78.12 g/mole

Molecular formula : C6-H6

Boiling/condensation point : 80.09°C (176.2°F)

Melting/freezing point : 5.49°C (41.9°F)

Critical temperature : 288.95°C (552.1°F)

Odor : Characteristic.

Odor threshold : Not available.

Section 9. Physical and chemical properties

pH	:	Not available.
Flash point	:	Closed cup: -11°C (12.2°F)
Burning time	:	Not applicable.
Burning rate	:	Not applicable.
Evaporation rate	:	3.5 (butyl acetate = 1)
Flammability (solid, gas)	:	Not available.
Lower and upper explosive (flammable) limits	:	Lower: 1.2% Upper: 7.8%
Vapor pressure	:	10 kPa (75.006094245 mm Hg) [room temperature]
Vapor density	:	2.7 (Air = 1)
Specific Volume (ft^3/lb)	:	1.1403
Gas Density (lb/ft^3)	:	0.877 (20°C / 68 to °F)
Relative density	:	0.88
Solubility	:	Not available.
Solubility in water	:	1.88 g/l
Partition coefficient: n-octanol/water	:	2.13
Auto-ignition temperature	:	498°C (928.4°F)
Decomposition temperature	:	Not available.
SADT	:	Not available.
Viscosity	:	Dynamic (room temperature): 0.604 mPa·s (0.604 cP)

Section 10. Stability and reactivity

Reactivity	:	No specific test data related to reactivity available for this product or its ingredients.
Chemical stability	:	The product is stable.
Possibility of hazardous reactions	:	Under normal conditions of storage and use, hazardous reactions will not occur.
Conditions to avoid	:	Avoid all possible sources of ignition (spark or flame). Do not pressurize, cut, weld, braze, solder, drill, grind or expose containers to heat or sources of ignition. Do not allow vapor to accumulate in low or confined areas.
Incompatibility with various substances	:	Highly reactive or incompatible with the following materials: oxidizing materials.
Hazardous decomposition products	:	Under normal conditions of storage and use, hazardous decomposition products should not be produced.
Hazardous polymerization	:	Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Information on toxicological effects

Acute toxicity

Product/ingredient name	Result	Species	Dose	Exposure
benzene	LC50 Inhalation Gas. LD50 Oral	Rat Rat	10000 ppm 930 mg/kg	7 hours -

Irritation/Corrosion

Product/ingredient name	Result	Species	Score	Exposure	Observation
benzene	Eyes - Moderate irritant Eyes - Severe irritant Skin - Mild irritant Skin - Mild irritant Skin - Moderate irritant	Rabbit Rabbit Rat Rabbit Rabbit	- - - - -	88 milligrams 24 hours 2 milligrams 8 hours 60 microliters 24 hours 15 milligrams 24 hours 20 milligrams	- - - - -

Sensitization

Not available.

Mutagenicity

Not available.

Carcinogenicity

Not available.

Classification

Product/ingredient name	OSHA	IARC	NTP
benzene	+	1	Known to be a human carcinogen.

Reproductive toxicity

Not available.

Teratogenicity

Not available.

Specific target organ toxicity (single exposure)

Not available.

Specific target organ toxicity (repeated exposure)

Name	Category	Route of exposure	Target organs
benzene	Category 1	Not determined	bone marrow

Aspiration hazard

Not available.

Information on the likely routes of exposure : Not available.

Potential acute health effects

Eye contact : Causes serious eye irritation.

Inhalation : No known significant effects or critical hazards.

Section 11. Toxicological information

Skin contact : Causes skin irritation.

Ingestion : Harmful if swallowed. Irritating to mouth, throat and stomach.

Symptoms related to the physical, chemical and toxicological characteristics

Eye contact : Adverse symptoms may include the following:
pain or irritation
watering
redness

Inhalation : No specific data.

Skin contact : Adverse symptoms may include the following:
irritation
redness

Ingestion : No specific data.

Delayed and immediate effects and also chronic effects from short and long term exposure

Short term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Long term exposure

Potential immediate effects : Not available.

Potential delayed effects : Not available.

Potential chronic health effects

Not available.

General : Causes damage to organs through prolonged or repeated exposure.

Carcinogenicity : May cause cancer. Risk of cancer depends on duration and level of exposure.

Mutagenicity : May cause genetic defects.

Teratogenicity : No known significant effects or critical hazards.

Developmental effects : No known significant effects or critical hazards.

Fertility effects : No known significant effects or critical hazards.

Numerical measures of toxicity

Acute toxicity estimates

Not available.

Section 12. Ecological information

Toxicity

Not available.

Persistence and degradability

Not available.

Bioaccumulative potential

Section 12. Ecological information

Product/ingredient name	$LogP_{ow}$	BCF	Potential
benzene	2.13	11	low

Mobility in soil

Soil/water partition coefficient (K_{OC}) : Not available.

Other adverse effects : No known significant effects or critical hazards.

Section 13. Disposal considerations

Disposal methods : The generation of waste should be avoided or minimized wherever possible. Disposal of this product, solutions and any by-products should at all times comply with the requirements of environmental protection and waste disposal legislation and any regional local authority requirements. Dispose of surplus and non-recyclable products via a licensed waste disposal contractor. Waste should not be disposed of untreated to the sewer unless fully compliant with the requirements of all authorities with jurisdiction. Waste packaging should be recycled. Incineration or landfill should only be considered when recycling is not feasible. This material and its container must be disposed of in a safe way. Care should be taken when handling emptied containers that have not been cleaned or rinsed out. Empty containers or liners may retain some product residues. Vapor from product residues may create a highly flammable or explosive atmosphere inside the container. Do not cut, weld or grind used containers unless they have been cleaned thoroughly internally. Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

United States - RCRA Toxic hazardous waste "U" List

Ingredient	CAS #	Status	Reference number
Benzene (I,T)	71-43-2	Listed	U019

Section 14. Transport information

	DOT	TDG	Mexico	IMDG	IATA
UN number	UN1114	UN1114	UN114	UN1114	UN1114
UN proper shipping name	BENZENE	BENZENE	BENZENE	BENZENE	BENZENE
Transport hazard class(es)	3 	3 	3 	3 	3 
Packing group	II	II	II	II	II
Environment	No.	No.	No.	No.	No.
Additional information	**Reportable quantity** 10 lbs / 4.54 kg [1.3675 gal / 5.1767 L] Package sizes shipped in quantities less than the product reportable quantity are not subject to the RQ (reportable quantity) transportation requirements.	**Explosive Limit and Limited Quantity Index** 1 **Passenger Carrying Road or Rail Index** 5	-	-	**Passenger and Cargo Aircraft**Quantity limitation: 5 L **Cargo Aircraft Only** Quantity limitation: 60 L **Limited Quantities - Passenger Aircraft** Quantity limitation: 1 L

Section 14. Transport information

	Limited quantity Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: 5 L **Cargo aircraft** Quantity limitation: 60 L **Special provisions** IB2, T4, TP1				

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Special precautions for user : **Transport within user's premises:** always transport in closed containers that are upright and secure. Ensure that persons transporting the product know what to do in the event of an accident or spillage.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code : Not available.

Section 15. Regulatory information

U.S. Federal regulations : **TSCA 8(a) CDR Exempt/Partial exemption**: Not determined

United States inventory (TSCA 8b): This material is listed or exempted.

Clean Water Act (CWA) 307: benzene

Clean Water Act (CWA) 311: benzene

Clean Air Act Section 112 (b) Hazardous Air Pollutants (HAPs) : Listed

Clean Air Act Section 602 Class I Substances : Not listed

Clean Air Act Section 602 Class II Substances : Not listed

DEA List I Chemicals (Precursor Chemicals) : Not listed

DEA List II Chemicals (Essential Chemicals) : Not listed

SARA 302/304

Composition/information on ingredients

No products were found.

SARA 304 RQ : Not applicable.

SARA 311/312

Classification : Fire hazard
Immediate (acute) health hazard
Delayed (chronic) health hazard

Composition/information on ingredients

Section 15. Regulatory information

Name	%	Fire hazard	Sudden release of pressure	Reactive	Immediate (acute) health hazard	Delayed (chronic) health hazard
benzene	100	Yes.	No.	No.	Yes.	Yes.

SARA 313

	Product name	CAS number	%
Form R - Reporting requirements	benzene	71-43-2	100
Supplier notification	benzene	71-43-2	100

SARA 313 notifications must not be detached from the SDS and any copying and redistribution of the SDS shall include copying and redistribution of the notice attached to copies of the SDS subsequently redistributed.

State regulations

Massachusetts : This material is listed.

New York : This material is listed.

New Jersey : This material is listed.

Pennsylvania : This material is listed.

California Prop. 65

WARNING: This product contains a chemical known to the State of California to cause cancer and birth defects or other reproductive harm.

Ingredient name	Cancer	Reproductive	No significant risk level	Maximum acceptable dosage level
benzene	Yes.	Yes.	6.4 µg/day (ingestion) 13 µg/day (inhalation)	24 µg/day (ingestion) 49 µg/day (inhalation)

Canada inventory : This material is listed or exempted.

International regulations

International lists : **Australia inventory (AICS)**: This material is listed or exempted.
China inventory (IECSC): This material is listed or exempted.
Japan inventory: This material is listed or exempted.
Korea inventory: This material is listed or exempted.
Malaysia Inventory (EHS Register): Not determined.
New Zealand Inventory of Chemicals (NZIoC): This material is listed or exempted.
Philippines inventory (PICCS): This material is listed or exempted.
Taiwan inventory (CSNN): Not determined.

Chemical Weapons Convention List Schedule I Chemicals : Not listed

Chemical Weapons Convention List Schedule II Chemicals : Not listed

Chemical Weapons Convention List Schedule III Chemicals : Not listed

Canada

Section 15. Regulatory information

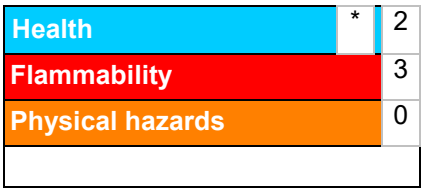
WHMIS (Canada) : Class B-2: Flammable liquid
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

CEPA Toxic substances: This material is listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

Canada Label requirements : Class B-2: Flammable liquid
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).

Hazardous Material Information System (U.S.A.)



Caution: HMIS® ratings are based on a 0-4 rating scale, with 0 representing minimal hazards or risks, and 4 representing significant hazards or risks Although HMIS® ratings are not required on SDSs under 29 CFR 1910. 1200, the preparer may choose to provide them. HMIS® ratings are to be used with a fully implemented HMIS® program. HMIS® is a registered mark of the National Paint & Coatings Association (NPCA). HMIS® materials may be purchased exclusively from J. J. Keller (800) 327-6868.

The customer is responsible for determining the PPE code for this material.

National Fire Protection Association (U.S.A.)

Reprinted with permission from NFPA 704-2001, Identification of the Hazards of Materials for Emergency Response Copyright ©1997, National Fire Protection Association, Quincy, MA 02269. This reprinted material is not the complete and official position of the National Fire Protection Association, on the referenced subject which is represented only by the standard in its entirety.

Copyright ©2001, National Fire Protection Association, Quincy, MA 02269. This warning system is intended to be interpreted and applied only by properly trained individuals to identify fire, health and reactivity hazards of chemicals. The user is referred to certain limited number of chemicals with recommended classifications in NFPA 49 and NFPA 325, which would be used as a guideline only. Whether the chemicals are classified by NFPA or not, anyone using the 704 systems to classify chemicals does so at their own risk.

History

Date of printing : 4/26/2015.

Date of issue/Date of revision : 4/26/2015.

Date of previous issue : 10/16/2014.

Version : 0.03

Section 16. Other information

Key to abbreviations : ATE = Acute Toxicity Estimate
BCF = Bioconcentration Factor
GHS = Globally Harmonized System of Classification and Labelling of Chemicals
IATA = International Air Transport Association
IBC = Intermediate Bulk Container
IMDG = International Maritime Dangerous Goods
LogPow = logarithm of the octanol/water partition coefficient
MARPOL 73/78 = International Convention for the Prevention of Pollution From Ships, 1973 as modified by the Protocol of 1978. ("Marpol" = marine pollution)
UN = United NationsACGIH – American Conference of Governmental Industrial Hygienists
AIHA – American Industrial Hygiene Association
CAS – Chemical Abstract Services
CEPA – Canadian Environmental Protection Act
CERCLA – Comprehensive Environmental Response, Compensation, and Liability Act (EPA)
CFR – United States Code of Federal Regulations
CPR – Controlled Products Regulations
DSL – Domestic Substances List
GWP – Global Warming Potential
IARC – International Agency for Research on Cancer
ICAO – International Civil Aviation Organisation
Inh – Inhalation
LC – Lethal concentration
LD – Lethal dosage
NDSL – Non-Domestic Substances List
NIOSH – National Institute for Occupational Safety and Health
TDG – Canadian Transportation of Dangerous Goods Act and Regulations
TLV – Threshold Limit Value
TSCA – Toxic Substances Control Act
WEEL – Workplace Environmental Exposure Level
WHMIS – Canadian Workplace Hazardous Material Information System

References : Not available.

Indicates information that has changed from previously issued version.

Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.

Safety Data Sheet

Prepared in accordance with Commission Regulation (EU) 2015/830

Stock Number: 31270
Revision Date: 13-08-2018
This document replaces SDS dated: 08-12-2016
2 Letter ISO country code/language code: UK/EN

Benzo(a)anthracene Standard

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

1.1 Product identifier: **Benzo(a)anthracene Standard**

Stock Number: 31270

Other means of identification:

Synonyms: None Known

REACH Registration No.: None Known

Molecular formula: CH3OH

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

Relevant identified uses: For Laboratory use only

Uses advised against: Uses other than recommended use.

1.3 Details of the Supplier of the Safety Data Sheet:	**Manufacturer**	**Supplier**
	Restek Corporation 110 Benner Circle Bellefonte, Pa. 16823 USA 00 1 814-353-1300 00 1 814-353-1309 sds@restek.com	Thames Restek UK LTD Units 8-16, Ministry Wharf Wycombe Road, Saunderton Buckinghamshire United Kingdom HP14 4HW 01494 563377 sales@thamesrestek.co.uk
1.4 Emergency telephone number:	00 1 800-424-9300 (CHEMTREC within the US) 00 1 703-741-5970 (Outside USA)	0870-8200418 (CHEMTREC within the UK) +1 703-741-5970 (CHEMTREC International)

Poison Centre contact information: National Poisons Information Service (NPIS)
Email: director.birmingham.unit@npis.org
Website: http://www.npis.org/

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture:

Classification according to Regulation (EC) No 1272/2008 [CLP]: Carcinogenicity Category 1B
Specific Target Organ Systemic Toxicity (STOT) - Single Exposure Category 1

Flammable Liquid Category 2
Hazardous to the aquatic environment - Chronic Category 2
Acute Toxicity - Dermal Category 3
Acute Toxicity - Oral Category 3

2.2 Label elements:

Labelling according to Regulation (EC) No 1272/2008 [CLP]:

Hazard pictograms:

Signal Word: Danger

Hazard Statements:
H225 - Highly flammable liquid and vapour
H301+H311 - Toxic if swallowed or in contact with skin
H350 - May cause cancer.
H370 - Causes damage to organs
H411 - Toxic to aquatic life with long lasting effects

Precautionary Statements:
P201 - Obtain special instructions before use.
P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
P233 - Keep container tightly closed.
P260 - Do not breathe dust/fume/gas/mist/vapours/spray.
P280 - Wear protective gloves/protective clothing/eye protection/face protection.
P301+P310 - IF SWALLOWED: Immediately call a POISON CENTER/doctor.

Supplemental Hazard information (EU): None Known

2.3 Other hazards: This substance does not meet the PBT or vPvB criteria of REACH, Annex XIII

SECTION 3: Composition/information on ingredients

3.1 Substances:
Not applicable

3.2 Mixtures:

Chemical Name	%	CAS #	EC No. REACH Registration No.	Classification (EC) No 1272/2008	M Factor	SCL	Acute Toxicity Estimates
benz (a) anthracene	0.1	56-55-3	200-280-6 None Known	Aquatic Acute 1; H400 Aquatic Chronic 1; H410 Carc. 1B; H350	AQUATIC CHRONIC 1: M = 100 AQUATIC ACUTE 1: M = 100	No data available	Not determined
methanol	99.9	67-56-1	200-659-6 None Known	Acute Tox. 3 (Dermal); H311 Acute Tox. 3 (Inh Dust/Mist); H331 Acute Tox. 3 (Oral); H301 Flam. Liq. 2; H225 STOT SE 1; H370	No data available	STOT SE 2: 3%<10% STOT SE 1: 10%	Not determined

For full text of H-statements see Section 16.

SECTION 4: First aid measures

4.1 Description of first aid measures:

Inhalation: Remove to fresh air. If breathing is difficult, have a trained individual administer oxygen. If not breathing, give artificial respiration and have a trained individual administer oxygen. Get medical attention immediately

Eye contact: Flush eyes with plenty of water for at least 20 minutes retracting eyelids often. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Get immediate medical attention.

Skin Contact: Wash with soap and water. Remove contaminated clothing and launder. Get medical attention if irritation develops or persists.

Ingestion: Do not induce vomiting and seek medical attention immediately. Drink two glasses of water or milk to dilute. Provide medical care provider with this SDS.

Self protection of the first aider: No data available

4.2 Most important symptoms and Coma and death

effects, both acute and delayed:

4.3 Indication of any immediate medical attention and special treatment needed: IF exposed or concerned: Get medical advice/ attention. IF exposed or concerned: Call a POISON CENTER/doctor. Call a POISON CENTER/doctor if you feel unwell.

SECTION 5: Firefighting measures

5.1 Extinguishing media:

Suitable extinguishing media: Use alcohol resistant foam, carbon dioxide, or dry chemical extinguishing agents. Water may be ineffective but water spray can be used extinguish a fire if swept across the base of the flames. Water can absorb heat and keep exposed material from being damaged by fire.

Unsuitable extinguishing media: None Known

5.2 Special hazards arising from the substance or mixture: Vapors may be ignited by sparks, flames or other sources of ignition if material is above the flash point giving rise to a fire (Class B). Vapors are heavier than air and may travel to a source of ignition and flash back.

Hazardous Combustion Products: Carbon dioxide, Carbon monoxide

5.3 Advice for firefighters: Do not enter fire area without proper protection including self-contained breathing apparatus and full protective equipment. Fight fire from a safe distance and a protected location due to the potential of hazardous vapors and decomposition products. Flammable component(s) of this material may be lighter than water and burn while floating on the surface.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures:

Non-emergency personnel: Non-emergency personnel should be kept clear of the area

Emergency responders: Exposure to the spilled material may be severely irritating or toxic. Follow personal protective equipment recommendations found in Section 8 of this SDS. Personal protective equipment needs must be evaluated based on information provided on this sheet and the special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred, and the expertise of employees in the area responding to the spill. Never exceed any occupational exposure limits.

6.2 Environmental precautions: No data available

6.3 Methods and material for containment and cleaning up:

Small spills: Refer to information provided for large spills

Large spills: Prevent the spread of any spill to minimize harm to human health and the

environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation.

6.4 Reference to other sections: Refer to section 13 for disposal information

SECTION 7: Handling and storage

7.1 Precautions for safe handling: Toxic or severely irritating material. Avoid contacting and avoid breathing the material. Use only in a well ventilated area. Use spark-proof tools and explosion-proof equipment

7.2 Conditions for safe storage, including any incompatibilities:

Conditions for safe storage: Store in a cool dry ventilated location. Isolate from incompatible materials and conditions. Keep container(s) closed. Keep away from sources of ignition

Materials to Avoid/Chemical Incompatibility: Strong oxidizing agents

7.3 Specific end use(s): For Laboratory use only

SECTION 8: Exposure controls/personal protection

8.1 Control parameters:

Occupational Exposure limit values:

Chemical Name	United Kingdom - Workplace Exposure Limits (WELs) - TWAs	United Kingdom - Workplace Exposure Limits (WELs) - STELs	United Kingdom - Biological Monitoring Guidance Values
methanol	200 ppm TWA; 266 mg/m3 TWA	250 ppm STEL; 333 mg/m3 STEL	No data available

DNEL: None Known

PNEC: None Known

8.2 Exposure controls:

Appropriate engineering controls: Local exhaust ventilation is recommended when generating excessive levels of vapours from handling or thermal processing.

Individual protection measures, such as personal protective equipment:

Eye and face protection: Wear chemically resistant safety glasses with side shields when handling this product. Do not wear contact lenses.

Skin Protection:

Hand protection: No information available

Other skin protection:	Wear protective gloves. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work
Respiratory Protection:	If an exposure limit is exceeded or if an operator is experiencing symptoms of inhalation overexposure as explained in Section 3, provide respiratory protection. Respiratory protection may be required to avoid overexposure when handling this product. General or local exhaust ventilation is the preferred means of protection. Use a respirator if general room ventilation is not available or sufficient to eliminate symptoms.
Respirator Type(s):	None required where adequate ventilation is provided. If airborne concentrations are above the applicable exposure limits, use NIOSH/MSHA approved respiratory protection.
Thermal Hazards:	Not applicable
Environmental exposure controls:	No data available

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties:

Appearance:	No data available
Colour:	No data available
Odour:	Mild
Odour threshold:	No data available
pH:	Not applicable
Melting Point/Freezing Point (°C):	
Melting point (°C):	No data available
Freezing point (°C):	No data available
Initial boiling point and boiling range (°C):	65
Flash point (°C):	11
Evaporation Rate (water = 1):	No data available
Flammability (solid, gas):	No data available
Upper/lower flammability or explosive limits:	
Upper flammable or explosive limit, % in air:	36
Lower flammable or explosive limit, %	6

in air:

Vapour pressure:	No data available
Vapor Density (Air=1):	1.1
Relative density (water = 1):	0.800
Solubility(ies):	Moderate; 50-99%
Partition coefficient: n-octanol/water:	No data available
Auto-ignition temperature (°C):	464
Decomposition temperature (°C):	No data available
Viscosity:	No data available
Explosive properties:	No data available
Oxidizing properties:	No data available

9.2 Other information:

Volatile Organic Chemicals:	0
Bulk density:	6.676

SECTION 10: Stability and reactivity

10.1 Reactivity:	Not expected to be reactive
10.2 Chemical stability:	Stable under normal conditions.
10.3 Possibility of hazardous reactions:	None expected under standard conditions of storage
10.4 Conditions to avoid:	No data available
10.5 Incompatible materials:	Strong oxidizing agents
10.6 Hazardous decomposition products:	Carbon dioxide, Carbon monoxide

SECTION 11: Toxicological information

11.1 Information on toxicological effects:

Acute toxicity:

Chemical Name	ORAL LD50 (rat)	DERMAL LD50 (rabbit)	INHALATION LC50 (rat)
methanol	No data available	No data available	INHALATION LC50-8H Rat 22500 ppm

Classification has been based on toxicological information of the components in Section 3.

Skin corrosion/irritation:
Based on available data, the classification criteria are not met.

Serious eye damage/irritation:
Based on available data, the classification criteria are not met.

Respiratory or skin sensitisation:
Based on available data, the classification criteria are not met.

Germ cell mutagenicity:
Based on available data, the classification criteria are not met.

Carcinogenicity:
Classification has been based on toxicological information of the components in Section 3.

Reproductive toxicity:
Based on available data, the classification criteria are not met.

STOT-single exposure:
Classification has been based on toxicological information of the components in Section 3.

STOT-repeated exposure:
Based on available data, the classification criteria are not met.

Aspiration hazard:
Based on available data, the classification criteria are not met.

SECTION 12: Ecological information

12.1 Toxicity: Moderate ecological hazard. This product may be dangerous to plants and/or wildlife.

Ecological Toxicity Data:

Chemical Name	CAS #	Aquatic EC50 Crustacea	Aquatic ERC50 Algae	Aquatic LC50 Fish
No data available				

12.2 Persistence and degradability: Biodegrades slowly.
12.3 Bioaccumulative potential: No data available
12.4 Mobility in soil: No data available
12.5 Results of PBT and vPvB assessment: No data available

12.6 Other adverse effects: None Known

12.7 Additional information: No data available

SECTION 13: Disposal considerations

13.1 Waste treatment methods:

Disposal methods: Spent or discarded material is a hazardous waste.
Dispose of by incineration following Federal, State, Local, or Provincial regulations.

Waste codes / waste designations according to LoW: No data available

SECTION 14: Transport information

International carriage of dangerous goods by road (ADR), rail or inland waterways:

14.1 UN number: UN1230

14.2 UN proper shipping name: Methanol

14.3 Transport hazard class(es): 3(6.1)

14.4 Packing group: II

International carriage of dangerous goods by air (IATA):

14.1 UN number: UN1230

14.2 UN proper shipping name: Methanol

14.3 Transport hazard class(es): 3(6.1)

14.4 Packing group: II

14.5 Environmental hazards: Yes

14.6 Special precautions for user: No data available

14.7 Transport in bulk according to Annex II of MARPOL and the IBC Code: No data available

SECTION 15: Regulatory information

15.1 Safety, health and environmental regulations/legislation specific for the substance or mixture:

Chemical Name	EINECS	SVHC
methanol	Yes	No

benz (a) anthracene	Yes	No

15.2 Chemical Safety Assessment No Chemical Safety Assessment has been carried out for this substance/mixture by the supplier.

SECTION 16: Other information

Revision Date: 13-08-2018

Indication of changes: Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.

Abbreviations and acronyms:

CAS = Chemical Abstract Service
DNEL= Derivative No Effect Level
EC= European Community
EINECS = European Inventory of Existing Chemical Substances
MSHA = Mine Safety Health Administration
NIOSH = National Institute of Occupational Safety & Health
OEL = Occupational Exposure Limit
PBT= Persistent, Bioaccumulative, Toxic
PNEC= Predicted No Effect Concentration
SCOEL= Scientific Committee on Occupational Exposure Limits
TLV = Threshold Limit Value
TWA= Time Weighted Average
vPvB= Very Persistent, Very Bioaccumulative
Wt.% = Weight Percent

Key literature references and sources for data: No data available

Hazard phrase(s) referenced in section 3

H350 - May cause cancer.
H225 - Highly flammable liquid and vapour
H301+H311+H331 - Toxic if swallowed, in contact with skin or if inhaled
H370 - Causes damage to organs
H410 - Very toxic to aquatic life with long lasting effects

Precautionary Statements:

Prevention:

P201 - Obtain special instructions before use.
P202 - Do not handle until all safety precautions have been read and understood.

	P210 - Keep away from heat, hot surfaces, sparks, open flames and other ignition sources. No smoking.
	P233 - Keep container tightly closed.
	P240 - Ground/bond container and receiving equipment.
	P241 - Use explosion-proof electrical/ventilating/lighting equipment.
	P242 - Use only non-sparking tools.
	P243 - Take precautionary measures against static discharge.
	P260 - Do not breathe dust/fume/gas/mist/vapours/spray.
	P264 - Wash thoroughly after handling.
	P270 - Do not eat, drink or smoke when using this product.
	P273 - Avoid release to the environment.
	P280 - Wear protective gloves/protective clothing/eye protection/face protection.
Response:	P301+P310 - IF SWALLOWED: Immediately call a POISON CENTER/doctor.
	P302+P352 - If on skin: Wash with plenty of water.
	P303+P361+P353 - IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
	P308+P311 - IF exposed or concerned: Call a POISON CENTER/doctor.
	P308+P313 - IF exposed or concerned: Get medical advice/ attention.
	P312 - Call a POISON CENTER/doctor if you feel unwell.
	P321 - Specific treatment (see Sections 4 to 8 on this SDS and any additional information on this label).
	P330 - Rinse mouth.
	P361+P364 - Take off immediately all contaminated clothing and wash it before reuse.
	P370+P378 - In case of fire: Use an appropriate extinguisher (see section 5) to extinguish.
	P391 - Collect spillage.
Storage:	P233 - Keep container tightly closed.
	P403+P235 - Store in a well-ventilated place. Keep cool.
	P405 - Store locked up.
Disposal:	P501 - Dispose of contents/container to a suitable disposal site in accordance with local/national/international regulations.

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Because many factors may affect processing or application/use, Restek Corporation recommends you perform an assessment to determine the suitability of a product for your particular purpose prior to use. No warranties of any kind, either expressed or implied, including fitness for a particular purpose, are made regarding products described, data or information set forth. In no case shall the descriptions, information, or data provided be considered a part of our terms and conditions of sale. Further, the descriptions, data and information furnished hereunder are given gratis. No obligation or liability for the description, data and information given are assumed. All such being given and accepted at your risk.

Safety Data Sheet

Revision Date: 07/11/19
www.restek.com

2 Letter ISO country code/language code: US/EN

1. IDENTIFICATION

Catalog Number / Product Name:	**31271 / Benzo(a)pyrene Standard**
Company:	Restek Corporation
Address:	110 Benner Circle Bellefonte, Pa. 16823
Phone#:	814-353-1300
Fax#:	814-353-1309
Emergency#:	800-424-9300 (CHEMTREC) 703-527-3887 (Outside the US)
Email:	www.restek.com
Revision Number:	11
Intended use:	For Laboratory use only

2. HAZARD(S)IDENTIFICATION

Emergency Overview:

GHS Hazard Symbols:

GHS Classification:
Skin Sensitisation Category 1
Germ Cell Mutagenicity Category 1B
Carcinogenicity Category 1B
Flammable Liquid Category 2
Serious Eye Damage/Eye Irritation Category 2
Specific Target Organ Systemic Toxicity (STOT) - Single Exposure Category 3

GHS Signal Word:
Danger

GHS Hazard:
Highly flammable liquid and vapour.
May cause an allergic skin reaction.
Causes serious eye irritation.
May cause drowsiness or dizziness.
May cause genetic defects.
May cause cancer.

GHS Precautions:

Safety Precautions:
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat/sparks/open flames/hot surfaces. – No smoking.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ventilation and lighting equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Avoid breathing dust/fume/gas/mist/vapours/spray.
Wash hands and skin thoroughly after handling.
Use only outdoors or in a well-ventilated area.
Contaminated work clothing should not be allowed out of the workplace.
Wear protective gloves/protective clothing/eye protection/face protection.

First Aid Measures:
IF ON SKIN: Wash with plenty of soap and water.
IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do.

Continue rinsing.
IF exposed or concerned: Get medical advice/attention.
Call a POISON CENTER or doctor/physician if you feel unwell.
Specific treatment see section 4.
If skin irritation or rash occurs: Get medical advice/attention.
If eye irritation persists: Get medical advice/attention.
Wash contaminated clothing before reuse.
In case of fire: Use extinguishing media in section 5 for extinction.

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

Disposal: Dispose of contents/container according to section 13 of the SDS.

Single Exposure Target Organs: Specific target organ toxicity - Single exposure - STOT SE 3: H336 May cause drowsiness or dizziness.

Repeated Exposure Target Organs: No data available

3. COMPOSITION / INFORMATION ON INGREDIENT

Chemical Name	CAS #	EINEC #	% Composition
Acetone	67-64-1	200-662-2	99.9
benzo (a) pyrene	50-32-8	200-028-5	0.1

4. FIRST-AID MEASURES

Inhalation: Remove to fresh air. If breathing is difficult, have a trained individual administer oxygen. If not breathing, give artificial respiration and have a trained individual administer oxygen. Get medical attention immediately

Eyes: Flush eyes with plenty of water for at least 20 minutes retracting eyelids often. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Get immediate medical attention.

Skin Contact: Wash with soap and water. Remove contaminated clothing and launder. Get medical attention if irritation develops or persists.

Ingestion: Do not induce vomiting and seek medical attention immediately. Drink two glasses of water or milk to dilute. Provide medical care provider with this SDS.

5. FIRE- FIGHTING MEASURES

Extinguishing Media: Use alcohol resistant foam, carbon dioxide, or dry chemical extinguishing agents. Water spray or fog may also be effective for extinguishing if swept across the base of the fire. Water can also be used to absorb heat and keep exposed material from being damaged by fire. Flammable component(s) of this material may be lighter than water and burn while floating on the surface.

Fire and/or Explosion Hazards: Vapors may be ignited by heat, sparks, flames or other sources of ignition at or above the low flash point giving rise to a Class B fire. Vapors are heavier than air and may travel to a source of ignition and flash back

Fire Fighting Methods and Protection: Do not enter fire area without proper protection including self-contained toxic breathing apparatus and full protective equipment. Fight fire from a safe distance and a protected location due to the potential of hazardous vapors and decomposition products. Flammable component(s) of this material may be lighter than water and burn while floating on the surface. Use water spray/fog for cooling. Flammable component(s) of this material may be lighter than water and burn while floating on the surface.

Hazardous Combustion Products: Carbon dioxide, Carbon monoxide

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions and Equipment: Exposure to the spilled material may be irritating or harmful. Follow personal protective equipment recommendations found in Section 8 of

	this SDS. Additional precautions may be necessary based on special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred. Also consider the expertise of employees in the area responding to the spill.
Methods for Clean-up:	Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation.

7. HANDLING AND STORAGE

Handling Technical Measures and Precautions:	Harmful or irritating material. Avoid contacting and avoid breathing the material. Use only in a well ventilated area. Use spark-proof tools and explosion-proof equipment
Storage Technical Measures and Conditions:	Store in a cool dry ventilated location. Isolate from incompatible materials and conditions. Keep container(s) closed. Keep away from sources of ignition

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

United States:

Chemical Name	CAS No.	IDLH	ACGIH STEL	ACGIH TLV-TWA	OSHA Exposure Limit
Acetone	67-64-1	2500 ppm IDLH (10% LEL)	750 ppm STEL; 1782 mg/m3 STEL	500 ppm TWA; 1188 mg/m3 TWA	1000 ppm TWA; 2400 mg/m3 TWA
benzo (a) pyrene	50-32-8	Not established	None Known	Not established	0.2 mg/m3 TWA (listed under Coal tar pitch volatiles)

Personal Protection:

Engineering Measures:	Local exhaust ventilation is recommended when generating excessive levels of vapours from handling or thermal processing.
Respiratory Protection:	No respiratory protection required under normal conditions of use. Provide general room exhaust ventilation if symptoms of overexposure occur as explained Section 3. A respirator is not normally required.
Eye Protection:	Wear chemically resistant safety glasses with side shields when handling this product. Do not wear contact lenses.
Skin Protection:	Wear protective gloves. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work
Medical Conditions Aggravated By Exposure:	Respiratory disease including asthma and bronchitis

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance, color:	Depends upon product selection
Odor:	Strong
Physical State:	No data available
pH:	Not applicable
Vapor Pressure:	No data available
Vapor Density:	2.0 (air = 1)
Boiling Point (°C):	56.05 °C at 1013.25 hPa
Melting Point (°C):	-95.4 °C Melting Point
Flash Point (°F):	39
Flammability:	Highly Flammable
Upper Flammable/Explosive Limit, % in air:	No data available
Lower Flammable/Explosive Limit, % in air:	No data available
Autoignition Temperature (°C):	465 deg C
Decomposition Temperature (°C):	No data available
Specific Gravity:	0.7845 g/cm3 at 25 °C
Evaporation Rate:	No data available
Odor Threshold:	ND
Solubility:	Complete; 100%
Partition Coefficient: n-octanol in water:	No data available
VOC % by weight:	99.9
Molecular Weight:	58.08

10. STABILITY AND REACTIVITY

Stability:	Stable under normal conditions.
Conditions to Avoid:	None known.
Materials to Avoid / Chemical Incompatiability:	Strong oxidizing agents Strong acids
Hazardous Decomposition Products:	Carbon dioxide Carbon monoxide

11. TOXICOLOGICAL INFORMATION

Routes of Entry:	Inhalation, Skin Contact, Eye Contact, Ingestion
Target Organs Potentially Affected By Exposure:	Eyes, Central nervous system stimulation, Respiratory Tract, Skin
Chemical Interactions That Change Toxicity:	None Known

Immediate (Acute) Health Effects by Route of Exposure:

Inhalation Irritation:	Can cause minor respiratory irritation, dizziness, weakness, fatigue, nausea, and headache.
Skin Contact:	Can cause minor skin irritation, defatting, and dermatitis.
Eye Contact:	Can cause minor irritation, tearing and reddening.
Ingestion Irritation:	May be harmful if swallowed.
Ingestion Toxicity:	Harmful if swallowed. May cause systemic poisoning.

Long-Term (Chronic) Health Effects:

Carcinogenicity:	Contains a probable or known human carcinogen.
Reproductive and Developmental Toxicity:	No data available to indicate product or any components present at greater than 0.1% may cause birth defects.
Inhalation:	Upon prolonged and/or repeated exposure, can cause minor respiratory irritation, dizziness, weakness, fatigue, nausea, and headache.
Skin Contact:	Upon prolonged or repeated contact, can cause minor skin irritation, defatting, and dermatitis.

Component Toxicological Data:
NIOSH:

Chemical Name	CAS No.	LD50/LC50
Acetone	67-64-1	Dermal LD50 Rabbit >15700 mg/kg; Inhalation LC50 Rat 50100 mg/m3 8 h; Oral LD50 Rat 5800 mg/kg

Component Carcinogenic Data:
OSHA:

Chemical Name	CAS No.	
Benzo[a]pyrene	50-32-8	Present

ACGIH:

Chemical Name	CAS No.	
Benzo[a]pyrene	50-32-8	A2 - Suspected Human Carcinogen
Acetone	67-64-1	A4 - Not Classifiable as a Human Carcinogen

NIOSH:

Chemical Name	CAS No.
No data available	

NTP:

Chemical Name	CAS No.
No data available	

IARC:

Chemical Name	CAS No.	Group No.
Monograph 100F [2012]; Monograph 92 [2010]; Supplement 7 [1987]; Monograph 32 [1983] (overall evaluation upgraded from 2B to 1 based on mechanistic and other relevant data)	50-32-8	Group 1

12. ECOLOGICAL INFORMATION

Overview:	This material is not expected to be harmful to the ecology.
Mobility:	No data
Persistence:	No data
Bioaccumulation:	No data
Degradability:	No data
Ecological Toxicity Data:	No data available

13. DISPOSAL CONSIDERATIONS

Waste Description of Spent Product:	Spent or discarded material is a hazardous waste.Mixing spent or discarded material with other materials may render the mixture hazardous. Perform a hazardous waste determination on mixtures.
Disposal Methods:	Dispose of by incineration following Federal, State, Local, or Provincial regulations.
Waste Disposal of Packaging:	Comply with all Local, State, Federal, and Provincial Environmental Regulations.

14. TRANSPORTATION INFORMATION

United States:

DOT Proper Shipping Name:	Acetone
UN Number:	UN1090
Hazard Class:	3
Packing Group:	II

International:

IATA Proper Shipping Name:	Acetone
UN Number:	UN1090
Hazard Class:	3
Packing Group:	II

Marine Pollutant: No

Chemical Name	CAS#	Marine Pollutant	Severe Marine Pollutant
No data available			

15. REGULATORY INFORMATION

United States:

Chemical Name	CAS#	CERCLA	SARA 313	SARA EHS 313	TSCA
Acetone	67-64-1	X	-	-	X
benzo (a) pyrene	50-32-8	X	X	-	X

The following chemicals are listed on CA Prop 65:

Chemical Name	CAS #	Regulation
Benzo[a]pyrene	50-32-8	Prop 65 Cancer

State Right To Know Listing:

Chemical Name	CAS#	New Jersey	Massachusetts	Pennsylvania	California
Acetone	67-64-1	X	X	X	X
benzo (a) pyrene	50-32-8	X	X	X	X

16. OTHER INFORMATION

Prior Version Date:	07/18/18
Other Information:	Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.
References:	No data available
Disclaimer:	Restek Corporation provides the descriptions, data and information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. It is provided for your guidance only. Because many factors may affect processing or application/use, Restek Corporation recommends you perform an

assessment to determine the suitability of a product for your particular purpose prior to use. No warranties of any kind, either expressed or implied, including fitness for a particular purpose, are made regarding products described, data or information set forth. In no case shall the descriptions, information, or data provided be considered a part of our terms and conditions of sale. Further, the descriptions, data and information furnished hereunder are given gratis. No obligation or liability for the description, data and information given are assumed. All such being given and accepted at your risk.

Safety Data Sheet

Revision Date: 08/13/18
www.restek.com

2 Letter ISO country code/language code: US/EN

1. IDENTIFICATION

Catalog Number / Product Name:	**31272 / Benzo(b)fluoranthene Standard**
Company:	Restek Corporation
Address:	110 Benner Circle Bellefonte, Pa. 16823
Phone#:	814-353-1300
Fax#:	814-353-1309
Emergency#:	800-424-9300 (CHEMTREC) 703-527-3887 (Outside the US)
Email:	www.restek.com
Revision Number:	10
Intended use:	For Laboratory use only

2. HAZARD(S)IDENTIFICATION

Emergency Overview:

GHS Hazard Symbols:

GHS Classification:
Carcinogenicity Category 1B
Flammable Liquid Category 2
Serious Eye Damage/Eye Irritation Category 2
Specific Target Organ Systemic Toxicity (STOT) - Single Exposure Category 3

GHS Signal Word:
Danger

GHS Hazard:
Highly flammable liquid and vapour.
Causes serious eye irritation.
May cause drowsiness or dizziness.
May cause cancer.

GHS Precautions:

Safety Precautions:
Obtain special instructions before use.
Do not handle until all safety precautions have been read and understood.
Keep away from heat/sparks/open flames/hot surfaces. – No smoking.
Ground/bond container and receiving equipment.
Use explosion-proof electrical/ventilation and lighting equipment.
Use only non-sparking tools.
Take precautionary measures against static discharge.
Avoid breathing dust/fume/gas/mist/vapours/spray.
Wash hands and skin thoroughly after handling.
Use only outdoors or in a well-ventilated area.
Wear protective gloves/protective clothing/eye protection/face protection.

First Aid Measures:
IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower.
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing.
IF exposed or concerned: Get medical advice/attention.
Call a POISON CENTER or doctor/physician if you feel unwell.
If eye irritation persists: Get medical advice/attention.
In case of fire: Use extinguishing media in section 5 for extinction.

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

Disposal: Dispose of contents/container according to section 13 of the SDS.

Single Exposure Target Organs: Specific target organ toxicity - Single exposure - STOT SE 3: H336 May cause drowsiness or dizziness.

Repeated Exposure Target Organs: No data available

3. COMPOSITION / INFORMATION ON INGREDIENT

Chemical Name	CAS #	EINEC #	% Composition
Acetone	67-64-1	200-662-2	99.9
benzo (b) fluoranthene	205-99-2	205-911-9	0.1

4. FIRST-AID MEASURES

Inhalation: Remove to fresh air. If breathing is difficult, have a trained individual administer oxygen. If not breathing, give artificial respiration and have a trained individual administer oxygen. Get medical attention immediately

Eyes: Flush eyes with plenty of water for at least 20 minutes retracting eyelids often. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Get immediate medical attention.

Skin Contact: Wash with soap and water. Remove contaminated clothing and launder. Get medical attention if irritation develops or persists.

Ingestion: Do not induce vomiting and seek medical attention immediately. Drink two glasses of water or milk to dilute. Provide medical care provider with this SDS.

5. FIRE- FIGHTING MEASURES

Extinguishing Media: Use alcohol resistant foam, carbon dioxide, or dry chemical extinguishing agents. Water spray or fog may also be effective for extinguishing if swept across the base of the fire. Water can also be used to absorb heat and keep exposed material from being damaged by fire. Flammable component(s) of this material may be lighter than water and burn while floating on the surface.

Fire and/or Explosion Hazards: Vapors may be ignited by heat, sparks, flames or other sources of ignition at or above the low flash point giving rise to a Class B fire. Vapors are heavier than air and may travel to a source of ignition and flash back

Fire Fighting Methods and Protection: Do not enter fire area without proper protection including self-contained toxic breathing apparatus and full protective equipment. Fight fire from a safe distance and a protected location due to the potential of hazardous vapors and decomposition products. Flammable component(s) of this material may be lighter than water and burn while floating on the surface. Use water spray/fog for cooling. Flammable component(s) of this material may be lighter than water and burn while floating on the surface.

Hazardous Combustion Products: Carbon dioxide, Carbon monoxide

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions and Equipment: Exposure to the spilled material may be irritating or harmful. Follow personal protective equipment recommendations found in Section 8 of this SDS. Additional precautions may be necessary based on special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred. Also consider the expertise of employees in the area responding to the spill.

Methods for Clean-up: Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal

evaluation.

7. HANDLING AND STORAGE

Handling Technical Measures and Precautions:	Harmful or irritating material. Avoid contacting and avoid breathing the material. Use only in a well ventilated area. Use spark-proof tools and explosion-proof equipment
Storage Technical Measures and Conditions:	Store in a cool dry ventilated location. Isolate from incompatible materials and conditions. Keep container(s) closed. Keep away from sources of ignition

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

United States:

Chemical Name	CAS No.	IDLH	ACGIH STEL	ACGIH TLV-TWA	OSHA Exposure Limit
Acetone	67-64-1	2500 ppm IDLH (10% LEL)	750 ppm STEL; 1782 mg/m3 STEL	500 ppm TWA; 1188 mg/m3 TWA	1000 ppm TWA; 2400 mg/m3 TWA
benzo (b) fluoranthene	205-99-2	Not established	None Known	Not established	No data available

Personal Protection:

Engineering Measures:	Local exhaust ventilation is recommended when generating excessive levels of vapours from handling or thermal processing.
Respiratory Protection:	No respiratory protection required under normal conditions of use. Provide general room exhaust ventilation if symptoms of overexposure occur as explained Section 3. A respirator is not normally required.
Eye Protection:	Wear chemically resistant safety glasses with side shields when handling this product. Do not wear contact lenses.
Skin Protection:	Wear protective gloves. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work
Medical Conditions Aggravated By Exposure:	Respiratory disease including asthma and bronchitis

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance, color:	Depends upon product selection
Odor:	Strong
Physical State:	No data available
pH:	Not applicable
Vapor Pressure:	No data available
Vapor Density:	2.0 (air = 1)
Boiling Point (°C):	56.05 °C at 1013.25 hPa
Melting Point (°C):	-95.4 °C Melting Point
Flash Point (°F):	39
Flammability:	Highly Flammable
Upper Flammable/Explosive Limit, % in air:	No data available
Lower Flammable/Explosive Limit, % in air:	No data available
Autoignition Temperature (°C):	465 deg C
Decomposition Temperature (°C):	No data available
Specific Gravity:	0.7845 g/cm3 at 25 °C
Evaporation Rate:	No data available
Odor Threshold:	ND
Solubility:	Complete; 100%
Partition Coefficient: n-octanol in water:	No data available
VOC % by weight:	0
Molecular Weight:	58.08

10. STABILITY AND REACTIVITY

Stability:	Stable under normal conditions.
Conditions to Avoid:	None known.
Materials to Avoid / Chemical Incompatiability:	Strong oxidizing agents Strong acids
Hazardous Decomposition Products:	Carbon dioxide Carbon monoxide

11. TOXICOLOGICAL INFORMATION

Routes of Entry:	Inhalation, Skin Contact, Eye Contact, Ingestion

Target Organs Potentially Affected By Exposure: Eyes, Central nervous system stimulation, Respiratory Tract, Skin

Chemical Interactions That Change Toxicity: None Known

Immediate (Acute) Health Effects by Route of Exposure:

Inhalation Irritation: Can cause minor respiratory irritation, dizziness, weakness, fatigue, nausea, and headache.

Skin Contact: Can cause minor skin irritation, defatting, and dermatitis.

Eye Contact: Can cause minor irritation, tearing and reddening.

Ingestion Irritation: May be harmful if swallowed.

Ingestion Toxicity: Harmful if swallowed. May cause systemic poisoning.

Long-Term (Chronic) Health Effects:

Carcinogenicity: Contains a probable or known human carcinogen.

Reproductive and Developmental Toxicity: No data available to indicate product or any components present at greater than 0.1% may cause birth defects.

Inhalation: Upon prolonged and/or repeated exposure, can cause minor respiratory irritation, dizziness, weakness, fatigue, nausea, and headache.

Skin Contact: Upon prolonged or repeated contact, can cause minor skin irritation, defatting, and dermatitis.

Component Toxicological Data:

NIOSH:

Chemical Name	CAS No.	LD50/LC50
Acetone	67-64-1	Dermal LD50 Rabbit >15700 mg/kg; Inhalation LC50 Rat 50100 mg/m3 8 h; Oral LD50 Rat 5800 mg/kg

Component Carcinogenic Data:

OSHA:

Chemical Name	CAS No.	
Benzo(b)fluoranthene	205-99-2	Present

ACGIH:

Chemical Name	CAS No.	
Benzo[b]fluoranthene	205-99-2	A2 - Suspected Human Carcinogen
Acetone	67-64-1	A4 - Not Classifiable as a Human Carcinogen

NIOSH:

Chemical Name	CAS No.
No data available	

NTP:

Chemical Name	CAS No.
No data available	

IARC:

Chemical Name	CAS No.	Group No.
Monograph 92 [2010]; Supplement 7 [1987]; Monograph 32 [1983]	205-99-2	Group 2B

12. ECOLOGICAL INFORMATION

Overview: This material is not expected to be harmful to the ecology.

Mobility: No data

Persistence: No data

Bioaccumulation: No data

Degradability: No data

Ecological Toxicity Data: No data available

13. DISPOSAL CONSIDERATIONS

Waste Description of Spent Product: Spent or discarded material is a hazardous waste.Mixing spent or discarded material with other materials may render the mixture hazardous. Perform a hazardous waste determination on mixtures.

Disposal Methods: Dispose of by incineration following Federal, State, Local, or Provincial regulations.

Waste Disposal of Packaging: Comply with all Local, State, Federal, and Provincial Environmental Regulations.

14. TRANSPORTATION INFORMATION

United States:

DOT Proper Shipping Name: Acetone
UN Number: UN1090
Hazard Class: 3
Packing Group: II

International:

IATA Proper Shipping Name: Acetone
UN Number: UN1090
Hazard Class: 3
Packing Group: II

Marine Pollutant: No

Chemical Name	CAS#	Marine Pollutant	Severe Marine Pollutant
No data available			

15. REGULATORY INFORMATION

United States:

Chemical Name	CAS#	CERCLA	SARA 313	SARA EHS 313	TSCA
Acetone	67-64-1	X	-	-	X
benzo (b) fluoranthene	205-99-2	X	X	-	-

The following chemicals are listed on CA Prop 65:

Chemical Name	CAS #	Regulation
Benzo[b]fluoranthene	205-99-2	Prop 65 Cancer

State Right To Know Listing:

Chemical Name	CAS#	New Jersey	Massachusetts	Pennsylvania	California
Acetone	67-64-1	X	X	X	X
benzo (b) fluoranthene	205-99-2	X	X	X	X

16. OTHER INFORMATION

Prior Version Date: 12/08/16

Other Information: Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.

References: No data available

Disclaimer: Restek Corporation provides the descriptions, data and information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. It is provided for your guidance only. Because many factors may affect processing or application/use, Restek Corporation recommends you perform an assessment to determine the suitability of a product for your particular purpose prior to use. No warranties of any kind, either expressed or implied, including fitness for a particular purpose, are made regarding products described, data or information set forth. In no case shall the descriptions, information, or data provided be considered a part of our terms and conditions of sale. Further, the descriptions, data and information furnished hereunder are given gratis. No obligation or liability for the description, data and information given are assumed. All such being given and accepted at your risk.

Safety Data Sheet

Revision Date: 06/15/18
www.restek.com

2 Letter ISO country code/language code: US/EN

1. IDENTIFICATION

Catalog Number / Product Name:	**31274 / Benzo(k)fluoranthene Standard**
Company:	Restek Corporation
Address:	110 Benner Circle Bellefonte, Pa. 16823
Phone#:	814-353-1300
Fax#:	814-353-1309
Emergency#:	800-424-9300 (CHEMTREC) 703-527-3887 (Outside the US)
Email:	www.restek.com
Revision Number:	11
Intended use:	For Laboratory use only

2. HAZARD(S)IDENTIFICATION

Emergency Overview:

GHS Hazard Symbols:

GHS Classification:	Carcinogenicity Category 1B Flammable Liquid Category 2 Serious Eye Damage/Eye Irritation Category 2 Specific Target Organ Systemic Toxicity (STOT) - Single Exposure Category 3
GHS Signal Word:	Danger
GHS Hazard:	Highly flammable liquid and vapour. Causes serious eye irritation. May cause drowsiness or dizziness. May cause cancer.
GHS Precautions:	
Safety Precautions:	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat/sparks/open flames/hot surfaces. – No smoking. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilation and lighting equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Avoid breathing dust/fume/gas/mist/vapours/spray. Wash hands and skin thoroughly after handling. Use only outdoors or in a well-ventilated area. Wear protective gloves/protective clothing/eye protection/face protection.
First Aid Measures:	IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing. IF exposed or concerned: Get medical advice/attention. Call a POISON CENTER or doctor/physician if you feel unwell. If eye irritation persists: Get medical advice/attention. In case of fire: Use extinguishing media in section 5 for extinction.

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

Disposal: Dispose of contents/container according to section 13 of the SDS.

Single Exposure Target Organs: Specific target organ toxicity - Single exposure - STOT SE 3: H336 May cause drowsiness or dizziness.

Repeated Exposure Target Organs: No data available

3. COMPOSITION / INFORMATION ON INGREDIENT

Chemical Name	CAS #	EINEC #	% Composition
Acetone	67-64-1	200-662-2	99.9
benzo (k) fluoranthene	207-08-9	205-916-6	0.1

4. FIRST-AID MEASURES

Inhalation: Remove to fresh air. If breathing is difficult, have a trained individual administer oxygen. If not breathing, give artificial respiration and have a trained individual administer oxygen. Get medical attention immediately

Eyes: Flush eyes with plenty of water for at least 20 minutes retracting eyelids often. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Get immediate medical attention.

Skin Contact: Wash with soap and water. Remove contaminated clothing and launder. Get medical attention if irritation develops or persists.

Ingestion: Do not induce vomiting and seek medical attention immediately. Drink two glasses of water or milk to dilute. Provide medical care provider with this SDS.

5. FIRE- FIGHTING MEASURES

Extinguishing Media: Use alcohol resistant foam, carbon dioxide, or dry chemical extinguishing agents. Water spray or fog may also be effective for extinguishing if swept across the base of the fire. Water can also be used to absorb heat and keep exposed material from being damaged by fire. Flammable component(s) of this material may be lighter than water and burn while floating on the surface.

Fire and/or Explosion Hazards: Vapors may be ignited by heat, sparks, flames or other sources of ignition at or above the low flash point giving rise to a Class B fire. Vapors are heavier than air and may travel to a source of ignition and flash back

Fire Fighting Methods and Protection: Do not enter fire area without proper protection including self-contained toxic breathing apparatus and full protective equipment. Fight fire from a safe distance and a protected location due to the potential of hazardous vapors and decomposition products. Flammable component(s) of this material may be lighter than water and burn while floating on the surface. Use water spray/fog for cooling. Flammable component(s) of this material may be lighter than water and burn while floating on the surface.

Hazardous Combustion Products: Carbon dioxide, Carbon monoxide

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions and Equipment: Exposure to the spilled material may be irritating or harmful. Follow personal protective equipment recommendations found in Section 8 of this SDS. Additional precautions may be necessary based on special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred. Also consider the expertise of employees in the area responding to the spill.

Methods for Clean-up: Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal

evaluation.

7. HANDLING AND STORAGE

Handling Technical Measures and Precautions:	Harmful or irritating material. Avoid contacting and avoid breathing the material. Use only in a well ventilated area. Use spark-proof tools and explosion-proof equipment
Storage Technical Measures and Conditions:	Store in a cool dry ventilated location. Isolate from incompatible materials and conditions. Keep container(s) closed. Keep away from sources of ignition

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

United States:

Chemical Name	CAS No.	IDLH	ACGIH STEL	ACGIH TLV-TWA	OSHA Exposure Limit
Acetone	67-64-1	2500 ppm IDLH (10% LEL)	750 ppm STEL; 1782 mg/m3 STEL	500 ppm TWA; 1188 mg/m3 TWA	1000 ppm TWA; 2400 mg/m3 TWA
benzo (k) fluoranthene	207-08-9	Not established	None Known	Not established	No data available

Personal Protection:

Engineering Measures:	Local exhaust ventilation is recommended when generating excessive levels of vapours from handling or thermal processing.
Respiratory Protection:	No respiratory protection required under normal conditions of use. Provide general room exhaust ventilation if symptoms of overexposure occur as explained Section 3. A respirator is not normally required.
Eye Protection:	Wear chemically resistant safety glasses with side shields when handling this product. Do not wear contact lenses.
Skin Protection:	Wear protective gloves. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work
Medical Conditions Aggravated By Exposure:	Respiratory disease including asthma and bronchitis

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance, color:	Depends upon product selection
Odor:	Strong
Physical State:	No data available
pH:	Not applicable
Vapor Pressure:	No data available
Vapor Density:	2.0 (air = 1)
Boiling Point (°C):	480 °C 56.05 °C at 1013.25 hPa
Melting Point (°C):	-95.4 °C Melting Point
Flash Point (°F):	39
Flammability:	Highly Flammable
Upper Flammable/Explosive Limit, % in air:	No data available
Lower Flammable/Explosive Limit, % in air:	No data available
Autoignition Temperature (°C):	465 deg C
Decomposition Temperature (°C):	No data available
Specific Gravity:	0.7845 g/cm3 at 25 °C
Evaporation Rate:	No data available
Odor Threshold:	ND
Solubility:	Complete; 100%
Partition Coefficient: n-octanol in water:	No data available
VOC % by weight:	0
Molecular Weight:	58.08

10. STABILITY AND REACTIVITY

Stability:	Stable under normal conditions.
Conditions to Avoid:	None known.
Materials to Avoid / Chemical Incompatiability:	Strong oxidizing agents Strong acids
Hazardous Decomposition Products:	Carbon dioxide Carbon monoxide

11. TOXICOLOGICAL INFORMATION

Routes of Entry:	Inhalation, Skin Contact, Eye Contact, Ingestion

Target Organs Potentially Affected By Exposure: Eyes, Central nervous system stimulation, Respiratory Tract, Skin

Chemical Interactions That Change Toxicity: None Known

Immediate (Acute) Health Effects by Route of Exposure:

Inhalation Irritation: Can cause minor respiratory irritation, dizziness, weakness, fatigue, nausea, and headache.

Skin Contact: Can cause minor skin irritation, defatting, and dermatitis.

Eye Contact: Can cause minor irritation, tearing and reddening.

Ingestion Irritation: May be harmful if swallowed.

Ingestion Toxicity: Harmful if swallowed. May cause systemic poisoning.

Long-Term (Chronic) Health Effects:

Carcinogenicity: Contains a probable or known human carcinogen.

Reproductive and Developmental Toxicity: No data available to indicate product or any components present at greater than 0.1% may cause birth defects.

Inhalation: Upon prolonged and/or repeated exposure, can cause minor respiratory irritation, dizziness, weakness, fatigue, nausea, and headache.

Skin Contact: Upon prolonged or repeated contact, can cause minor skin irritation, defatting, and dermatitis.

Component Toxicological Data:

NIOSH:

Chemical Name	CAS No.	LD50/LC50
Acetone	67-64-1	Dermal LD50 Rabbit >15700 mg/kg; Inhalation LC50 Rat 50100 mg/m3 8 h; Oral LD50 Rat 5800 mg/kg

Component Carcinogenic Data:

OSHA:

Chemical Name	CAS No.	
Benzo(k)fluoranthene	207-08-9	Present

ACGIH:

Chemical Name	CAS No.	
Acetone	67-64-1	A4 - Not Classifiable as a Human Carcinogen

NIOSH:

Chemical Name	CAS No.
No data available	

NTP:

Chemical Name	CAS No.
No data available	

IARC:

Chemical Name	CAS No.	Group No.
Monograph 92 [2010]; Supplement 7 [1987]; Monograph 32 [1983]	207-08-9	Group 2B

12. ECOLOGICAL INFORMATION

Overview: This material is not expected to be harmful to the ecology.

Mobility: No data

Persistence: No data

Bioaccumulation: No data

Degradability: No data

Ecological Toxicity Data: No data available

13. DISPOSAL CONSIDERATIONS

Waste Description of Spent Product: Spent or discarded material is a hazardous waste.Mixing spent or discarded material with other materials may render the mixture hazardous. Perform a hazardous waste determination on mixtures.

Disposal Methods: Dispose of by incineration following Federal, State, Local,

or Provincial regulations.

Waste Disposal of Packaging: Comply with all Local, State, Federal, and Provincial Environmental Regulations.

14. TRANSPORTATION INFORMATION

United States:

DOT Proper Shipping Name: Acetone
UN Number: UN1090
Hazard Class: 3
Packing Group: II

International:

IATA Proper Shipping Name: Acetone
UN Number: UN1090
Hazard Class: 3
Packing Group: II

Marine Pollutant: No

Chemical Name	CAS#	Marine Pollutant	Severe Marine Pollutant
No data available			

15. REGULATORY INFORMATION

United States:

Chemical Name	CAS#	CERCLA	SARA 313	SARA EHS 313	TSCA
Acetone	67-64-1	X	-	-	X
benzo (k) fluoranthene	207-08-9	X	X	-	-

The following chemicals are listed on CA Prop 65:

Chemical Name	CAS #	Regulation
Benzo[k]fluoranthene	207-08-9	Prop 65 Cancer

State Right To Know Listing:

Chemical Name	CAS#	New Jersey	Massachusetts	Pennsylvania	California
Acetone	67-64-1	X	X	X	X
benzo (k) fluoranthene	207-08-9	X	X	X	X

16. OTHER INFORMATION

Prior Version Date: 12/30/16

Other Information: Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.

References: No data available

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SAFETY DATA SHEET

Version 6.0
Revision Date 02/08/2019
Print Date 06/29/2019

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

1.1 Product identifiers

Product name : BENZO(G,H,I)PERYLENE, 98%

Product Number : B9009
Brand : Aldrich
CAS-No. : 191-24-2

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

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

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

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

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

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

Short-term (acute) aquatic hazard (Category 1), H400
Long-term (chronic) aquatic hazard (Category 1), H410

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

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)
P273 Avoid release to the environment.
P391 Collect spillage.

P501	Dispose of contents/ container to an approved waste disposal plant.

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

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms : 1,12-Benzoperylene

Formula : $C_{22}H_{12}$
Molecular weight : 276.33 g/mol
CAS-No. : 191-24-2
EC-No. : 205-883-8

Component	Classification	Concentration
Benzo[ghi]perylene Included in the Candidate List of Substances of Very High Concern (SVHC) according to Regulation (EC) No. 1907/2006 (REACH)		
	Aquatic Acute 1; Aquatic Chronic 1; H400, H410 M-Factor - Aquatic Acute: 1,000 - Aquatic Chronic: 1,000	<= 100 %

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

SECTION 4: First aid measures

4.1 Description of first aid measures

General advice
Consult a physician. Show this safety data sheet to the doctor in attendance.

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

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

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

SECTION 5: Firefighting measures

5.1 Extinguishing media

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

5.2 Special hazards arising from the substance or mixture
Carbon oxides

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

5.4 Further information
No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation.
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
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling
Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
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.
Storage class (TRGS 510): 13: Non Combustible Solids

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

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

Components with workplace control parameters

Component	CAS-No.	Value	Control parameters	Basis
Benzo[ghi]perylene	191-24-2	PEL	0.2 mg/m3	California permissible exposure limits for chemical contaminants (Title 8, Article 107)
	Remarks	Coal tar pitch volatiles (benzene or cyclohexane-soluble fraction) include fused polycyclic hydrocarbons (some of which are known carcinogens) which volatilize from the distillation residues of coal, petroleum (excluding asphalt), wood, and other organic matter. Asphalt (CAS 8052-42-4, and CAS 64742-93-4) is not covered under the 'coal tar pitch volatiles' standard.		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Benzo[ghi]perylene	191-24-2	1-Hydroxypyrene	2.5 µg/l	Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	End of shift at end of workweek			
		3-hydroxybenzo(a)pyrene		Urine	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
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: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

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
Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

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

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: solid
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 277 - 279 °C (531 - 534 °F) - lit.
f)	Initial boiling point and boiling range	> 500 °C > 932 °F - lit.
g)	Flash point	()No data available
h)	Evaporation rate	No data available
i)	Flammability (solid, gas)	No data available
j)	Upper/lower flammability or explosive limits	No data available
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	No data available
n)	Water solubility	insoluble
o)	Partition coefficient: n-octanol/water	log Pow: 6.22 at 25 °C (77 °F)

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

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents

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

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
No data available
Inhalation: No data available
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
This product is or contains a component that is not classifiable as to its carcinogenicity based on its IARC, ACGIH, NTP, or EPA classification.

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 on OSHA's list of regulated carcinogens.

Reproductive toxicity
No data available
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: Not available

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

SECTION 12: Ecological information

12.1 Toxicity
No data available

Toxicity to daphnia and other aquatic invertebrates	static test EC50 - Daphnia magna (Water flea) - 0.0002 mg/l - 48 h
Toxicity to algae	Growth rate EC10 - Pseudokirchneriella subcapitata (green algae) - > 0.0016 mg/l - 72 h

12.2 Persistence and degradability
Biodegradability — Result: - Not rapidly biodegradable
Remarks: 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.
Very toxic to aquatic life with long lasting effects.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

SECTION 14: Transport information

DOT (US)
Not dangerous goods

IMDG
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Benzo[ghi]perylene)
Marine pollutant : yes

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Benzo[ghi]perylene)
Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

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

	CAS-No.	Revision Date
Benzo[ghi]perylene	191-24-2	2015-11-23

SARA 311/312 Hazards
No SARA Hazards

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Benzo[ghi]perylene	191-24-2	2015-11-23

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Benzo[ghi]perylene	191-24-2	2015-11-23

California Prop. 65 Components

	CAS-No.	Revision Date
, which is/are known to the State of California to cause cancer. For more information go to www.P65Warnings.ca.gov.Benzo[ghi]perylene	191-24-2	2007-09-28

SECTION 16: Other information

Further information

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

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Version: 6.0 Revision Date: 02/08/2019 Print Date: 06/29/2019

SAFETY DATA SHEET

Version 6.0
Revision Date 01/31/2017
Print Date 06/22/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Butylbenzene

Product Number : B90203
Brand : Aldrich

CAS-No. : 104-51-8

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

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

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

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

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Flammable liquids (Category 3), H226
Flammable liquids (Category 3), H226
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

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

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)
H226 Flammable liquid and vapour.

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.
P280	Wear protective gloves/ eye protection/ face protection.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P403 + P235	Store in a well-ventilated place. Keep cool.
P501	Dispose of contents/ container to an approved waste disposal plant.

Pictogram

Signal word Warning

Hazard statement(s)

H226	Flammable liquid and vapour.
H410	Very toxic 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.
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.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam for extinction.
P391	Collect spillage.
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

Synonyms	:	1-Phenylbutane
Formula	:	$C_{10}H_{14}$
Molecular weight	:	134.22 g/mol
CAS-No.	:	104-51-8
EC-No.	:	203-209-7

Hazardous components

Component	Classification	Concentration
Butylbenzene		
	Flam. Liq. 3; H226	<= 100 %
Butylbenzene		
	Flam. Liq. 3; H226	<= 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
For small (incipient) fires, use media such as "alcohol" foam, dry chemica of water applied ineffective. Cool all affected containers with flooding

5.2 Special hazards arising from the substance or mixture
Carbon oxides

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
Avoid breathing vapours, mist or gas. Remove all sources of ignition. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.Avoid breathing vapours, mist or gas. Ensure adequate ventilation. Remove all sources of ignition. 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.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 inhalation of vapour or mist.
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

Store in cool place. 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

Contains no substances with occupational exposure limit values.
Contains no substances with occupational exposure limit values.
Hazardous components without workplace control parameters

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

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

Body Protection

Impervious clothing, 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 (US) or type ABEK (EN 14387) respirator cartridges as a backup to enginee 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.
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, 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: -88 °C (-126 °F) - lit.
f)	Initial boiling point and boiling range	183 °C (361 °F) - lit.
g)	Flash point	59.0 °C (138.2 °F) - closed cup59.0 °C (138.2 °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: 5.8 %(V) Lower explosion limit: 0.8 %(V)
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	0.86 g/cm3 at 25 °C (77 °F)
n)	Water solubility	insoluble
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	412.0 °C (773.6 °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.

10.3 Possibility of hazardous reactions

No data available

10.4 Conditions to avoid

Heat, flames and sparks.

10.5 Incompatible materials

Strong oxidizing agents

10.6 Hazardous decomposition products

Hazardous decomposition products formed under fire conditions. - Carbon oxides
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
No data availableButylbenzene
Inhalation: No data available(Butylbenzene)
Dermal: No data available(Butylbenzene)
No data available(Butylbenzene)

Skin corrosion/irritation
No data available(Butylbenzene)

Serious eye damage/eye irritation
No data available(Butylbenzene)

Respiratory or skin sensitisation
No data available(Butylbenzene)

Germ cell mutagenicity

No data available(Butylbenzene)

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.

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.

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

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.

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.

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(Butylbenzene)

No data available(Butylbenzene)

Specific target organ toxicity - single exposure
No data available(Butylbenzene)

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available(Butylbenzene)

Additional Information
RTECS: CY9070000

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

12. ECOLOGICAL INFORMATION

12.1 Toxicity

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available(Butylbenzene)

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.
Very toxic to aquatic life with long lasting effects.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Burn in a chemical incinerator equipped with an afterburner and scrubber b highly flammable. Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 2709 Class: 3 Packing group: III
Proper shipping name: Butyl benzenesMarine pollutant: no
Poison Inhalation Hazard: No

IMDG
UN number: 2709 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: BUTYLBENZENES
Marine pollutant : yesMarine pollutant : yes

IATA
UN number: 2709 Class: 3 Packing group: III
Proper shipping name: Butylbenzenes

15. REGULATORY INFORMATION

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

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.

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
Butylbenzene	104-51-8	1993-04-24

	CAS-No.	Revision Date
Butylbenzene	104-51-8	1993-04-24

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Butylbenzene	104-51-8	1993-04-24

	CAS-No.	Revision Date
Butylbenzene	104-51-8	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Butylbenzene	104-51-8	1993-04-24

	CAS-No.	Revision Date
Butylbenzene	104-51-8	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.
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.

H226	Flammable liquid and vapour.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

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

NFPA Rating

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

Further information

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

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.0 Revision Date: 01/31/2017 Print Date: 06/22/2019

Cadmium

Print

SAFETY DATA SHEET

1 PRODUCT AND SUPPLIER IDENTIFICATION

Product Name: Cadmium - pieces, shot, sheet, foil, rod, wire, target

Formula: Cd

Supplier: ESPI Metals

1050 Benson Way

Ashland, OR 97520

Telephone: 800-638-2581

Fax: 541-488-8313

Email: sales@espimetals.com

Emergency: Infotrac 800-535-5053 (US) or 352-323-3500 (24 hour)

Recommended Uses: Scientific Research

2 HAZARDS IDENTIFICATION

GHS Classification (29 CFR 1910.1200): Acute toxicity - oral, category 3, Acute toxicity - inhalation, category 1, Carcinogenicity, category 1B, Specific target organ toxicity - repeated exposure, category 2.

GHS Label Elements:

Signal Word: Danger

Hazard Statements: H301 Toxic if swallowed, H330 Fatal if inhaled, H350 May cause cancer, H373 May cause damage to kidneys through prolonged or repeated exposure.

Precautionary Statements: P201 Obtain special instructions before use, P202 Do not handle until all safety precautions have been read and understood, P260 Do not breath dust or fume, P264 Wash skin thoroughly after handling, P270 Do not eat, drink or smoke when using this product, P271 Use only outdoors or in a well-ventilated area, P281 Use personal protective equipment as

required, P284 Wear respiratory protection, P301+P310 IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician, P330 Rinse mouth, P304+P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing, P310 Immediately call a POISON CENTER or doctor/physician, P308+P313 IF exposed or concerned: Get medical advice/attention, P314 Get medical advice/attention if you feel unwell, P405 Store locked up, P501 Dispose of contents/container in accordance with local, state or federal regulations.

NOTE: **In the solid form in which it is provided, and under typical handling and use, this material does not pose a health hazard. Subsequent operations performed by the end user, such as exposure to high temperatures, melting or grinding, may produce highly toxic cadmium oxide dust or fume. ESPI Metals does not warranty this material for any specific application and all precautions must be taken by the end user to prevent and protect against exposure to inhalable particulate. See section 8 for information on exposure controls and personal protection**.

3 COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient: Cadmium

CAS#: 7440-43-9

%: 100

EC#: 231-152-8

4 FIRST AID MEASURES

General Measures: Under normal handling and use, exposure to solid forms of this material present few health hazards, however subsequent operations such as grinding, melting or welding may produce hazardous dust or fumes. Emergency responders should take care to avoid secondary exposure to cadmium particulate. Wear appropriate protective equipment.

INHALATION: Remove to fresh air, keep warm and quiet, give oxygen if breathing is difficult. Seek immediate medical attention. Treat pulmonary edema as a priority, even if no symptoms (i.e. wheezing, coughing, shortness of breath, etc.) are apparent. Symptoms of pulmonary edema can be delayed up to 48 hours after exposure. Quickly transport victim to an emergency care facility.

INGESTION: Rinse mouth with water. Do not induce vomiting. Seek immediate medical attention. Never induce vomiting or give anything by mouth to an unconscious person. Ingested cadmium may lead to spontaneous vomiting. If vomiting occurs naturally, have victim rinse mouth with water again.

SKIN: Remove contaminated clothing, wash affected area with soap and water. Seek medical attention. Wash contaminated clothing before reusing.

EYES: Flush eyes with lukewarm water, including under upper and lower eyelids, for at least 15 minutes. Seek medical attention.

Most Important Symptoms/Effects, Acute and Delayed: May cause respiratory irritation, coughing, headache. See section 11 for more information.

Indication of Immediate Medical Attention and Special Treatment: No other information available.

5 FIREFIGHTING MEASURES

Extinguishing Media: Use Class D dry powder extinguishing agent.

Unsuitable Extinguishing Media: Do not use water or foam.

Specific Hazards Arising from the Material: This product does not present fire or explosion hazards as shipped. Fine dust from processing may ignite if allowed to accumulate and subjected to an ignition source. When heated, cadmium emits highly toxic fumes of cadmium oxide.

Special Protective Equipment and Precautions for Firefighters: Full face, self-contained breathing apparatus and full protective clothing.

6 ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment, and Emergency Procedures: Wear appropriate respiratory and protective equipment specified in section 8. Isolate spill area and provide ventilation. Avoid breathing dust or fume. Avoid contact with skin and eyes. Eliminate all sources of ignition.

Methods and Materials for Containment and Cleaning Up: Avoid creating dusts. For larger pieces - pick up mechanically. For chips or dust - vacuum spill using a system equipped with a HEPA filtration system and place in properly labeled closed containers. Special precautions must be taken when changing filters on HEPA vacuum cleaners used to clean up hazardous materials. Caution should be taken to minimize airborne generation of particulate and avoid contamination of air and water.

Environmental Precautions: Do not allow to enter drains or to be released to the environment.

7 HANDLING AND STORAGE

Precautions for Safe Handling: Handle in a well-ventilated area. Avoid exposure to high temperature. Avoid creating dust. Avoid breathing dust or fumes. Provide local exhaust ventilation if dusts are created. Avoid contact with skin and eyes. Wash thoroughly before eating or smoking. See section 8 for information on personal protection equipment.

Conditions for Safe Storage, Including Any Incompatibilities: Store in a sealed container. Store in a cool, dry area. . Do not store together with oxidizers, acids or halogens. See section 10 for more information on incompatible materials.

8 EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits: Cadmium

OSHA/PEL: 0.005 mg/m^3

ACGIH/TLV: 0.01 mg/m^3

Appropriate Engineering Controls: Whenever possible the use of local exhaust ventilation or other engineering controls is the preferred method of controlling exposure to airborne dust and fume to meet established occupational exposure limits. Use good housekeeping and sanitation practices. Do not use tobacco or food in work area. Wash thoroughly before eating or smoking. Do not blow dust off clothing or skin with compressed air. Clothing worn in areas of exposure to cadmium dust or fume should be restricted to the workplace and laundered regularly.

Individual Protection Measures, Such as Personal Protective Equipment:

Respiratory Protection: When potential exposures are above the occupational limits, approved respirators must be used.

Eye Protection: Safety glasses

Skin Protection: Wear impermeable gloves, protective work clothing as necessary.

9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance:

Form: Solid in various forms

Color: Silvery metallic

Odor: Odorless

Odor Threshold: Not determined

pH: N/A

Melting Point: 320.9 ^{o}C

Boiling Point: 765 ^{o}C

Flash Point: N/A

Evaporation Rate: N/A

Flammability: No data

Upper Flammable Limit: No data

Lower Flammable Limit: No data

Vapor Pressure: 1 mm Hg @ 394 ^{o}C

Vapor Density: N/A

Relative Density (Specific Gravity): 8.642 g/cc

Solubility in H_2O: Insoluble

Partition Coefficient (n-octanol/water): Not determined

Autoignition Temperature: No data

Decomposition Temperature: No data

Viscosity: N/A

10 STABILITY AND REACTIVITY

Reactivity: No data

Chemical Stability: Stable under recommended storage conditions.

Possibility of Hazardous Reactions: High temperatures will generate toxic cadmium oxide fumes.

Conditions to Avoid: Avoid creating or accumulating fines or dusts. Avoid high temperatures.

Incompatible Materials: Peroxides, chlorates, nitrates, halogens, interhalogens, strong acids, strong bases, sulphur, potassium, zinc, selenium and tellurium.

Hazardous Decomposition Products: Cadmium oxide fume.

11 TOXICOLOGICAL INFORMATION

Likely Routes of Exposure: Inhalation, skin, eyes.

Symptoms of Exposure: Inhalation of fumes may cause upper respiratory tract irritation and systemic poisoning with early symptoms including headache, coughing, and a metallic taste.

Acute and Chronic Effects: After a delay of several hours (up to 10) after inhalation of dust or fumes, a person may develop constriction of the chest, persistent cough, and progressive shortness of breath. There may be headache, chills, diarrhea, muscle aches, nausea, vomiting, irritability, and restlessness. Prolonged exposure to cadmium dust and/or fume may cause loss of sense of smell, occasional ulcerations of the nasal passages, rhinolaryngitis, cough, shortness of breath, mild anemia, sleeplessness, irritability, loss of appetite, and cadmium-yellow fringe on teeth. The primary target organ for chronic cadmium effects is the kidney with increased excretion of a specific low molecular weight protein (beta-2-microglobulin). Exposures to high levels of cadmium dust or fume may be immediately dangerous to life or health and can cause delayed pneumonitis with fever and chest pain, and pulmonary edema resulting in death.

Acute Toxicity: LD50 oral - rat - 225mg/kg, LC50 inhalation - rat - 25mg/kg/30 min

Carcinogenicity: **NTP**: K - Known to be carcinogenic **IARC**: 1 - Carcinogenic to humans

To the best of our knowledge the chemical, physical and toxicological characteristics of the substance are not fully known.

12 ECOLOGICAL INFORMATION

Ecotoxicity: No data

Persistence and Degradability: No data

Bioaccumulative Potential: No data

Mobility in Soil: No data

Other Adverse Effects: May be toxic to aquatic organisms. Do not allow material to be released to the environment. No further relevant information available.

13 DISPOSAL CONSIDERATIONS

Waste Disposal Method:

Product: Dispose of in accordance with Federal, State and Local regulations.

Packaging: Dispose of in accordance with Federal, State and Local regulations.

14 TRANSPORT INFORMATION

Shipping Regulations: Not regulated

UN Number: N/A

UN Proper Shipping Name: N/A

Transport Hazard Class: N/A

Packing Group: N/A

Marine Pollutant: No

15 REGULATORY INFORMATION

TSCA Listed: All components are listed.

Regulation (EC) No 1272/2008 (CLP): Acute toxicity - oral, category 3, Acute toxicity - inhalation, category 1, Carcinogenicity, category 1B, Specific target organ toxicity - repeated exposure, category 2, Hazardous to the aquatic environment - acute hazard, category 1, Hazardous to the aquatic environment - chronic hazard, category 1.

Canada WHMIS Classification (CPR, SOR/88-66): Acute toxicity, Carcinogenicity, Specific target organ toxicity - repeated exposure.

HMIS Ratings: **Health**: 1 **Flammability**: 0 **Physical**: 0

NFPA Ratings: **Health**: 3 **Flammability**: 0 **Instability**: 0

Chemical Safety Assessment: A chemical safety assessment has not been carried out.

16 OTHER INFORMATION

The information contained in this document is based on the state of our knowledge at the time of publication and is believed to be correct, but does not purport to be all inclusive and shall be used only as a guide. ESPI Metals makes no representation, warranty, or guarantee of any kind with respect to the information contained in this document or any use of the product based on this information. ESPI Metals shall not be held liable for any damages resulting from handling or from contact with the above product. Users should satisfy themselves that they have all current data relevant to their particular use.

Prepared by: ESPI Metals

Revised/Reviewed: July 2015

Safety Data Sheet

Revision Date: 07/03/19
www.restek.com

2 Letter ISO country code/language code: US/EN

1. IDENTIFICATION

Catalog Number / Product Name:	**32207 / cis-Chlordane Standard**
Company:	Restek Corporation
Address:	110 Benner Circle Bellefonte, Pa. 16823
Phone#:	814-353-1300
Fax#:	814-353-1309
Emergency#:	800-424-9300 (CHEMTREC) 703-527-3887 (Outside the US)
Email:	www.restek.com
Revision Number:	10
Intended use:	For Laboratory use only

2. HAZARD(S)IDENTIFICATION

Emergency Overview:

GHS Hazard Symbols:

GHS Classification:	Specific Target Organ Systemic Toxicity (STOT) - Single Exposure Category 1 Flammable Liquid Category 2 Acute Toxicity - Dermal Category 3 Acute Toxicity - Oral Category 3
GHS Signal Word:	Danger
GHS Hazard:	Highly flammable liquid and vapour. Toxic if swallowed or in contact with skin. Causes damage to organs.
GHS Precautions:	
Safety Precautions:	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/ventilation and lighting equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Do not breathe dust/fume/gas/mist/vapours/spray. Wash hands and skin thoroughly after handling. Do not eat, drink or smoke when using this product. Wear protective gloves/protective clothing/eye protection/face protection.
First Aid Measures:	IF SWALLOWED: Immediately call a POISON CENTER/doctor/.... IF ON SKIN: Wash with plenty of soap and water. IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. IF exposed: Call a POISON CENTER or doctor/physician. Call a POISON CENTER or doctor/physician if you feel unwell. Specific treatment see section 4. Rinse mouth. Take off immediately all contaminated clothing and wash it before reuse. In case of fire: Use extinguishing media in section 5 for extinction.
Storage:	Keep container tightly closed.

Store in a well-ventilated place. Keep cool.
Store locked up.

Disposal: Dispose of contents/container according to section 13 of the SDS.

Single Exposure Target Organs: Specific target organ toxicity - Single exposure - STOT SE 1: H370 Causes damage to organs. (C >= 10 %; No information to prove exclusion of certain routes of exposure); Specific target organ toxicity - Single exposure - STOT SE 2: H371 May cause damage to organs. (3 % <= C <10 %; Concentration limits for acute toxicity cannot be translated into GHS from the DSD especially when minimum classifications are given)

Repeated Exposure Target Organs: No data available

3. COMPOSITION / INFORMATION ON INGREDIENT

Chemical Name	CAS #	EINEC #	% Composition
methanol	67-56-1	200-659-6	99.9
cis-chlordane	5103-71-9	225-825-5	0.1

4. FIRST-AID MEASURES

Inhalation: Remove to fresh air. If breathing is difficult, have a trained individual administer oxygen. If not breathing, give artificial respiration and have a trained individual administer oxygen. Get medical attention immediately

Eyes: Flush eyes with plenty of water for at least 20 minutes retracting eyelids often. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Get immediate medical attention.

Skin Contact: Wash with soap and water. Remove contaminated clothing and launder. Get medical attention if irritation develops or persists.

Ingestion: Do not induce vomiting and seek medical attention immediately. Drink two glasses of water or milk to dilute. Provide medical care provider with this SDS.

5. FIRE- FIGHTING MEASURES

Extinguishing Media: Use alcohol resistant foam, carbon dioxide, or dry chemical extinguishing agents. Water may be ineffective but water spray can be used extinguish a fire if swept across the base of the flames. Water can absorb heat and keep exposed material from being damaged by fire.

Fire and/or Explosion Hazards: Vapors may be ignited by sparks, flames or other sources of ignition if material is above the flash point giving rise to a fire (Class B). Vapors are heavier than air and may travel to a source of ignition and flash back.

Fire Fighting Methods and Protection: Do not enter fire area without proper protection including self-contained breathing apparatus and full protective equipment. Fight fire from a safe distance and a protected location due to the potential of hazardous vapors and decomposition products. Flammable component(s) of this material may be lighter than water and burn while floating on the surface.

Hazardous Combustion Products: Carbon dioxide, Carbon monoxide

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions and Equipment: Exposure to the spilled material may be severely irritating or toxic. Follow personal protective equipment recommendations found in Section 8 of this SDS. Personal protective equipment needs must be evaluated based on information provided on this sheet and the special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred, and the expertise of employees in the area responding to the spill. Never exceed any occupational exposure limits.

Methods for Clean-up: Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation.

7. HANDLING AND STORAGE

Handling Technical Measures and Precautions: Toxic or severely irritating material. Avoid contacting and avoid

	breathing the material. Use only in a well ventilated area. Use spark-proof tools and explosion-proof equipment
Storage Technical Measures and Conditions:	Store in a cool dry ventilated location. Isolate from incompatible materials and conditions. Keep container(s) closed. Keep away from sources of ignition

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

United States:

Chemical Name	CAS No.	IDLH	ACGIH STEL	ACGIH TLV-TWA	OSHA Exposure Limit
methanol	67-56-1	6000 ppm IDLH	250 ppm STEL	200 ppm TWA	200 ppm TWA; 260 mg/m3 TWA

Personal Protection:

Engineering Measures:	Local exhaust ventilation is recommended when generating excessive levels of vapours from handling or thermal processing.
Respiratory Protection:	Respiratory protection may be required to avoid overexposure when handling this product. General or local exhaust ventilation is the preferred means of protection. Use a respirator if general room ventilation is not available or sufficient to eliminate symptoms.If an exposure limit is exceeded or if an operator is experiencing symptoms of inhalation overexposure as explained in Section 3, provide respiratory protection.
Eye Protection:	Wear chemically resistant safety glasses with side shields when handling this product. Do not wear contact lenses.
Skin Protection:	Wear protective gloves. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance, color:	No data available
Odor:	Mild
Physical State:	No data available
pH:	Not applicable
Vapor Pressure:	No data available
Vapor Density:	1.1 (air = 1)
Boiling Point (°C):	64.7 °C at 760 mmHg (HSDB)
Melting Point (°C):	-98 °C
Flash Point (°F):	52
Flammability:	Highly Flammable
Upper Flammable/Explosive Limit, % in air:	36
Lower Flammable/Explosive Limit, % in air:	6
Autoignition Temperature (°C):	464 deg C
Decomposition Temperature (°C):	No data available
Specific Gravity:	0.791 - 0.792 g/cm3 at 20 °C
Evaporation Rate:	No data available
Odor Threshold:	No data available
Solubility:	Moderate; 50-99%
Partition Coefficient: n-octanol in water:	No data available
VOC % by weight:	99.9
Molecular Weight:	32.04

10. STABILITY AND REACTIVITY

Stability:	Stable under normal conditions.
Conditions to Avoid:	None known.
Materials to Avoid / Chemical Incompatiability:	Strong oxidizing agents
Hazardous Decomposition Products:	Carbon dioxide Carbon monoxide

11. TOXICOLOGICAL INFORMATION

Routes of Entry:	Inhalation, Skin Contact, Eye Contact, Ingestion
Target Organs Potentially Affected By Exposure:	Eyes, Central nervous system stimulation, Skin, GI Tract, Respiratory Tract
Chemical Interactions That Change Toxicity:	None Known

Immediate (Acute) Health Effects by Route of Exposure:

Inhalation Irritation:	Can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache.
Inhalation Toxicity:	Harmful! Can cause systemic damage (see "Target Organs)Methanol can cause central nervous system depression and overexposure can cause damage to the optic nerve resulting in visual impairment or blindness.
Skin Contact:	Can cause moderate skin irritation, defatting, and dermatitis. Not likely to cause permanent damage.
Eye Contact:	Can cause moderate irritation, tearing and reddening, but not likely to permanently injure eye tissue.
Ingestion Irritation:	Irritating to mouth, throat, and stomach. Can cause abdominal discomfort, nausea, vomiting and diarrhea.Highly toxic and may be fatal if swallowed.
Ingestion Toxicity:	Toxic if swallowed. May cause target organ failure and/or death.May be fatal if swallowed.

Long-Term (Chronic) Health Effects:

Carcinogenicity:	No data.
Reproductive and Developmental Toxicity:	No data available to indicate product or any components present at greater than 0.1% may cause birth defects.
Inhalation:	Upon prolonged and/or repeated exposure, can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache.Harmful! Can cause systemic damage upon prolonged and/or repeated exposure (see "Target Organs)
Skin Contact:	Upon prolonged or repeated contact, can cause moderate skin irritation, defatting, and dermatitis. Not likely to cause permanent damage.
Ingestion:	Toxic if swallowed. May cause target organ failure and/or death.

Component Toxicological Data:

NIOSH:

Chemical Name	CAS No.	LD50/LC50
Methanol	67-56-1	Inhalation LC50 Rat 22500 ppm 8 h

Component Carcinogenic Data:

OSHA:

Chemical Name	CAS No.
No data available	

ACGIH:

Chemical Name	CAS No.
No data available	

NIOSH:

Chemical Name	CAS No.
No data available	

NTP:

Chemical Name	CAS No.
No data available	

IARC:

Chemical Name	CAS No.	Group No.
Monograph 79 [2001] (listed under Chlordane and Heptachlor); Monograph 53 [1991]; Supplement 7 [1987]	5103-71-9	Group 2B

12. ECOLOGICAL INFORMATION

Overview:	Moderate ecological hazard. This product may be dangerous to plants and/or wildlife.
Mobility:	No data
Persistence:	No data
Bioaccumulation:	No data
Degradability:	Biodegrades slowly.
Ecological Toxicity Data:	No data available

13. DISPOSAL CONSIDERATIONS

Waste Description of Spent Product:	Spent or discarded material is a hazardous waste.Mixing spent or discarded material with other materials may render the mixture hazardous. Perform a hazardous waste determination on mixtures.
Disposal Methods:	Dispose of by incineration following Federal, State, Local, or Provincial regulations.
Waste Disposal of Packaging:	Comply with all Local, State, Federal, and Provincial Environmental Regulations.

14. TRANSPORTATION INFORMATION

United States:

DOT Proper Shipping Name:	Methanol
UN Number:	UN1230
Hazard Class:	3
Packing Group:	II

International:

IATA Proper Shipping Name:	Methanol
UN Number:	UN1230
Hazard Class:	3(6.1)
Packing Group:	II

Marine Pollutant: No

Chemical Name	CAS#	Marine Pollutant	Severe Marine Pollutant
No data available			

15. REGULATORY INFORMATION

United States:

Chemical Name	CAS#	CERCLA	SARA 313	SARA EHS 313	TSCA
methanol	67-56-1	X	X	-	X

The following chemicals are listed on CA Prop 65:

Chemical Name	CAS #	Regulation
Methanol	67-56-1	Prop 65 Devolop Tox

State Right To Know Listing:

Chemical Name	CAS#	New Jersey	Massachusetts	Pennsylvania	California
methanol	67-56-1	X	X	X	X
cis-chlordane	5103-71-9	-	-	-	-

16. OTHER INFORMATION

Prior Version Date:	12/17/18
Other Information:	Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.
References:	No data available
Disclaimer:	Restek Corporation provides the descriptions, data and information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. It is provided for your guidance only. Because many factors may affect processing or application/use, Restek Corporation recommends you perform an assessment to determine the suitability of a product for your particular purpose prior to use. No warranties of any kind, either expressed or implied, including fitness for a particular purpose, are made regarding products described, data or information set forth. In no case shall the descriptions, information, or data provided be considered a part of our terms and conditions of sale. Further, the descriptions, data and information furnished hereunder are given gratis. No obligation or liability for the description, data and information given are assumed. All such being given and accepted at your risk.

SAFETY DATA SHEET

Based upon Regulation (EC) No 1907/2006, as amended by Regulation (EU) No 2015/830

chloromethane

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

1.1. Product identifier

Product name	: chloromethane
Synonyms	: artic; chloride of methyl; chloromethyl; chloromethyl ether (=chloromethane); methane, chloro; methane, chloro-; methyl chloride; monochloromethane; MTC; R40; refrigerant gas 40
Registration number REACH	: 01-2119493708-22
Product type REACH	: Substance/mono-constituent
CAS number	: 74-87-3
EC index number	: 602-001-00-7
EC number	: 200-817-4
RTECS number	: PA6300000
Molecular mass	: 50.49 g/mol
Formula	: CH3Cl

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

1.2.1 Relevant identified uses

Industrial and professional use. Before use: carry out a risk assessment

1.2.2 Uses advised against

No uses advised against known

1.3. Details of the supplier of the safety data sheet

Supplier of the safety data sheet

CHEMOGAS NV
Westvaartdijk 85
B-1850 Grimbergen Belgium
☎ +32 2 251 60 87
🖷 +32 2 252 17 51
info@chemogas.com

Distributor of the product

CHEMOGAS NV
Westvaartdijk 85
B-1850 Grimbergen Belgium
☎ +32 2 251 60 87
🖷 +32 2 252 17 51
info@chemogas.com

1.4. Emergency telephone number

24h/24h (Telephone advice: English, French, German, Dutch):

+32 14 58 45 45 (BIG)

SECTION 2: Hazards identification

2.1. Classification of the substance or mixture

Classified as dangerous according to the criteria of Regulation (EC) No 1272/2008

Class	Category	Hazard statements
Flam. Gas	category 1	H220: Extremely flammable gas.
Press. Gas	Liquefied gas	H280: Contains gas under pressure; may explode if heated.
Carc.	category 2	H351: Suspected of causing cancer.
STOT RE	category 2	H373: May cause damage to organs through prolonged or repeated exposure.
Ozone	category 1	H420: Harms public health and the environment by destroying ozone in the upper atmosphere.

2.2. Label elements

Signal word Danger

H-statements

H220	Extremely flammable gas.
H280	Contains gas under pressure; may explode if heated.
H351	Suspected of causing cancer.
H373	May cause damage to organs through prolonged or repeated exposure.
H420	Harms public health and the environment by destroying ozone in the upper atmosphere.

P-statements

P210	Keep away from heat, hot surfaces, sparks, open flames and other igni. on sources. No smoking.
P280	Wear protective gloves, protective clothing and eye protection/face protection.
P260	Do not breathe gas.
P308 + P313	IF exposed or concerned: Get medical advice/attention.
P381	Eliminate all ignition sources if safe to do so.
P377	Leaking gas fire: Do not extinguish, unless leak can be stopped safely.

2.3. Other hazards

May be ignited by sparks
Gas/vapour spreads at floor level: ignition hazard
Produces effects on the nervous system
May cause frostbites
Caution! Substance is absorbed through the skin
Causes damage to the central nervous system
Not readily biodegradable in water

SECTION 3: Composition/information on ingredients

3.1. Substances

Name REACH Registration No	CAS No EC No	Conc. (C)	Classification according to CLP	Note	Remark
chloromethane 01-2119493708-22	74-87-3 200-817-4	C>99 %	Flam. Gas 1; H220 Press. Gas - Liquefied gas; H280 Carc. 2; H351 STOT RE 2; H373 Ozone 1; H420	(1)(10)(2)	Mono-constituent

(10) Subject to restrictions of Annex XVII of Regulation (EC) No. 1907/2006
(1) For H-statements in full: see heading 16
(2) Substance with a Community workplace exposure limit

3.2. Mixtures

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

General:

Check the vital functions. Unconscious: maintain adequate airway and respiration. Respiratory arrest: artificial respiration or oxygen. Cardiac arrest: perform resuscitation. Victim conscious with laboured breathing: half-seated. Victim in shock: on his back with legs slightly raised. Vomiting: prevent asphyxia/aspiration pneumonia. Prevent cooling by covering the victim (no warming up). Keep watching the victim. Give psychological aid. Keep the victim calm, avoid physical strain. Depending on the victim's condition: doctor/hospital. Never give alcohol to drink.

After inhalation:

Remove the victim into fresh air. Respiratory problems: consult a doctor/medical service.

After skin contact:

In case of frostbites: Wash immediately with lots of water (15 minutes)/shower. Do not apply (chemical) neutralizing agents. Remove clothing while washing. Do not remove clothing if it sticks to the skin. Cover wounds with sterile bandage. Consult a doctor/medical service. If burned surface > 10%: take victim to hospital.

After eye contact:

Rinse immediately with plenty of water for 15 minutes. Do not apply neutralizing agents. Take victim to an ophthalmologist.

After ingestion:

Rinse mouth with water. Consult a doctor/medical service if you feel unwell.

4.2. Most important symptoms and effects, both acute and delayed

4.2.1 Acute symptoms

After inhalation:

Central nervous system depression. Dizziness. Drunkenness. Headache. Nausea. Vomiting. EXPOSURE TO HIGH CONCENTRATIONS: Feeling of weakness. Mental confusion. Movement disturbances. Coordination disorders. Disturbances of consciousness. Accelerated heart action. Low arterial pressure. Rapid respiration. Gastrointestinal complaints. Tremor. Cramps/uncontrolled muscular contractions. Visual disturbances. FOLLOWING SYMPTOMS MAY APPEAR LATER: Risk of lung oedema.

After skin contact:

Frostbites.

After eye contact:

Redness of the eye tissue. Frostbites.

After ingestion:

No effects known.

4.2.2 Delayed symptoms

No effects known.

4.3. Indication of any immediate medical attention and special treatment needed

If applicable and available it will be listed below.

SECTION 5: Firefighting measures

5.1. Extinguishing media

5.1.1 Suitable extinguishing media:

Polyvalent foam. BC powder. Carbon dioxide. MAJOR FIRE: Water spray. Alcohol-resistant foam.

5.1.2 Unsuitable extinguishing media:

Solid water jet ineffective as extinguishing medium.

5.2. Special hazards arising from the substance or mixture

Decomposes on exposure to temperature rise: release of toxic and corrosive gases/vapours (phosgene, hydrogen chloride, chlorine). Decomposes slowly on exposure to water (moisture): release of corrosive gases/vapours (hydrogen chloride). Reacts on exposure to water (moisture) with (some) metals: release of highly flammable gases/vapours (hydrogen).

5.3. Advice for firefighters

5.3.1 Instructions:

If no hazard for/from the surroundings: controlled burning. If hazardous substances are nearby: consider extinguishment. Extinguish only if gas supply/leak can be shut afterwards. Cool tanks/drums with water spray/remove them into safety. Physical explosion risk: extinguish/cool from behind cover. Do not move the load if exposed to heat. After cooling: persistant risk of physical explosion. Dilute toxic gases with water spray. Take account of toxic/corrosive precipitation water.

5.3.2 Special protective equipment for fire-fighters:

Insulating gloves. Protective clothing. Large spills/in enclosed spaces: compressed air apparatus. Heat/fire exposure: compressed air/oxygen apparatus.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

Keep upwind. Seal off low-lying areas. Close doors and windows of adjacent premises. Stop engines and no smoking. No naked flames or sparks. Spark- and explosionproof appliances and lighting equipment. Avoid ingress of water in the containers.

6.1.1 Protective equipment for non-emergency personnel

See heading 8.2

6.1.2 Protective equipment for emergency responders

Insulating gloves. Protective clothing. Large spills/in enclosed spaces: compressed air apparatus.

Suitable protective clothing

See heading 8.2

6.2. Environmental precautions

Contain released substance, pump into suitable containers. Plug the leak, cut off the supply. Dam up the liquid spill. Tip the container on one side to stop the leakage. Try to reduce evaporation. Prevent spreading in sewers.

6.3. Methods and material for containment and cleaning up

Damaged/cooled tanks must be emptied. Do not use compressed air for pumping over spills. Prevent evaporation by covering with: sand/earth or foam. Take collected spill to manufacturer/competent authority. Wash clothing and equipment after handling.

6.4. Reference to other sections

See heading 13.

SECTION 7: Handling and storage

The information in this section is a general description. If applicable and available, exposure scenarios are attached in annex. Always use the relevant exposure scenarios that correspond to your identified use.

7.1. Precautions for safe handling

Use spark-/explosionproof appliances and lighting system. Take precautions against electrostatic charges. Keep away from naked flames/heat. Keep away from ignition sources/sparks. Gas/vapour heavier than air at 20°C. Observe strict hygiene.

7.2. Conditions for safe storage, including any incompatibilities

7.2.1 Safe storage requirements:

Storage temperature: <50 °C. Keep out of direct sunlight. Ventilation at floor level. Fireproof storeroom. Provide for an automatic sprinkler system. Provide for a tub to collect spills. Provide the tank with earthing. Detached building. Meet the legal requirements.

7.2.2 Keep away from:

Heat sources, ignition sources, combustible materials, oxidizing agents, (strong) acids, moisture.

7.2.3 Suitable packaging material:

Steel, iron, copper, bronze.

7.2.4 Non suitable packaging material:

Aluminium, zinc.

7.3. Specific end use(s)

If applicable and available, exposure scenarios are attached in annex. See information supplied by the manufacturer.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

8.1.1 Occupational exposure

a) Occupational exposure limit values

If limit values are applicable and available these will be listed below.

The Netherlands

Methylchloride	Time-weighted average exposure limit 8 h (Private occupational exposure limit value)	25 ppm
	Time-weighted average exposure limit 8 h (Private occupational exposure limit value)	52 mg/m³

Belgium

Chlorure de méthyle	Time-weighted average exposure limit 8 h	50 ppm
	Time-weighted average exposure limit 8 h	104 mg/m³
	Short time value	100 ppm
	Short time value	210 mg/m³

USA (TLV-ACGIH)

Methyl chloride	Time-weighted average exposure limit 8 h (TLV - Adopted Value)	50 ppm
	Short time value (TLV - Adopted Value)	100 ppm

Germany

Chlormethan	Time-weighted average exposure limit 8 h (TRGS 900)	50 ppm
	Time-weighted average exposure limit 8 h (TRGS 900)	100 mg/m³

France

Chlorométhane	Time-weighted average exposure limit 8 h (VL: Valeur non réglementaire indicative)	50 ppm
	Time-weighted average exposure limit 8 h (VL: Valeur non réglementaire indicative)	105 mg/m³
	Short time value (VL: Valeur non réglementaire indicative)	100 ppm
	Short time value (VL: Valeur non réglementaire indicative)	210 mg/m³

UK

Chloromethane	Time-weighted average exposure limit 8 h (Workplace exposure limit (EH40/2005))	50 ppm
	Time-weighted average exposure limit 8 h (Workplace exposure limit (EH40/2005))	105 mg/m³
	Short time value (Workplace exposure limit (EH40/2005))	100 ppm
	Short time value (Workplace exposure limit (EH40/2005))	210 mg/m³

b) National biological limit values

If limit values are applicable and available these will be listed below.

8.1.2 Sampling methods

Product name	Test	Number
Methyl Chloride	NIOSH	1001

8.1.3 Applicable limit values when using the substance or mixture as intended

If limit values are applicable and available these will be listed below.

8.1.4 DNEL/PNEC values

DNEL/DMEL - Workers

chloromethane

Effect level (DNEL/DMEL)	Type	Value	Remark
DNEL	Long-term systemic effects inhalation	100 mg/m³	

PNEC

chloromethane

Compartments	Value	Remark
Fresh water	0.2 mg/l	
Salt water	0.02 mg/l	
Aqua (intermittent releases)	2 mg/l	
Fresh water sediment	0.556 mg/kg sediment dw	
Soil	0.079 mg/kg soil dw	

8.1.5 Control banding

If applicable and available it will be listed below.

8.2. Exposure controls

The information in this section is a general description. If applicable and available, exposure scenarios are attached in annex. Always use the relevant exposure scenarios that correspond to your identified use.

8.2.1 Appropriate engineering controls

Use spark-/explosionproof appliances and lighting system. Take precautions against electrostatic charges. Keep away from naked flames/heat. Keep away from ignition sources/sparks. Measure the concentration in the air regularly. Work under local exhaust/ventilation.

8.2.2 Individual protection measures, such as personal protective equipment

Observe strict hygiene. Do not eat, drink or smoke during work.

a) Respiratory protection:

Self-contained breathing apparatus if conc. in air > 1 vol %. Self-contained breathing apparatus if conc. in air > 1 vol %.

b) Hand protection:

Insulated gloves.

- materials (excellent resistance)

Viton.

- materials (good resistance)

Leather, PVA, tetrafluoroethylene.

- materials (less resistance)

Butyl rubber.

- materials (poor resistance)

Neoprene, natural rubber, nitrile rubber, polyethylene, polyurethane, PVC, styrene-butadiene rubber, neoprene/SBR.

c) Eye protection:

Protective goggles.

d) Skin protection:

Protective clothing.

8.2.3 Environmental exposure controls:

See headings 6.2, 6.3 and 13

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical form	Liquefied gas
Odour	Ether-like odour
	Sweet odour
	Mild odour
Odour threshold	10 ppm
	21 mg/m³
Colour	Colourless
Particle size	Not applicable (gas)
Explosion limits	8.1 - 17.4 vol %
	160 - 410 g/m³
Flammability	Extremely flammable gas.
Log Kow	0.91 ; Experimental value
Dynamic viscosity	0.00018 Pa.s ; 20 °C
Kinematic viscosity	No data available
Melting point	-98 °C
Boiling point	-24 °C
Flash point	Not applicable
Evaporation rate	No data available
Relative vapour density	1.7
Vapour pressure	4900 hPa ; 20 °C
	5733 hPa ; 25 °C
	10900 hPa ; 50 °C
Solubility	water ; 0.53 g/100 ml ; 25 °C
	ethanol ; Complete
	acetone ; Complete

Relative density	1 ; -24 °C
Decomposition temperature	> 370 °C
Auto-ignition temperature	632 °C
Explosive properties	No chemical group associated with explosive properties
Oxidising properties	No chemical group associated with oxidising properties
pH	No data available

9.2. Other information

Critical temperature	143 °C
Critical pressure	66789 hPa
Surface tension	0.016 N/m ; 20 °C
Absolute density	997 kg/m³ ; -24 °C

SECTION 10: Stability and reactivity

10.1. Reactivity

May be ignited by sparks. Gas/vapour spreads at floor level: ignition hazard.

10.2. Chemical stability

Stable under normal conditions.

10.3. Possibility of hazardous reactions

Reacts violently with (strong) oxidizers: (increased) risk of fire.

10.4. Conditions to avoid

Use spark-/explosionproof appliances and lighting system. Take precautions against electrostatic charges. Keep away from naked flames/heat. Keep away from ignition sources/sparks.

10.5. Incompatible materials

Combustible materials, oxidizing agents, (strong) acids, moisture.

10.6. Hazardous decomposition products

Decomposes on exposure to temperature rise: release of toxic and corrosive gases/vapours (phosgene, hydrogen chloride, chlorine). Decomposes slowly on exposure to water (moisture): release of corrosive gases/vapours (hydrogen chloride). Reacts on exposure to water (moisture) with (some) metals: release of highly flammable gases/vapours (hydrogen).

SECTION 11: Toxicological information

11.1. Information on toxicological effects

11.1.1 Test results

Acute toxicity

chloromethane

Route of exposure	Parameter	Method	Value	Exposure time	Species	Value determination	Remark
Oral						Data waiving	
Dermal						Data waiving	
Inhalation (gases)	LC50	OECD 403	> 21800 mg/m³	4 h	Rat (male/female)	Experimental value	

Conclusion

Not classified as acute toxic if swallowed

Not classified as acute toxic in contact with skin

Not classified as acute toxic if inhaled

Corrosion/irritation

chloromethane

Route of exposure	Result	Method	Exposure time	Time point	Species	Value determination	Remark
Eye						Data waiving	
Skin						Data waiving	

Conclusion

Not classified as irritating to the skin

Not classified as irritating to the eyes

Respiratory or skin sensitisation

chloromethane

Route of exposure	Result	Method	Exposure time	Observation time point	Species	Value determination	Remark
Skin						Data waiving	

Conclusion

Not sensitizing for inhalation

Not sensitizing for skin

Specific target organ toxicity

chloromethane

Route of exposure	Parameter	Method	Value	Organ	Effect	Exposure time	Species	Value determination
Oral								Data waiving
Dermal								Data waiving
Inhalation (gases)	NOAEC	Equivalent to OECD 453	465 mg/m³ air		No effect	104 weeks (6h/day, 5 days/week)	Mouse (male/female)	Experimental value

Conclusion

May cause damage to organs through prolonged or repeated exposure.

Mutagenicity (in vitro)

chloromethane

Result	Method	Test substrate	Effect	Value determination
Positive	Equivalent to OECD 471	Bacteria (S.typhimurium)		Experimental value

Mutagenicity (in vivo)

chloromethane

Result	Method	Exposure time	Test substrate	Organ	Value determination
Negative	Equivalent to OECD 486		Rat (male)		Experimental value
Negative	Equivalent to OECD 478	5 days (6h/day)	Rat (male)		Experimental value

Carcinogenicity

chloromethane

Route of exposure	Parameter	Method	Value	Exposure time	Species	Value determination	Organ	Effect
Inhalation (gases)	NOAEC	Equivalent to OECD 453	2065 mg/m³	104 weeks (6h/day, 5 days/week)	Rat (male/female)	Experimental value		No carcinogenic effect

Reproductive toxicity

chloromethane

	Parameter	Method	Value	Exposure time	Species	Effect	Organ	Value determination
Developmental toxicity	NOAEC	Equivalent to OECD 414	207 mg/m³ air	12 days (gestation, daily)	Mouse	No effect		Experimental value
Maternal toxicity	NOAEC	Equivalent to OECD 414	1033 mg/m³ air	12 week(s)	Mouse	No effect		Experimental value
Effects on fertility	NOAEC (P/F1)	Equivalent to OECD 416	310 mg/m³ air	10 weeks (6h/day, 5 days/week)	Rat (male/female)	No effect		Experimental value

Conclusion CMR

Suspected of causing cancer if inhaled.

Not classified for mutagenic or genotoxic toxicity

Not classified for reprotoxic or developmental toxicity

Toxicity other effects

chloromethane

No (test)data available

Chronic effects from short and long-term exposure

chloromethane

ON CONTINUOUS/REPEATED EXPOSURE/CONTACT: Feeling of weakness. Loss of appetite. Sleeplessness. Headache. Impairment of the nervous system. Behavioural disturbances. Mental confusion. Coordination disorders. Impaired memory. Impaired concentration. Tremor. Visual disturbances. Emotional instability. Brain affection. Change in the haemogramme/blood composition. Impairment of the blood forming system. Degeneration of heart tissue. Enlargement/affection of the liver. Affection of the renal tissue.

SECTION 12: Ecological information

12.1. Toxicity

chloromethane

	Parameter	Method	Value	Duration	Species	Test design	Fresh/salt water	Value determination
Acute toxicity fishes	LC50		550 mg/l	96 h	Lepomis macrochirus	Static system		
	LC50	ECOSAR	396 mg/l	96 h	Pisces		Fresh water	Calculated value
Acute toxicity invertebrates	EC50	OECD 202	200 mg/l	48 h	Daphnia magna	Semi-static system	Fresh water	Experimental value; GLP
Toxicity algae and other aquatic plants	EC0		1450 mg/l	148 h	Scenedesmus quadricauda			
	EC50	ECOSAR	231 mg/l	96 h	Algae			Calculated value

Conclusion

Slightly harmful to fishes
Slightly harmful to invertebrates (Daphnia)
Slightly harmful to algae
Not classified as dangerous for the environment according to the criteria of Regulation (EC) No 1272/2008

12.2. Persistence and degradability

chloromethane

Biodegradation water

Method	Value	Duration	Value determination
OECD 301D: Closed Bottle Test	1 %	28 day(s)	Experimental value

Phototransformation air (DT50 air)

Method	Value	Conc. OH-radicals	Value determination
AOPWIN v1.91	360 day(s)		Experimental value

Half-life soil (t1/2 soil)

Method	Value	Primary degradation/mineralisation	Value determination
	7 day(s) - 28 day(s)		

Conclusion

Not readily biodegradable in water

12.3. Bioaccumulative potential

chloromethane

Log Kow

Method	Remark	Value	Temperature	Value determination
		0.91		Experimental value

Conclusion

Low potential for bioaccumulation (Log Kow < 4)

12.4. Mobility in soil

Not applicable (gas)

12.5. Results of PBT and vPvB assessment

Substance does not meet the criteria of PBT, nor the criteria of vPvB according to Annex XIII of Regulation (EC) No 1907/2006, so is neither PBT nor vPvB.

12.6. Other adverse effects

chloromethane

Global warming potential (GWP)

Included in the list of substances which may contribute to the greenhouse effect (IPCC)

Ozone-depleting potential (ODP)

Chemical name	Trade name	Ozone-depleting potential	Group	Formula
Chloromethane (methyl chloride)		0,02		CH3Cl

Classified as dangerous for the ozone layer (Regulation (EC) No 1005/2009)

SECTION 13: Disposal considerations

The information in this section is a general description. If applicable and available, exposure scenarios are attached in annex. Always use the relevant exposure scenarios that correspond to your identified use.

13.1. Waste treatment methods

13.1.1 Provisions relating to waste

Waste material code (Directive 2008/98/EC, Decision 2000/0532/EC).
16 05 04* (gases in pressure containers and discarded chemicals: gases in pressure containers (including halons) containing dangerous substances).
Depending on branch of industry and production process, also other waste codes may be applicable. Hazardous waste according to Regulation (EU) No 1357/2014.

13.1.2 Disposal methods

Refer to manufacturer/supplier for information on recovery/ recycling. Remove waste in accordance with local and/or national regulations. Hazardous waste shall not be mixed together with other waste. Different types of hazardous waste shall not be mixed together if this may entail a risk of pollution or create problems for the further management of the waste. Hazardous waste shall be managed responsibly. All entities that store, transport or handle hazardous waste shall take the necessary measures to prevent risks of pollution or damage to people or animals.

13.1.3 Packaging/Container

Waste material code packaging (Directive 2008/98/EC).
15 01 10* (packaging containing residues of or contaminated by dangerous substances).

SECTION 14: Transport information

Road (ADR)

14.1. UN number

UN number	1063

14.2. UN proper shipping name

Proper shipping name	Methyl chloride (refrigerant gas R 40)

14.3. Transport hazard class(es)

Hazard identification number	23
Class	2
Classification code	2F

14.4. Packing group

Packing group	
Labels	2.1

14.5. Environmental hazards

Environmentally hazardous substance mark	no

14.6. Special precautions for user

Special provisions	662
Limited quantities	none.

Rail (RID)

14.1. UN number

UN number	1063

14.2. UN proper shipping name

Proper shipping name	Methyl chloride (refrigerant gas R 40)

14.3. Transport hazard class(es)

Hazard identification number	23
Class	2
Classification code	2F

14.4. Packing group

Packing group	
Labels	2.1 (+13)

14.5. Environmental hazards

Environmentally hazardous substance mark	no

14.6. Special precautions for user

Special provisions	662
Limited quantities	none.

Inland waterways (ADN)

14.1. UN number

UN number	1063

14.2. UN proper shipping name

Proper shipping name	Methyl chloride (refrigerant gas R 40)

14.3. Transport hazard class(es)

Class	2
Classification code	2F

14.4. Packing group

Packing group	
Labels	2.1

14.5. Environmental hazards

Environmentally hazardous substance mark	no

14.6. Special precautions for user

Special provisions	662
Limited quantities	none.

Sea (IMDG/IMSBC)

14.1. UN number

UN number	1063

14.2. UN proper shipping name

Proper shipping name	Methyl chloride (refrigerant gas R 40)

14.3. Transport hazard class(es)

Class	2.1

14.4. Packing group

Packing group	
Labels	2.1

14.5. Environmental hazards

Marine pollutant	-
Environmentally hazardous substance mark	no

14.6. Special precautions for user

Special provisions	
Limited quantities	none.

14.7. Transport in bulk according to Annex II of Marpol and the IBC Code

Annex II of MARPOL 73/78	Not applicable

Air (ICAO-TI/IATA-DGR)

14.1. UN number

UN number	1063

14.2. UN proper shipping name

Proper shipping name	Methyl chloride

14.3. Transport hazard class(es)

Class	2.1

14.4. Packing group

Packing group	
Labels	2.1

14.5. Environmental hazards

Environmentally hazardous substance mark	no

14.6. Special precautions for user

Special provisions	A1
Passenger and cargo transport: limited quantities: maximum net quantity per packaging	

SECTION 15: Regulatory information

15.1. Safety, health and environmental regulations/legislation specific for the substance or mixture

European legislation:

VOC content Directive 2010/75/EU

VOC content	Remark
100 %	

REACH Annex XVII - Restriction

Subject to restrictions of Annex XVII of Regulation (EC) No. 1907/2006: restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles.

	Designation of the substance, of the group of substances or of the mixture	Conditions of restriction
· chloromethane	Substances classified as flammable gases category 1 or 2, flammable liquids categories 1, 2 or 3, flammable solids category 1 or 2, substances and mixtures which, in contact with water, emit flammable gases, category 1, 2 or 3, pyrophoric liquids category 1 or pyrophoric solids category 1, regardless of whether they appear in Part 3 of Annex VI to that Regulation or not.	1. Shall not be used, as substance or as mixtures in aerosol dispensers where these aerosol dispensers are intended for supply to the general public for entertainment and decorative purposes such as the following: — metallic glitter intended mainly for decoration, — artificial snow and frost, — “whoopee” cushions, — silly string aerosols, — imitation excrement, — horns for parties, — decorative flakes and foams, — artificial cobwebs, — stink bombs.2. Without prejudice to the application of other Community provisions on the classification, packaging and labelling of substances, suppliers shall ensure before the placing on the market that the packaging of aerosol dispensers referred to above is marked visibly, legibly and indelibly with: “For professional users only”.3. By way of derogation, paragraphs 1 and 2 shall not apply to the aerosol dispensers referred to Article 8 (1a) of Council Directive 75/ 324/EEC.4. The aerosol dispensers referred to in paragraphs 1 and 2 shall not be placed on the market unless they conform to the requirements indicated.

National legislation The Netherlands

Waste identification (the Netherlands)	LWCA (the Netherlands): KGA category 06
SZW - List of reprotoxic substances (fertility)	May have an effect on fertility
Waterbezwaarlijkheid	11

National legislation Germany

Schwangerschaft Gruppe	B

MAK - Krebserzeugend Kategorie	3B
WGK	2; Classification water polluting in compliance with Verwaltungsvorschrift wassergefährdender Stoffe (VwVwS) of 27 July 2005 (Anhang 2)
TA-Luft	5.2.5; I
	5.2.5

National legislation France

Catégorie cancérogène	C2

National legislation Belgium

No data available

Other relevant data

TLV - Carcinogen	Methyl chloride; A4
IARC - classification	3; Methyl chloride

15.2. Chemical safety assessment

A chemical safety assessment has been performed.

SECTION 16: Other information

Full text of any H-statements referred to under headings 2 and 3:

H220 Extremely flammable gas.
H280 Contains gas under pressure; may explode if heated.
H351 Suspected of causing cancer.
H373 May cause damage to organs through prolonged or repeated exposure.
H420 Harms public health and the environment by destroying ozone in the upper atmosphere.
(*) = INTERNAL CLASSIFICATION BY BIG
PBT-substances = persistent, bioaccumulative and toxic substances
CLP (EU-GHS) Classification, labelling and packaging (Globally Harmonised System in Europe)

The information in this safety data sheet is based on data and samples provided to BIG. The sheet was written to the best of our ability and according to the state of knowledge at that time. The safety data sheet only constitutes a guideline for the safe handling, use, consumption, storage, transport and disposal of the substances/preparations/mixtures mentioned under point 1. New safety data sheets are written from time to time. Only the most recent versions may be used. Old versions must be destroyed. Unless indicated otherwise word for word on the safety data sheet, the information does not apply to substances/preparations/mixtures in purer form, mixed with other substances or in processes. The safety data sheet offers no quality specification for the substances/preparations/mixtures in question. Compliance with the instructions in this safety data sheet does not release the user from the obligation to take all measures dictated by common sense, regulations and recommendations or which are necessary and/or useful based on the real applicable circumstances. BIG does not guarantee the accuracy or exhaustiveness of the information provided and cannot be held liable for any changes by third parties. This safety data sheet is only to be used within the European Union, Switzerland, Iceland, Norway and Liechtenstein. Any use outside of this area is at your own risk. Use of this safety data sheet is subject to the licence and liability limiting conditions as stated in your BIG licence agreement or when this is failing the general conditions of BIG. All intellectual property rights to this sheet are the property of BIG and its distribution and reproduction are limited. Consult the mentioned agreement/conditions for details.

Chromium

Print

SAFETY DATA SHEET

1 PRODUCT AND SUPPLIER IDENTIFICATION

Product Name: Chromium - flake, granules, pellets, pieces, rod, target

Formula: Cr

Supplier: ESPI Metals

1050 Benson Way

Ashland, OR 97520

Telephone: 800-638-2581

Fax: 541-488-8313

Email: sales@espimetals.com

Emergency: Infotrac 800-535-5053 (US) or 352-323-3500 (24 hour)

Recommended Uses: Scientific Research

2 HAZARDS IDENTIFICATION

GHS Classification (29 CFR 1910.1200): Not classified as hazardous

GHS Label Elements:

Signal Word: N/A

Hazard Statements: N/A

Precautionary Statements: N/A

3 COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient: Chromium

CAS#: 7440-47-3

%: 100

EC#: 231-157-5

4 FIRST AID MEASURES

General Measures: No special requirements.

INHALATION: Remove to fresh air, keep warm and quiet, give oxygen if breathing is difficult. Seek medical attention.

INGESTION: Rinse mouth with water. Do not induce vomiting. Seek medical attention. Never induce vomiting or give anything by mouth to an unconscious person.

SKIN: Remove contaminated clothing, brush material off skin, wash affected area with soap and water. Seek medical attention if symptoms develop or persist.

EYES: Flush eyes with lukewarm water, including under upper and lower eyelids, for at least 15 minutes. Seek medical attention if symptoms develop or persist.

Most Important Symptoms/Effects, Acute and Delayed: May cause irritation. See section 11 for more information.

Indication of Immediate Medical Attention and Special Treatment: No other relevant information available.

5 FIREFIGHTING MEASURES

Extinguishing Media: Use extinguishing agent suitable for surrounding material and type of fire.

Unsuitable Extinguishing Media: No information available.

Specific Hazards Arising from the Material: This product does not present fire or explosion hazards as shipped. Fine dust from processing is a weak to moderate fire hazard if allowed to accumulate and subjected to an ignition source. May emit toxic metal oxide fumes under fire conditions.

Special Protective Equipment and Precautions for Firefighters: Full face, self-contained breathing apparatus and full protective clothing when necessary.

6 ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment, and Emergency Procedures: Wear appropriate respiratory and protective equipment specified in section 8. Isolate spill area and provide ventilation. Avoid breathing dust or fume. Avoid contact with skin and eyes. Eliminate all sources of ignition.

Methods and Materials for Containment and Cleaning Up: Avoid dust formation. Sweep or scoop up. Place in properly labeled closed container for further handling and disposal.

Environmental Precautions: Do not allow to be released to the environment.

7 HANDLING AND STORAGE

Precautions for Safe Handling: Avoid creating dust. Keep finely divided chromium away from any source of ignition and cleaned up immediately. Do not breathe dust or fumes. Provide adequate ventilation if dusts are created. Avoid contact with skin and eyes. Wash thoroughly before eating or smoking. See section 8 for information on personal protection equipment.

Conditions for Safe Storage: Store in a cool, dry area. See section 10 for more information on incompatible materials.

8 EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits: Chromium

OSHA/PEL: 1 mg/m^3

ACGIH/TLV: 0.5 mg/m^3

Engineering Controls: Ensure adequate ventilation to maintain exposures below occupational limits. Whenever possible the use of local exhaust ventilation or other engineering controls is the preferred method of controlling exposure to airborne dust and fume to meet established occupational exposure limits. Use good housekeeping and sanitation practices. Do not allow dusts to accumulate as they may present a fire hazard. Do not use tobacco or food in work area. Wash thoroughly before eating or smoking. Do not blow dust off clothing or skin with compressed air.

Respiratory Protection: If permissible levels are exceeded, use NIOSH approved dust respirator.

Eye Protection: Safety glasses

Skin Protection: Wear impermeable gloves, protective work clothing as necessary.

9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance:

Form: Solid in various forms

Color: Silver gray metallic

Odor: Odorless

Odor Threshold: Not determined

pH: N/A

Melting Point: 1857±20 ^oC

Boiling Point: 2672 ^oC

Flash Point: N/A

Evaporation Rate: N/A

Flammability: No data

Upper Flammable Limit: No data

Lower Flammable Limit: No data

Vapor Pressure: 1 mm Hg @ 1616 ^{o}C

Vapor Density: N/A

Relative Density (Specific Gravity): 7.20 g/cc @ 28 ^{o}C

Solubility in H_2O: Insoluble

Partition Coefficient (n-octanol/water): Not determined

Autoignition Temperature: No data

Decomposition Temperature: No data

Viscosity: N/A

10 STABILITY AND REACTIVITY

Reactivity: No data

Chemical Stability: Stable under recommended storage conditions.

Possibility of Hazardous Reactions: No data

Conditions to Avoid: Avoid creating or accumulating fines or dusts.

Incompatible Materials: Acids, strong oxidizing agents, ammonium nitrite, bromine pentafluoride and carbon dioxide.

Hazardous Decomposition Products: Chromium oxide fume.

11 TOXICOLOGICAL INFORMATION

Likely Routes of Exposure: Inhalation, skin, eyes.

Symptoms of Exposure: May cause irritation if dusts or fumes are inhaled or swallowed. Fines/dusts may irritate skin and eyes.

Acute and Chronic Effects: Although much is known about the health effects of chromium compounds, the health effects of chromium metal, Cr(0), is not well studied. Due to insolubility most elements in their metallic state are not considered to be serious health hazards.

Acute Toxicity: No data

Carcinogenicity: **NTP**: Not identified as carcinogenic **IARC**: 3 - Not classifiable as to carcinogenicity in humans

To the best of our knowledge the chemical, physical and toxicological characteristics of the substance are not fully known.

12 ECOLOGICAL INFORMATION

Ecotoxicity: No data

Persistence and Degradability: No data

Bioaccumulative Potential: No data

Mobility in Soil: No data

Other Adverse Effects: Do not allow material to be released to the environment without proper governmental permits. No further relevant information available.

13 DISPOSAL CONSIDERATIONS

Waste Disposal Method:

Product: Dispose of in accordance with Federal, State and Local regulations.

Packaging: Dispose of in accordance with Federal, State and Local regulations.

14 TRANSPORT INFORMATION

Shipping Regulations: Not regulated

UN Number: N/A

UN Proper Shipping Name: N/A

Transport Hazard Class: N/A

Packing Group: N/A

Marine Pollutant: No

15 REGULATORY INFORMATION

TSCA Listed: All components are listed.

Regulation (EC) No 1272/2008 (CLP): N/A

Canada WHMIS Classification (CPR, SOR/88-66): N/A

HMIS Ratings: **Health**: 0 **Flammability**: 0 **Physical**: 0

NFPA Ratings: **Health**: 0 **Flammability**: 0 **Instability**: 0

Chemical Safety Assessment: A chemical safety assessment has not been carried out.

16 OTHER INFORMATION

The information contained in this document is based on the state of our knowledge at the time of publication and is believed to be correct, but does not purport to be all inclusive and shall be used only as a guide. ESPI Metals makes no representation, warranty, or guarantee of any kind with respect to the information contained in this document or any use of the product based on this information. ESPI Metals shall not be held liable for any damages resulting from handling or from contact with the above product. Users should satisfy themselves that they have all current data relevant to their particular use.

Prepared by: ESPI Metals

Revised/Reviewed: July 2015

Material Safety Data Sheet
Chrysene, 98%

MSDS# 95251

Section 1 - Chemical Product and Company Identification

MSDS Name:	Chrysene, 98%
Catalog Numbers:	AC224140000, AC224140010, AC224140050, AC224145000
Synonyms:	1,2-Benzophenanthrene; Benzo(a)phenanthrene; 1,2,5,6-Dibenzonaphthalene.
Company Identification:	Acros Organics BVBA Janssen Pharmaceuticalaan 3a 2440 Geel, Belgium
Company Identification: (USA)	Acros Organics One Reagent Lane Fair Lawn, NJ 07410
For information in the US, call:	800-ACROS-01
For information in Europe, call:	+32 14 57 52 11
Emergency Number, Europe:	+32 14 57 52 99
Emergency Number US:	201-796-7100
CHEMTREC Phone Number, US:	800-424-9300
CHEMTREC Phone Number, Europe:	703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#:	218-01-9
Chemical Name:	Chrysene
%:	98
EINECS#:	205-923-4

Hazard Symbols: T

Risk Phrases: 45 50/53

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Caution! May cause respiratory tract irritation. May cause eye and skin irritation. May cause cancer in humans. Target Organs: Liver, skin.

Potential Health Effects

Eye:	May cause eye irritation.
Skin:	May cause skin irritation.
Ingestion:	May cause gastrointestinal irritation with nausea, vomiting and diarrhea.
Inhalation:	May cause respiratory tract irritation.
Chronic:	May cause cancer according to animal studies.

Section 4 - First Aid Measures

Eyes:	Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid.

Skin: Get medical aid. Immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.

Ingestion: Do not induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.

Inhalation: Get medical aid immediately. Remove from exposure and move to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Notes to Physician:

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion. This material in sufficient quantity and reduced particle size is capable of creating a dust explosion.

Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or chemical foam.

Autoignition Temperature: Not available.

Flash Point: Not applicable.

Explosion Limits: Lower: Not available

Explosion Limits: Upper: Not available

NFPA Rating: health: ; flammability: 1; instability: ;

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Vacuum or sweep up material and place into a suitable disposal container. Clean up spills immediately, observing precautions in the Protective Equipment section. Wear a self contained breathing apparatus and appropriate personal protection. (See Exposure Controls, Personal Protection section). Provide ventilation.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Wash thoroughly after handling. Avoid contact with eyes, skin, and clothing. Use only with adequate ventilation. Avoid breathing dust.

Storage: Store in a tightly closed container. Store in a cool, dry area away from incompatible substances.

Section 8 - Exposure Controls, Personal Protection

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Chrysene	0.2 mg/m3 TWA (as benzene soluble aerosol) (listed under Coal tar pitches).	0.1 mg/m3 TWA	0.2 mg/m3 TWA (benzene soluble fraction) (listed under Coal tar pitches).

OSHA Vacated PELs: Chrysene: 0.2 mg/m3 TWA (benzene soluble fraction) (listed under Coal tar pitches)

Engineering Controls:

Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use process enclosure, local exhaust ventilation, or other engineering controls to control airborne levels.

Exposure Limits

Personal Protective Equipment

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

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

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

Section 9 - Physical and Chemical Properties

Physical State:	Solid
Color:	very light beige
Odor:	Not available
pH:	Not available
Vapor Pressure:	Not available
Vapor Density:	Not available
Evaporation Rate:	Not available
Viscosity:	Not available
Boiling Point:	448 deg C @ 760 mm Hg (838.40°F)
Freezing/Melting Point:	250-255 deg C
Decomposition Temperature:	Not available
Solubility in water:	insoluble
Specific Gravity/Density:	
Molecular Formula:	C18H12
Molecular Weight:	228.29

Section 10 - Stability and Reactivity

Chemical Stability:	Stable under normal temperatures and pressures.
Conditions to Avoid:	Dust generation.
Incompatibilities with Other Materials	Not available
Hazardous Decomposition Products	Carbon monoxide, carbon dioxide.
Hazardous Polymerization	Has not been reported.

Section 11 - Toxicological Information

RTECS#: CAS# 218-01-9: GC0700000

LD50/LC50: RTECS: Not available.

Carcinogenicity: Chrysene - ACGIH: A1 - Confirmed Human Carcinogen (Coal tar pitches). California: carcinogen, initial date 1/1/90 NTP: Known carcinogen (Coal tar pitches). IARC: Group 1 carcinogen (Coal tar pitches).

Other: See actual entry in RTECS for complete information.

Section 12 - Ecological Information

Ecotoxicity: Water flea LC50 = 1.9 mg/L; 2 Hr.; Unspecified

Section 13 - Disposal Considerations

Dispose of in a manner consistent with federal, state, and local regulations.

Section 14 - Transport Information

US DOT
Shipping Name: Please contact Fisher Scientific for shipping information
Hazard Class:
UN Number:
Packing Group:
Canada TDG
Shipping Name: Not available
Hazard Class:
UN Number:
Packing Group:

USA RQ: CAS# 218-01-9: 100 lb final RQ; 45.4 kg final RQ

Section 15 - Regulatory Information

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: T

Risk Phrases:

R 45 May cause cancer.

R 50/53 Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Safety Phrases:

S 53 Avoid exposure - obtain special instructions before use.

S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

S 60 This material and its container must be disposed of as hazardous waste.

S 61 Avoid release to the environment. Refer to special instructions/safety data sheets.

WGK (Water Danger/Protection)

CAS# 218-01-9: Not available

Canada

CAS# 218-01-9 is listed on Canada's DSL List

Canadian WHMIS Classifications: D2A

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

CAS# 218-01-9 is listed on Canada's Ingredient Disclosure List

US Federal

TSCA

CAS# 218-01-9 is listed on the TSCA Inventory.

Section 16 - Other Information

MSDS Creation Date: 6/30/1999

Revision #6 Date 7/20/2009

Safety Data Sheet

Revision Date: 06/05/19
www.restek.com

2 Letter ISO country code/language code: US/EN

1. IDENTIFICATION

Catalog Number / Product Name:	**30279 / cis-1,2-Dichloroethene Standard**
Company:	Restek Corporation
Address:	110 Benner Circle Bellefonte, Pa. 16823
Phone#:	814-353-1300
Fax#:	814-353-1309
Emergency#:	800-424-9300 (CHEMTREC) 703-527-3887 (Outside the US)
Email:	www.restek.com
Revision Number:	11
Intended use:	For Laboratory use only

2. HAZARD(S)IDENTIFICATION

Emergency Overview:

GHS Hazard Symbols:

GHS Classification:	Specific Target Organ Systemic Toxicity (STOT) - Single Exposure Category 1 Flammable Liquid Category 2 Acute Toxicity - Inhalation Dust / Mist Category 3 Acute Toxicity - Dermal Category 3 Acute Toxicity - Oral Category 3
GHS Signal Word:	Danger
GHS Hazard:	Highly flammable liquid and vapour. Toxic if swallowed, in contact with skin or if inhaled. Causes damage to organs.
GHS Precautions:	
Safety Precautions:	Keep away from heat/sparks/open flames/hot surfaces. – No smoking. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilation and lighting equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Do not breathe dust/fume/gas/mist/vapours/spray. Wash hands and skin thoroughly after handling. Do not eat, drink or smoke when using this product. Use only outdoors or in a well-ventilated area. Wear protective gloves/protective clothing/eye protection/face protection.
First Aid Measures:	IF SWALLOWED: Immediately call a POISON CENTER/doctor/.... IF ON SKIN: Wash with plenty of soap and water. IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing. Specific treatment see section 4. Rinse mouth. Take off immediately all contaminated clothing and wash it before reuse. In case of fire: Use extinguishing media in section 5 for extinction.
Storage:	Store in a well-ventilated place. Keep container tightly closed.

Store in a well-ventilated place. Keep cool.
Store locked up.

Disposal: Dispose of contents/container according to section 13 of the SDS.

Single Exposure Target Organs: Specific target organ toxicity - Single exposure - STOT SE 1: H370 Causes damage to organs. (C >= 10 %; No information to prove exclusion of certain routes of exposure); Specific target organ toxicity - Single exposure - STOT SE 2: H371 May cause damage to organs. (3 % <= C <10 %; Concentration limits for acute toxicity cannot be translated into GHS from the DSD especially when minimum classifications are given)

Repeated Exposure Target Organs: No data available

3. COMPOSITION / INFORMATION ON INGREDIENT

Chemical Name	CAS #	EINEC #	% Composition
methanol	67-56-1	200-659-6	99.8
cis-1,2-dichloroethylene	156-59-2	205-859-7	0.2

4. FIRST-AID MEASURES

Inhalation: Remove to fresh air. If breathing is difficult, have a trained individual administer oxygen. If not breathing, give artificial respiration and have a trained individual administer oxygen. Get medical attention immediately

Eyes: Flush eyes with plenty of water for at least 20 minutes retracting eyelids often. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Get immediate medical attention.

Skin Contact: Wash with soap and water. Remove contaminated clothing and launder. Get medical attention if irritation develops or persists.

Ingestion: Do not induce vomiting and seek medical attention immediately. Drink two glasses of water or milk to dilute. Provide medical care provider with this SDS.

5. FIRE- FIGHTING MEASURES

Extinguishing Media: Use alcohol resistant foam, carbon dioxide, or dry chemical extinguishing agents. Water may be ineffective but water spray can be used extinguish a fire if swept across the base of the flames. Water can absorb heat and keep exposed material from being damaged by fire.

Fire and/or Explosion Hazards: Vapors may be ignited by sparks, flames or other sources of ignition if material is above the flash point giving rise to a fire (Class B). Vapors are heavier than air and may travel to a source of ignition and flash back.

Fire Fighting Methods and Protection: Do not enter fire area without proper protection including self-contained breathing apparatus and full protective equipment. Fight fire from a safe distance and a protected location due to the potential of hazardous vapors and decomposition products. Flammable component(s) of this material may be lighter than water and burn while floating on the surface.

Hazardous Combustion Products: Carbon dioxide, Carbon monoxide

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions and Equipment: Exposure to the spilled material may be severely irritating or toxic. Follow personal protective equipment recommendations found in Section 8 of this SDS. Personal protective equipment needs must be evaluated based on information provided on this sheet and the special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred, and the expertise of employees in the area responding to the spill. Never exceed any occupational exposure limits.

Methods for Clean-up: Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation.

7. HANDLING AND STORAGE

Handling Technical Measures and Precautions: Toxic or severely irritating material. Avoid contacting and avoid

	breathing the material. Use only in a well ventilated area. Use spark-proof tools and explosion-proof equipment
Storage Technical Measures and Conditions:	Store in a cool dry ventilated location. Isolate from incompatible materials and conditions. Keep container(s) closed. Keep away from sources of ignition

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

United States:

Chemical Name	CAS No.	IDLH	ACGIH STEL	ACGIH TLV-TWA	OSHA Exposure Limit
methanol	67-56-1	6000 ppm IDLH	250 ppm STEL	200 ppm TWA	200 ppm TWA; 260 mg/m3 TWA

Personal Protection:

Engineering Measures:	Local exhaust ventilation is recommended when generating excessive levels of vapours from handling or thermal processing.
Respiratory Protection:	Respiratory protection may be required to avoid overexposure when handling this product. General or local exhaust ventilation is the preferred means of protection. Use a respirator if general room ventilation is not available or sufficient to eliminate symptoms.If an exposure limit is exceeded or if an operator is experiencing symptoms of inhalation overexposure as explained in Section 3, provide respiratory protection.
Eye Protection:	Wear chemically resistant safety glasses with side shields when handling this product. Do not wear contact lenses.
Skin Protection:	Wear protective gloves. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance, color:	No data available
Odor:	Mild
Physical State:	Liquid
pH:	Not applicable
Vapor Pressure:	No data available
Vapor Density:	1.1 (air = 1)
Boiling Point (°C):	64.7 °C at 760 mmHg (HSDB)
Melting Point (°C):	-98 °C
Flash Point (°F):	52
Flammability:	Highly Flammable
Upper Flammable/Explosive Limit, % in air:	36
Lower Flammable/Explosive Limit, % in air:	6
Autoignition Temperature (°C):	464 deg C
Decomposition Temperature (°C):	No data available
Specific Gravity:	0.791 - 0.792 g/cm3 at 20 °C
Evaporation Rate:	No data available
Odor Threshold:	No data available
Solubility:	Moderate; 50-99%
Partition Coefficient: n-octanol in water:	No data available
VOC % by weight:	99.8
Molecular Weight:	32.04

10. STABILITY AND REACTIVITY

Stability:	Stable under normal conditions.
Conditions to Avoid:	None known.
Materials to Avoid / Chemical Incompatiability:	Strong oxidizing agents
Hazardous Decomposition Products:	Carbon dioxide Carbon monoxide

11. TOXICOLOGICAL INFORMATION

Routes of Entry:	Inhalation, Skin Contact, Eye Contact, Ingestion
Target Organs Potentially Affected By Exposure:	Eyes, Central nervous system stimulation, Skin, GI Tract, Respiratory Tract
Chemical Interactions That Change Toxicity:	None Known

Immediate (Acute) Health Effects by Route of Exposure:

Inhalation Irritation:	Can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache.
Inhalation Toxicity:	Harmful! Can cause systemic damage (see "Target Organs)Methanol can cause central nervous system depression and overexposure can cause damage to the optic nerve resulting in visual impairment or blindness.
Skin Contact:	Can cause moderate skin irritation, defatting, and dermatitis. Not likely to cause permanent damage.
Eye Contact:	Can cause moderate irritation, tearing and reddening, but not likely to permanently injure eye tissue.
Ingestion Irritation:	Irritating to mouth, throat, and stomach. Can cause abdominal discomfort, nausea, vomiting and diarrhea.Highly toxic and may be fatal if swallowed.
Ingestion Toxicity:	Toxic if swallowed. May cause target organ failure and/or death.May be fatal if swallowed.

Long-Term (Chronic) Health Effects:

Carcinogenicity:	No data.
Reproductive and Developmental Toxicity:	No data available to indicate product or any components present at greater than 0.1% may cause birth defects.
Inhalation:	Upon prolonged and/or repeated exposure, can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache.Harmful! Can cause systemic damage upon prolonged and/or repeated exposure (see "Target Organs)
Skin Contact:	Upon prolonged or repeated contact, can cause moderate skin irritation, defatting, and dermatitis. Not likely to cause permanent damage.
Ingestion:	Toxic if swallowed. May cause target organ failure and/or death.

Component Toxicological Data:
NIOSH:

Chemical Name	CAS No.	LD50/LC50
Methanol	67-56-1	Inhalation LC50 Rat 22500 ppm 8 h

Component Carcinogenic Data:
OSHA:

Chemical Name	CAS No.
No data available	

ACGIH:

Chemical Name	CAS No.
No data available	

NIOSH:

Chemical Name	CAS No.
No data available	

NTP:

Chemical Name	CAS No.
No data available	

IARC:

Chemical Name	CAS No.	Group No.

12. ECOLOGICAL INFORMATION

Overview:	Moderate ecological hazard. This product may be dangerous to plants and/or wildlife.
Mobility:	No data
Persistence:	No data
Bioaccumulation:	No data
Degradability:	Biodegrades slowly.
Ecological Toxicity Data:	No data available

13. DISPOSAL CONSIDERATIONS

Waste Description of Spent Product:	Spent or discarded material is a hazardous waste.Mixing spent or discarded material with other materials may

render the mixture hazardous. Perform a hazardous waste determination on mixtures.

Disposal Methods: Dispose of by incineration following Federal, State, Local, or Provincial regulations.

Waste Disposal of Packaging: Comply with all Local, State, Federal, and Provincial Environmental Regulations.

14. TRANSPORTATION INFORMATION

United States:

DOT Proper Shipping Name: Methanol
UN Number: UN1230
Hazard Class: 3
Packing Group: II

International:

IATA Proper Shipping Name: Methanol
UN Number: UN1230
Hazard Class: 3(6.1)
Packing Group: II

Marine Pollutant: No

Chemical Name	CAS#	Marine Pollutant	Severe Marine Pollutant
No data available			

15. REGULATORY INFORMATION

United States:

Chemical Name	CAS#	CERCLA	SARA 313	SARA EHS 313	TSCA
methanol	67-56-1	X	X	-	X

The following chemicals are listed on CA Prop 65:

Chemical Name	CAS #	Regulation
Methanol	67-56-1	Prop 65 Devolop Tox

State Right To Know Listing:

Chemical Name	CAS#	New Jersey	Massachusetts	Pennsylvania	California
methanol	67-56-1	X	X	X	X
cis-1,2-dichloroethylene	156-59-2	-	X	X	-

16. OTHER INFORMATION

Prior Version Date: 10/29/18

Other Information: Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.

References: No data available

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Safety Data Sheet

Revision Date: 07/31/18
www.restek.com

2 Letter ISO country code/language code: US/EN

1. IDENTIFICATION

Catalog Number / Product Name:	**32201 / 4,4'-DDD Standard**
Company:	Restek Corporation
Address:	110 Benner Circle Bellefonte, Pa. 16823
Phone#:	814-353-1300
Fax#:	814-353-1309
Emergency#:	800-424-9300 (CHEMTREC) 703-527-3887 (Outside the US)
Email:	www.restek.com
Revision Number:	8
Intended use:	For Laboratory use only

2. HAZARD(S)IDENTIFICATION

Emergency Overview:

GHS Hazard Symbols:

GHS Classification:	Specific Target Organ Systemic Toxicity (STOT) - Single Exposure Category 1 Flammable Liquid Category 2 Acute Toxicity - Dermal Category 3 Acute Toxicity - Oral Category 3
GHS Signal Word:	Danger
GHS Hazard:	Highly flammable liquid and vapour. Toxic if swallowed or in contact with skin. Causes damage to organs.
GHS Precautions:	
Safety Precautions:	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/ventilation and lighting equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Do not breathe dust/fume/gas/mist/vapours/spray. Wash hands and skin thoroughly after handling. Do not eat, drink or smoke when using this product. Wear protective gloves/protective clothing/eye protection/face protection.
First Aid Measures:	IF SWALLOWED: Immediately call a POISON CENTER/doctor/.... IF ON SKIN: Wash with plenty of soap and water. IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. IF exposed: Call a POISON CENTER or doctor/physician. Call a POISON CENTER or doctor/physician if you feel unwell. Specific treatment see section 4. Rinse mouth. Take off immediately all contaminated clothing and wash it before reuse. In case of fire: Use extinguishing media in section 5 for extinction.
Storage:	Keep container tightly closed.

Store in a well-ventilated place. Keep cool.
Store locked up.

Disposal: Dispose of contents/container according to section 13 of the SDS.

Single Exposure Target Organs: Specific target organ toxicity - Single exposure - STOT SE 1: H370 Causes damage to organs. (C >= 10 %; No information to prove exclusion of certain routes of exposure); Specific target organ toxicity - Single exposure - STOT SE 2: H371 May cause damage to organs. (3 % <= C <10 %; Concentration limits for acute toxicity cannot be translated into GHS from the DSD especially when minimum classifications are given)

Repeated Exposure Target Organs: No data available

3. COMPOSITION / INFORMATION ON INGREDIENT

Chemical Name	CAS #	EINEC #	% Composition
methanol	67-56-1	200-659-6	99.9
4,4'-DDD	72-54-8	200-783-0	0.1

4. FIRST-AID MEASURES

Inhalation: Remove to fresh air. If breathing is difficult, have a trained individual administer oxygen. If not breathing, give artificial respiration and have a trained individual administer oxygen. Get medical attention immediately

Eyes: Flush eyes with plenty of water for at least 20 minutes retracting eyelids often. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Get immediate medical attention.

Skin Contact: Wash with soap and water. Remove contaminated clothing and launder. Get medical attention if irritation develops or persists.

Ingestion: Do not induce vomiting and seek medical attention immediately. Drink two glasses of water or milk to dilute. Provide medical care provider with this SDS.

5. FIRE- FIGHTING MEASURES

Extinguishing Media: Use alcohol resistant foam, carbon dioxide, or dry chemical extinguishing agents. Water may be ineffective but water spray can be used extinguish a fire if swept across the base of the flames. Water can absorb heat and keep exposed material from being damaged by fire.

Fire and/or Explosion Hazards: Vapors may be ignited by sparks, flames or other sources of ignition if material is above the flash point giving rise to a fire (Class B). Vapors are heavier than air and may travel to a source of ignition and flash back.

Fire Fighting Methods and Protection: Do not enter fire area without proper protection including self-contained breathing apparatus and full protective equipment. Fight fire from a safe distance and a protected location due to the potential of hazardous vapors and decomposition products. Flammable component(s) of this material may be lighter than water and burn while floating on the surface.

Hazardous Combustion Products: Carbon dioxide, Carbon monoxide

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions and Equipment: Exposure to the spilled material may be severely irritating or toxic. Follow personal protective equipment recommendations found in Section 8 of this SDS. Personal protective equipment needs must be evaluated based on information provided on this sheet and the special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred, and the expertise of employees in the area responding to the spill. Never exceed any occupational exposure limits.

Methods for Clean-up: Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation.

7. HANDLING AND STORAGE

Handling Technical Measures and Precautions: Toxic or severely irritating material. Avoid contacting and avoid

	breathing the material. Use only in a well ventilated area. Use spark-proof tools and explosion-proof equipment
Storage Technical Measures and Conditions:	Store in a cool dry ventilated location. Isolate from incompatible materials and conditions. Keep container(s) closed. Keep away from sources of ignition

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

United States:

Chemical Name	CAS No.	IDLH	ACGIH STEL	ACGIH TLV-TWA	OSHA Exposure Limit
methanol	67-56-1	6000 ppm IDLH	250 ppm STEL	200 ppm TWA	200 ppm TWA; 260 mg/m3 TWA

Personal Protection:

Engineering Measures:	Local exhaust ventilation is recommended when generating excessive levels of vapours from handling or thermal processing.
Respiratory Protection:	Respiratory protection may be required to avoid overexposure when handling this product. General or local exhaust ventilation is the preferred means of protection. Use a respirator if general room ventilation is not available or sufficient to eliminate symptoms.If an exposure limit is exceeded or if an operator is experiencing symptoms of inhalation overexposure as explained in Section 3, provide respiratory protection.
Eye Protection:	Wear chemically resistant safety glasses with side shields when handling this product. Do not wear contact lenses.
Skin Protection:	Wear protective gloves. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance, color:	No data available
Odor:	Mild
Physical State:	No data available
pH:	Not applicable
Vapor Pressure:	No data available
Vapor Density:	1.1 (air = 1)
Boiling Point (°C):	64.7 °C at 760 mmHg (HSDB)
Melting Point (°C):	-98 °C
Flash Point (°F):	52
Flammability:	Highly Flammable
Upper Flammable/Explosive Limit, % in air:	36
Lower Flammable/Explosive Limit, % in air:	6
Autoignition Temperature (°C):	464 deg C
Decomposition Temperature (°C):	No data available
Specific Gravity:	0.791 - 0.792 g/cm3 at 20 °C
Evaporation Rate:	No data available
Odor Threshold:	No data available
Solubility:	Moderate; 50-99%
Partition Coefficient: n-octanol in water:	No data available
VOC % by weight:	0
Molecular Weight:	32.04

10. STABILITY AND REACTIVITY

Stability:	Stable under normal conditions.
Conditions to Avoid:	None known.
Materials to Avoid / Chemical Incompatiability:	Strong oxidizing agents
Hazardous Decomposition Products:	Carbon dioxide Carbon monoxide

11. TOXICOLOGICAL INFORMATION

Routes of Entry:	Inhalation, Skin Contact, Eye Contact, Ingestion
Target Organs Potentially Affected By Exposure:	Eyes, Central nervous system stimulation, Skin, GI Tract, Respiratory Tract
Chemical Interactions That Change Toxicity:	None Known

Immediate (Acute) Health Effects by Route of Exposure:

Inhalation Irritation:	Can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache.
Inhalation Toxicity:	Harmful! Can cause systemic damage (see "Target Organs)Methanol can cause central nervous system depression and overexposure can cause damage to the optic nerve resulting in visual impairment or blindness.
Skin Contact:	Can cause moderate skin irritation, defatting, and dermatitis. Not likely to cause permanent damage.
Eye Contact:	Can cause moderate irritation, tearing and reddening, but not likely to permanently injure eye tissue.
Ingestion Irritation:	Irritating to mouth, throat, and stomach. Can cause abdominal discomfort, nausea, vomiting and diarrhea.Highly toxic and may be fatal if swallowed.
Ingestion Toxicity:	Toxic if swallowed. May cause target organ failure and/or death.May be fatal if swallowed.

Long-Term (Chronic) Health Effects:

Carcinogenicity:	Contains a probable or known human carcinogen.
Reproductive and Developmental Toxicity:	No data available to indicate product or any components present at greater than 0.1% may cause birth defects.
Inhalation:	Upon prolonged and/or repeated exposure, can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache.Harmful! Can cause systemic damage upon prolonged and/or repeated exposure (see "Target Organs)
Skin Contact:	Upon prolonged or repeated contact, can cause moderate skin irritation, defatting, and dermatitis. Not likely to cause permanent damage.
Ingestion:	Toxic if swallowed. May cause target organ failure and/or death.

Component Toxicological Data:

NIOSH:

Chemical Name	CAS No.	LD50/LC50
Methanol	67-56-1	Inhalation LC50 Rat 22500 ppm 8 h

Component Carcinogenic Data:

OSHA:

Chemical Name	CAS No.
No data available	

ACGIH:

Chemical Name	CAS No.
No data available	

NIOSH:

Chemical Name	CAS No.
No data available	

NTP:

Chemical Name	CAS No.
No data available	

IARC:

Chemical Name	CAS No.	Group No.
Monograph 53 [1991] (listed under DDT and associated compounds)	72-54-8	Group 2B

12. ECOLOGICAL INFORMATION

Overview:	Moderate ecological hazard. This product may be dangerous to plants and/or wildlife.
Mobility:	No data
Persistence:	No data
Bioaccumulation:	No data
Degradability:	Biodegrades slowly.
Ecological Toxicity Data:	No data available

13. DISPOSAL CONSIDERATIONS

Waste Description of Spent Product: Spent or discarded material is a hazardous waste.Mixing spent or discarded material with other materials may render the mixture hazardous. Perform a hazardous waste determination on mixtures.

Disposal Methods: Dispose of by incineration following Federal, State, Local, or Provincial regulations.

Waste Disposal of Packaging: Comply with all Local, State, Federal, and Provincial Environmental Regulations.

14. TRANSPORTATION INFORMATION

United States:

DOT Proper Shipping Name: Methanol
UN Number: UN1230
Hazard Class: 3
Packing Group: II

International:

IATA Proper Shipping Name: Methanol
UN Number: UN1230
Hazard Class: 3(6.1)
Packing Group: II

Marine Pollutant: No

Chemical Name	CAS#	Marine Pollutant	Severe Marine Pollutant
No data available			

15. REGULATORY INFORMATION

United States:

Chemical Name	CAS#	CERCLA	SARA 313	SARA EHS 313	TSCA
methanol	67-56-1	X	X	-	X

The following chemicals are listed on CA Prop 65:

Chemical Name	CAS #	Regulation
DDD	72-54-8	Prop 65 Cancer
Methanol	67-56-1	Prop 65 Devolop Tox

State Right To Know Listing:

Chemical Name	CAS#	New Jersey	Massachusetts	Pennsylvania	California
methanol	67-56-1	X	X	X	X
4,4'-DDD	72-54-8	X	X	X	X

16. OTHER INFORMATION

Prior Version Date: 06/14/18

Other Information: Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.

References: No data available

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SAFETY DATA SHEET
p,p'-DDE

Revision: 06/25/2018

according to Regulation (EC) No. 1907/2006 as amended by (EC) No. 1272/2008

Section 1. Identification of the Substance/Mixture and of the Company/Undertaking

1.1 Product Code: 24241

Product Name: p,p'-DDE

Synonyms: 1,1'-(2,2-dichloroethenylidene)bis[4-chloro-benzene]; 4,4'-DDE; p,p'-Dichlorodiphenyldichloroethylene; NSC 1153;

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

Relevant identified uses: For research use only, not for human or veterinary use.

1.3 Details of the Supplier of the Safety Data Sheet:

Company Name: Cayman Chemical Company
1180 E. Ellsworth Rd.
Ann Arbor, MI 48108

Web site address: www.caymanchem.com

Information: Cayman Chemical Company +1 (734)971-3335

1.4 Emergency telephone number:

Emergency Contact: CHEMTREC Within USA and Canada: +1 (800)424-9300
CHEMTREC Outside USA and Canada: +1 (703)527-3887

Section 2. Hazards Identification

2.1 Classification of the Substance or Mixture:

Acute Toxicity: Inhalation, Category 4

Acute Toxicity: Oral, Category 4

Skin Corrosion/Irritation, Category 2

Aquatic Toxicity (Chronic), Category 1

2.2 Label Elements:

GHS Signal Word: **Warning**

GHS Hazard Phrases:

H302: Harmful if swallowed.

H315: Causes skin irritation.

H332: Harmful if inhaled.

H410: Very toxic to aquatic life with long lasting effects.

GHS Precaution Phrases:

P261: Avoid breathing {dust/fume/gas/mist/vapors/spray}.

P264: Wash {hands} thoroughly after handling.

P273: Avoid release to the environment.

P280: Wear {protective gloves/protective clothing/eye protection/face protection}.

GHS Response Phrases:

P301+312: IF SWALLOWED: P312: Call a POISON CENTER or doctor/physician if you feel unwell.

P302+352: IF ON SKIN: Wash with plenty of soap and water.

P304+340: IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing.

P330: Rinse mouth.

P332+313: If skin irritation occurs, get medical advice/attention.

P362+364: Take off contaminated clothing and wash it before reuse.

P391: Collect spillage.

GHS Storage and Disposal Phrases:

Please refer to Section 7 for Storage and Section 13 for Disposal information.

2.3 Adverse Human Health Effects and Symptoms: Causes skin irritation.
Harmful if inhaled or swallowed..
Material may be irritating to the mucous membranes and upper respiratory tract.
May be harmful by skin absorption.
May cause eye or respiratory system irritation.
Very toxic to aquatic life with long lasting effects.
To the best of our knowledge, the toxicological properties have not been thoroughly investigated.

Section 3. Composition/Information on Ingredients

CAS # / RTECS #	Hazardous Components (Chemical Name)/ REACH Registration No.	Concentration	EC No./ EC Index No.	GHS Classification
72-55-9 KV9450000	DDE {p,p'-DDE; 2,2-Bis(4-chlorophenyl)-1,1-dichloroethylene; 4,4-DDE}	100.0 %	200-784-6 NA	Acute Tox.(O) 4: H302 Skin Corr. 2: H315 Aquatic (C) 1: H410 Acute Tox.(I) 4: H332

Section 4. First Aid Measures

4.1 Description of First Aid Measures:

In Case of Inhalation: Remove to fresh air. If not breathing, give artificial respiration or give oxygen by trained personnel. Get immediate medical attention.

In Case of Skin Contact: Immediately wash skin with soap and plenty of water for at least 15 minutes. Remove contaminated clothing. Get medical attention if symptoms occur. Wash clothing before reuse.

In Case of Eye Contact: Hold eyelids apart and flush eyes with plenty of water for at least 15 minutes. Have eyes examined and tested by medical personnel.

In Case of Ingestion: Wash out mouth with water provided person is conscious. Never give anything by mouth to an unconscious person. Get medical attention. Do NOT induce vomiting unless directed to do so by medical personnel.

Section 5. Fire Fighting Measures

5.1 Suitable Extinguishing Media: Use alcohol-resistant foam, carbon dioxide, water, or dry chemical spray.
Use water spray to cool fire-exposed containers.

Unsuitable Extinguishing Media: A solid water stream may be inefficient.

5.2 Flammable Properties and Hazards: No data available.

No data available.

Flash Pt: No data.

Explosive Limits: LEL: No data. UEL: No data.

Autoignition Pt: No data.

5.3 Fire Fighting Instructions: As in any fire, wear self-contained breathing apparatus pressure-demand (NIOSH approved or equivalent), and full protective gear to prevent contact with skin and eyes.

Section 6. Accidental Release Measures

6.1 Protective Precautions, Protective Equipment and Emergency Procedures: Avoid raising and breathing dust, and provide adequate ventilation. As conditions warrant, wear a NIOSH approved self-contained breathing apparatus, or respirator, and appropriate personal protection (rubber boots, safety goggles, and heavy rubber gloves).

6.2 Environmental Precautions: Take steps to avoid release into the environment, if safe to do so.

6.3 Methods and Material For Containment and Cleaning Up: Contain spill and collect, as appropriate. Transfer to a chemical waste container for disposal in accordance with local regulations.

Section 7. Handling and Storage

7.1 Precautions To Be Taken in Handling: Avoid breathing dust/fume/gas/mist/vapours/spray. Avoid prolonged or repeated exposure.

7.2 Precautions To Be Taken in Storing: Keep container tightly closed. Store in accordance with information listed on the product insert.

Section 8. Exposure Controls/Personal Protection

8.1 Exposure Parameters:

8.2 Exposure Controls:

8.2.1 Engineering Controls (Ventilation etc.): Use process enclosures, local exhaust ventilation, or other engineering controls to control airborne levels below recommended exposure limits.

8.2.2 Personal protection equipment:

Eye Protection: Safety glasses

Protective Gloves: Compatible chemical-resistant gloves

Other Protective Clothing: Lab coat

Respiratory Equipment (Specify Type): NIOSH approved respirator, as conditions warrant.

Work/Hygienic/Maintenance Practices: Do not take internally. Facilities storing or utilizing this material should be equipped with an eyewash and a safety shower. Wash thoroughly after handling.

No data available.

Section 9. Physical and Chemical Properties

9.1 Information on Basic Physical and Chemical Properties

Physical States:	[ ] Gas [ ] Liquid [X] Solid
Appearance and Odor:	A solid
pH:	No data.
Melting Point:	No data.
Boiling Point:	No data.
Flash Pt:	No data.
Evaporation Rate:	No data.
Flammability (solid, gas):	No data available.
Explosive Limits:	LEL: No data. UEL: No data.
Vapor Pressure (vs. Air or mm Hg):	No data.
Vapor Density (vs. Air = 1):	No data.

Specific Gravity (Water = 1):	No data.
Solubility in Water:	No data.
Solubility Notes:	Soluble (slightly) in: chloroform;
Octanol/Water Partition Coefficient:	No data.
Autoignition Pt:	No data.
Decomposition Temperature:	No data.
Viscosity:	No data.

9.2 Other Information

Percent Volatile:	No data.
Molecular Formula & Weight:	C14H8Cl4 318.0

Section 10. Stability and Reactivity

10.1	**Reactivity:**	No data available.
10.2	**Stability:**	Unstable [ ] Stable [X]
10.3	**Stability Note(s):**	Stable if stored in accordance with information listed on the product insert.
	Polymerization:	Will occur [ ] Will not occur [X]
10.4	**Conditions To Avoid:**	No data available.
10.5	**Incompatibility - Materials To Avoid:**	strong bases strong oxidizing agents
10.6	**Hazardous Decomposition or Byproducts:**	carbon dioxide carbon monoxide hydrogen chloride gas

Section 11. Toxicological Information

11.1	**Information on Toxicological Effects:**	The toxicological effects of this product have not been thoroughly studied. p,p'-DDE - Toxicity Data: Oral LD50 (rat): 880 mg/kg; Oral LD50 (mouse): 700 mg/kg; Intraperitoneal LD50 (rat): 159 mg/kg; Intraperitoneal LD50 (mouse): 500 ug/kg;
	Chronic Toxicological Effects:	p,p'-DDE - Investigated as an agricultural chemical, mutagen, reproductive effector, and tumorigen. Only select Registry of Toxic Effects of Chemical Substances (RTECS) data is presented here. See actual entry in RTECS for complete information. p,p'-DDE RTECS Number: KV9450000

CAS #	Hazardous Components (Chemical Name)	NTP	IARC	ACGIH	OSHA
72-55-9	DDE {p,p'-DDE; 2,2-Bis(4-chlorophenyl)-1,1-dichloroethylene; 4,4-DDE}	n.a.	n.a.	n.a.	n.a.

Section 12. Ecological Information

12.1	**Toxicity:**	Avoid release into the environment. Runoff from fire control or dilution water may cause pollution.
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:**	No data available.
12.6	**Other adverse effects:**	No data available.

Section 13. Disposal Considerations

13.1 Waste Disposal Method: Dispose in accordance with local, state, and federal regulations.

Section 14. Transport Information

14.1 LAND TRANSPORT (US DOT):

DOT Proper Shipping Name: Environmentally hazardous substances, solid, n.o.s. (p,p'-DDE)
DOT Hazard Class: 9 CLASS 9
UN/NA Number: UN3077 **Packing Group:** III

14.1 LAND TRANSPORT (European ADR/RID):

ADR/RID Shipping Name: Environmentally hazardous substances, solid, n.o.s. (p,p'-DDE)
UN Number: 3077 **Packing Group:** III
Hazard Class: 9 - CLASS 9

14.3 AIR TRANSPORT (ICAO/IATA):

ICAO/IATA Shipping Name: Environmentally hazardous substances, solid, n.o.s. (p,p'-DDE)
UN Number: 3077 **Packing Group:** III
Hazard Class: 9 - CLASS 9 **IATA Classification:** 9

Additional Transport Information: Transport in accordance with local, state, and federal regulations.
When sold in quantities of less than or equal to 1 mL, or 1 g, with an Excepted Quantity Code of E1, E2, E4, or E5, this item meets the De Minimis Quantities exemption, per IATA 2.6.10. Therefore packaging does not have to be labeled as Dangerous Goods/Excepted Quantity.

Section 15. Regulatory Information

EPA SARA (Superfund Amendments and Reauthorization Act of 1986) Lists

CAS #	Hazardous Components (Chemical Name)	S. 302 (EHS)	S. 304 RQ	S. 313 (TRI)
72-55-9	DDE {p,p'-DDE; 2,2-Bis(4-chlorophenyl)-1,1-dichloroethylene; 4,4-DDE}	No	Yes 1 LB	No

CAS #	Hazardous Components (Chemical Name)	Other US EPA or State Lists
72-55-9	DDE {p,p'-DDE; 2,2-Bis(4-chlorophenyl)-1,1-dichloroethylene; 4,4-DDE}	CAA HAP,ODC: HAP; CWA NPDES: Yes; TSCA: No; CA PROP.65: Yes: RDTox(M)

Regulatory Information Statement: This SDS was prepared in accordance with 29 CFR 1910.1200 and Regulation (EC) No.1272/2008.

Section 16. Other Information

Revision Date:	06/25/2018
Additional Information About This Product:	No data available.
Company Policy or Disclaimer:	DISCLAIMER: This information is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes.

Safety Data Sheet

Revision Date: 09/13/18
www.restek.com

2 Letter ISO country code/language code: US/EN

1. IDENTIFICATION

Catalog Number / Product Name:	**32203 / 4,4'-DDT Standard**
Company:	Restek Corporation
Address:	110 Benner Circle Bellefonte, Pa. 16823
Phone#:	814-353-1300
Fax#:	814-353-1309
Emergency#:	800-424-9300 (CHEMTREC) 703-527-3887 (Outside the US)
Email:	www.restek.com
Revision Number:	9
Intended use:	For Laboratory use only

2. HAZARD(S)IDENTIFICATION

Emergency Overview:

GHS Hazard Symbols:

GHS Classification:	Specific Target Organ Systemic Toxicity (STOT) - Single Exposure Category 1 Flammable Liquid Category 2 Carcinogenicity Category 2 Acute Toxicity - Dermal Category 3 Acute Toxicity - Oral Category 3
GHS Signal Word:	Danger
GHS Hazard:	Highly flammable liquid and vapour. Toxic if swallowed or in contact with skin. Suspected of causing cancer. Causes damage to organs.
GHS Precautions:	
Safety Precautions:	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Keep away from heat/sparks/open flames/hot surfaces. – No smoking. Keep container tightly closed. Ground/bond container and receiving equipment. Use explosion-proof electrical/ventilation and lighting equipment. Use only non-sparking tools. Take precautionary measures against static discharge. Do not breathe dust/fume/gas/mist/vapours/spray. Wash hands and skin thoroughly after handling. Do not eat, drink or smoke when using this product. Wear protective gloves/protective clothing/eye protection/face protection.
First Aid Measures:	IF SWALLOWED: Immediately call a POISON CENTER/doctor/.... IF ON SKIN: Wash with plenty of soap and water. IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower. IF exposed: Call a POISON CENTER or doctor/physician. IF exposed or concerned: Get medical advice/attention. Call a POISON CENTER or doctor/physician if you feel unwell. Specific treatment see section 4.

Rinse mouth.
Take off immediately all contaminated clothing and wash it before reuse.
In case of fire: Use extinguishing media in section 5 for extinction.

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

Disposal: Dispose of contents/container according to section 13 of the SDS.

Single Exposure Target Organs: Specific target organ toxicity - Single exposure - STOT SE 1: H370 Causes damage to organs. (C >= 10 %; No information to prove exclusion of certain routes of exposure); Specific target organ toxicity - Single exposure - STOT SE 2: H371 May cause damage to organs. (3 % <= C <10 %; Concentration limits for acute toxicity cannot be translated into GHS from the DSD especially when minimum classifications are given)

Repeated Exposure Target Organs: Specific target organ toxicity - Repeated exposure - STOT RE 1: H372 Causes damage to organs through prolonged or repeated exposure. (No information to prove exclusion of certain routes of exposure)

3. COMPOSITION / INFORMATION ON INGREDIENT

Chemical Name	CAS #	EINEC #	% Composition
methanol	67-56-1	200-659-6	99.9
4,4'-DDT	50-29-3	200-024-3	0.1

4. FIRST-AID MEASURES

Inhalation: Remove to fresh air. If breathing is difficult, have a trained individual administer oxygen. If not breathing, give artificial respiration and have a trained individual administer oxygen. Get medical attention immediately

Eyes: Flush eyes with plenty of water for at least 20 minutes retracting eyelids often. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Get immediate medical attention.

Skin Contact: Wash with soap and water. Remove contaminated clothing and launder. Get medical attention if irritation develops or persists.

Ingestion: Do not induce vomiting and seek medical attention immediately. Drink two glasses of water or milk to dilute. Provide medical care provider with this SDS.

5. FIRE- FIGHTING MEASURES

Extinguishing Media: Use alcohol resistant foam, carbon dioxide, or dry chemical extinguishing agents. Water may be ineffective but water spray can be used extinguish a fire if swept across the base of the flames. Water can absorb heat and keep exposed material from being damaged by fire.

Fire and/or Explosion Hazards: Vapors may be ignited by sparks, flames or other sources of ignition if material is above the flash point giving rise to a fire (Class B). Vapors are heavier than air and may travel to a source of ignition and flash back.

Fire Fighting Methods and Protection: Do not enter fire area without proper protection including self-contained breathing apparatus and full protective equipment. Fight fire from a safe distance and a protected location due to the potential of hazardous vapors and decomposition products. Flammable component(s) of this material may be lighter than water and burn while floating on the surface.

Hazardous Combustion Products: Carbon dioxide, Carbon monoxide

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions and Equipment: Exposure to the spilled material may be severely irritating or toxic. Follow personal protective equipment recommendations found in Section 8 of this SDS. Personal protective equipment needs must be evaluated based on information provided on this sheet and the special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred, and the expertise of employees in the area responding to the spill. Never exceed any occupational exposure limits.

Methods for Clean-up: Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay.

Gather and store in a sealed container pending a waste disposal evaluation.

7. HANDLING AND STORAGE

Handling Technical Measures and Precautions: Toxic or severely irritating material. Avoid contacting and avoid breathing the material. Use only in a well ventilated area. Use spark-proof tools and explosion-proof equipment

Storage Technical Measures and Conditions: Store in a cool dry ventilated location. Isolate from incompatible materials and conditions. Keep container(s) closed. Keep away from sources of ignition

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

United States:

Chemical Name	CAS No.	IDLH	ACGIH STEL	ACGIH TLV-TWA	OSHA Exposure Limit
methanol	67-56-1	6000 ppm IDLH	250 ppm STEL	200 ppm TWA	200 ppm TWA; 260 mg/m3 TWA
4,4'-DDT	50-29-3	500 mg/m3 IDLH	None Known	1 mg/m3 TWA	1 mg/m3 TWA (listed under Dichlorodiphenyltric hloroethane)

Personal Protection:

Engineering Measures: Local exhaust ventilation is recommended when generating excessive levels of vapours from handling or thermal processing.

Respiratory Protection: Respiratory protection may be required to avoid overexposure when handling this product. General or local exhaust ventilation is the preferred means of protection. Use a respirator if general room ventilation is not available or sufficient to eliminate symptoms.If an exposure limit is exceeded or if an operator is experiencing symptoms of inhalation overexposure as explained in Section 3, provide respiratory protection.

Eye Protection: Wear chemically resistant safety glasses with side shields when handling this product. Do not wear contact lenses.

Skin Protection: Wear protective gloves. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance, color:	No data available
Odor:	Mild
Physical State:	No data available
pH:	Not applicable
Vapor Pressure:	No data available
Vapor Density:	1.1 (air = 1)
Boiling Point (°C):	260 °C 64.7 °C at 760 mmHg (HSDB)
Melting Point (°C):	-98 °C
Flash Point (°F):	52
Flammability:	Highly Flammable
Upper Flammable/Explosive Limit, % in air:	36
Lower Flammable/Explosive Limit, % in air:	6
Autoignition Temperature (°C):	464 deg C
Decomposition Temperature (°C):	No data available
Specific Gravity:	0.791 - 0.792 g/cm3 at 20 °C
Evaporation Rate:	No data available
Odor Threshold:	No data available
Solubility:	Moderate; 50-99%
Partition Coefficient: n-octanol in water:	No data available
VOC % by weight:	0
Molecular Weight:	32.04

10. STABILITY AND REACTIVITY

Stability:	Stable under normal conditions.
Conditions to Avoid:	None known.
Materials to Avoid / Chemical Incompatiability:	Strong oxidizing agents

Hazardous Decomposition Products: Carbon dioxide Carbon monoxide

11. TOXICOLOGICAL INFORMATION

Routes of Entry: Inhalation, Skin Contact, Eye Contact, Ingestion
Target Organs Potentially Affected By Exposure: Eyes, Central nervous system stimulation, Skin, GI Tract, Respiratory Tract
Chemical Interactions That Change Toxicity: None Known

Immediate (Acute) Health Effects by Route of Exposure:

Inhalation Irritation: Can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache.

Inhalation Toxicity: Harmful! Can cause systemic damage (see "Target Organs)Methanol can cause central nervous system depression and overexposure can cause damage to the optic nerve resulting in visual impairment or blindness.

Skin Contact: Can cause moderate skin irritation, defatting, and dermatitis. Not likely to cause permanent damage.

Eye Contact: Can cause moderate irritation, tearing and reddening, but not likely to permanently injure eye tissue.

Ingestion Irritation: Irritating to mouth, throat, and stomach. Can cause abdominal discomfort, nausea, vomiting and diarrhea.Highly toxic and may be fatal if swallowed.

Ingestion Toxicity: Toxic if swallowed. May cause target organ failure and/or death.May be fatal if swallowed.

Long-Term (Chronic) Health Effects:

Carcinogenicity: Contains a probable or known human carcinogen.

Reproductive and Developmental Toxicity: Contains a known human reproductive and/or developmental hazard.

Inhalation: Upon prolonged and/or repeated exposure, can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache.Harmful! Can cause systemic damage upon prolonged and/or repeated exposure (see "Target Organs)

Skin Contact: Upon prolonged or repeated contact, can cause moderate skin irritation, defatting, and dermatitis. Not likely to cause permanent damage.

Ingestion: Toxic if swallowed. May cause target organ failure and/or death.

Component Toxicological Data:
NIOSH:

Chemical Name	CAS No.	LD50/LC50
DDT	50-29-3	Dermal LD50 Rabbit 300 - 2820 mg/kg
Methanol	67-56-1	Inhalation LC50 Rat 22500 ppm 8 h

Component Carcinogenic Data:
OSHA:

Chemical Name	CAS No.	
DDT	50-29-3	Present

ACGIH:

Chemical Name	CAS No.	
DDT	50-29-3	A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans

NIOSH:

Chemical Name	CAS No.	
DDT	50-29-3	potential occupational carcinogen

NTP:

Chemical Name	CAS No.
No data available	

IARC:

Chemical Name	CAS No.	Group No.
Monograph 113 [in preparation]; Monograph 53 [1991]; Supplement 7 [1987]	50-29-3	Group 2A

12. ECOLOGICAL INFORMATION

Overview:	Moderate ecological hazard. This product may be dangerous to plants and/or wildlife.
Mobility:	No data
Persistence:	No data
Bioaccumulation:	No data
Degradability:	Biodegrades slowly.
Ecological Toxicity Data:	No data available

13. DISPOSAL CONSIDERATIONS

Waste Description of Spent Product:	Spent or discarded material is a hazardous waste.Mixing spent or discarded material with other materials may render the mixture hazardous. Perform a hazardous waste determination on mixtures.
Disposal Methods:	Dispose of by incineration following Federal, State, Local, or Provincial regulations.
Waste Disposal of Packaging:	Comply with all Local, State, Federal, and Provincial Environmental Regulations.

14. TRANSPORTATION INFORMATION

United States:

DOT Proper Shipping Name:	Methanol
UN Number:	UN1230
Hazard Class:	3
Packing Group:	II

International:

IATA Proper Shipping Name:	Methanol
UN Number:	UN1230
Hazard Class:	3(6.1)
Packing Group:	II

Marine Pollutant: No

Chemical Name	CAS#	Marine Pollutant	Severe Marine Pollutant
No data available			

15. REGULATORY INFORMATION

United States:

Chemical Name	CAS#	CERCLA	SARA 313	SARA EHS 313	TSCA
methanol	67-56-1	X	X	-	X
4,4'-DDT	50-29-3	X	-	-	X

The following chemicals are listed on CA Prop 65:

Chemical Name	CAS #	Regulation
DDT	50-29-3	Prop 65 Cancer
p,p"-DDT	50-29-3	Prop 65 Devolop Tox
Methanol	67-56-1	Prop 65 Devolop Tox
p,p"-DDT	50-29-3	Prop 65 Rep Female
p,p"-DDT	50-29-3	Prop 65 Rep Male

State Right To Know Listing:

Chemical Name	CAS#	New Jersey	Massachusetts	Pennsylvania	California
methanol	67-56-1	X	X	X	X
4,4'-DDT	50-29-3	X	X	X	X

16. OTHER INFORMATION

Prior Version Date: 12/23/16
Other Information: Any changes to the SDS compared to previous versions are marked by a vertical

line in front of the concerned paragraph.

References: No data available

Disclaimer: Restek Corporation provides the descriptions, data and information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. It is provided for your guidance only. Because many factors may affect processing or application/use, Restek Corporation recommends you perform an assessment to determine the suitability of a product for your particular purpose prior to use. No warranties of any kind, either expressed or implied, including fitness for a particular purpose, are made regarding products described, data or information set forth. In no case shall the descriptions, information, or data provided be considered a part of our terms and conditions of sale. Further, the descriptions, data and information furnished hereunder are given gratis. No obligation or liability for the description, data and information given are assumed. All such being given and accepted at your risk.

SAFETY DATA SHEET

Version 6.0
Revision Date 04/15/2019
Print Date 06/28/2019

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

1.1 Product identifiers

Product name : Dibenzofuran

Product Number : 236373
Brand : Aldrich
CAS-No. : 132-64-9

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

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

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

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

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

Not a hazardous substance or mixture.

2.2 GHS Label elements, including precautionary statements

Not a hazardous substance or mixture.

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

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms : Diphenylene oxide

Formula : $C_{12}H_8O$
Molecular weight : 168.19 g/mol
CAS-No. : 132-64-9

EC-No. : 205-071-3

No components need to be disclosed according to the applicable regulations.

SECTION 4: First aid measures

4.1 Description of first aid measures

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

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

In case of eye contact
Flush eyes with water as a precaution.

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

4.2 Most important symptoms and effects, both acute and delayed

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

4.3 Indication of any immediate medical attention and special treatment needed

No data available

SECTION 5: Firefighting measures

5.1 Extinguishing media

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

5.2 Special hazards arising from the substance or mixture

Carbon oxides

5.3 Advice for firefighters

Wear self-contained breathing apparatus for firefighting if necessary.

5.4 Further information

No data available

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures

Avoid dust formation. Avoid breathing vapours, mist or gas.
For personal protection see section 8.

6.2 Environmental precautions

No special environmental precautions required.

6.3 Methods and materials for containment and cleaning up

Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections

For disposal see section 13.

SECTION 7: Handling and storage

7.1 Precautions for safe handling

Further processing of solid materials may result in the formation of combustible dusts. The potential for combustible dust formation should be taken into consideration before additional processing occurs.
Provide appropriate exhaust ventilation at places where dust is formed.
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.
Storage class (TRGS 510): 13: Non Combustible Solids

7.3 Specific end use(s)

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

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

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

8.2 Exposure controls

Appropriate engineering controls
General industrial hygiene practice.

Personal protective equipment

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

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

Full contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 480 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, Size M)

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
Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection
Respiratory protection is not required. Where protection from nuisance levels of dusts are desired, use type N95 (US) or type P1 (EN 143) dust masks. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

Control of environmental exposure
No special environmental precautions required.

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: powder, finecrystalline Colour: white, beige
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 80 - 82 °C (176 - 180 °F) - lit.
f)	Initial boiling point and boiling range	154 - 155 °C 309 - 311 °F at 27 hPa - lit.
g)	Flash point	130 °C (266 °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	1.3 g/cm3 at 20 °C (68 °F)
n)	Water solubility	insoluble
o)	Partition coefficient: n-octanol/water	log Pow: 4.12 - (Lit.), Potential bioaccumulation
p)	Auto-ignition temperature	No data available
q)	Decomposition	No data available

temperature

r)	Viscosity	No data available
s)	Explosive properties	No data available
t)	Oxidizing properties	No data available

9.2 Other safety information
No data available

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents

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

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
No data available
Inhalation: No data available
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 on OSHA's list of regulated carcinogens.

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
No data available

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
No data available

Additional Information
RTECS: Not available

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

Hazardous properties cannot be excluded.
Handle in accordance with good industrial hygiene and safety practice.

SECTION 12: Ecological information

12.1 Toxicity
No data available

12.2 Persistence and degradability
No data available

12.3 Bioaccumulative potential
No data available

12.4 Mobility in soil
No data available

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

12.6 Other adverse effects
No ecological problems are to be expected when the product is handled and used with due care and attention.

SECTION 13: Disposal considerations

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

SECTION 14: Transport information

DOT (US)
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Dibenzofuran)
Reportable Quantity (RQ): 100 lbs
- Marine pollutant: yesPoison Inhalation Hazard: No

IMDG
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Dibenzofuran)
Marine pollutant : yes

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Dibenzofuran)

SECTION 15: Regulatory information

SARA 302 Components
This material does not contain any components with a section 302 EHS TPQ.

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

	CAS-No.	Revision Date
Dibenzofuran	132-64-9	2007-07-01

SARA 311/312 Hazards
No SARA Hazards

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Dibenzofuran	132-64-9	2007-07-01

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Dibenzofuran	132-64-9	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.

SECTION 16: Other information

Further information

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

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

Version: 6.0 Revision Date: 04/15/2019 Print Date: 06/28/2019

SAFETY DATA SHEET

Creation Date 06-Aug-2010 **Revision Date** 17-Jan-2018 **Revision Number** 6

1. Identification

Product Name **Ethylbenzene**

Cat No. : **O2751-1**

CAS-No 100-41-4
Synonyms Ethylbenzol; Phenylethane

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
Acute Inhalation Toxicity - Vapors	Category 4
Carcinogenicity	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
Aspiration Toxicity	Category 1

Label Elements

Signal Word
Danger

Hazard Statements
Highly flammable liquid and vapor
May be fatal if swallowed and enters airways
Harmful if inhaled
May cause respiratory irritation
May cause drowsiness or dizziness
Suspected of causing 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
Use only outdoors or in a well-ventilated area
Do not breathe dust/fume/gas/mist/vapors/spray
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Keep cool
Response
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 (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Ingestion
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Do NOT induce vomiting
Fire
In case of fire: Use CO2, dry chemical, or foam for extinction
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Harmful to aquatic life with long lasting effects
WARNING. Cancer - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Ethylbenzene	100-41-4	>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. Get 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. Aspiration into lungs can produce severe lung damage.

Ingestion Clean mouth with water and drink afterwards plenty of water. Do not induce vomiting. Call a physician or Poison Control Center immediately. If vomiting occurs naturally, have victim lean forward.

Most important symptoms and effects Breathing difficulties. . Inhalation of high vapor concentrations may cause symptoms like headache, dizziness, tiredness, nausea and vomiting: May cause central nervous system depression

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 Do not use a solid water stream as it may scatter and spread fire

Flash Point 22 °C / 71 °F

Method - No information available

Autoignition Temperature 432 °C / 810 °F

Explosion Limits

Upper 6.8%

Lower 1.2%

Sensitivity to Mechanical Impact No information available

Sensitivity to Static Discharge Yes

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

Hazardous Combustion Products

Carbon monoxide (CO) Carbon dioxide (CO_2)

Protective Equipment and Precautions for Firefighters

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

NFPA

Health	Flammability	Instability	Physical hazards
3	3	0	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment. 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. See Section 12 for additional ecological information. Collect spillage.

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. Keep away from heat and sources of ignition. Flammables area.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Ethylbenzene	TWA: 20 ppm	(Vacated) TWA: 100 ppm (Vacated) TWA: 435 mg/m^3 (Vacated) STEL: 125 ppm (Vacated) STEL: 545 mg/m^3 TWA: 100 ppm TWA: 435 mg/m^3	IDLH: 800 ppm TWA: 100 ppm TWA: 435 mg/m^3 STEL: 125 ppm STEL: 545 mg/m^3	TWA: 100 ppm TWA: 435 mg/m^3 STEL: 125 ppm STEL: 545 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. Use explosion-proof electrical/ventilating/lighting/equipment.

Personal Protective Equipment

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

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

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

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

9. Physical and chemical properties

Physical State	Liquid
Appearance	Colorless
Odor	aromatic
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-95 °C / -139 °F
Boiling Point/Range	136 °C / 276.8 °F
Flash Point	22 °C / 71 °F
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	6.8%
Lower	1.2%
Vapor Pressure	No information available
Vapor Density	No information available
Specific Gravity	0.860
Solubility	Slightly soluble in water
Partition coefficient; n-octanol/water	No data available

Autoignition Temperature	432 °C / 810 °F
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	C8 H10
Molecular Weight	106.17

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat. Keep away from open flames, hot surfaces and sources of ignition.

Incompatible Materials Strong oxidizing agents

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
Ethylbenzene	3500 mg/kg (Rat)	15400 mg/kg (Rabbit)	17.2 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 May cause eye, skin, and respiratory tract irritation

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
Ethylbenzene	100-41-4	Group 2B	Not listed	A3	X	Not listed

IARC: (International Agency for Research on Cancer)
Group 2B - Possibly Carcinogenic to Humans
IARC: (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
Group 2A - Probably Carcinogenic to Humans

ACGIH: (American Conference of Governmental Industrial Hygienists)
A1 - Known Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Animal Carcinogen
ACGIH: (American Conference of Governmental Industrial Hygienists)

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system Central nervous system (CNS)
STOT - repeated exposure 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: May cause central nervous system depression

Endocrine Disruptor Information No information available

Other Adverse Effects See actual entry in RTECS for complete information.

12. Ecological information

Ecotoxicity

Do not empty into drains. The product contains following substances which are hazardous for the environment. Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Ethylbenzene	EC50: 1.7 - 7.6 mg/L, 96h static (Pseudokirchneriella subcapitata) EC50: 2.6 - 11.3 mg/L, 72h static (Pseudokirchneriella subcapitata) EC50: > 438 mg/L, 96h (Pseudokirchneriella subcapitata) EC50: = 4.6 mg/L, 72h (Pseudokirchneriella subcapitata)	LC50: 11.0 - 18.0 mg/L, 96h static (Oncorhynchus mykiss) LC50: = 4.2 mg/L, 96h semi-static (Oncorhynchus mykiss) LC50: = 32 mg/L, 96h static (Lepomis macrochirus) LC50: 7.55 - 11 mg/L, 96h flow-through (Pimephales promelas) LC50: 9.1 - 15.6 mg/L, 96h static (Pimephales promelas) LC50: = 9.6 mg/L, 96h static (Poecilia reticulata)	EC50 = 9.68 mg/L 30 min EC50 = 96 mg/L 24 h	EC50: 1.8 - 2.4 mg/L, 48h (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
Ethylbenzene	3.2

13. Disposal considerations

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

14. Transport information

DOT

- **UN-No** UN1175
- **Proper Shipping Name** ETHYLBENZENE
- **Hazard Class** 3
- **Packing Group** II

TDG

- **UN-No** UN1175
- **Proper Shipping Name** ETHYLBENZENE
- **Hazard Class** 3
- **Packing Group** II

IATA

UN-No	UN1175
Proper Shipping Name	ETHYLBENZENE
Hazard Class	3
Packing Group	II

IMDG/IMO

UN-No	UN1175
Proper Shipping Name	ETHYLBENZENE
Hazard Class	3
Packing Group	II

15. Regulatory information

All of the components in the product are on the following Inventory lists: X = listed The product is classified and labeled according to EC directives or corresponding national laws The product is classified and labeled in accordance with Directive 1999/45/EC

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Ethylbenzene	X	X	-	202-849-4	-		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

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Ethylbenzene	100-41-4	>95	0.1

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
Ethylbenzene	X	1000 lb	X	X

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Ethylbenzene	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
Ethylbenzene	1000 lb	-

California Proposition 65 This product contains the following proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Ethylbenzene	100-41-4	Carcinogen	54 µg/day 41 µg/day	Carcinogen

U.S. State Right-to-Know Regulations

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

U.S. Department of Transportation

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

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade Serious risk, Grade 3

16. Other information

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

Creation Date 06-Aug-2010
Revision Date 17-Jan-2018
Print Date 17-Jan-2018
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 08-Nov-2010 **Revision Date** 16-Jan-2019 **Revision Number** 6

1. Identification

Product Name **Fluoranthene**

Cat No. : **AC119170000; AC119170250; AC119171000; AC119175000**

CAS-No 206-44-0
Synonyms Benzo[j,k]fluorene

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company
Fisher Scientific
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)

Acute oral toxicity	Category 4

Label Elements

Signal Word
Warning

Hazard Statements
Harmful if swallowed

Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Ingestion
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Rinse mouth
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Very toxic to aquatic life with long lasting effects

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Fluoranthene	206-44-0	>95

4. First-aid measures

General Advice If symptoms persist, call a physician.

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

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

Inhalation 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. Get medical attention if symptoms occur.

Most important symptoms and effects None reasonably foreseeable.

Notes to Physician Treat symptomatically

5. Fire-fighting measures

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

Unsuitable Extinguishing Media No information available

Flash Point Not applicable
Method - No information available

Autoignition Temperature No information available
Explosion Limits
Upper No data available
Lower No data available
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products

Carbon monoxide (CO) Carbon dioxide (CO_2)

Protective Equipment and Precautions for Firefighters

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

NFPA

Health	Flammability	Instability	Physical hazards
2	0	0	N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment. Avoid dust formation.

Environmental Precautions Should not be released into the environment.

Methods for Containment and Clean Up Sweep up or vacuum up spillage and collect in suitable container for disposal. Keep in suitable, closed containers for disposal.

7. Handling and storage

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

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

8. Exposure controls / personal protection

Exposure Guidelines This product does not contain any hazardous materials with occupational exposure limitsestablished by the region specific regulatory bodies.

Engineering Measures Ensure adequate ventilation, especially in confined areas. Ensure that eyewash stations and safety showers are close to the workstation location.

Personal Protective Equipment

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

Skin and body protection 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	Powder Solid
Appearance	Light green
Odor	Odorless
Odor Threshold	No information available
pH	Not applicable
Melting Point/Range	109 - 111 °C / 228.2 - 231.8 °F
Boiling Point/Range	384 °C / 723.2 °F
Flash Point	Not applicable
Evaporation Rate	No information available
Flammability (solid,gas)	No information available
Flammability or explosive limits	

Upper	No data available
Lower	No data available
Vapor Pressure	No information available
Vapor Density	No information available
Specific Gravity	No information available
Solubility	insoluble
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	C16 H10
Molecular Weight	202.25

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products.

Incompatible Materials Strong oxidizing agents

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 No acute toxicity information is available for this product

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
Fluoranthene	LD50 = 2 g/kg (Rat)	LD50 = 3180 mg/kg (Rabbit)	Not listed

Toxicologically Synergistic Products No information available

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

Irritation No information available

Sensitization No information available

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

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Fluoranthene	206-44-0	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known

STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed No information available

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated. See actual entry in RTECS for complete information.

12. Ecological information

Ecotoxicity

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Fluoranthene	Not listed	Oncorhynchus mykiss: LC50=0.0077 mg/L 96h	Not listed	EC50: 0.78 mg/L 20h

Persistence and Degradability No information available

Bioaccumulation/ Accumulation No information available.

Mobility .

Component	log Pow
Fluoranthene	5.1

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
Fluoranthene - 206-44-0	U120	-

14. Transport information

DOT

UN-No UN3077
Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Proper technical name Fluoranthene
Hazard Class 9
Packing Group III

TDG

UN-No UN3077
Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Hazard Class 9
Packing Group III

IATA

UN-No UN3077
Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Hazard Class 9
Packing Group III

IMDG/IMO

UN-No UN3077
Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Hazard Class 9
Packing Group III

15. Regulatory information

All of the components in the product are on the following Inventory lists: The product is classified and labeled according to EC directives or corresponding national laws The product is classified and labeled in accordance with Directive 1999/45/EC Europe China Canada TSCA Japan X = listed Australia U.S.A. (TSCA) Canada (DSL/NDSL) Europe (EINECS/ELINCS/NLP) Australia (AICS) Korea (ECL) China (IECSC) Japan (ENCS) Philippines (PICCS) Complete Regulatory Information contained in following SDS's

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Fluoranthene	X	-	X	205-912-4	-		-	X	X	X	-

Legend:
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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 %
Fluoranthene	206-44-0	>95	1.0 0.1

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

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

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
Fluoranthene	100 lb	-

California Proposition 65 This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

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

U.S. Department of Transportation

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

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

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

Creation Date	08-Nov-2010
Revision Date	16-Jan-2019
Print Date	16-Jan-2019
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

Revision Date: 06/04/19
www.restek.com

2 Letter ISO country code/language code: US/EN

1. IDENTIFICATION

Catalog Number / Product Name:	**31279 / Indeno(1,2,3-c,d)pyrene Standard**
Company:	Restek Corporation
Address:	110 Benner Circle Bellefonte, Pa. 16823
Phone#:	814-353-1300
Fax#:	814-353-1309
Emergency#:	800-424-9300 (CHEMTREC) 703-527-3887 (Outside the US)
Email:	www.restek.com
Revision Number:	11
Intended use:	For Laboratory use only

2. HAZARD(S)IDENTIFICATION

Emergency Overview:

GHS Hazard Symbols:

GHS Classification:	Carcinogenicity Category 2
GHS Signal Word:	Warning
GHS Hazard:	Suspected of causing cancer.
GHS Precautions:	
Safety Precautions:	Obtain special instructions before use. Do not handle until all safety precautions have been read and understood. Wear protective gloves/protective clothing/eye protection/face protection.
First Aid Measures:	IF exposed or concerned: Get medical advice/attention.
Storage:	Store locked up.
Disposal:	Dispose of contents/container according to section 13 of the SDS.
Single Exposure Target Organs:	No data available
Repeated Exposure Target Organs:	No data available

3. COMPOSITION / INFORMATION ON INGREDIENT

Chemical Name	CAS #	EINEC #	% Composition
Dichloromethane	75-09-2	200-838-9	99.9
indeno (1,2,3-c,d) pyrene	193-39-5	205-893-2	0.1

4. FIRST-AID MEASURES

Inhalation:	Remove to fresh air. If breathing is difficult, have a trained individual administer oxygen. If not breathing, give artificial respiration and have a trained individual administer oxygen. Get medical attention immediately
Eyes:	Immediately flush eyes with plenty of water for at least 20 minutes retracting eyelids often. Tilt the head to prevent chemical from transferring to the uncontaminated eye. Get immediate medical attention and monitor the eye daily as advised by your physician. Serious harm (damage) may result if treatment is delayed. Continue to flush eyes while awaiting medical attention
Skin Contact:	Wash with soap and water. Remove contaminated clothing, launder immediately, and discard contaminated leather goods. Get medical attention immediately.
Ingestion:	Do not induce vomiting and seek medical attention immediately. Drink two glasses of water or milk to dilute. Provide medical care provider with this SDS. Never give anything by mouth to an unconscious person

5. FIRE- FIGHTING MEASURES

Extinguishing Media:	Use alcohol resistant foam, carbon dioxide, or dry chemical when fighting fires. Water or foam may cause frothing if liquid is burning but it still may be a useful extinguishing agent if carefully applied to the surface of the fire. Do Not direct a stream of water into the hot burning liquid. Use methods suitable to fight surrounding fire.
Fire and/or Explosion Hazards:	No data.
Fire Fighting Methods and Protection:	Use methods for the surrounding fire.
Hazardous Combustion Products:	Carbon dioxide, Carbon monoxide

6. ACCIDENTAL RELEASE MEASURES

Personal Precautions and Equipment:	Exposure to the spilled material may be severely irritating or toxic. Follow personal protective equipment recommendations found in Section 8 of this SDS. Personal protective equipment needs must be evaluated based on information provided on this sheet and the special circumstances created by the spill including; the material spilled, the quantity of the spill, the area in which the spill occurred, and the expertise of employees in the area responding to the spill. Never exceed any occupational exposure limits.
Methods for Clean-up:	Prevent the spread of any spill to minimize harm to human health and the environment if safe to do so. Wear complete and proper personal protective equipment following the recommendation of Section 8 at a minimum. Dike with suitable absorbent material like granulated clay. Gather and store in a sealed container pending a waste disposal evaluation.

7. HANDLING AND STORAGE

Handling Technical Measures and Precautions:	Toxic or severely irritating material. Avoid contacting and avoid breathing the material. Use only in a well ventilated area. As with all chemicals, good industrial hygiene practices should be followed when handling this material.
Storage Technical Measures and Conditions:	Store in a cool dry place. Isolate from incompatible materials. Keep container closed when not in use

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

United States:

Chemical Name	CAS No.	IDLH	ACGIH STEL	ACGIH TLV-TWA	OSHA Exposure Limit
Dichloromethane	75-09-2	2300 ppm IDLH	None Known	50 ppm TWA	25 ppm TWA; 125 ppm STEL (15 min. TWA)
indeno (1,2,3-c,d) pyrene	193-39-5	Not established	None Known	Not established	No data available

Personal Protection:

Engineering Measures:	Local exhaust ventilation or other engineering controls are normally required when handling or using this product to avoid overexposure.
Respiratory Protection:	Respiratory protection may be required to avoid overexposure when handling this product. General or local exhaust ventilation is the preferred means of protection. Use a respirator if general room ventilation is not available or sufficient to

	eliminate symptoms.
Eye Protection:	Wear chemically resistant safety glasses with side shields when handling this product. Wear additional eye protection such as chemical splash goggles and/or face shield when the possibility exists for eye contact with splashing or spraying liquid, or airborne material. Do not wear contact lenses. Have an eye wash station available.
Skin Protection:	Avoid skin contact by wearing chemically resistant gloves, an apron and other protective equipment depending upon conditions of use. Inspect gloves for chemical break-through and replace at regular intervals. Clean protective equipment regularly. Wash hands and other exposed areas with mild soap and water before eating, drinking, and when leaving work.
Medical Conditions Aggravated By Exposure:	Eye disease Skin disease including eczema and sensitization Respiratory disease including asthma and bronchitis

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance, color:	Colorless
Odor:	Strong
Physical State:	No data available
pH:	Not applicable
Vapor Pressure:	No data available
Vapor Density:	2.93 (air = 1)
Boiling Point (°C):	530 °C
Melting Point (°C):	-96.7 °C
Flash Point (°F):	No data available
Upper Flammable/Explosive Limit, % in air:	No data available
Lower Flammable/Explosive Limit, % in air:	No data available
Autoignition Temperature (°C):	556 deg C
Decomposition Temperature (°C):	No data available
Specific Gravity:	1.3254 - 1.3258 g/cm3 at 20 °C
Evaporation Rate:	No data available
Odor Threshold:	ND
Solubility:	Moderate; 50-99%
Partition Coefficient: n-octanol in water:	No data available
VOC % by weight:	99.9
Molecular Weight:	No data available

10. STABILITY AND REACTIVITY

Stability:	Stable under normal conditions.
Conditions to Avoid:	None known.Contamination High temperatures
Materials to Avoid / Chemical Incompatiability:	Strong oxidizing agents Caustics (bases)
Hazardous Decomposition Products:	Carbon dioxide Carbon monoxide

11. TOXICOLOGICAL INFORMATION

Routes of Entry:	Inhalation Absorption Ingestion Skin contact Eye contact
Target Organs Potentially Affected By Exposure:	Skin, Cardiovascular System, Eyes, Liver
Chemical Interactions That Change Toxicity:	None Known

Immediate (Acute) Health Effects by Route of Exposure:

Inhalation Irritation:	Can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache.
Inhalation Toxicity:	Harmful! Can cause systemic damage (see "Target Organs)Inhalation may cause severe central nervous system depression (including unconsciousness).
Skin Contact:	Contact causes severe skin irritation and possible burns.
Skin Absorption:	Harmful if absorbed through the skin. May cause severe irritation and systemic damage.
Eye Contact:	Contact with the eyes may cause moderate to severe eye injury. Eye contact may result in tearing and reddening, but not likely to permanently injure eye tissue. Temporary vision impairment (cloudy or blurred vision) is possible.
Ingestion Irritation:	Irritating to mouth, throat, and stomach. Can cause abdominal discomfort, nausea, vomiting and diarrhea.
Ingestion Toxicity:	Harmful if swallowed. May cause systemic poisoning.

Long-Term (Chronic) Health Effects:

Carcinogenicity:	Contains a probable or known human carcinogen.
Reproductive and Developmental Toxicity:	No data available to indicate product or any components

present at greater than 0.1% may cause birth defects.

Inhalation: Upon prolonged and/or repeated exposure, can cause moderate respiratory irritation, dizziness, weakness, fatigue, nausea and headache.Harmful! Can cause systemic damage upon prolonged and/or repeated exposure (see "Target Organs)

Skin Absorption: Upon prolonged or repeated exposure, harmful if absorbed through the skin. May cause severe irritation and systemic damage

Component Toxicological Data:

NIOSH:

Chemical Name	CAS No.	LD50/LC50
Methane, dichloro-	75-09-2	Inhalation LC50 Rat 53 mg/L 6 h

Component Carcinogenic Data:

OSHA:

Chemical Name	CAS No.	
Indeno[1,2,3-cd]pyrene	193-39-5	Present
Methylene chloride	75-09-2	25 ppm TWA (8 hr.); 125 ppm STEL (15 min.); 12.5 ppm Action Level (see 29 CFR 1910.1051); effective date for respiratory protection for certain employers to acheive the 8-hour TWA PEL is August 31, 1998; the start up date to install engineering controls is December 10, 1998.; {OSHA - 29 CFR 1910 Specifically Regulate

ACGIH:

Chemical Name	CAS No.	
Dichloromethane	75-09-2	A3 - Confirmed Animal Carcinogen with Unknown Relevance to Humans

NIOSH:

Chemical Name	CAS No.	
Methylene chloride	75-09-2	potential occupational carcinogen

NTP:

Chemical Name	CAS No.
No data available	

IARC:

Chemical Name	CAS No.	Group No.
Monograph 110 [in preparation]; Monograph 71 [1999]	75-09-2	Group 2A
Monograph 92 [2010]; Supplement 7 [1987]; Monograph 32 [1983]	193-39-5	Group 2B

12. ECOLOGICAL INFORMATION

Overview: Moderate ecological hazard. This product may be dangerous to plants and/or wildlife. Keep out of waterways.

Mobility: No data

Persistence: No data

Bioaccumulation: No data

Degradability: No data

Ecological Toxicity Data: No data available

13. DISPOSAL CONSIDERATIONS

Waste Description of Spent Product: Spent or discarded material is a hazardous waste.Mixing spent or discarded material with other materials may render the mixture hazardous. Perform a hazardous waste determination on mixtures.

Disposal Methods: Incinerate spent or discarded material a permitted hazardous waste facility.

Waste Disposal of Packaging: Comply with all Local, State, Federal, and Provincial

Environmental Regulations.

14. TRANSPORTATION INFORMATION

United States:
DOT Proper Shipping Name: Dichloromethane
UN Number: UN1593
Hazard Class: 6.1
Packing Group: III

International:
IATA Proper Shipping Name: Dichloromethane
UN Number: UN1593
Hazard Class: 6.1
Packing Group: III

Marine Pollutant: No

Chemical Name	CAS#	Marine Pollutant	Severe Marine Pollutant
No data available			

15. REGULATORY INFORMATION

United States:

Chemical Name	CAS#	CERCLA	SARA 313	SARA EHS 313	TSCA
Dichloromethane	75-09-2	X	X	-	X
indeno (1,2,3-c,d) pyrene	193-39-5	X	X	-	X

The following chemicals are listed on CA Prop 65:

Chemical Name	CAS #	Regulation
Indeno[1,2,3-cd]pyrene	193-39-5	Prop 65 Cancer
Dichloromethane Dichloromethane (Methylene chloride)	75-09-2	Prop 65 Cancer

State Right To Know Listing:

Chemical Name	CAS#	New Jersey	Massachusetts	Pennsylvania	California
Dichloromethane	75-09-2	X	X	X	X
indeno (1,2,3-c,d) pyrene	193-39-5	X	X	X	X

16. OTHER INFORMATION

Prior Version Date: 03/22/18
Other Information: Any changes to the SDS compared to previous versions are marked by a vertical line in front of the concerned paragraph.
References: No data available
Disclaimer: Restek Corporation provides the descriptions, data and information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. It is provided for your guidance only. Because many factors may affect processing or application/use, Restek Corporation recommends you perform an assessment to determine the suitability of a product for your particular purpose prior to use. No warranties of any kind, either expressed or implied, including fitness for a particular purpose, are made regarding products described, data or information set forth. In no case shall the descriptions, information, or data provided be considered a part of our terms and conditions of sale. Further, the descriptions, data and information furnished hereunder are given gratis. No obligation or liability for the description, data and information given are assumed. All such being given and accepted at your risk.

SAFETY DATA SHEET

Creation Date 16-Apr-2012 **Revision Date** 19-Jan-2018 **Revision Number** 3

1. Identification

Product Name **Cumene**

Cat No. : **AC329730000; AC329730025; AC329730050; AC329735000**

CAS-No 98-82-8
Synonyms Isopropylbenzene

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 3
Acute oral toxicity	Category 4
Skin Corrosion/irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Carcinogenicity	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system.	
Aspiration Toxicity	Category 1

Label Elements

Signal Word
Danger

Hazard Statements
Flammable liquid and vapor
Harmful if swallowed
Causes skin irritation
Causes eye irritation
Suspected of causing cancer
May cause respiratory irritation

May be fatal if swallowed and enters airways

Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Wear protective gloves/protective clothing/eye protection/face protection
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Response
Call a POISON CENTER or doctor/physician if you feel unwell
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Skin
Take off contaminated clothing and wash before reuse
IF ON SKIN: Wash with plenty of soap and water
If skin irritation 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
Ingestion
Rinse mouth
Do NOT induce vomiting
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Fire
Fight fire with normal precautions from a reasonable distance
Evacuate area
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. Cancer - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Cumene	98-82-8	>95

4. First-aid measures

General Advice	If symptoms persist, call a physician.
Eye Contact	Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Get medical attention.
Skin Contact	Wash off immediately with plenty of water for at least 15 minutes. Obtain medical attention.
Inhalation	Move to fresh air. Obtain medical attention. If not breathing, give artificial respiration. Risk of serious damage to the lungs.
Ingestion	Do not induce vomiting. Obtain medical attention. Call a physician or Poison Control Center immediately. If vomiting occurs naturally, have victim lean forward.
Most important symptoms and effects	Breathing difficulties. Symptoms of overexposure may be 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	Do not use a solid water stream as it may scatter and spread fire
Flash Point	31 °C / 87 °F
Method -	No information available
Autoignition Temperature	424 °C / 795 °F

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

Hazardous Combustion Products
Carbon monoxide (CO) Carbon dioxide (CO_2)
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
3	2	0	N/A

6. Accidental release measures

Personal Precautions	Use personal protective equipment. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges.
Environmental Precautions	Do not flush into surface water or sanitary sewer system.
Methods for Containment and Clean Up	Keep in suitable, closed containers for disposal. Soak up with inert absorbent material. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment. Take precautionary measures against static discharges.

7. Handling and storage

Handling Wear personal protective equipment. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. Take precautionary measures against static discharges. Use explosion-proof equipment.

Storage Keep container tightly closed in a dry and well-ventilated place. Keep away from heat and sources of ignition. Flammables area.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Cumene	TWA: 50 ppm	(Vacated) TWA: 50 ppm (Vacated) TWA: 245 mg/m^3 Skin TWA: 50 ppm TWA: 245 mg/m^3	IDLH: 900 ppm TWA: 50 ppm TWA: 245 mg/m^3	TWA: 50 ppm TWA: 245 mg/m^3 STEL: 75 ppm STEL: 365 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. Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting/equipment.

Personal Protective Equipment

Eye/face Protection Tightly fitting safety goggles. Face-shield.

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	No information available
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-96 °C / -141 °F
Boiling Point/Range	152 - 154 °C / 306 - 309 °F
Flash Point	31 °C / 87 °F
Evaporation Rate	No information available
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	5.3 hPa @ 20 °C
Vapor Density	No information available
Specific Gravity	0.862
Solubility	No information available
Partition coefficient; n-octanol/water	No data available

Autoignition Temperature	424 °C / 795 °F
Decomposition Temperature	No information available
Viscosity	0.79 mPa.s at 20 °C
Molecular Formula	C9 H12
Molecular Weight	120.19

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Excess heat. Incompatible products. Keep away from open flames, hot surfaces and sources of ignition.

Incompatible Materials Strong oxidizing agents

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
Cumene	1400 mg/kg (Rat) 2700 mg/kg (Rat)	LD50 = 12300 µL/kg (Rabbit)	LC50 > 3577 ppm (Rat) 6 h LC50 = 39000 mg/m³ (Rat) 4 h

Toxicologically Synergistic Products No information available

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

Irritation Irritating to eyes, 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
Cumene	98-82-8	Group 2B	Reasonably Anticipated	Not listed	X	Not listed

IARC: (International Agency for Research on Cancer)

IARC: (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
Group 2A - Probably Carcinogenic to Humans
Group 2B - Possibly Carcinogenic to Humans

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system
STOT - repeated exposure None known

Aspiration hazard Category 1

Symptoms / effects,both acute and delayed Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

The product contains following substances which are hazardous for the environment. Contains a substance which is:. Very toxic to aquatic organisms.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Cumene	EC50: = 2.6 mg/L, 72h (Pseudokirchneriella subcapitata)	LC50: = 4.8 mg/L, 96h flow-through (Oncorhynchus mykiss) LC50: 6.04 - 6.61 mg/L, 96h flow-through (Pimephales promelas) LC50: = 2.7 mg/L, 96h semi-static (Oncorhynchus mykiss) LC50: = 5.1 mg/L, 96h semi-static (Poecilia reticulata)	EC50 = 0.89 mg/L 5 min EC50 = 1.10 mg/L 15 min EC50 = 1.48 mg/L 30 min EC50 = 172 mg/L 24 h	EC50: 7.9 - 14.1 mg/L, 48h Static (Daphnia magna) EC50: = 0.6 mg/L, 48h (Daphnia magna)

Persistence and Degradability Persistence is unlikely

Bioaccumulation/ Accumulation No information available.

Mobility . Is not likely mobile in the environment due its low water solubility.

Component	log Pow
Cumene	3.7

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
Cumene - 98-82-8	U055	-

14. Transport information

DOT

UN-No UN1918
Proper Shipping Name ISOPROPYLBENZENE
Hazard Class 3
Packing Group III

TDG

UN-No UN1918
Proper Shipping Name ISOPROPYLBENZENE
Hazard Class 3
Packing Group III

IATA

UN-No UN1918
Proper Shipping Name ISOPROPYLBENZENE
Hazard Class 3

Packing Group III

IMDG/IMO

UN-No UN1918
Proper Shipping Name ISOPROPYLBENZENE
Hazard Class 3
Packing Group III

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Cumene	X	X	-	202-704-5	-		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 %
Cumene	98-82-8	>95	1.0

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act) Not applicable

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Cumene	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
Cumene	5000 lb	-

California Proposition 65 This product does not contain any Proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Cumene	98-82-8	Carcinogen	-	Carcinogen

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island

Cumene	X	X	X	X	X

U.S. Department of Transportation

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

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade Serious risk, Grade 3

16. Other information

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

Creation Date 16-Apr-2012
Revision Date 19-Jan-2018
Print Date 19-Jan-2018
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

1. Identification

Product identifier **p-Isopropyltoluene**

Other means of identification

Item N-12779

Synonyms p-Cymene * 1-Methyl-4-(1-methylethyl)benzene

Recommended use For Laboratory Use Only

Recommended restrictions None known.

Manufacturer/Importer/Supplier/Distributor information

Manufacturer

Company name Chem Service, Inc.

Address 660 Tower Lane
West Chester, PA 19380
United States

Telephone Toll Free 800-452-9994
Direct 610-692-3026

Website www.chemservice.com

E-mail info@chemservice.com

Emergency phone number Chemtrec US 800-424-9300
Chemtrec outside US +1 703-527-3887

2. Hazard(s) identification

Physical hazards	Flammable liquids	Category 3
Health hazards	Aspiration hazard	Category 1
Environmental hazards	Hazardous to the aquatic environment, acute hazard	Category 3
	Hazardous to the aquatic environment, long-term hazard	Category 3

OSHA defined hazards Not classified.

Label elements

Signal word Danger

Hazard statement Flammable liquid and vapor. May be fatal if swallowed and enters airways. Harmful to aquatic life. Harmful to aquatic life with long lasting effects.

Precautionary statement

Prevention 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. Avoid release to the environment. Wear protective gloves/eye protection/face protection.

Response If swallowed: Immediately call a poison center/doctor. If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower. Do NOT induce vomiting. In case of fire: Use appropriate media to extinguish.

Storage Store in a well-ventilated place. Keep cool. Store locked up.

Disposal Dispose of contents/container in accordance with local/regional/national/international regulations.

Hazard(s) not otherwise classified (HNOC) None known.

Supplemental information Not applicable.

3. Composition/information on ingredients

Substances

Chemical name	Common name and synonyms	CAS number	%
p-Isopropyltoluene	p-Cymene 1-Methyl-4-(1-methylethyl)benzene	99-87-6	100

*Designates that a specific chemical identity and/or percentage of composition has been withheld as a trade secret.

4. First-aid measures

Inhalation
Move to fresh air. Call a physician if symptoms develop or persist.

Skin contact
Take off immediately all contaminated clothing. Rinse skin with water/shower. Get medical attention if irritation develops and persists.

Eye contact
Immediately flush eyes with plenty of water for at least 15 minutes. Remove contact lenses, if present and easy to do. Get medical attention if irritation develops and persists.

Ingestion
Call a physician or poison control center immediately. Rinse mouth. Do not induce vomiting. If vomiting occurs, keep head low so that stomach content doesn't get into the lungs. Aspiration may cause pulmonary edema and pneumonitis.

Most important symptoms/effects, acute and delayed
Direct contact with eyes may cause temporary irritation.

Indication of immediate medical attention and special treatment needed
Provide general supportive measures and treat symptomatically. Thermal burns: Flush with water immediately. While flushing, remove clothes which do not adhere to affected area. Call an ambulance. Continue flushing during transport to hospital. Keep victim under observation. Symptoms may be delayed.

General information
Take off all contaminated clothing immediately. Ensure that medical personnel are aware of the material(s) involved, and take precautions to protect themselves. Wash contaminated clothing before reuse.

5. Fire-fighting measures

Suitable extinguishing media
Water fog. Foam. Dry chemical powder. Carbon dioxide (CO2).

Unsuitable extinguishing media
Do not use water jet as an extinguisher, as this will spread the fire.

Specific hazards arising from the chemical
Vapors may form explosive mixtures with air. Vapors may travel considerable distance to a source of ignition and flash back. During fire, gases hazardous to health may be formed.

Special protective equipment and precautions for firefighters
Self-contained breathing apparatus and full protective clothing must be worn in case of fire.

Fire fighting equipment/instructions
In case of fire and/or explosion do not breathe fumes. Move containers from fire area if you can do so without risk.

Specific methods
Use standard firefighting procedures and consider the hazards of other involved materials.

General fire hazards
Flammable liquid and vapor.

6. Accidental release measures

Personal precautions, protective equipment and emergency procedures
Keep unnecessary personnel away. Keep people away from and upwind of spill/leak. Keep out of low areas. Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Wear appropriate protective equipment and clothing during clean-up. Do not touch damaged containers or spilled material unless wearing appropriate protective clothing. Ventilate closed spaces before entering them. Local authorities should be advised if significant spillages cannot be contained. For personal protection, see section 8 of the SDS.

Methods and materials for containment and cleaning up
Eliminate all ignition sources (no smoking, flares, sparks, or flames in immediate area). Take precautionary measures against static discharge. Use only non-sparking tools. Keep combustibles (wood, paper, oil, etc.) away from spilled material.

Large Spills: Stop the flow of material, if this is without risk. Dike the spilled material, where this is possible. Cover with plastic sheet to prevent spreading. Use a non-combustible material like vermiculite, sand or earth to soak up the product and place into a container for later disposal. Prevent entry into waterways, sewer, basements or confined areas. Following product recovery, flush area with water.

Small Spills: Wipe up with absorbent material (e.g. cloth, fleece). Clean surface thoroughly to remove residual contamination.

Never return spills to original containers for re-use. For waste disposal, see section 13 of the SDS.

Environmental precautions	Avoid release to the environment. Contact local authorities in case of spillage to drain/aquatic environment. Prevent further leakage or spillage if safe to do so. Do not contaminate water. Avoid discharge into drains, water courses or onto the ground.

7. Handling and storage

Precautions for safe handling	Vapors may form explosive mixtures with air. Do not handle, store or open near an open flame, sources of heat or sources of ignition. Protect material from direct sunlight. Do not smoke. Take precautionary measures against static discharges. All equipment used when handling the product must be grounded. Use non-sparking tools and explosion-proof equipment. Provide adequate ventilation. Wear appropriate personal protective equipment. Observe good industrial hygiene practices. Wash hands thoroughly after handling. Avoid release to the environment. Do not empty into drains.
Conditions for safe storage, including any incompatibilities	Store locked up. Keep away from heat, sparks and open flame. Prevent electrostatic charge build-up by using common bonding and grounding techniques. Store in original tightly closed container. Store in a cool, dry place out of direct sunlight. Store in a well-ventilated place. Refrigeration recommended. Store away from incompatible materials (see Section 10 of the SDS). Keep in an area equipped with sprinklers.

8. Exposure controls/personal protection

Occupational exposure limits	No exposure limits noted for ingredient(s).
Biological limit values	No biological exposure limits noted for the ingredient(s).
Appropriate engineering controls	Explosion-proof general and local exhaust ventilation.

Individual protection measures, such as personal protective equipment

Eye/face protection	Wear safety glasses with side shields (or goggles).
Skin protection	
Hand protection	Wear protective gloves.
Other	Wear suitable protective clothing.
Respiratory protection	If engineering controls do not maintain airborne concentrations below recommended exposure limits (where applicable) or to an acceptable level (in countries where exposure limits have not been established), an approved respirator must be worn.
Thermal hazards	Wear appropriate thermal protective clothing, when necessary.
General hygiene considerations	When using, do not eat, drink or smoke. Always observe good personal hygiene measures, such as washing after handling the material and before eating, drinking, and/or smoking. Routinely wash work clothing and protective equipment to remove contaminants.

9. Physical and chemical properties

Appearance

Physical state	Liquid.
Form	Liquid
Color	Colorless
Odor	Not available.
Odor threshold	Not available.
pH	Not available.
Melting point/freezing point	-92.02 °F (-68.9 °C)
Initial boiling point and boiling range	350.78 °F (177.1 °C)
Flash point	117.0 °F (47.2 °C) Open Cup
Evaporation rate	Not available.
Flammability (solid, gas)	Not available.

Upper/lower flammability or explosive limits

Flammability limit - lower (%)	Not available.
Flammability limit - upper (%)	5.6
Explosive limit - lower (%)	Not available.
Explosive limit - upper (%)	Not available.

Vapor pressure	0.22 kPa at 25 °C
Vapor density	4.62
Relative density	Not available.
Solubility(ies)	
Solubility (water)	Insoluble
Partition coefficient (n-octanol/water)	4.1
Auto-ignition temperature	816.8 °F (436 °C)
Decomposition temperature	Not available.
Viscosity	Not available.
Other information	
Density	0.86 g/ml
Flammability class	Combustible II estimated
Molecular formula	C10-H14
Molecular weight	134.22 g/mol
Specific gravity	0.86 at 20 °C

10. Stability and reactivity

Reactivity	The product is stable and non-reactive under normal conditions of use, storage and transport.
Chemical stability	Material is stable under normal conditions.
Possibility of hazardous reactions	Hazardous polymerization does not occur.
Conditions to avoid	Avoid heat, sparks, open flames and other ignition sources. Avoid temperatures exceeding the flash point. Contact with incompatible materials.
Incompatible materials	Strong oxidizing agents.
Hazardous decomposition products	No hazardous decomposition products are known.

11. Toxicological information

Information on likely routes of exposure

Inhalation	May be fatal if swallowed and enters airways.
Skin contact	No adverse effects due to skin contact are expected.
Eye contact	Direct contact with eyes may cause temporary irritation.
Ingestion	May be fatal if swallowed and enters airways.
Symptoms related to the physical, chemical and toxicological characteristics	Direct contact with eyes may cause temporary irritation.

Information on toxicological effects

Acute toxicity	May be fatal if swallowed and enters airways. Expected to be a low hazard for usual industrial or commercial handling by trained personnel.

Product	Species	Test Results
p-Isopropyltoluene (CAS 99-87-6)		
Acute		
Oral		
LD50	Rat	4750 mg/kg

* Estimates for product may be based on additional component data not shown.

Skin corrosion/irritation	Prolonged skin contact may cause temporary irritation.
Serious eye damage/eye irritation	Direct contact with eyes may cause temporary irritation.
Respiratory or skin sensitization	
Respiratory sensitization	Not available.
Skin sensitization	This product is not expected to cause skin sensitization.

Germ cell mutagenicity No data available to indicate product or any components present at greater than 0.1% are mutagenic or genotoxic.

Carcinogenicity This product is not considered to be a carcinogen by IARC, ACGIH, NTP, or OSHA.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Reproductive toxicity This product is not expected to cause reproductive or developmental effects.

Specific target organ toxicity - single exposure Not classified.

Specific target organ toxicity - repeated exposure Not classified.

Aspiration hazard May be fatal if swallowed and enters airways.

12. Ecological information

Ecotoxicity Harmful to aquatic life with long lasting effects. Accumulation in aquatic organisms is expected.

Product		Species	Test Results
p-Isopropyltoluene (CAS 99-87-6)			
Aquatic			
Fish	LC50	Sheepshead minnow (Cyprinodon variegatus)	36 - 64 mg/l, 96 hours

* Estimates for product may be based on additional component data not shown.

Persistence and degradability No data is available on the degradability of this product.

Bioaccumulative potential Not available.

Partition coefficient n-octanol / water (log Kow)

4.1

Mobility in soil No data available.

Other adverse effects No other adverse environmental effects (e.g. ozone depletion, photochemical ozone creation potential, endocrine disruption, global warming potential) are expected from this component.

13. Disposal considerations

Disposal instructions Collect and reclaim or dispose in sealed containers at licensed waste disposal site. This material and its container must be disposed of as hazardous waste. Do not allow this material to drain into sewers/water supplies. Do not contaminate ponds, waterways or ditches with chemical or used container. Dispose of contents/container in accordance with local/regional/national/international regulations.

Local disposal regulations Dispose in accordance with all applicable regulations.

Hazardous waste code The waste code should be assigned in discussion between the user, the producer and the waste disposal company.

Waste from residues / unused products Dispose of in accordance with local regulations. Empty containers or liners may retain some product residues. This material and its container must be disposed of in a safe manner (see: Disposal instructions).

Contaminated packaging Empty containers should be taken to an approved waste handling site for recycling or disposal. Since emptied containers may retain product residue, follow label warnings even after container is emptied.

14. Transport information

DOT

UN number UN2046

UN proper shipping name Cymenes

Transport hazard class(es)

Class 3

Subsidiary risk -

Label(s) 3

Packing group III

Special precautions for user Read safety instructions, SDS and emergency procedures before handling.

Special provisions B1, IB3, T2, TP1

Packaging exceptions 150

Packaging non bulk 203

Packaging bulk	242

IATA

UN number	UN2046
UN proper shipping name	Cymenes
Transport hazard class(es)	
Class	3
Subsidiary risk	-
Packing group	III
Environmental hazards	No.
ERG Code	3L
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.
Other information	
Passenger and cargo aircraft	Allowed.
Cargo aircraft only	Allowed.

IMDG

UN number	UN2046
UN proper shipping name	CYMENES
Transport hazard class(es)	
Class	3
Subsidiary risk	-
Packing group	III
Environmental hazards	
Marine pollutant	Yes
EmS	F-E, S-D
Special precautions for user	Read safety instructions, SDS and emergency procedures before handling.

Transport in bulk according to Annex II of MARPOL 73/78 and the IBC Code Not available.

DOT

IATA; IMDG

Marine pollutant

General information IMDG Regulated Marine Pollutant.

15. Regulatory information

US federal regulations This product is a "Hazardous Chemical" as defined by the OSHA Hazard Communication Standard, 29 CFR 1910.1200.
All components are on the U.S. EPA TSCA Inventory List.

TSCA Section 12(b) Export Notification (40 CFR 707, Subpt. D)

Not regulated.

CERCLA Hazardous Substance List (40 CFR 302.4)

Not listed.

SARA 304 Emergency release notification

Not regulated.

US. OSHA Specifically Regulated Substances (29 CFR 1910.1001-1050)

Not listed.

Superfund Amendments and Reauthorization Act of 1986 (SARA)

Hazard categories Immediate Hazard - Yes
Delayed Hazard - No
Fire Hazard - Yes
Pressure Hazard - No
Reactivity Hazard - No

SARA 302 Extremely hazardous substance

Not listed.

SARA 311/312 Hazardous chemical Yes

SARA 313 (TRI reporting)

Not regulated.

Other federal regulations

Clean Air Act (CAA) Section 112 Hazardous Air Pollutants (HAPs) List

Not regulated.

Clean Air Act (CAA) Section 112(r) Accidental Release Prevention (40 CFR 68.130)

Not regulated.

Safe Drinking Water Act (SDWA) Not regulated.

US state regulations

US - New Jersey RTK - Substances: Listed substance

p-Isopropyltoluene (CAS 99-87-6)

US. California Controlled Substances. CA Department of Justice (California Health and Safety Code Section 11100)

Not listed.

US. Massachusetts RTK - Substance List

p-Isopropyltoluene (CAS 99-87-6)

US. New Jersey Worker and Community Right-to-Know Act

Not regulated.

US. Pennsylvania RTK - Hazardous Substances

p-Isopropyltoluene (CAS 99-87-6)

US. Pennsylvania Worker and Community Right-to-Know Law

p-Isopropyltoluene (CAS 99-87-6)

US. Rhode Island RTK

Not regulated.

US. California Proposition 65

California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65): This material is not known to contain any chemicals currently listed as carcinogens or reproductive toxins.

International Inventories

Country(s) or region	Inventory name	On inventory (yes/no)*
Australia	Australian Inventory of Chemical Substances (AICS)	Yes
Canada	Domestic Substances List (DSL)	Yes
Canada	Non-Domestic Substances List (NDSL)	No
China	Inventory of Existing Chemical Substances in China (IECSC)	Yes
Europe	European Inventory of Existing Commercial Chemical Substances (EINECS)	Yes
Europe	European List of Notified Chemical Substances (ELINCS)	No
Japan	Inventory of Existing and New Chemical Substances (ENCS)	Yes
Korea	Existing Chemicals List (ECL)	Yes
New Zealand	New Zealand Inventory	Yes
Philippines	Philippine Inventory of Chemicals and Chemical Substances (PICCS)	Yes
United States & Puerto Rico	Toxic Substances Control Act (TSCA) Inventory	Yes

*A "Yes" indicates that all components of this product comply with the inventory requirements administered by the governing country(s)
A "No" indicates that one or more components of the product are not listed or exempt from listing on the inventory administered by the governing country(s).

16. Other information, including date of preparation or last revision

Issue date 10-23-2014

Revision date 11-20-2015

Version # 02

Disclaimer The above information is believed to be correct on the date it was last revised and must not be considered all inclusive. The information has been obtained only by a search of available literature and is only a guide for handling the chemicals. OSHA regulations require that if other hazards become evident, an upgraded SDS must be made available to the employee within three months. RESPONSIBILITY for updates lies with the employer and not with CHEM SERVICE, Inc.

Persons not specifically and properly trained should not handle this chemical or its container. This product is furnished FOR LABORATORY USE ONLY! Our products may NOT BE USED as drugs, cosmetics, agricultural or pesticide products, food additives or as household chemicals.

This Safety Data Sheet (SDS) is intended only for use with Chem Service, Inc. products and should not be relied on for use with materials from any other supplier even if the chemical name(s) on the product are identical! Whenever using an SDS for a solution or mixture the user should refer to the SDS for every component of the solution or mixture. Chem Service warrants that this SDS is based upon the most current information available to Chem Service at the time it was last revised. THIS WARRANTY IS EXCLUSIVE, AND CHEM SERVICE, INC. MAKES NO OTHER WARRANTY, EXPRESSED OR IMPLIED, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR ANY PARTICULAR PURPOSE. This SDS is provided gratis and CHEM SERVICE, INC. SHALL NOT BE LIABLE FOR ANY INCIDENTAL, CONSEQUENTIAL OR CONTINGENT DAMAGES.

This product is furnished FOR LABORATORY USE ONLY.

Lead Metal Sheet

SECTION 1 : Identification of the substance/mixture and of the supplier

Product name : **Lead Metal Sheet**

Manufacturer/Supplier Trade name:

Manufacturer/Supplier Article number: **S25383A**

Recommended uses of the product and uses restrictions on use:

Manufacturer Details:

AquaPhoenix Scientific
9 Barnhart Drive, Hanover, PA 17331

Supplier Details:

Fisher Science Education
15 Jet View Drive, Rochester, NY 14624

Emergency telephone number:

Fisher Science Education Emergency Telephone No.: 800-535-5053

SECTION 2 : Hazards identification

Classification of the substance or mixture:

Irritant
Acute toxicity (oral, dermal, inhalation), category 4

Health hazard
Reproductive toxicity, category 1A
Specific target organ toxicity following repeated exposure, category 2

Environmentally Damaging
Acute hazards to the aquatic environment, category 1
Chronic hazards to the aquatic environment, category 1

Acute Tox. 4
Repr. 1A
STOT RE 2
Aquatic Acute 1
Aquatic Chronic 1
Hazards Not Otherwise Classified - Combustible Dust

Signal word :Danger

Hazard statements:
Harmful if swallowed
Harmful if inhaled
May damage fertility or the unborn child
May cause damage to organs through prolonged or repeated exposure
Very toxic to aquatic life
Very toxic to aquatic life with long lasting effects

Precautionary statements:
If medical advice is needed, have product container or label at hand

Keep out of reach of children
Read label before use
Wash skin thoroughly after handling
Do not eat, drink or smoke when using this product
Avoid release to the environment
Avoid breathing dust/fume/gas/mist/vapours/spray
Use only outdoors or in a well-ventilated area
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Do not eat, drink or smoke when using this product
Rinse mouth
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
IF exposed or concerned: Get medical advice/attention
Store locked up
Dispose of contents and container to an approved waste disposal plant

Combustible Dust Hazard: :
May form combustible dust concentrations in air (during processing).

Other Non-GHS Classification:

WHMIS

D2A

NFPA/HMIS

NFPA SCALE (0-4)

HMIS RATINGS (0-4)

SECTION 3 : Composition/information on ingredients

Ingredients:		
CAS 7439-92-1	Lead	100 %
		Percentages are by weight

SECTION 4 : First aid measures

Description of first aid measures

After inhalation: Loosen clothing as necessary and position individual in a comfortable position.Move exposed to fresh air. Give artificial respiration if necessary. If breathing is difficult give oxygen.Get medical assistance if cough or other symptoms appear.

After skin contact: Rinse/flush exposed skin gently using soap and water for 15-20 minutes.Seek medical advice if discomfort or irritation persists.

After eye contact: Protect unexposed eye. Rinse/flush exposed eye(s) gently using water for 15-20 minutes. Remove contact lens(es) if able to do so during rinsing. Seek medical attention if irritation persists or if concerned.

After swallowing: Rinse mouth thoroughly. Do not induce vomiting. Have exposed individual drink sips of water. Seek medical attention if irritation, discomfort or vomiting persists.

Most important symptoms and effects, both acute and delayed:

Irritation, Nausea,Headache, Shortness of breath.;

Indication of any immediate medical attention and special treatment needed:

If seeking medical attention, provide SDS document to physician.Physician should treat symptomatically.

SECTION 5 : Firefighting measures

Extinguishing media

Suitable extinguishing agents: Use appropriate fire suppression agents for adjacent combustible materials or sources of ignition. Use water, dry chemical, chemical foam, carbon dioxide, or alcohol-resistant foam.

For safety reasons unsuitable extinguishing agents:

Special hazards arising from the substance or mixture:

Lead oxides.Combustion products may include carbon oxides or other toxic vapors.Thermal decomposition can lead to release of irritating gases and vapors.

Advice for firefighters:

Protective equipment: Use NIOSH-approved respiratory protection/breathing apparatus.

Additional information (precautions): Move product containers away from fire or keep cool with water spray as a protective measure, where feasible.Use spark-proof tools and explosion-proof equipment.Avoid generating dust; fine dust dispersed in air in sufficient concentrations, and in the presence of an ignition source is a potential dust explosion hazard.Avoid inhaling gases, fumes, dust, mist, vapor, and aerosols.Avoid contact with skin, eyes, and clothing.

SECTION 6 : Accidental release measures

Personal precautions, protective equipment and emergency procedures:

Wear protective equipment. Use spark-proof tools and explosion-proof equipment.Ensure that air-handling systems are operational.Ensure adequate ventilation.

Environmental precautions:

Prevent from reaching drains, sewer or waterway. Collect contaminated soil for characterization per Section 13. Should not be released into environment.

Methods and material for containment and cleaning up:

Keep in suitable closed containers for disposal.Wear protective eyeware, gloves, and clothing. Refer to Section 8.Always obey local regulations.Dust deposits should not be allowed to accumulate on surfaces, as these may form an explosive mixture if they are released into the atmosphere in sufficient concentration. Avoid dispersal of dust in the air (i.e., clearing dust surfaces with compressed air). Collect solids in powder form using vacuum with (HEPA filter). Evacuate personnel to safe areas.

Reference to other sections:

SECTION 7 : Handling and storage

Precautions for safe handling:

Minimize dust generation and accumulation. Follow good hygiene procedures when handling chemical materials. Refer to Section 8.Do not eat, drink, smoke, or use personal products when handling chemical substances. Avoid contact with eyes, skin, and clothing.

Conditions for safe storage, including any incompatibilities:

Store away from incompatible materials.Protect from freezing and physical damage.Keep away from food and beverages.Provide ventilation for containers. Avoid storage near extreme heat, ignition sources or open flame. Store in cool, dry conditions in well sealed containers. Store with like hazards

SECTION 8 : Exposure controls/personal protection



Control Parameters: 7439-92-1, Lead, ACGIH TLV TWA 0.05 mg/m3
7439-92-1, Lead, NIOSH TWA 0.05 mg/m3

Appropriate Engineering controls: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use/handling.It is recommended that all dust control equipment such as local exhaust ventilation and material transport systems involved in handling of this product contain explosion relief vents or an explosion suppression system or an oxygen deficient environment.Ensure that dust-handling systems (such as exhaust ducts, dust collectors, vessels, and processing equipment) are designed in a manner to prevent the escape of dust into the work area (i.e., there is no leakage from the equipment).Use under a fume hood

Respiratory protection: Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls.When necessary use NIOSH approved breathing equipment.

Protection of skin: Select glove material impermeable and resistant to the substance.Select glove material based on rates of diffusion and degradation.Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices.Use proper glove removal technique without touching outer surface. Avoid skin contact with used gloves.Wear protective clothing.

Eye protection: Wear equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).Safety glasses or goggles are appropriate eye protection.

General hygienic measures: Perform routine housekeeping.Wash hands before breaks and at the end of work.Avoid contact with skin, eyes, and clothing.Before wearing wash contaminated clothing.

SECTION 9 : Physical and chemical properties

Appearance (physical state,color):	Bluish white, silver gray solid	**Explosion limit lower**: **Explosion limit upper**:	Not Determined Not Determined
Odor:	Not Determined	**Vapor pressure**:	1.3 mm Hg @970 C

Odor threshold:	Not Determined	**Vapor density**:	Not Determined
pH-value:	Not Determined	**Relative density**:	11.3
Melting/Freezing point:	327.4 C	**Solubilities**:	Insoluble in water.
Boiling point/Boiling range:	1740 C	**Partition coefficient (n-octanol/water)**:	Not Determined
Flash point (closed cup):	Not Determined	**Auto/Self-ignition temperature**:	Not Determined
Evaporation rate:	Not Determined	**Decomposition temperature**:	Not Determined
Flammability (solid,gaseous):	Not Determined	**Viscosity**:	a. Kinematic:Not Determined b. Dynamic: Not Determined
Density: Not Determined			

SECTION 10 : Stability and reactivity

Reactivity: Nonreactive under normal conditions.
Chemical stability: Stable under normal conditions.
Possible hazardous reactions: None under normal processing
Conditions to avoid: Incompatible Materials.
Incompatible materials: Strong acids, Strong oxidizing agents.Strong acids.Strong bases.Oxidizing agents.
Hazardous decomposition products: Lead oxides.

SECTION 11 : Toxicological information

Acute Toxicity: No additional information.	
Chronic Toxicity: No additional information.	
Corrosion Irritation: No additional information.	
Sensitization:	No additional information.
Single Target Organ (STOT):	No additional information.
Numerical Measures:	No additional information.
Carcinogenicity:	IARC: 2B : Possibly carcinogenic to humans (Lead) NTP: Reasonably anticipated to be a human carcinogen (Lead)
Mutagenicity:	No additional information.
Reproductive Toxicity:	Reproductive toxicity - rat - Inhalation Effects on Newborn: Biochemical and metabolic.Reproductive toxicity - rat - Oral Effects on Newborn: Behavioral.

SECTION 12 : Ecological information

Ecotoxicity

LC50 - Micropterus dolomieui : 2.2 mg/l - 96.0 h

EC50 - Skeletonema costatum: 7.94 mg/l - 10 d

Persistence and degradability:
Bioaccumulative potential:
Mobility in soil:
Other adverse effects:

SECTION 13 : Disposal considerations

Waste disposal recommendations:

Contact a licensed professional waste disposal service to dispose of this material.Dispose of empty containers as unused product.It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities (US 40CFR262.11).Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations. Ensure complete and accurate classification.

SECTION 14 : Transport information

UN-Number

3077

UN proper shipping name

Environmentally hazardous substance, solid, n.o.s. (Lead)

Transport hazard class(es)

Class:
9 Miscellaneous dangerous substances and articles

Packing group:III
Environmental hazard:
Transport in bulk:
Special precautions for user:

SECTION 15 : Regulatory information

United States (USA)

SARA Section 311/312 (Specific toxic chemical listings):

Acute, Chronic

SARA Section 313 (Specific toxic chemical listings):

7439-92-1 Lead

RCRA (hazardous waste code):

None of the ingredients is listed

TSCA (Toxic Substances Control Act):

All ingredients are listed.

CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act):

7439-92-1 Lead 10 lbs.

Proposition 65 (California):

Chemicals known to cause cancer:

None of the ingredients is listed

Chemicals known to cause reproductive toxicity for females:

None of the ingredients is listed

Chemicals known to cause reproductive toxicity for males:

None of the ingredients is listed

Chemicals known to cause developmental toxicity:

None of the ingredients is listed

Canada

Canadian Domestic Substances List (DSL):

All ingredients are listed.

Canadian NPRI Ingredient Disclosure list (limit 0.1%):

None of the ingredients is listed

Canadian NPRI Ingredient Disclosure list (limit 1%):

None of the ingredients is listed

SECTION 16 : Other information

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations.Note:. The responsibility to provide a safe workplace remains with the user.The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment.The information contained herein is, to the best of our knowledge and belief, accurate.However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material.It is the responsibility of the user to comply with all applicable laws and regulations applicable to this material.

GHS Full Text Phrases:

Abbreviations and acronyms:
IMDG: International Maritime Code for Dangerous Goods
PNEC: Predicted No-Effect Concentration (REACH)
CFR: Code of Federal Regulations (USA)
SARA: Superfund Amendments and Reauthorization Act (USA)
RCRA: Resource Conservation and Recovery Act (USA)
TSCA: Toxic Substances Control Act (USA)
NPRI: National Pollutant Release Inventory (Canada)
DOT: US Department of Transportation
IATA: International Air Transport Association
GHS: Globally Harmonized System of Classification and Labelling of Chemicals
ACGIH: American Conference of Governmental Industrial Hygienists
CAS: Chemical Abstracts Service (division of the American Chemical Society)
NFPA: National Fire Protection Association (USA)
HMIS: Hazardous Materials Identification System (USA)
WHMIS: Workplace Hazardous Materials Information System (Canada)
DNEL: Derived No-Effect Level (REACH)

Effective date : 02.11.2015
Last updated : 03.19.2015

Manganese

Print

SAFETY DATA SHEET

1 PRODUCT AND SUPPLIER IDENTIFICATION

Product Name: Manganese - flake, pieces, rod, target

Formula: Mn

Supplier: ESPI Metals

1050 Benson Way

Ashland, OR 97520

Telephone: 800-638-2581

Fax: 541-488-8313

Email: sales@espimetals.com

Emergency: Infotrac 800-535-5053 (US) or 352-323-3500 (24 hour)

Recommended Uses: Scientific Research

2 HAZARDS IDENTIFICATION

GHS Classification (29 CFR 1910.1200): Not classified as hazardous

GHS Label Elements:

Signal Word: N/A

Hazard Statements: N/A

Precautionary Statements: N/A

3 COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient: Manganese

CAS#: 7439-96-5

%: 100

EC#: 231-105-1

4 FIRST AID MEASURES

General Measures: No special requirements.

INHALATION: Remove to fresh air, keep warm and quiet, give oxygen if breathing is difficult. Seek medical attention.

INGESTION: Rinse mouth with water. Do not induce vomiting. Seek medical attention. Never induce vomiting or give anything by mouth to an unconscious person.

SKIN: Remove contaminated clothing, brush material off skin, wash affected area with soap and water. Seek medical attention if symptoms develop or persist.

EYES: Flush eyes with lukewarm water, including under upper and lower eyelids, for at least 15 minutes. Seek medical attention if symptoms develop or persist.

Most Important Symptoms/Effects, Acute and Delayed: May cause irritation. See section 11 for more information.

Indication of Immediate Medical Attention and Special Treatment: No other relevant information available.

5 FIREFIGHTING MEASURES

Extinguishing Media: Use Class D dry powder extinguishing agent.

Unsuitable Extinguishing Media: Do not use water, foam, halogenated gas or carbon dioxide.

Specific Hazards Arising from the Material: This product does not present fire or explosion hazards as shipped. Dust from processing may be flammable when exposed to heat, sparks or flame. May emit toxic metal oxide fumes under fire conditions.

Special Protective Equipment and Precautions for Firefighters: Full face, self-contained breathing apparatus and full protective clothing when necessary.

6 ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment, and Emergency Procedures: Wear appropriate respiratory and protective equipment specified in section 8. Isolate spill area and provide ventilation. Avoid breathing dust or fume. Avoid contact with skin and eyes. Eliminate all sources of ignition.

Methods and Materials for Containment and Cleaning Up: Avoid dust formation. Sweep or scoop up and place in a closed container for further handling and disposal.

Environmental Precautions: Do not allow to be released to the environment.

7 HANDLING AND STORAGE

Precautions for Safe Handling: Avoid creating dust. Avoid breathing dust or fumes. Provide adequate ventilation if dusts are created. Avoid contact with skin and eyes. Wash thoroughly before eating or smoking. See section 8 for information on personal protection equipment.

Conditions for Safe Storage: Store in a cool, dry area. Store in a closed container. Protect from moisture. Do not store together with oxidizers, acids or halogens. See section 10 for more information on incompatible materials.

8 EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits: Manganese

OSHA/PEL: 5 mg/m^3

ACGIH/TLV: 0.2 mg/m^3

Engineering Controls: Ensure adequate ventilation to maintain exposures below occupational limits. Whenever possible the use of local exhaust ventilation or other engineering controls is the preferred method of controlling exposure to airborne dust and fume to meet established occupational exposure limits. Use good housekeeping and sanitation practices. Do not allow dusts to accumulate as they may present a fire hazard. Do not use tobacco or food in work area. Wash thoroughly before eating or smoking. Do not blow dust off clothing or skin with compressed air.

Respiratory Protection: If permissible levels are exceeded, use NIOSH approved dust respirator.

Eye Protection: Safety glasses

Skin Protection: Wear impermeable gloves, protective work clothing as necessary.

9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance:

Form: Solid in various forms

Color: Gray metallic

Odor: Odorless

Odor Threshold: Not determined

pH: N/A

Melting Point: 1244±3 ^oC

Boiling Point: 1962 ^oC

Flash Point: N/A

Evaporation Rate: N/A

Flammability: No data

Upper Flammable Limit: No data

Lower Flammable Limit: N/A

Vapor Pressure: 1 mm Hg @ 1292 ^{o}C

Vapor Density: N/A

Relative Density (Specific Gravity): 7.20 g/cc

Solubility in H_2O: Decomposes

Partition Coefficient (n-octanol/water): Not determined

Autoignition Temperature: No data

Decomposition Temperature: No data

Viscosity: N/A

10 STABILITY AND REACTIVITY

Reactivity: No data

Chemical Stability: Stable under recommended storage conditions.

Possibility of Hazardous Reactions: Manganese dusts dispersed in air in sufficient concentrations, and in the presence of an ignition source, may be flammable in open spaces or explosive in confined spaces.

Conditions to Avoid: Avoid creating or accumulating fines or dusts.

Incompatible Materials: Acids, water or steam, halogens, hydrogen peroxide, nitrous oxide, phosphorous vapor, sulfur dioxide, all alkalis.

Hazardous Decomposition Products: Manganese oxide fume, hydrogen gas.

11 TOXICOLOGICAL INFORMATION

Likely Routes of Exposure: Inhalation, skin, eyes.

Symptoms of Exposure: May cause irritation if dusts or fumes are inhaled or swallowed. Fines/dusts may irritate skin and eyes.

Acute and Chronic Effects: Chronic inhalation exposure of humans to high levels of manganese may result in a syndrome called manganism which typically begins with feelings of weakness and lethargy and progresses to other symptoms such as gait disturbances, clumsiness, tremors, speech disturbances, a mask-like facial expression and psychological disturbances. Manganese is an essential micronutrient in humans.

Acute Toxicity: No data

Carcinogenicity: **NTP**: Not identified as carcinogenic **IARC**: Not identified as carcinogenic

To the best of our knowledge the chemical, physical and toxicological characteristics of the substance are not fully known.

12 ECOLOGICAL INFORMATION

Ecotoxicity: No data

Persistence and Degradability: No data

Bioaccumulative Potential: No data

Mobility in Soil: No data

Other Adverse Effects: Possibly harmful to aquatic life. Do not allow material to be released to the environment without proper governmental permits. No further relevant information available.

13 DISPOSAL CONSIDERATIONS

Waste Disposal Method:

Product: Dispose of in accordance with Federal, State and Local regulations.

Packaging: Dispose of in accordance with Federal, State and Local regulations.

14 TRANSPORT INFORMATION

Shipping Regulations: Not regulated

UN Number: N/A

UN Proper Shipping Name: N/A

Transport Hazard Class: N/A

Packing Group: N/A

Marine Pollutant: No

15 REGULATORY INFORMATION

TSCA Listed: All components are listed.

Regulation (EC) No 1272/2008 (CLP): N/A

Canada WHMIS Classification (CPR, SOR/88-66): N/A

HMIS Ratings: **Health**: 0 **Flammability**: 0 **Physical**: 0

NFPA Ratings: **Health**: 0 **Flammability**: 0 **Instability**: 0

Chemical Safety Assessment: A chemical safety assessment has not been carried out.

16 OTHER INFORMATION

The information contained in this document is based on the state of our knowledge at the time of publication and is believed to be correct, but does not purport to be all inclusive and shall be used only as a guide. ESPI Metals makes no representation, warranty, or guarantee of any kind with respect to the information contained in this document or any use of the product based on this information. ESPI Metals shall not be held liable for any damages resulting from handling or from contact with the above product. Users should satisfy themselves that they have all current data relevant to their particular use.

Prepared by: ESPI Metals

Revised/Reviewed: July 2015

SAFETY DATA SHEET

Creation Date 20-Aug-2014 **Revision Date** 17-Jan-2018 **Revision Number** 3

1. Identification

Product Name **Mercury (Certified ACS)**

Cat No. : **M141-1LB; M141-6LB**

Synonyms Colloidal mercury; Hydrargyrum; Metallic mercury

Recommended Use Laboratory chemicals.
Uses advised against 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)

Corrosive to metals	Category 1
Acute Inhalation Toxicity - Vapors	Category 2
Reproductive Toxicity	Category 1B
Specific target organ toxicity - (repeated exposure)	Category 1
Target Organs - Central nervous system (CNS), Kidney.	

Label Elements

Signal Word
Danger

Hazard Statements
May be corrosive to metals
Fatal if inhaled
May damage the unborn child
Causes damage to organs through prolonged or repeated exposure

Precautionary Statements
Prevention
Obtain special instructions before use
Do not handle until all safety precautions have been read and understood
Use personal protective equipment as required
Do not get in eyes, on skin, or on clothing
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Do not breathe dust/fume/gas/mist/vapors/spray
Use only outdoors or in a well-ventilated area
Wear respiratory 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
Immediately call a POISON CENTER or doctor/physician
Skin
Immediately call a POISON CENTER or doctor/physician
IF ON SKIN: Gently wash with plenty of soap and water
Remove/Take off immediately all contaminated clothing
Wash contaminated clothing before reuse
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Very toxic to aquatic life with long lasting effects
WARNING. Reproductive Harm - https://www.p65warnings.ca.gov/.

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Mercury	7439-97-6	100

4. First-aid measures

Eye Contact Rinse immediately with plenty of water, also under the eyelids, for at least 15 minutes. Immediate medical attention is required.

Skin Contact Wash off immediately with soap and plenty of water while removing all contaminated clothes and shoes. Immediate medical attention is required.

Inhalation Move to fresh air. If breathing is difficult, give oxygen. Do not use mouth-to-mouth method if victim ingested or inhaled the substance; give artificial respiration with the aid of a pocket mask equipped with a one-way valve or other proper respiratory medical device. Immediate medical attention is required.

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

Most important symptoms and effects No information available.

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media Substance is nonflammable; use agent most appropriate to extinguish surrounding fire.

Unsuitable Extinguishing Media No information available

Flash Point No information available
Method - No information available

Autoignition Temperature No information available

Explosion Limits
Upper No data available
Lower No data available
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Very toxic. Non-combustible, substance itself does not burn but may decompose upon heating to produce corrosive and/or toxic fumes. Keep product and empty container away from heat and sources of ignition.

Hazardous Combustion Products
Mercury oxide Highly toxic fumes
Protective Equipment and Precautions for Firefighters
As in any fire, wear self-contained breathing apparatus pressure-demand, MSHA/NIOSH (approved or equivalent) and full protective gear.

NFPA

Health	Flammability	Instability	Physical hazards
4	0	0	N/A

6. Accidental release measures

Personal Precautions Wear self-contained breathing apparatus and protective suit. Evacuate personnel to safe areas. Ensure adequate ventilation. Do not get in eyes, on skin, or on clothing.

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

Methods for Containment and Clean Up Wear self-contained breathing apparatus and protective suit. Soak up with inert absorbent material. Keep in suitable, closed containers for disposal.

7. Handling and storage

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

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

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Mercury	TWA: 0.025 mg/m³ Skin	(Vacated) TWA: 0.05 mg/m³ Ceiling: 0.1 mg/m³ (Vacated) STEL: 0.03 mg/m³ Skin (Vacated) Ceiling: 0.1 mg/m³	IDLH: 10 mg/m³ TWA: 0.05 mg/m³ Ceiling: 0.1 mg/m³	TWA: 0.05 mg/m³

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 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	Silver
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	-38.87 °C / -38 °F
Boiling Point/Range	356.72 °C / 674.1 °F
Flash Point	No information available
Evaporation Rate	No information available
Flammability (solid,gas)	No information available
Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	0.002 mmHg @ 25 °C
Vapor Density	7.0
Specific Gravity	13.59 (H2O=1)
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	No information available
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	Hg
Molecular Weight	200.59

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat.

Incompatible Materials Strong oxidizing agents, Ammonia, Metals, Halogens

Hazardous Decomposition Products Mercury oxide, Highly toxic fumes

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information No acute toxicity information is available for this product

Component Information

Toxicologically Synergistic Products No information available

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

Irritation No information available

Sensitization No information available

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

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Mercury	7439-97-6	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects May cause harm to the unborn child.

Teratogenicity No information available.

STOT - single exposure None known

STOT - repeated exposure Central nervous system (CNS) Kidney

Aspiration hazard No information available

Symptoms / effects,both acute and delayed No information available

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

This product contains the following substance(s) which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Mercury	Not listed	0.9 mg/L LC50 96h 0.18 mg/L LC50 96h 0.16 mg/L LC50 96h 0.5 mg/L LC50 96h	Not listed	EC50: = 5.0 µg/L, 96h (water flea)

Persistence and Degradability No information available

Bioaccumulation/ Accumulation No information available.

Mobility No information available.

13. Disposal considerations

Waste Disposal Methods

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

Component	RCRA - U Series Wastes	RCRA - P Series Wastes
Mercury - 7439-97-6	U151	-

14. Transport information

DOT

UN-No	UN2809
Proper Shipping Name	MERCURY
Hazard Class	8
Subsidiary Hazard Class	6.1
Packing Group	III

TDG

UN-No	UN2809
Proper Shipping Name	MERCURY
Hazard Class	8
Subsidiary Hazard Class	6.1
Packing Group	III

IATA

UN-No	UN2809
Proper Shipping Name	MERCURY
Hazard Class	8
Subsidiary Hazard Class	6.1
Packing Group	III

IMDG/IMO

UN-No	UN2809
Proper Shipping Name	MERCURY
Hazard Class	8
Subsidiary Hazard Class	6.1
Packing Group	III

15. Regulatory information

International Inventories

Component	TSCA	DSL	NDSL	EINECS	ELINCS	NLP	PICCS	ENCS	AICS	IECSC	KECL
Mercury	X	X	-	231-106-7	-		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)

Component	TSCA 12(b)
Mercury	Section 5

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
Mercury	7439-97-6	100	1.0

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

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

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
Mercury	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
Mercury	1 lb	-

California Proposition 65 This product contains the following proposition 65 chemicals

Component	CAS-No	California Prop. 65	Prop 65 NSRL	Category
Mercury	7439-97-6	Developmental	-	Developmental

U.S. State Right-to-Know Regulations

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

U.S. Department of Transportation

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

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

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

Creation Date 20-Aug-2014
Revision Date 17-Jan-2018
Print Date 17-Jan-2018
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 27-Jan-2010 **Revision Date** 17-Jan-2018 **Revision Number** 6

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; D37RS1000ASME; NC1485726; D37RE200ASME; NC1568702; NC1641358; XXMECLDOW2000; XXMECLDOW200LI**

CAS-No 75-09-2
Synonyms Dichloromethane; DCM

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company
Fisher Scientific
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).	
Specific target organ toxicity - (repeated exposure)	Category 2
Target Organs - Liver, Kidney, Blood.	

Label Elements

Signal Word
Danger

Hazard Statements
Causes skin irritation
Causes serious eye irritation
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
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. Cancer - https://www.p65warnings.ca.gov/.

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. Get

medical attention.

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

Inhalation 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 and effects None reasonably foreseeable. 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 (CO_2) 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	Flammability	Instability	Physical hazards
2	1	0	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment. Ensure adequate ventilation.
Environmental Precautions Should not be released into the environment.

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. Ensure adequate ventilation.

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: 50 ppm

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 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	sweet
Odor Threshold	No information available
pH	No information available
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 H2 Cl2
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 (CO_2), 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/m³ (Rat) 4 h

Toxicologically Synergistic Products No information available

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

Irritation Irritating to eyes and skin

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)

IARC: (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
Group 2A - Probably Carcinogenic to Humans
Group 2B - Possibly Carcinogenic to Humans

NTP: (National Toxicity Program)

NTP: (National Toxicity Program)
Known - Known Carcinogen
Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen

ACGIH: (American Conference of Governmental Industrial Hygienists)

A1 - Known Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Animal Carcinogen
ACGIH: (American Conference of Governmental Industrial Hygienists)

Mexico - Occupational Exposure Limits - Carcinogens

Mexico - Occupational Exposure Limits - Carcinogens
A1 - Confirmed Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Confirmed Animal Carcinogen
A4 - Not Classifiable as a Human Carcinogen
A5 - Not Suspected as a Human Carcinogen

Mutagenic Effects Mutagenic effects have occured in microorganisms.

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

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

Endocrine Disruptor Information No information available

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

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

United States of America Inventory

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
Methylene chloride	75-09-2	X	ACTIVE	R

Legend:
TSCA - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed
R - Indicates a substance that is the subject of a Section 6 risk management rule under TSCA.

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
Methylene chloride	75-09-2	X	-	200-838-9	X	X	X	X	KE-23893

U.S. Federal Regulations

SARA 313

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

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
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	17-Jan-2018
Print Date	17-Jan-2018
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).

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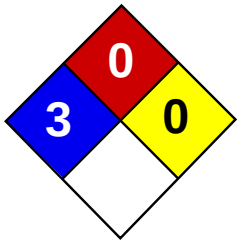
End of SDS



Health	3
Fire	0
Reactivity	0
Personal Protection	E

Material Safety Data Sheet
Pentachlorophenol MSDS

Section 1: Chemical Product and Company Identification

Product Name: Pentachlorophenol

Catalog Codes: SLP3943, SLP1126

CAS#: 87-86-5

RTECS: SM6300000

TSCA: TSCA 8(b) inventory: Pentachlorophenol

CI#: Not available.

Synonym:

Chemical Name: Not available.

Chemical Formula: C6Cl5OH

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Pentachlorophenol	87-86-5	100

Toxicological Data on Ingredients: Pentachlorophenol: ORAL (LD50): Acute: 27 mg/kg [Rat]. 117 mg/kg [Mouse]. VAPOR (LC50): Acute: 502 ppm 4 hour(s) [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion. Hazardous in case of skin contact (permeator), of inhalation. Slightly hazardous in case of skin contact (corrosive, sensitizer). Severe over-exposure can result in death. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Not available. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to blood, kidneys, lungs, the nervous system, liver, mucous membranes. Repeated or prolonged exposure to the substance can produce target organs damage. Repeated exposure to an highly toxic material may produce general deterioration of health by an accumulation in one or many human organs.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do not induce vomiting. Examine the lips and mouth to ascertain whether the tissues are damaged, a possible indication that the toxic material was ingested; the absence of such signs, however, is not conclusive. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Non-flammable.

Auto-Ignition Temperature: Not applicable.

Flash Points: Not applicable.

Flammable Limits: Not applicable.

Products of Combustion: Not available.

Fire Hazards in Presence of Various Substances: Not applicable.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions: Not applicable.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:
Use a shovel to put the material into a convenient waste disposal container. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up Keep container dry. Do not ingest. Do not breathe dust. Never add water to this product In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

Storage:
Keep container tightly closed. Keep in a cool, well-ventilated place. Highly toxic or infectious materials should be stored in a separate locked safety storage cabinet or room.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection:
Splash goggles. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.5 (mg/m3) from ACGIH Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid.

Odor: Pungent. (Strong.)

Taste: Not available.

Molecular Weight: 266.34 g/mole

Color: White.

pH (1% soln/water): Not available.

Boiling Point: Decomposes. (310°C or 590°F)

Melting Point: 188°C (370.4°F)

Critical Temperature: Not available.

Specific Gravity: 1.987 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: 9.2 (Air = 1)

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility: Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 27 mg/kg [Rat]. Acute toxicity of the vapor (LC50): 502 ppm 4 hour(s) [Rat].

Chronic Effects on Humans: The substance is toxic to blood, kidneys, lungs, the nervous system, liver, mucous membranes.

Other Toxic Effects on Humans:
Very hazardous in case of skin contact (irritant), of ingestion. Hazardous in case of skin contact (permeator), of inhalation. Slightly hazardous in case of skin contact (corrosive, sensitizer).

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Chlorophenol, solid : UN2020 PG: III

Special Provisions for Transport: Marine Pollutant

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Pentachlorophenol California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Pentachlorophenol Pennsylvania RTK: Pentachlorophenol Massachusetts RTK: Pentachlorophenol TSCA 8(b) inventory: Pentachlorophenol SARA 313 toxic chemical notification and release reporting: Pentachlorophenol

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1A: Material causing immediate and serious toxic effects (VERY TOXIC). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R38- Irritating to skin. R41- Risk of serious damage to eyes. R48/20- Harmful: danger of serious damage to health by prolonged exposure through inhalation. R48/25- Toxic: danger of serious damage to health in case of prolonged exposure if swallowed.

HMIS (U.S.A.):

Health Hazard: 3

Fire Hazard: 0

Reactivity: 0

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 3

Flammability: 0

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 11:12 AM

Last Updated: 05/21/2013 12:00 PM

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Methyl tert-Butyl Ether

Safety Data Sheet

according to Federal Register / Vol. 77, No. 58 / Monday, March 26, 2012 / Rules and Regulations

Date of issue: 06/01/2015 Revision date: 06/01/2015 Supersedes: 12/06/2012

SECTION 1: Identification

1.1. Identification

Product form	:	Substance
Trade name	:	Methyl tert-Butyl Ether
CAS No	:	1634-04-4
Product code	:	HP-040900-FP
Formula	:	C5H12O
Synonyms	:	tert-Butyl methyl ether / Ether, methyl tert-butyl / Ether, tert-butyl methyl / 2-Methoxy-2-methylpropane / Propane, 2-methoxy-2-methyl- / Methyl tertiary-butyl ether / MTBE / tertiary-Butyl methyl ether / 2-Methyl-2-methoxypropane / Methyl-tert-butyl-ether / Methyl tert-butylether / Tert-butyl-methyl ether / Methyl tertiary butyl ether

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

Use of the substance/mixture	:	Octane booster for gasolines; manufacture of isobutene; extraction solvent, etc.

1.3. Details of the supplier of the safety data sheet

Monument Chemical
16717 Jacintoport Blvd.
Houston, TX 77015 - USA
T (281) 452-5951 - F (281) 457-1127
sds@monumentchemical.com - www.monumentchemical.com

1.4. Emergency telephone number

Emergency number	:	24 HR CHEMTREC: 1-800-424-9300; 24 HR Emergency Assistance: 1-832-376-2026

SECTION 2: Hazard(s) identification

2.1. Classification of the substance or mixture

GHS-US classification

Flam. Liq. 2	H225 -	Highly flammable liquid and vapour
Skin Irrit. 2	H315 -	Causes skin irritation

Full text of H-phrases: see section 16

2.2. Label elements

GHS-US labeling

Hazard pictograms (GHS-US) :

GHS02 GHS07

Signal word (GHS-US) : Danger

Hazard statements (GHS-US) :
H225 - Highly flammable liquid and vapor
H315 - Causes skin irritation

Precautionary statements (GHS-US) :
P210 - Keep away from heat, hot surfaces, open flames, sparks. - No smoking
P233 - Keep container tightly closed
P240 - Ground/bond container and receiving equipment
P241 - Use explosion-proof electrical, lighting, ventilating equipment
P242 - Use only non-sparking tools
P243 - Take precautionary measures against static discharge
P264 - Wash hands thoroughly after handling
P280 - Wear eye protection, protective clothing, protective gloves
P302+P352 - If on skin: Wash with plenty of water
P303+P361+P353 - If on skin (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
P321 - Specific treatment (see a doctor on this label)
P332+P313 - If skin irritation occurs: Get medical advice/attention
P362+P364 - Take off contaminated clothing and wash it before reuse
P370+P378 - In case of fire: Use alcohol resistant foam, carbon dioxide (CO2), dry extinguishing powder, Water spray to extinguish
P403+P235 - Store in a well-ventilated place. Keep cool
P501 - Dispose of contents/container to hazardous or special waste collection point, in

accordance with local, regional, national and/or international regulation

2.3. Other hazards

No additional information available

2.4. Unknown acute toxicity (GHS US)

Not applicable

SECTION 3: Composition/Information on ingredients

3.1. Substance

Name	Product identifier	%	GHS-US classification
Methyl tert-Butyl Ether (Main constituent)	(CAS No) 1634-04-4	100	Flam. Liq. 2, H225 Skin Irrit. 2, H315

Full text of H-phrases: see section 16

3.2. Mixture

Not applicable

SECTION 4: First aid measures

4.1. Description of first aid measures

First-aid measures general : Never give anything by mouth to an unconscious person. If you feel unwell, seek medical advice (show the label where possible).

First-aid measures after inhalation : Allow victim to breathe fresh air. Allow the victim to rest.

First-aid measures after skin contact : Rinse skin with water/shower. Remove/Take off immediately all contaminated clothing. Wash with plenty of soap and water. Wash contaminated clothing before reuse. If skin irritation occurs: Wash with plenty of soap and water, Get medical advice/attention. Get medical advice/attention. Specific treatment (see Consult a doctor/medical service on this label).

First-aid measures after eye contact : Rinse immediately with plenty of water. Obtain medical attention if pain, blinking or redness persist.

First-aid measures after ingestion : Rinse mouth. Do NOT induce vomiting. Obtain emergency medical attention.

4.2. Most important symptoms and effects, both acute and delayed

Symptoms/injuries after skin contact : Causes skin irritation.

4.3. Indication of any immediate medical attention and special treatment needed

No additional information available

SECTION 5: Firefighting measures

5.1. Extinguishing media

Suitable extinguishing media : Foam. Dry powder. Carbon dioxide. Water spray. Sand.

Unsuitable extinguishing media : Do not use a heavy water stream.

5.2. Special hazards arising from the substance or mixture

Fire hazard : Highly flammable liquid and vapor.

Explosion hazard : May form flammable/explosive vapor-air mixture.

5.3. Advice for firefighters

Firefighting instructions : Use water spray or fog for cooling exposed containers. Exercise caution when fighting any chemical fire. Prevent fire-fighting water from entering environment.

Protection during firefighting : Do not enter fire area without proper protective equipment, including respiratory protection.

SECTION 6: Accidental release measures

6.1. Personal precautions, protective equipment and emergency procedures

General measures : Remove ignition sources. Use special care to avoid static electric charges. No open flames. No smoking.

6.1.1. For non-emergency personnel

Emergency procedures : Evacuate unnecessary personnel.

6.1.2. For emergency responders

Protective equipment : Equip cleanup crew with proper protection.

Emergency procedures : Ventilate area.

6.2. Environmental precautions

Prevent entry to sewers and public waters. Notify authorities if liquid enters sewers or public waters.

6.3. Methods and material for containment and cleaning up

Methods for cleaning up : Soak up spills with inert solids, such as clay or diatomaceous earth as soon as possible. Collect spillage. Store away from other materials.

6.4. Reference to other sections

See Heading 8. Exposure controls and personal protection.

SECTION 7: Handling and storage

7.1. Precautions for safe handling

Additional hazards when processed : Handle empty containers with care because residual vapors are flammable.

Precautions for safe handling : Wash hands and other exposed areas with mild soap and water before eating, drinking or smoking and when leaving work. Provide good ventilation in process area to prevent formation of vapor. No open flames. No smoking. Use only non-sparking tools.

Hygiene measures : Wash hands thoroughly after handling.

7.2. Conditions for safe storage, including any incompatibilities

Technical measures : Proper grounding procedures to avoid static electricity should be followed. Ground/bond container and receiving equipment. Use explosion-proof electrical, lighting, Ventilation equipment.

Storage conditions : Keep only in the original container in a cool, well ventilated place away from : Ignition sources, Incompatible materials. Keep in fireproof place. Keep container tightly closed.

Incompatible products : Strong bases. Strong acids.

Incompatible materials : Sources of ignition. Direct sunlight. Heat sources.

SECTION 8: Exposure controls/personal protection

8.1. Control parameters

Methyl tert-Butyl Ether (1634-04-4)		
ACGIH	ACGIH TWA (ppm)	50 ppm
ACGIH	Remark (ACGIH)	URT irr; kidney dam

8.2. Exposure controls

Personal protective equipment : Avoid all unnecessary exposure.

Hand protection : Wear protective gloves.

Eye protection : Chemical goggles or safety glasses.

Skin and body protection : Wear suitable protective clothing.

Respiratory protection : Wear appropriate mask.

Other information : Do not eat, drink or smoke during use.

SECTION 9: Physical and chemical properties

9.1. Information on basic physical and chemical properties

Physical state : Liquid

Appearance : Clear, colorless liquid.

Color : Colorless clear

Odor : characteristic ether-like

Odor threshold : No data available

pH : No data available

Melting point : -108.6 °C ; -163.5 °F

Freezing point : No data available

Boiling point : 55.2 °C ; 131.0 °F

Flash point : -33 °C ; -27.4 °F (closed cup)

Relative evaporation rate (butyl acetate=1) : No data available

Flammability (solid, gas) : No data available

Explosion limits : 1.5 - 8.5 vol %

Explosive properties : No data available

Oxidizing properties : No data available

Vapor pressure	:	268 hPa (at 20 °C)
Relative density	:	0.74
Relative vapor density at 20 °C	:	3
Specific gravity / density	:	0.74 g/cm³ (at 20 °C)
Molecular mass	:	88.2 g/mol
Solubility	:	Water: 50 g/l (at 25 °C)
Log Pow	:	1.06 (at 23 °C)
Auto-ignition temperature	:	375 °C ; 705.2 °F
Decomposition temperature	:	No data available
Viscosity	:	No data available
Viscosity, kinematic	:	No data available
Viscosity, dynamic	:	No data available

9.2. Other information

No additional information available

SECTION 10: Stability and reactivity

10.1. Reactivity

No additional information available

10.2. Chemical stability

Highly flammable liquid and vapor. May form flammable/explosive vapor-air mixture.

10.3. Possibility of hazardous reactions

Not established.

10.4. Conditions to avoid

Direct sunlight. Extremely high or low temperatures. Open flame.

10.5. Incompatible materials

Strong acids. Strong bases.

10.6. Hazardous decomposition products

fume. Carbon monoxide. Carbon dioxide. May release flammable gases.

SECTION 11: Toxicological information

11.1. Information on toxicological effects

Acute toxicity : Not classified

Methyl tert-Butyl Ether (1634-04-4)	
LD50 oral rat	2963 mg/kg
LD50 dermal rabbit	10000 mg/kg
LC50 inhalation rat (mg/l)	85 mg/l/4h
LC50 inhalation rat (ppm)	23576 ppm/4h
ATE US (oral)	2963.000 mg/kg body weight
ATE US (dermal)	10000.000 mg/kg body weight
ATE US (gases)	23576.000 ppmV/4h
ATE US (vapors)	85.000 mg/l/4h
ATE US (dust, mist)	85.000 mg/l/4h

Skin corrosion/irritation	:	Causes skin irritation.
Serious eye damage/irritation	:	Not classified
Respiratory or skin sensitization	:	Not classified
Germ cell mutagenicity	:	Not classified
Carcinogenicity	:	Not classified

Methyl tert-Butyl Ether (1634-04-4)	
IARC group	3 - Not classifiable

Reproductive toxicity	:	Not classified
Specific target organ toxicity (single exposure)	:	Not classified

Specific target organ toxicity (repeated exposure)	:	Not classified
Aspiration hazard	:	Not classified
Potential Adverse human health effects and symptoms	:	Based on available data, the classification criteria are not met.
Symptoms/injuries after skin contact	:	Causes skin irritation.

SECTION 12: Ecological information

12.1. Toxicity

Methyl tert-Butyl Ether (1634-04-4)	
LC50 fish 1	672 mg/l (Exposure time: 96 h - Species: Pimephales promelas [flow-through])
EC50 Daphnia 1	542 mg/l (Exposure time: 48 h - Species: Daphnia magna)
LC50 fish 2	929 mg/l (Exposure time: 96 h - Species: Pimephales promelas [static])

12.2. Persistence and degradability

Methyl tert-Butyl Ether (1634-04-4)	
Persistence and degradability	Not established.

12.3. Bioaccumulative potential

Methyl tert-Butyl Ether (1634-04-4)	
BCF fish 1	(no bioaccumulation expected)
Log Pow	1.06 (at 23 °C)
Bioaccumulative potential	Not established.

12.4. Mobility in soil

No additional information available

12.5. Other adverse effects

Other information	:	Avoid release to the environment.

SECTION 13: Disposal considerations

13.1. Waste treatment methods

Waste disposal recommendations	:	Dispose in a safe manner in accordance with local/national regulations. Dispose of contents/container to hazardous or special waste collection point, in accordance with local, regional, national and/or international regulation.
Additional information	:	Handle empty containers with care because residual vapors are flammable.
Ecology - waste materials	:	Avoid release to the environment.

SECTION 14: Transport information

Department of Transportation (DOT)

In accordance with DOT

Transport document description	:	UN2398 Methyl tert-butyl ether, 3, II
UN-No.(DOT)	:	UN2398
Proper Shipping Name (DOT)	:	Methyl tert-butyl ether
Transport hazard class(es) (DOT)	:	3 - Class 3 - Flammable and combustible liquid 49 CFR 173.120
Hazard labels (DOT)	:	3 - Flammable liquid

Packing group (DOT)	:	II - Medium Danger
DOT Packaging Non Bulk (49 CFR 173.xxx)	:	202
DOT Packaging Bulk (49 CFR 173.xxx)	:	242

DOT Special Provisions (49 CFR 172.102)	:	IB2 - Authorized IBCs: Metal (31A, 31B and 31N); Rigid plastics (31H1 and 31H2); Composite (31HZ1). Additional Requirement: Only liquids with a vapor pressure less than or equal to 110 kPa at 50 C (1.1 bar at 122 F), or 130 kPa at 55 C (1.3 bar at 131 F) are authorized. T7 - 4 178.274(d)(2) Normal..... 178.275(d)(3) TP1 - The maximum degree of filling must not exceed the degree of filling determined by the following: Degree of filling = 97 / 1 + a (tr - tf) Where: tr is the maximum mean bulk temperature during transport, and tf is the temperature in degrees celsius of the liquid during filling.
DOT Packaging Exceptions (49 CFR 173.xxx)	:	150
DOT Quantity Limitations Passenger aircraft/rail (49 CFR 173.27)	:	5 L
DOT Quantity Limitations Cargo aircraft only (49 CFR 175.75)	:	60 L
DOT Vessel Stowage Location	:	E - The material may be stowed ''on deck'' or ''under deck'' on a cargo vessel and on a passenger vessel carrying a number of passengers limited to not more than the larger of 25 passengers, or one passenger per each 3 m of overall vessel length, but is prohibited from carriage on passenger vessels in which the limiting number of passengers is exceeded.
Emergency Response Guide (ERG) Number	:	127
Other information	:	No supplementary information available.

TDG

No additional information available

Transport by sea

UN-No. (IMDG)	:	2398
Proper Shipping Name (IMDG)	:	METHYL tert-BUTYL ETHER
Class (IMDG)	:	3 - Flammable liquids
Packing group (IMDG)	:	II - substances presenting medium danger

Air transport

UN-No. (IATA)	:	2398
Proper Shipping Name (IATA)	:	Methyl tert-butyl ether
Class (IATA)	:	3 - Flammable Liquids
Packing group (IATA)	:	II - Medium Danger

SECTION 15: Regulatory information

15.1. US Federal regulations

Methyl tert-Butyl Ether (1634-04-4)	
Listed on the United States TSCA (Toxic Substances Control Act) inventory Subject to reporting requirements of United States SARA Section 313	
RQ (Reportable quantity, section 304 of EPA's List of Lists)	1000 lb
SARA Section 313 - Emission Reporting	1.0 %

15.2. International regulations

CANADA

Methyl tert-Butyl Ether (1634-04-4)
Listed on the Canadian DSL (Domestic Substances List)

EU-Regulations

No additional information available

National regulations

Methyl tert-Butyl Ether (1634-04-4)
Listed on the AICS (Australian Inventory of Chemical Substances) Listed on IECSC (Inventory of Existing Chemical Substances Produced or Imported in China) Listed on the Japanese ENCS (Existing & New Chemical Substances) inventory Listed on the Japanese ISHL (Industrial Safety and Health Law) Listed on the Korean ECL (Existing Chemicals List) Listed on NZIoC (New Zealand Inventory of Chemicals) Listed on PICCS (Philippines Inventory of Chemicals and Chemical Substances) Listed on INSQ (Mexican national Inventory of Chemical Substances) Listed on Turkish inventory of chemical

15.3. US State regulations

Methyl tert-Butyl Ether (1634-04-4)	
State or local regulations	U.S. - Massachusetts - Right To Know List U.S. - New Jersey - Right to Know Hazardous Substance List U.S. - Pennsylvania - RTK (Right to Know) - Environmental Hazard List U.S. - Pennsylvania - RTK (Right to Know) List

SECTION 16: Other information

Revision date : 06/01/2015

Other information : None.

Full text of H-phrases:

Flam. Liq. 2	Flammable liquids Category 2
Skin Irrit. 2	Skin corrosion/irritation Category 2
H225	Highly flammable liquid and vapor
H315	Causes skin irritation

SDS US (GHS HazCom 2012)

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Naphthalene

SECTION 1 : Identification of the substance/mixture and of the supplier

Product name : **Naphthalene**

Manufacturer/Supplier Trade name:

Manufacturer/Supplier Article number: **S25441**

Recommended uses of the product and uses restrictions on use:

Manufacturer Details:

AquaPhoenix Scientific
9 Barnhart Drive, Hanover, PA 17331

Supplier Details:

Fisher Science Education
15 Jet View Drive, Rochester, NY 14624

Emergency telephone number:

Fisher Science Education Emergency Telephone No.: 800-535-5053

SECTION 2 : Hazards identification

Classification of the substance or mixture:

Explosive
Organic peroxides, type B

Flammable
Organic peroxides, type B

Irritant
Eye irritation, category 2A
Skin sensitization, category 1

Organic peroxides Type B
Eye Irrit. 2A
Skin Sens. 1

Signal word :Danger

Hazard statements:
Heating may cause a fire or explosion
May cause an allergic skin reaction
Causes serious eye irritation

Precautionary statements:
If medical advice is needed, have product container or label at hand
Keep out of reach of children
Read label before use
Keep away from heat/sparks/open flames/hot surfaces. No smoking
Keep/Store away from clothing/combustible materials
Keep only in original container
Avoid breathing dust/fume/gas/mist/vapours/spray

Wash skin thoroughly after handling
Contaminated work clothing should not be allowed out of the workplace
Wear protective gloves/protective clothing/eye protection/face protection
IF ON SKIN: Wash with soap and water
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses if present and easy to do. Continue rinsing
Specific treatment (see supplemental first aid instructions on this label)
If skin irritation or a rash occurs: Get medical advice/attention
If eye irritation persists get medical advice/attention
Wash contaminated clothing before reuse
Protect from sunlight
Store at temperatures not exceeding ... °C/... °F. Keep cool
Store away from other materials
Dispose of contents and container to an approved waste disposal plant

Other Non-GHS Classification:

WHMIS

C 

F 

D2B 

NFPA/HMIS

NFPA SCALE (0-4)

HMIS RATINGS (0-4)

SECTION 3 : Composition/information on ingredients

Ingredients:		
CAS 94-36-0	Benzoyl Peroxide	100 %
		Percentages are by weight

SECTION 4 : First aid measures

Description of first aid measures

After inhalation: Move exposed to fresh air. Give artificial respiration if necessary. If breathing is difficult give oxygen.Loosen clothing and place exposed in a comfortable position.Seek medical assistance if cough or other symptoms appear.

After skin contact: Wash hands and exposed skin with soap and plenty of water. Seek medical attention if irritation persists or if concerned.

After eye contact: Protect unexposed eye.Flush exposed eye gently using water for 15-20 minutes. Remove contact lenses while rinsing.Seek medical attention if irritation persists or concerned.

After swallowing: Rinse mouth with water.Do not induce vomiting. Never give anything by mouth to an unconscious person.Seek medical attention if irritation, discomfort, or vomiting persists.

Most important symptoms and effects, both acute and delayed:

Irritation.Shortness of breath.Headache.Nausea.Dizziness.;

Indication of any immediate medical attention and special treatment needed:

If seeking medical attention provide SDS document to physician. Physician should treat symptomatically.Move out of dangerous area

SECTION 5 : Firefighting measures

Extinguishing media

Suitable extinguishing agents: Use water spray, dry chemical, carbon dioxide, or chemical foam.

For safety reasons unsuitable extinguishing agents: Do NOT use halogenated agents or foam

Special hazards arising from the substance or mixture:

Thermal decomposition can lead to release of irritating gases and vapors.Oxidizer. Contact with combustible materials may cause a fire. Dry residue is explosive. Will burn if involved in a fire. This material poses an explosion hazard when exposed to heat, friction or when agitated.Explosion hazard if exposed to mechanical shock.

Advice for firefighters:

Protective equipment: Wear protective eyeware, gloves, and clothing. Refer to Section 8.

Additional information (precautions): Avoid inhaling gases, fumes, dust, mist, vapor, and aerosols. Avoid contact with skin, eyes, and clothing.Explosion hazard if exposed to mechanical shock.

SECTION 6 : Accidental release measures

Personal precautions, protective equipment and emergency procedures:

Ensure adequate ventilation.Ensure that air-handling systems are operational.Avoid contact with skin, eyes and clothing.

Environmental precautions:

Should not be released into environment.Prevent from reaching drains, sewer, or waterway.

Methods and material for containment and cleaning up:

Wear protective eyeware, gloves, and clothing. Refer to Section 8.Avoid dust generation.Remove all sources of ignition.Always obey local regulations.If necessary use trained response staff or contractor. Evacuate personnel to safe areas. Containerize for disposal. Refer to Section 13.Keep in suitable closed containers for disposal.Keep combustibles away from spill area.Sweep up spillage and collect in suitable container for disposal.Use spark-proof tools and explosion-proof equipment.

Reference to other sections:

SECTION 7 : Handling and storage

Precautions for safe handling:

Avoid contact with skin, eyes, and clothing.Follow good hygiene procedures when handling chemical materials. Refer to Section 8.Follow proper disposal methods. Refer to Section 13.Do not eat, drink, smoke, or use personal products when handling chemical substances.Use under a chemical fume hood.

Conditions for safe storage, including any incompatibilities:

Store in a cool location.Keep away from food and beverages.Protect from freezing and physical damage.Provide ventilation for containers. Keep container tightly sealed. Store away from incompatible materials. Keep in temperatures below 40C. Store away from combustibles. Material can explode if dry.

SECTION 8 : Exposure controls/personal protection

Control Parameters:	94-36-0, Benzoyl Peroxide, ACGIH TLV TWA 5 mg/m3 94-36-0, Benzoyl Peroxide, OSHA PEL TWA 5 mg/m3
Appropriate Engineering controls:	Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling. Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapor and mists below the applicable workplace exposure limits (Occupational Exposure Limits-OELs) indicated above.
Respiratory protection:	Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls.When necessary use NIOSH approved breathing equipment. Use under a chemical fume hood.
Protection of skin:	Select glove material impermeable and resistant to the substance.Select glove material based on rates of diffusion and degradation. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices.Use proper glove removal technique without touching outer surface. Avoid skin contact with used gloves.Wear protective clothing.
Eye protection:	Wear equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).Safety glasses or goggles are appropriate eye protection.
General hygienic measures:	Perform routine housekeeping.Wash hands before breaks and immediately after handling the product.Avoid contact with skin, eyes, and clothing.Before rewearing wash contaminated clothing.

SECTION 9 : Physical and chemical properties

Appearance (physical state,color):	White powder	**Explosion limit lower**: **Explosion limit upper**:	Not Determined Not Determined
Odor:	Weak odor	**Vapor pressure**:	Not Determined
Odor threshold:	Not Determined	**Vapor density**:	Not Determined
pH-value:	Not Determined	**Relative density**:	Not Determined
Melting/Freezing point:	104-106C	**Solubilities**:	Slightly in water

Naphthalene

Boiling point/Boiling range:	Not Determined	**Partition coefficient (n-octanol/water)**:	Not Determined
Flash point (closed cup):	Not Determined	**Auto/Self-ignition temperature**:	Not Determined
Evaporation rate:	Not Determined	**Decomposition temperature**:	Not Determined
Flammability (solid,gaseous):	Not Determined	**Viscosity**:	a. Kinematic:Not Determined b. Dynamic: Not Determined
Density: Not Determined			

SECTION 10 : Stability and reactivity

Reactivity: Nonreactive under normal conditions.
Chemical stability: Organic peroxides may undergo hazardous decomposition
Possible hazardous reactions: None under normal processing.
Conditions to avoid: Incompatible materials.Mechanical shock, ignition sources, excess heat, combustible materials, organic matter, excess temperatures
Incompatible materials: Strong oxidizing agents.Alcohols. metals
Hazardous decomposition products: Carbon oxides.

SECTION 11 : Toxicological information

Acute Toxicity:		
Oral:		LD50 Rat: 7,710 mg/kg
Chronic Toxicity: No additional information.		
Corrosion Irritation:		
Ocular:		Rabbit: Mild Eye Irritation - 24 - h
Sensitization:		No additional information.
Single Target Organ (STOT):		No additional information.
Numerical Measures:		No additional information.
Carcinogenicity:		No additional information.
Mutagenicity:		Not mutagenic in AMES Test
Reproductive Toxicity:		No additional information.

SECTION 12 : Ecological information

Ecotoxicity Persistence and degradability: Expected to be biodegradable
Bioaccumulative potential: Not Determined
Mobility in soil: Not Determined
Other adverse effects: None identified.

SECTION 13 : Disposal considerations

Waste disposal recommendations:

Contact a licensed professional waste disposal service to dispose of this material.Dispose of empty containers as unused product.Product or containers must not be disposed together with household garbage. It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities (US 40CFR262.11). Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations. Ensure complete and accurate classification.

SECTION 14 : Transport information

UN-Number

3104

UN proper shipping name

Organic peroxide type B, solid (Benzoyl peroxide)

Transport hazard class(es)

Class:
5.2 Organic peroxides

Packing group:II
Environmental hazard:
Transport in bulk:
Special precautions for user:

SECTION 15 : Regulatory information

United States (USA)

SARA Section 311/312 (Specific toxic chemical listings):

Reactive, Acute

SARA Section 313 (Specific toxic chemical listings):

94-36-0 Benzoyl peroxide

RCRA (hazardous waste code):

None of the ingredients is listed

TSCA (Toxic Substances Control Act):

All ingredients are listed.

CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act):

None of the ingredients is listed

Proposition 65 (California):

Chemicals known to cause cancer:

None of the ingredients is listed

Chemicals known to cause reproductive toxicity for females:

None of the ingredients is listed

Chemicals known to cause reproductive toxicity for males:

None of the ingredients is listed

Chemicals known to cause developmental toxicity:

None of the ingredients is listed

Naphthalene

Canada

Canadian Domestic Substances List (DSL):

All ingredients are listed.

Canadian NPRI Ingredient Disclosure list (limit 0.1%):

None of the ingredients is listed

Canadian NPRI Ingredient Disclosure list (limit 1%):

94-36-0 Benzoyl peroxide

SECTION 16 : Other information

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations. Note: . The responsibility to provide a safe workplace remains with the user. The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment.The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material. It is the responsibility of the user to comply with all applicable laws and regulations applicable to this material.

GHS Full Text Phrases:

Abbreviations and acronyms:

Effective date : 01.31.2015
Last updated : 03.19.2015

Nickel

Print

SAFETY DATA SHEET

1 PRODUCT AND SUPPLIER IDENTIFICATION

Product Name: Nickel - pellets, pieces, shot, sheet, foil, rod, wire, target

Formula: Ni

Supplier: ESPI Metals

1050 Benson Way

Ashland, OR 97520

Telephone: 800-638-2581

Fax: 541-488-8313

Email: sales@espimetals.com

Emergency: Infotrac 800-535-5053 (US) or 352-323-3500 (24 hour)

Recommended Uses: Scientific Research

2 HAZARDS IDENTIFICATION

GHS Classification (29 CFR 1910.1200): Not classified as hazardous

GHS Label Elements:

Signal Word: N/A

Hazard Statements: N/A

Precautionary Statements: N/A

3 COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient: Nickel

CAS#: 7440-02-0

%: >99

EC#: 231-111-4

4 FIRST AID MEASURES

General Measures: No special requirements.

INHALATION: Remove to fresh air, keep warm and quiet, give oxygen if breathing is difficult. Seek medical attention.

INGESTION: Rinse mouth with water. Do not induce vomiting. Seek medical attention. Never induce vomiting or give anything by mouth to an unconscious person.

SKIN: Remove contaminated clothing, brush material off skin, wash affected area with soap and water. Seek medical attention if symptoms develop or persist.

EYES: Flush eyes with lukewarm water, including under upper and lower eyelids, for at least 15 minutes. Seek medical attention if symptoms develop or persist.

Most Important Symptoms/Effects, Acute and Delayed: May cause irritation. See section 11 for more information.

Indication of Immediate Medical Attention and Special Treatment: No other relevant information available.

5 FIREFIGHTING MEASURES

Extinguishing Media: Use extinguishing agent suitable for surrounding material and type of fire.

Unsuitable Extinguishing Media: No information available.

Specific Hazards Arising from the Material: May emit toxic metal oxide fumes under fire conditions.

Special Protective Equipment and Precautions for Firefighters: Full face, self-contained breathing apparatus and full protective clothing when necessary.

6 ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment, and Emergency Procedures: Wear appropriate respiratory and protective equipment specified in section 8. Isolate spill area and provide ventilation. Avoid breathing dust or fume. Avoid contact with skin and eyes.

Methods and Materials for Containment and Cleaning Up: Avoid dust formation. Sweep or scoop up. Place in properly labeled closed containers.

Environmental Precautions: Do not allow to be released to the environment.

7 HANDLING AND STORAGE

Precautions for Safe Handling: Avoid creating dust. Avoid breathing dust or fumes. Provide adequate ventilation if dusts are created. Avoid contact with skin and eyes. Wash thoroughly before eating or smoking. See section 8 for information on personal protection equipment.

Conditions for Safe Storage: Store in a cool, dry area. Store away from acids. See section 10 for more information on incompatible materials.

8 EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits: Nickel

OSHA/PEL: 1 mg/m^3

ACGIH/TLV: 1.5 mg/m^3

Engineering Controls: Ensure adequate ventilation to maintain exposures below occupational limits. Whenever possible the use of local exhaust ventilation or other engineering controls is the preferred method of controlling exposure to airborne dust and fume to meet established occupational exposure limits. Use good housekeeping and sanitation practices. Do not use tobacco or food in work area. Wash thoroughly before eating or smoking. Do not blow dust off clothing or skin with compressed air.

Respiratory Protection: If permissible levels are exceeded, use NIOSH approved dust respirator.

Eye Protection: Safety glasses

Skin Protection: Wear impermeable gloves, protective work clothing as necessary.

9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance:

Form: Solid in various forms

Color: Silver gray metallic

Odor: Odorless

Odor Threshold: Not determined

pH: N/A

Melting Point: 1455 ^oC

Boiling Point: 2730 ^oC

Flash Point: N/A

Evaporation Rate: N/A

Flammability: N/A

Upper Flammable Limit: N/A

Lower Flammable Limit: N/A

Vapor Pressure: 1 mm Hg @ 1810 ^{o}C

Vapor Density: N/A

Relative Density (Specific Gravity): 8.9 g/cc

Solubility in H_2O: Insoluble

Partition Coefficient (n-octanol/water): Not determined

Autoignition Temperature: N/A

Decomposition Temperature: No data

Viscosity: N/A

10 STABILITY AND REACTIVITY

Reactivity: No data

Chemical Stability: Stable under recommended storage conditions.

Possibility of Hazardous Reactions: No data.

Conditions to Avoid: Avoid creating or accumulating fines or dusts.

Incompatible Materials: Acids.

Hazardous Decomposition Products: Nickel oxide fume.

11 TOXICOLOGICAL INFORMATION

Likely Routes of Exposure: Inhalation, skin, eyes.

Symptoms of Exposure: May cause irritation. May cause an allergic reaction in sensitized individuals.

Acute and Chronic Effects: The most common harmful health effect of metallic nickel in humans is an allergic skin reaction in those who are sensitive to nickel. Although nickel compounds are known human carcinogens, the evidence suggests that the relatively insoluble metallic nickel is less likely to present a carcinogenic hazard than are the nickel compounds that tend to release proportionately more nickel ion.

Acute Toxicity: No data

Carcinogenicity: **NTP**: R - reasonably anticipated to be a human carcinogen **IARC**: 2B - possibly carcinogenic to humans

To the best of our knowledge the chemical, physical and toxicological characteristics of the substance are not fully known.

12 ECOLOGICAL INFORMATION

Ecotoxicity: No data

Persistence and Degradability: No data

Bioaccumulative Potential: No data

Mobility in Soil: No data

Other Adverse Effects: Do not allow material to be released to the environment without proper governmental permits. No further relevant information available.

13 DISPOSAL CONSIDERATIONS

Waste Disposal Method:

Product: Dispose of in accordance with Federal, State and Local regulations.

Packaging: Dispose of in accordance with Federal, State and Local regulations.

14 TRANSPORT INFORMATION

Shipping Regulations: Not regulated

UN Number: N/A

UN Proper Shipping Name: N/A

Transport Hazard Class: N/A

Packing Group: N/A

Marine Pollutant: No

15 REGULATORY INFORMATION

TSCA Listed: All components are listed.

Regulation (EC) No 1272/2008 (CLP): N/A

Canada WHMIS Classification (CPR, SOR/88-66): N/A

HMIS Ratings: **Health**: 1 **Flammability**: 0 **Physical**: 0

NFPA Ratings: **Health**: 1 **Flammability**: 0 **Instability**: 0

Chemical Safety Assessment: A chemical safety assessment has not been carried out.

16 OTHER INFORMATION

The information contained in this document is based on the state of our knowledge at the time of publication and is believed to be correct, but does not purport to be all inclusive and shall be used only as a guide. ESPI

Metals makes no representation, warranty, or guarantee of any kind with respect to the information contained in this document or any use of the product based on this information. ESPI Metals shall not be held liable for any damages resulting from handling or from contact with the above product. Users should satisfy themselves that they have all current data relevant to their particular use.

Prepared by: ESPI Metals

Revised/Reviewed: July 2015

PCB DISPOSAL

MATERIAL SAFETY DATA SHEET

(POLYCHLORINATED BIPHENYLS)

COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients Name: polychlorinated biphenyls (PCBs)

HAZARD IDENTIFICATION

Reports of Carcinogenicity: YES

HEALTH HAZARDS ACUTE AND CHRONIC

- **Eyes**: Moderately irritating to eye tissues.
- **Skin**: Can be absorbed through intact skin, may cause de-fatting, potential for chloracne.
- **Inhalation**: Possible liver injury.
- **Ingestion**: Slightly toxic; reasonably anticipated to be carcinogenic.

EFFECTS OF OVER-EXPOSURE

Can cause dermatological symptoms; however, these are reversible upon removal of exposure source.

FIRST AID MEASURES

- **Eyes**: Irrigate immediately with copious quantities of running water for at least 15 minutes if liquid or solid PCBs get into them.
- **Skin:** Contaminated clothing should be removed and the skin washed thoroughly with soap and water. Hot PCBs may cause thermal burns.
- **Inhalation**: Remove to fresh air; if skin rash or respiratory irritation persists, consult a physician (if electrical equipment arcs over, PCBs may decompose to produce hydrochloric acid).
- **Ingestion**: Consult a physician. Do not induce vomiting or give any oily laxatives. (If large amounts are ingested, gastric lavage is suggested).

FIRE FIGHTING MEASURES: Flash Point: >141 ^{o}C (285.8 ^{o}F)

EXTINGUISHING MEDIA: PCBs are fire-resistant compounds.

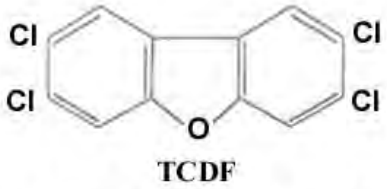
FIRE-FIGHTING PROCEDURES

Standard fire-fighting wearing apparel and self-contained breathing apparatus should be worn when fighting fires that involve possible exposure to chemical combustion products. Fire fighting equipment should be thoroughly cleaned and decontaminated after use.

UNUSUAL FIRE/EXPLOSION HAZARD

If a PCB transformer is involved in a fire-related incident, the owner of the transformer is required to report the incident. Consult and follow appropriate federal, provincial and local regulations.

***Note**: When askarel liquid becomes involved in a fire, toxic by-products of combustion are typically produced including polychlorinated dibenzofurans and polychlorinated dibenzodioxins, both known carcinogens. The structures of these chemical species are as follows:*

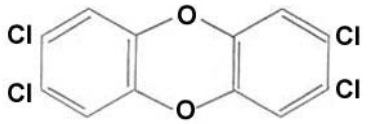


$C_{12}H_{8-n}Cl_nO$

$n = 4 - 8$

TCDF

2,3,7,8-tetrachlorodibenzofuran



$C_{12}H_{8-n}Cl_nO_2$

$n = 4 - 8$

TCDD

2,3,7,8-tetrachloro-dibenzo-p-dioxin

***Note**: 2,3,7,8-tetrachloro-dibenzo-p-dioxin is one of the most potent teratogenic, mutagenic and carcinogenic agents known to man.*

SPILL RELEASE PROCEDURES

Cleanup & disposal of liquid PCBs are strictly regulated by the federal government. Ventilate area. Contain spill/leak. Remove spill by means of absorptive material. Spill clean-up personnel should use proper protective clothing. All wastes and residues containing PCBs should be collected, containerized, marked and disposed of in the manner prescribed by applicable federal, provincial and local laws.

HANDLING AND STORAGE PRECAUTIONS

Care should be taken to prevent entry into the environment through spills, leakage, use, vaporization, or disposal of liquid. Avoid prolonged breathing of vapours or mists. Avoid contact with eyes or prolonged contact with skin. Comply with all federal, provincial and local regulations.

OTHER PRECAUTIONS

Federal regulations require PCBs, PCB items, storage areas, transformer vaults, and transport vehicles to be appropriately labelled.

RESPIRATORY PROTECTION

Use OHSA approved equipment when airborne exposure limits are exceeded. Full facepiece equipment is recommended and, if used, replaces need for face shield and/or chemical splash goggles. The respirator use limitations specified by the manufacturer must be observed.

VENTILATION

Provide natural or mechanical ventilation to control exposure levels below airborne exposure levels.

PROTECTIVE GLOVES: Wear appropriate chemical resistant gloves to prevent skin contact.

EYE PROTECTION: Wear chemical splash goggles and have eye baths available.

OTHER PROTECTIVE EQUIPMENT

Wear appropriate protective clothing. Provide a safety shower at any location where skin contact can occur.

WORK HYGIENIC PRACTICES

Wash thoroughly after handling. Supplemental safety and health : none

PHYSICAL/CHEMICAL PROPERTIES

- **Vapour pressure:** (mm Hg @100 ^{o}F) 0.005 - 0.00006
- **Viscosity:** (CENTISTOKES) 3.6 - 540
- **Stability indicator/materials to avoid:** Yes
- **Stability Condition to Avoid:** PCBs are very stable, fire-resistant compounds.

HAZARDOUS DECOMPOSITION PRODUCTS

Carbon monoxide, carbon dioxide, hydrogen chloride, phenolics, aldehydes, furans, dioxins

WASTE DISPOSAL METHODS

Consult the applicable PCB regulations prior to any disposal of PCBs or PCB-contaminated items.

SAFETY DATA SHEET

Creation Date 10-Dec-2009 **Revision Date** 23-Jan-2018 **Revision Number** 5

1. Identification

Product Name **Tetrachloroethylene**

Cat No. : **AC445690000; ACR445690010; AC445690025; AC445691000**

CAS-No 127-18-4
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. Cancer - https://www.p65warnings.ca.gov/.

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. Get medical attention.

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

Inhalation 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 and 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	Flammability	Instability	Physical hazards
2	0	0	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
ACGIH: (American Conference of Governmental Industrial Hygienists)
A1 - Known Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Animal Carcinogen
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 Disrupters 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	2.53 - 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 See section 2 for more information

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 23-Jan-2018
Print Date 23-Jan-2018
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 01-May-2012 **Revision Date** 16-Jan-2019 **Revision Number** 4

1. Identification

Product Name **Phenanthrene**

Cat No. : **AC130090000; AC130090050; AC130090500; AC130095000**

CAS-No 85-01-8
Synonyms No information available

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

Company
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)

Acute oral toxicity	Category 4

Label Elements

Signal Word
Warning

Hazard Statements
Harmful if swallowed

Precautionary Statements
Prevention
Wash face, hands and any exposed skin thoroughly after handling
Do not eat, drink or smoke when using this product
Ingestion
IF SWALLOWED: Call a POISON CENTER or doctor/physician if you feel unwell
Rinse mouth
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Very toxic to aquatic life with long lasting effects

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
Phenanthrene	85-01-8	>95

4. First-aid measures

General Advice If symptoms persist, call a physician.

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

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

Inhalation Move to fresh air. Obtain medical attention. If not breathing, give artificial respiration.

Ingestion Clean mouth with water and drink afterwards plenty of water. Get medical attention if symptoms occur.

Most important symptoms and effects None reasonably foreseeable.

Notes to Physician Treat symptomatically

5. Fire-fighting measures

Suitable Extinguishing Media 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
Explosion Limits
Upper No data available
Lower No data available
Sensitivity to Mechanical Impact No information available
Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical
Do not allow run-off from fire fighting to enter drains or water courses.

Hazardous Combustion Products
Carbon monoxide (CO) Carbon dioxide (CO_2)
Protective Equipment and Precautions for Firefighters

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

NFPA

Health	Flammability	Instability	Physical hazards
1	1	0	N/A

6. Accidental release measures

Personal Precautions Ensure adequate ventilation. Use personal protective equipment. Avoid dust formation.

Environmental Precautions Do not flush into surface water or sanitary sewer system. Do not allow material to contaminate ground water system. Prevent product from entering drains. Local authorities should be advised if significant spillages cannot be contained.

Methods for Containment and Clean Up Sweep up or vacuum up spillage and collect in suitable container for disposal. Keep in suitable, closed containers for disposal.

7. Handling and storage

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

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

8. Exposure controls / personal protection

Exposure Guidelines This product does not contain any hazardous materials with occupational exposure limitsestablished by the region specific regulatory bodies.

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
Phenanthrene		TWA: 0.2 mg/m³		

Engineering Measures Ensure adequate ventilation, especially in confined areas.

Personal Protective Equipment

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

Skin and body protection 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	Solid
Appearance	Beige
Odor	Odorless
Odor Threshold	No information available
pH	No information available
Melting Point/Range	95 - 101 °C / 203 - 213.8 °F
Boiling Point/Range	336 °C / 636.8 °F
Flash Point	No information available
Evaporation Rate	Not applicable
Flammability (solid,gas)	No information available

Flammability or explosive limits	
Upper	No data available
Lower	No data available
Vapor Pressure	1 mmHg @ 116 °C
Vapor Density	Not applicable
Specific Gravity	1.063
Solubility	Insoluble in water
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	
Decomposition Temperature	No information available
Viscosity	Not applicable
Molecular Formula	C14 H10
Molecular Weight	178.23

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat. Avoid dust formation.

Incompatible Materials Strong oxidizing agents

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
Phenanthrene	1.8 g/kg (Rat)	Not listed	Not listed

Toxicologically Synergistic Products No information available

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

Irritation No information available

Sensitization No information available

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

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
Phenanthrene	85-01-8	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure None known

STOT - repeated exposure None known

Aspiration hazard No information available

Symptoms / effects,both acute and delayed No information available

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

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

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
Phenanthrene	Not listed	LC50 = 3.2 mg/L 96h	Not listed	LC50 = 0.35 mg/L 48h

Persistence and Degradability May persist

Bioaccumulation/ Accumulation No information available.

Mobility . Is not likely mobile in the environment due its low water solubility.

Component	log Pow
Phenanthrene	4.5

13. Disposal considerations

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

14. Transport information

DOT

UN-No UN3077
Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Hazard Class 9
Packing Group III

TDG

UN-No UN3077
Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Hazard Class 9
Packing Group III

IATA

UN-No UN3077
Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.*
Hazard Class 9
Packing Group III

IMDG/IMO

UN-No UN3077
Proper Shipping Name ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S.
Hazard Class 9
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

Phenanthrene	X	X	-	201-581-5	-		X	X	X	X	KE-28202

Legend:
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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 %
Phenanthrene	85-01-8	>95	1.0

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

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

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
Phenanthrene	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
Phenanthrene	X	X	X	-	-

U.S. Department of Transportation

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

U.S. Department of Homeland Security
This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

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

Creation Date 01-May-2012
Revision Date 16-Jan-2019
Print Date 16-Jan-2019
Revision Summary This document has been updated to comply with the US OSHA HazCom 2012 Standard replacing the current legislation under 29 CFR 1910.1200 to align with the Globally Harmonized System of Classification and Labeling of Chemicals (GHS).

Disclaimer

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

End of SDS

SAFETY DATA SHEET

Version 6.0
Revision Date 05/09/2019
Print Date 06/29/2019

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

1.1 Product identifiers

Product name : Propylbenzene

Product Number : P52407
Brand : Aldrich
Index-No. : 601-024-00-X
CAS-No. : 103-65-1

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

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

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

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

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

SECTION 2: Hazards identification

2.1 Classification of the substance or mixture

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

Flammable liquids (Category 3), H226
Specific target organ toxicity - single exposure (Category 3), Respiratory system, H335
Aspiration hazard (Category 1), H304
Short-term (acute) aquatic hazard (Category 2), H401
Long-term (chronic) aquatic hazard (Category 2), H411

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

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Danger

Hazard statement(s)

H226	Flammable liquid and vapour.
H304	May be fatal if swallowed and enters airways.
H335	May cause respiratory irritation.
H411	Toxic 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/ eye protection/ face protection.
P301 + P310	IF SWALLOWED: Immediately call a POISON CENTER/doctor.
P303 + P361 + P353	IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower.
P304 + P340 + P312	IF INHALED: Remove person to fresh air and keep comfortable for breathing. Call a POISON CENTER/doctor if you feel unwell.
P331	Do NOT induce vomiting.
P370 + P378	In case of fire: Use dry sand, dry chemical or alcohol-resistant foam to extinguish.
P391	Collect spillage.
P403 + P233	Store in a well-ventilated place. Keep container tightly closed.
P403 + P235	Store in a well-ventilated place. Keep cool.
P405	Store locked up.
P501	Dispose of contents/ container to an approved waste disposal plant.

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

SECTION 3: Composition/information on ingredients

3.1 Substances

Synonyms	:	1-Phenylpropane
Formula	:	C_9H_{12}
Molecular weight	:	120.19 g/mol
CAS-No.	:	103-65-1
EC-No.	:	203-132-9
Index-No.	:	601-024-00-X

Component	Classification	Concentration
Propylbenzene		
	Flam. Liq. 3; STOT SE 3; Asp. Tox. 1; Aquatic Acute 2; Aquatic Chronic 2; H226, H335, H304, H401, H411	<= 100 %

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

SECTION 4: First aid measures

4.1 Description of first aid measures

General advice
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

SECTION 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
Carbon oxides

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.

SECTION 6: Accidental release measures

6.1 Personal precautions, protective equipment and emergency procedures
Use personal protective equipment. Avoid breathing vapours, mist or gas. Ensure adequate ventilation. 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 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.

SECTION 7: Handling and storage

7.1 Precautions for safe handling
Avoid contact with skin and eyes. Avoid inhalation of vapour or mist.
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.
Storage class (TRGS 510): 3: Flammable liquids

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

SECTION 8: Exposure controls/personal protection

8.1 Control parameters

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

8.2 Exposure controls

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

Personal protective equipment

Eye/face protection
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: 30 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, 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 ABEK (EN 14387) respirator cartridges as a backup to engineering controls. If the respirator is the sole means of protection, use a full-face supplied air respirator. Use respirators and components tested and approved under appropriate government standards such as NIOSH (US) or CEN (EU).

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

SECTION 9: Physical and chemical properties

9.1 Information on basic physical and chemical properties

a)	Appearance	Form: liquid, clear Colour: colourless
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: -99 °C (-146 °F) - lit.
f)	Initial boiling point and boiling range	159 °C 318 °F - lit.
g)	Flash point	42.0 °C (107.6 °F) - closed cup
h)	Evaporation rate	No data available
i)	Flammability (solid,	No data available

gas)

j)	Upper/lower flammability or explosive limits	Upper explosion limit: 6 %(V) Lower explosion limit: 0.8 %(V)
k)	Vapour pressure	No data available
l)	Vapour density	No data available
m)	Relative density	0.862 g/cm3 at 25 °C (77 °F)
n)	Water solubility	slightly soluble
o)	Partition coefficient: n-octanol/water	No data available
p)	Auto-ignition temperature	450.0 °C (842.0 °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

SECTION 10: Stability and reactivity

10.1 Reactivity
No data available

10.2 Chemical stability
Stable under recommended storage conditions.

10.3 Possibility of hazardous reactions
No data available

10.4 Conditions to avoid
Heat, flames and sparks.

10.5 Incompatible materials
Strong oxidizing agents

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

SECTION 11: Toxicological information

11.1 Information on toxicological effects

Acute toxicity
LD50 Oral - Rat - 6,040 mg/kg
Remarks: Behavioral:Somnolence (general depressed activity).

LC50 Inhalation - Rat - 2 h - 65000 ppm
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 on OSHA's list of regulated carcinogens.

Reproductive toxicity
No data available

Specific target organ toxicity - single exposure
May cause respiratory irritation.

Specific target organ toxicity - repeated exposure
No data available

Aspiration hazard
May be fatal if swallowed and enters airways.

Additional Information
RTECS: DA8750000

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

Kidney -

SECTION 12: Ecological information

12.1 Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - 1.55 mg/l - 96.0 h
Toxicity to daphnia and other aquatic invertebrates	Immobilization EC50 - Daphnia magna (Water flea) - 2 mg/l - 24 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
An environmental hazard cannot be excluded in the event of unprofessional handling or disposal.
Toxic to aquatic life with long lasting effects.
Avoid release to the environment.

SECTION 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.

SECTION 14: Transport information

DOT (US)
UN number: 2364 Class: 3 Packing group: III
Proper shipping name: n-Propyl benzene
Reportable Quantity (RQ):
Poison Inhalation Hazard: No

IMDG
UN number: 2364 Class: 3 Packing group: III EMS-No: F-E, S-D
Proper shipping name: n-PROPYLBENZENE
Marine pollutant : yes

IATA
UN number: 2364 Class: 3 Packing group: III
Proper shipping name: n-Propylbenzene

SECTION 15: Regulatory information

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

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

SARA 311/312 Hazards
Fire Hazard, Acute Health Hazard

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Propylbenzene	103-65-1	1993-04-24

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

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Propylbenzene	103-65-1	1993-04-24

	CAS-No.	Revision Date
Propylbenzene	103-65-1	1993-04-24

New Jersey Right To Know Components

	CAS-No.	Revision Date
Propylbenzene	103-65-1	1993-04-24

SECTION 16: Other information

Further information

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

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

Version: 6.0 Revision Date: 05/09/2019 Print Date: 06/29/2019

SAFETY DATA SHEET

Version 6.1
Revision Date 05/28/2017
Print Date 06/28/2019

1. PRODUCT AND COMPANY IDENTIFICATION

1.1 Product identifiers

Product name : Pyrene

Product Number : 185515
Brand : Aldrich

CAS-No. : 129-00-0

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

Identified uses : Laboratory chemicals, Synthesis of substances

1.3 Details of the supplier of the safety data sheet

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

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

1.4 Emergency telephone number

Emergency Phone # : +1-703-527-3887

2. HAZARDS IDENTIFICATION

2.1 Classification of the substance or mixture

GHS Classification in accordance with 29 CFR 1910 (OSHA HCS)
Acute aquatic toxicity (Category 1), H400
Chronic aquatic toxicity (Category 1), H410

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

2.2 GHS Label elements, including precautionary statements

Pictogram

Signal word Warning

Hazard statement(s)
H410 Very toxic to aquatic life with long lasting effects.

Precautionary statement(s)
P273 Avoid release to the environment.
P391 Collect spillage.
P501 Dispose of contents/ container to an approved waste disposal plant.

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

Rapidly absorbed through skin.

3. COMPOSITION/INFORMATION ON INGREDIENTS

3.1 Substances

Synonyms : Benzo[<I>def</>]phenanthrene

Formula : $C_{16}H_{10}$
Molecular weight : 202.25 g/mol
CAS-No. : 129-00-0
EC-No. : 204-927-3

Hazardous components

Component	Classification	Concentration
Pyrene		
	Aquatic Acute 1; Aquatic Chronic 1; H410	<= 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.

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
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

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

Avoid dust formation. Avoid breathing vapours, mist or gas. Ensure adequate ventilation.
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
Pick up and arrange disposal without creating dust. Sweep up and shovel. Keep in suitable, closed containers for disposal.

6.4 Reference to other sections
For disposal see section 13.

7. HANDLING AND STORAGE

7.1 Precautions for safe handling
Further processing of solid materials may result in the formation of combu formation should be taken into consideration before additional processing
Provide appropriate exhaust ventilation at places where dust is formed.
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.

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
Pyrene	129-00-0	TWA	0.200000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
		TWA	0.200000 mg/m3	USA. Occupational Exposure Limits (OSHA) - Table Z-1 Limits for Air Contaminants
	Remarks	1910.1002 As used in §1910.1000 (Table Z-1), coal tar pitch volatiles include the fused polycyclic hydrocarbons which volatilize from the distillation residues of coal, petroleum (excluding asphalt), wood, and other organic matter. Asphalt (CAS 8052-42-4, and CAS 64742-93-4) is not covered under the 'coal tar pitch volatiles' standard OSHA specifically regulated carcinogen		
		TWA	0.100000 mg/m3	USA. NIOSH Recommended Exposure Limits
		Potential Occupational Carcinogen NIOSH considers coal tar, coal tar pitch, and creosote to be coal tar products. cyclohexane-extractable fraction See Appendix C See Appendix A		

Biological occupational exposure limits

Component	CAS-No.	Parameters	Value	Biological specimen	Basis
Pyrene	129-00-0	1-Hydroxypyrene (1-HP)		Urine	ACGIH - Biological Exposure Indices (BEI)
	Remarks	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

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: Nitrile rubber
Minimum layer thickness: 0.4 mm
Break through time: 480 min
Material tested:Camatril® (KCL 730 / Aldrich Z677442, Size M)

Splash contact
Material: Nitrile rubber
Minimum layer thickness: 0.11 mm
Break through time: 30 min
Material tested:Dermatril® (KCL 740 / Aldrich Z677272, 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 industria situation of anticipated use by our customers. It should not be construed as offering an approval for any specific use scenario.

Body Protection

Choose body protection in relation to its type, to the concentration and amount of dangerous substances, and to the specific work-place., The type of protective equipment must be selected according to the concentration and amount of the dangerous substance at the specific workplace.

Respiratory protection

Respiratory protection is not required. Where protection from nuisance le (EN 143) dust masks. 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: crystalline Colour: yellow
b)	Odour	No data available
c)	Odour Threshold	No data available
d)	pH	No data available
e)	Melting point/freezing point	Melting point/range: 145 - 148 °C (293 - 298 °F) - lit.
f)	Initial boiling point and boiling range	390.0 - 395.0 °C (734.0 - 743.0 °F)
g)	Flash point	> 200.0 °C (> 392.0 °F)
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	1.21 g/cm3
n)	Water solubility	No data available
o)	Partition coefficient: n-octanol/water	log Pow: 4.88
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

Bulk density	650 kg/m3

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
Risk of dust explosion.

10.4 Conditions to avoid
No data available

10.5 Incompatible materials
Strong oxidizing agents

10.6 Hazardous decomposition products
Hazardous decomposition products formed under fire conditions. - Carbon oxides
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
Dermal: No data available(Pyrene)
No data available(Pyrene)

Skin corrosion/irritation

Serious eye damage/eye irritation

Respiratory or skin sensitisation
No data available(Pyrene)

Germ cell mutagenicity

No data available(Pyrene)

Carcinogenicity
No data available(Pyrene)
(Pyrene)

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: OSHA specifically regulated carcinogen (Pyrene)

Reproductive toxicity
No data available(Pyrene)

No data available(Pyrene)

Specific target organ toxicity - single exposure
No data available(Pyrene)

Specific target organ toxicity - repeated exposure

Aspiration hazard
No data available(Pyrene)

Additional Information
RTECS: UR2450000

Inhalation studies in animals have caused:, Liver toxicity, pulmonary pathologies, intragastric pathologies, neutropenia, leukopenia, anemia, Contact with skin can cause:, hyperemia, weight loss, hematopoietic changes, Dermatitis, Chronic effects, leukocytosis(Pyrene)

12. ECOLOGICAL INFORMATION

12.1 Toxicity

Toxicity to fish	LC50 - Oncorhynchus mykiss (rainbow trout) - > 2 mg/l - 96.0 h(Pyrene)
Toxicity to daphnia and other aquatic invertebrates	EC50 - Daphnia magna (Water flea) - 0.002 - 0.003 mg/l - 48 h(Pyrene)

12.2 Persistence and degradability

12.3 Bioaccumulative potential

Bioaccumulation: other fish - 48 h
- 0.056 mg/l(Pyrene)

Bioconcentration factor (BCF): 4,810

12.4 Mobility in soil

No data available(Pyrene)

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.
Very toxic to aquatic life with long lasting effects.

Avoid release to the environment.

13. DISPOSAL CONSIDERATIONS

13.1 Waste treatment methods

Product
Offer surplus and non-recyclable solutions to a licensed disposal company.

Contaminated packaging
Dispose of as unused product.

14. TRANSPORT INFORMATION

DOT (US)
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substances, solid, n.o.s. (Pyrene)
Reportable Quantity (RQ) : 5000 lbs

no
Poison Inhalation Hazard: No

IMDG
UN number: 3077 Class: 9 Packing group: III EMS-No: F-A, S-F
Proper shipping name: ENVIRONMENTALLY HAZARDOUS SUBSTANCE, SOLID, N.O.S. (Pyrene)
Marine pollutant : yes

IATA
UN number: 3077 Class: 9 Packing group: III
Proper shipping name: Environmentally hazardous substance, solid, n.o.s. (Pyrene)

Further information
EHS-Mark required (ADR 2.2.9.1.10, IMDG code 2.10.3) for single packagings and combination packagings containing inner packagings with Dangerous Goods > 5L for liquids or > 5kg for solids.

15. REGULATORY INFORMATION

SARA 302 Components
The following components are subject to reporting levels established by SARA Title III, Section 302:

	CAS-No.	Revision Date
Pyrene	129-00-0	2008-11-03

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
No SARA Hazards

Massachusetts Right To Know Components

	CAS-No.	Revision Date
Pyrene	129-00-0	2008-11-03

Pennsylvania Right To Know Components

	CAS-No.	Revision Date
Pyrene	129-00-0	2008-11-03

New Jersey Right To Know Components

	CAS-No.	Revision Date
Pyrene	129-00-0	2008-11-03

California Prop. 65 Components

	CAS-No.	Revision Date
WARNING! This product contains a chemical known to the State of California to cause cancer.	129-00-0	2007-09-28

Pyrene

16. OTHER INFORMATION

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

H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

HMIS Rating

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

NFPA Rating

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

Further information

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

Preparation Information

Sigma-Aldrich Corporation
Product Safety – Americas Region
1-800-521-8956
Version: 6.1 Revision Date: 05/28/2017 Print Date: 06/28/2019

Silver

Print

SAFETY DATA SHEET

1 PRODUCT AND SUPPLIER IDENTIFICATION

Product Name: Silver - shot, sheet, foil, rod, wire, pellets, target

Formula: Ag

Supplier: ESPI Metals

1050 Benson Way

Ashland, OR 97520

Telephone: 800-638-2581

Fax: 541-488-8313

Email: sales@espimetals.com

Emergency: Infotrac 800-535-5053 (US) or 352-323-3500 (24 hour)

Recommended Uses: Scientific Research

2 HAZARDS IDENTIFICATION

GHS Classification (29 CFR 1910.1200): Not classified as hazardous

GHS Label Elements:

Signal Word: N/A

Hazard Statements: N/A

Precautionary Statements: N/A

3 COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient: Silver

CAS#: 7440-22-4

%: 100

EC#: 231-131-3

4 FIRST AID MEASURES

General Measures: No special requirements.

INHALATION: Remove to fresh air, keep warm and quiet, give oxygen if breathing is difficult. Seek medical attention.

INGESTION: Rinse mouth with water. Do not induce vomiting. Seek medical attention. Never induce vomiting or give anything by mouth to an unconscious person.

SKIN: Remove contaminated clothing, brush material off skin, wash affected area with soap and water. Seek medical attention if symptoms persist.

EYES: Flush eyes with lukewarm water, including under upper and lower eyelids, for at least 15 minutes. Seek medical attention if symptoms persist.

Most Important Symptoms/Effects, Acute and Delayed: May cause irritation. See section 11 for more information.

Indication of Immediate Medical Attention and Special Treatment: No other relevant information available.

5 FIREFIGHTING MEASURES

Extinguishing Media: Use suitable extinguishing agent for surrounding materials and type of fire.

Unsuitable Extinguishing Media: No information available.

Specific Hazards Arising from the Material: May emit silver oxide fumes under fire conditions.

Special Protective Equipment and Precautions for Firefighters: Full face, self-contained breathing apparatus and full protective clothing when necessary.

6 ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment, and Emergency Procedures: Wear appropriate respiratory and protective equipment specified in section 8.

Methods and Materials for Containment and Cleaning Up: Sweep or scoop up. Place in properly labeled closed containers. Scrap can be collected for recycling.

Environmental Precautions: Do not allow to enter drains or to be released to the environment.

7 HANDLING AND STORAGE

Precautions for Safe Handling: Avoid creating dust. Avoid contact with skin and eyes. Do not breathe dust or fumes. Provide adequate ventilation if dusts are created. See section 8 for information on personal protection equipment.

Conditions for Safe Storage: Store in a sealed container. Store in a cool, dry area. See section 10 for more information on incompatible materials.

8 EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits: Silver

OSHA/PEL: 0.01 mg/m^3

ACGIH/TLV: 0.1 mg/m^3

Engineering Controls: Ensure adequate ventilation to maintain exposures below occupational limits. Whenever possible the use of local exhaust ventilation or other engineering controls is the preferred method of controlling exposure to airborne dust and fume to meet established occupational exposure limits. Use good housekeeping and sanitation practices. Do not use tobacco or food in work area. Wash thoroughly before eating or smoking. Do not blow dust off clothing or skin with compressed air.

Respiratory Protection: If permissible levels are exceeded, use NIOSH approved dust respirator.

Eye Protection: Safety glasses

Skin Protection: Wear impermeable gloves, protective work clothing as necessary.

9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance:

Form: Solid in various forms

Color: Silver metallic

Odor: Odorless

Odor Threshold: Not determined

pH: N/A

Melting Point: 961.93 ^oC

Boiling Point: 2212 ^oC

Flash Point: N/A

Evaporation Rate: N/A

Flammability: N/A

Upper Flammable Limit: N/A

Lower Flammable Limit: N/A

Vapor Pressure: No data

Vapor Density: N/A

Relative Density (Specific Gravity): 10.5 g/cc @ 20 ^{o}C

Solubility in H_2O: Insoluble

Partition Coefficient (n-octanol/water): Not determined

Autoignition Temperature: No data

Decomposition Temperature: No data

Viscosity: N/A

10 STABILITY AND REACTIVITY

Reactivity: No data

Chemical Stability: Stable under recommended storage conditions.

Possibility of Hazardous Reactions: None expected.

Conditions to Avoid: No data

Incompatible Materials: Acids, halogens, sulfur.

Hazardous Decomposition Products: Silver oxide fume.

11 TOXICOLOGICAL INFORMATION

Likely Routes of Exposure: Inhalation, skin, eyes.

Symptoms of Exposure: May cause irritation.

Acute and Chronic Effects: Silver metal is relatively inert. Chronic exposure to soluble silver compounds may cause a permanent bluish-gray discoloration of the skin and eyes known as argyria.

Acute Toxicity: No data

Carcinogenicity: **NTP**: Not identified as carcinogenic **IARC**: Not identified as carcinogenic

To the best of our knowledge the chemical, physical and toxicological characteristics of the substance are not fully known.

12 ECOLOGICAL INFORMATION

Ecotoxicity: No data

Persistence and Degradability: No data

Bioaccumulative Potential: No data

Mobility in Soil: No data

Other Adverse Effects: No further relevant information available.

13 DISPOSAL CONSIDERATIONS

Waste Disposal Method:

Product: Dispose of in accordance with Federal, State and Local regulations.

Packaging: Dispose of in accordance with Federal, State and Local regulations.

14 TRANSPORT INFORMATION

Shipping Regulations: Not regulated

UN Number: N/A

UN Proper Shipping Name: N/A

Transport Hazard Class: N/A

Packing Group: N/A

Marine Pollutant: No

15 REGULATORY INFORMATION

TSCA Listed: All components are listed.

Regulation (EC) No 1272/2008 (CLP): N/A

Canada WHMIS Classification (CPR, SOR/88-66): N/A

HMIS Ratings: **Health**: 0 **Flammability**: 0 **Physical**: 0

NFPA Ratings: **Health**: 0 **Flammability**: 0 **Instabiliity**: 0

Chemical Safety Assessment: A chemical safety assessment has not been carried out.

16 OTHER INFORMATION

The information contained in this document is based on the state of our knowledge at the time of publication and is believed to be correct, but does not purport to be all inclusive and shall be used only as a guide. ESPI Metals makes no representation, warranty, or guarantee of any kind with respect to the information contained in this document or any use of the product based on this information. ESPI Metals shall not be held liable for any damages resulting from handling or from contact with the above product. Users should satisfy themselves that they have all current data relevant to their particular use.

Prepared by: ESPI Metals

Revised/Reviewed: July 2015

Sodium

Print

SAFETY DATA SHEET

1 PRODUCT AND SUPPLIER IDENTIFICATION

Product Name: Sodium Metal

Formula: Na

Supplier: ESPI Metals

1050 Benson Way

Ashland, OR 97520

Telephone: 800-638-2581

Fax: 541-488-8313

Email: sales@espimetals.com

Emergency: Infotrac 800-535-5053 (US) or 352-323-3500 (24 hour)

Recommended Uses: Scientific Research

2 HAZARDS IDENTIFICATION

GHS Classification (29 CFR 1910.1200): Substances and mixtures which, in contact with water, emit flammable gases, category 1, Skin corrosion/irritation, category 1B, Eye damage/irritation, category 1.

GHS Label Elements:

Signal Word: Danger

Hazard Statements: H260 In contact with water releases flammable gases which may ignite spontaneously, H314 Causes severe skin burns and eye damage.

Precautionary Statements: P223 Keep away from any possible contact with water, because of violent reaction and possible flash fire, P231+P232 Handle under inert gas. Protect from moisture, P260 Do not breath dust or fume, P264 Wash skin thoroughly after handling, P280 Wear protective gloves/protective clothing/eye protection/face protection, P301+P330+P331 IF SWALLOWED: rinse

mouth. Do NOT induce vomiting, P303+P361+P353 IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse SKIN with water/shower, P335+P334 Brush off loose particles from skin and immerse in cool water/wrap in wet bandages, P304+P340 IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing, P305+P351+P338 IF IN EYES: rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing, P310 Immediately call a POISON CENTER or doctor/physician, P363 Wash contaminated clothing before reuse, P370+P378 In case of fire: Use class D metal extinguishing agent for extinction, do not use water, P402+P404 Store in a dry place. Store in a closed container, P405 Store locked up, P501 Dispose of contents/container in accordance with local, state or federal regulations.

3 COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient: Sodium

CAS#: 7440-23-5

%: 100

EC#: 231-132-9

4 FIRST AID MEASURES

General information: It is advisable to have tongs, tweezers, scrapers or some kind of implement on hand to remove bits of metal from skin or clothing in the event of an accident. Large amounts of water should be used to rinse or flood the area of contact as small amounts of water may do more harm than good.

INHALATION: Remove the victim to fresh air. Seek immediate medical attention.

INGESTION: Quickly wipe material from mouth and rinse with water. Do not induce vomiting. Seek medical attention immediately.

SKIN: Remove contaminated clothing if necessary. Brush off any visible solids. Wash the affected area with water for at least 15 minutes. Seek medical attention.

EYES: Immediately flush eyes with copious amounts of water, including under eyelids for at least 10-15 minutes. A victim may need assistance in keeping their eyelids open. A 5% solution of boric acid may be used to neutralize any remaining caustic. Seek immediate medical attention.

Most Important Symptoms/Effects, Acute and Delayed: May cause severe irritation and burns. See section 11 for more information.

Indication of Immediate Medical Attention and Special Treatment: This product is corrosive and reacts violently with water. Treatment should first remove as much of the material as possible as quickly as possible and then flush with very large quantities of water. Ingestion presents a singular problem as emesis may produce esophageal damage and/or aspiration damage; dilution with water or other water-containing materials may produce a reaction that exacerbates the corrosive activity. Consideration may be given to gastric lavage with a large diameter tube for removal of material and then dilution with large amounts of water. Esophagoscopy may be of assistance in this procedure and to assess extent of damage. Treatment is otherwise symptomatic and supportive.

5 FIREFIGHTING MEASURES

Extinguishing Media: USE CLASS D metal extinguishing agent such as Met-L-X, dry soda ash (anhydrous Na_2CO_3), dry sand or graphite powder. If the chosen extinguishing agent is capable of absorbing moisture, provision must be made to keep it dry.

Unsuitable Extinguishing Media: DO NOT USE water, carbon dioxide or carbon tetrachloride.

Specific Hazards Arising from the Material: Reacts violently with water. Contact with water releases flammable gases. When heated to decomposition sodium may emit toxic fumes of sodium oxide and sodium hydroxide.

Special Protective Equipment and Precautions for Firefighters: Full face, self-contained breathing apparatus and full protective clothing to prevent contact with skin and eyes. Material can reignite after fire is initially extinguished. Never leave extinguished fire unattended. Alkali metal fires may produce large quantities of white, opaque smoke that is caustic and may react with nearby materials. Flames may be practically invisible.

6 ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment, and Emergency Procedures: Wear appropriate respiratory and protective equipment specified in section 8. Isolate spill area and provide ventilation. Avoid breathing dust or fume. Avoid contact with skin and eyes. Eliminate all sources of ignition.

Methods and Materials for Containment and Cleaning Up: The material may ignite spontaneously in air. Burning material may release toxic fumes. Leave the area unless fitted with a self-contained breathing apparatus. Use completely dry non-sparking tools only. Do not use water for clean-up. Soda ash (powdered lime) or dry sand should be used to completely smother and cover any small spill that occurs. Sweep or scoop up. Place in a dry metal container equipped with a lid and replace the lid promptly. This can be done even if the metal is burning. With the lid in place oxygen will be excluded and the fire will go out.

Environmental Precautions: Do not allow to enter drains or to be released to the environment.

7 HANDLING AND STORAGE

Precautions for Safe Handling: It is strongly recommended that at least two persons be involved in the handling and use of this material. Sodium should only be handled by trained personnel wearing proper protective clothing and equipment specified in section 8. Handle in an enclosed, controlled process under dry protective gas such as argon. Make certain that all equipment and tools to be used in handling are absolutely dry. Protect from air and moisture. Protect from heat, flame and sources of ignition. It is advisable to keep a container of dry sand or soda ash readily available in the work area. Keep combustible materials out of the work area. Avoid contact with skin and eyes. Avoid creating dust. Avoid breathing dust or fumes. Wash thoroughly before eating or smoking.

Conditions for Safe Storage, Including Any Incompatibilities: Protect from oxygen and water. Protect from moisture/humidity. Store under dry inert gas such as argon. Store in a sealed container. Storage containers should be labeled to indicate their contents. Containers should be inspected periodically to check for container integrity. Storage area should be free of combustibles and ignition sources. Do not store together with acids, oxidizers, halogens, halocarbons or alcohols. See section 10 for more information on incompatible materials.

8 EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits: Sodium

OSHA/PEL: No exposure limit established

ACGIH/TLV: No exposure limit established

Appropriate Engineering Controls: Handle in an inert gas such as argon. Handle in an enclosed, controlled process. Use local exhaust to maintain exposure at low levels. Whenever possible the use of local exhaust ventilation or other engineering controls is the preferred method of controlling exposure to airborne dust and fume to meet established occupational exposure limits. Do not use tobacco or food in work area. Wash thoroughly before eating or smoking. Do not blow dust off clothing or skin with compressed air. Prepare for the possibility of a fire. Keep extinguishing agents, tools for handling and protective clothing readily available.

Individual Protection Measures, Such as Personal Protective Equipment:

Respiratory Protection: Wear a NIOSH/MSHA approved respirator when high concentrations are present.

Eye Protection: Always wear approved chemical splash proof goggles.

Skin Protection: Rubber gloves, flame retardant protective work clothing.

9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance:

Form: Solid

Color: Silver metallic

Odor: Not determined

Odor Threshold: Not determined

pH: N/A

Melting Point: 97.8 ^{o}C

Boiling Point: 883 ^{o}C

Flash Point: N/A

Evaporation Rate: N/A

Flammability: Flammable solid

Upper Flammable Limit: No data

Lower Flammable Limit: No data

Vapor Pressure: 1 mm at 439 ^{o}C

Vapor Density: N/A

Relative Density (Specific Gravity): 0.97 g/cc

Solubility in H_2O: Decomposes

Partition Coefficient (n-octanol/water): Not determined

Autoignition Temperature: No data

Decomposition Temperature: No data

Viscosity: N/A

10 STABILITY AND REACTIVITY

Reactivity: No data

Chemical Stability: Stable under recommended storage conditions.

Possibility of Hazardous Reactions: Sodium reacts violently with water releasing flammable hydrogen gas.

Conditions to Avoid: Contact with air or water.

Incompatible Materials: Water, alcohols, oxidizers, oxygen, carbon dioxide, halogens, halocarbons, acids, sulfur, sulfur dioxide, phosphorus, ammonia, chlorinated hydrocarbons, hydrogen peroxide, lead oxide, potassium oxides.

Hazardous Decomposition Products: Sodium oxides, hydrogen gas, sodium hydroxides.

11 TOXICOLOGICAL INFORMATION

Likely Routes of Exposure: Product as shipped does not present an inhalation or contact hazard. However subsequent operations may create dusts or fumes or debris which could be inhaled or come into contact with skin or eyes.

Symptoms of Exposure: Inhalation of dust will severely irritate the nasal cavity and respiratory tract. Ingestion will cause burns and perforations of the gastrointestinal tract. Severe thermal burns, corrosion and ulceration of the skin any eyes may occur on direct contact.

Acute and Chronic Effects: Sodium reacts readily with moisture to form caustic and highly corrosive sodium hydroxide with evolution of heat. Corrosive materials are acutely destructive to the respiratory tract, eyes, skin and digestive tract. Eye contact may result in permanent damage and complete vision loss. Inhalation may result in respiratory effects such as inflammation, edema, and chemical pneumonitis. May cause coughing, wheezing, laryngitis, shortness of breath, headache, nausea, and vomiting. Ingestion may cause damage to the mouth, throat and esophagus. May cause skin burns or irritation depending on the severity of the exposure.

Acute Toxicity: LD50 intraperitoneal - mouse - 4g/kg

Carcinogenicity: **NTP**: Not identified as carcinogenic **IARC**: Not identified as carcinogenic

To the best of our knowledge the chemical, physical and toxicological characteristics of the substance are not fully known.

12 ECOLOGICAL INFORMATION

Ecotoxicity: No data

Persistence and Degradability: No data

Bioaccumulative Potential: No data

Mobility in Soil: No data

Other Adverse Effects: Do not allow material to be released to the environment. No further relevant information available.

13 DISPOSAL CONSIDERATIONS

Waste Disposal Method:

Product: Dispose of in accordance with Federal, State and Local regulations.

Packaging: Dispose of in accordance with Federal, State and Local regulations.

14 TRANSPORT INFORMATION

UN Number: UN1428

UN Proper Shipping Name: Sodium

Transport Hazard Class: 4.3

Packing Group: I

Marine Pollutant: No

Special Precautions: Warning, substances which, in contact with water, emit flammable gases.

15 REGULATORY INFORMATION

TSCA Listed: All components are listed.

Regulation (EC) No 1272/2008 (CLP): Substances and mixtures which, in contact with water, emit flammable gases, category 1, Skin corrosion/irritation, category 1B, Eye damage/irritation, category 1.

Canada WHMIS Classification (CPR, SOR/88-66): Substances and mixtures which, in contact with water, emit flammable gases, Skin corrosion/irritation, Serious eye damage/eye irritation.

HMIS Ratings: **Health**: 3 **Flammability**: 3 **Physical**: 2

NFPA Ratings: **Health**: 3 **Flammability**: 3 **Instability**: 2 **Special Hazard**: W

Chemical Safety Assessment: A chemical safety assessment has not been carried out.

16 OTHER INFORMATION

The information contained in this document is based on the state of our knowledge at the time of publication and is believed to be correct, but does not purport to be all inclusive and shall be used only as a guide. ESPI Metals makes no representation, warranty, or guarantee of any kind with respect to the information contained in this document or any use of the product based on this information. ESPI Metals shall not be held liable for any damages resulting from handling or from contact with the above product. Users should satisfy themselves that they have all current data relevant to their particular use.

Prepared by: ESPI Metals

Revised/Reviewed: July 2015

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 (CO_2)

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

NFPA

Health	Flammability	Instability	Physical hazards
2	1	0	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/m³ Ceiling: 200 ppm (Vacated) STEL: 200 ppm (Vacated) STEL: 1080 mg/m³ TWA: 100 ppm	IDLH: 1000 ppm	TWA: 100 ppm TWA: 535 mg/m³ STEL: 200 ppm STEL: 1080 mg/m³

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 (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
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)

IARC: (International Agency for Research on Cancer)
Group 1 - Carcinogenic to Humans
Group 2A - Probably Carcinogenic to Humans
Group 2B - Possibly Carcinogenic to Humans

NTP: (National Toxicity Program)

NTP: (National Toxicity Program)
Known - Known Carcinogen
Reasonably Anticipated - Reasonably Anticipated to be a Human Carcinogen

ACGIH: (American Conference of Governmental Industrial Hygienists)

A1 - Known Human Carcinogen
A2 - Suspected Human Carcinogen
A3 - Animal Carcinogen
ACGIH: (American Conference of Governmental Industrial Hygienists)

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

Toluene, Reagent Grade

SECTION 1 : Identification of the substance/mixture and of the supplier

Product name : **Toluene, Reagent Grade**

Manufacturer/Supplier Trade name:

Manufacturer/Supplier Article number: **S25611**

Recommended uses of the product and uses restrictions on use:

Manufacturer Details:

AquaPhoenix Scientific
9 Barnhart Drive, Hanover, PA 17331

Supplier Details:

Fisher Science Education
15 Jet View Drive, Rochester, NY 14624

Emergency telephone number:

Fisher Science Education Emergency Telephone No.: 800-535-5053

SECTION 2 : Hazards identification

Classification of the substance or mixture:

Flammable
Flammable liquids, category 2

Irritant
Skin irritation, category 2
Specific target organ toxicity following single exposure, category 3

Health hazard
Reproductive toxicity, category 2
Specific target organ toxicity following repeated exposure, category 2
Aspiration hazard, category 2

Flam. Liq. 2
Skin Irrit. 2
Repr. 2
STOT SE 3, Central nervous system
STOT RE 2
Asp. Tox. 1
Aquatic Acute 2

Signal word :Danger

Hazard statements:
Highly flammable liquid and vapour
May be harmful if swallowed and enters airways
Causes skin irritation
May cause drowsiness or dizziness
Suspected of damaging fertility or the unborn child
May cause damage to organs through prolonged or repeated exposure
Toxic to aquatic life

Precautionary statements:
If medical advice is needed, have product container or label at hand
Keep out of reach of children
Read label before use
Obtain special instructions before use
Wash skin thoroughly after handling
Use only outdoors or in a well-ventilated area
Avoid release to the environment
Wear protective gloves/protective clothing/eye protection/face protection
Do not handle until all safety precautions have been read and understood
Keep away from heat/sparks/open flames/hot surfaces. No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/light/equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Do not breathe dust/fume/gas/mist/vapours/spray
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
IF ON SKIN (or hair): Remove/Take off immediately all contaminated clothing. Rinse skin with water/shower
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
IF exposed or concerned: Get medical advice/attention
Specific treatment (see supplemental first aid instructions on this label)
Do NOT induce vomiting
If skin irritation occurs: Get medical advice/attention
Take off contaminated clothing and wash before reuse
In case of fire: Use agents recommended in section 5 for extinction
Store in a well ventilated place. Keep container tightly closed
Store in a well ventilated place. Keep cool
Store locked up
Dispose of contents and container to an approved waste disposal plant

Other Non-GHS Classification:

WHMIS

B2 

D2A 

D2B 

NFPA/HMIS

NFPA SCALE (0-4)

HMIS RATINGS (0-4)

SECTION 3 : Composition/information on ingredients

Ingredients:
Percentages are by weight

SECTION 4 : First aid measures

Description of first aid measures

After inhalation: Move exposed to fresh air. Give artificial respiration if necessary. If breathing is difficult give oxygen.Loosen clothing and place exposed in a comfortable position.Seek immediate medical attention.

After skin contact: IMMEDIATELY flood affected skin with water while removing and isolating all contaminated clothing. Gently wash all affected skin areas thoroughly with soap and water. If symptoms such as redness or irritation develop, IMMEDIATELY call a physician and be prepared to transport the victim to a hospital for treatment.

After eye contact: Protect unexposed eye.Flush exposed eye gently using water for 15-20 minutes. Remove contact lenses while rinsing.IMMEDIATELY transport the victim after flushing eyes to a hospital even if no symptoms (such as redness or irritation) develop.

After swallowing: Rinse mouth with water.Never give anything by mouth to an unconscious person.DO NOT INDUCE VOMITING. IMMEDIATELY transport the victim to a hospital.

Most important symptoms and effects, both acute and delayed:

Irritation.Shortness of breath.Headache.Nausea.Dizziness.The substance is irritating to the eyes and respiratory tract. The substance may cause effects on the central nervous system. If this liquid is swallowed, aspiration into the lungs may result in chemical pneumonitis. Exposure at high levels could cause cardiac dysrhythmia and unconsciousness.;The substance defats the skin, which may cause dryness or cracking. The substance may have effects on the central nervous system. Exposure to the substance may increase noise-induced hearing loss. Animal tests show that this substance possibly causes toxicity to human reproduction or development.

Indication of any immediate medical attention and special treatment needed:

If seeking medical attention provide SDS document to physician. Physician should treat symptomatically.

SECTION 5 : Firefighting measures

Extinguishing media

Suitable extinguishing agents: Use foam, dry chemical, or carbon dioxide.

For safety reasons unsuitable extinguishing agents: Solid streams of water may spread fire.

Special hazards arising from the substance or mixture:

Thermal decomposition can lead to release of irritating gases and vapors.Vapors may ignited and cause explosion if in confined space. Vapors can flow across ignition source and flashback.

Advice for firefighters:

Protective equipment: Wear protective eyeware, gloves, and clothing. Refer to Section 8.

Additional information (precautions): Avoid inhaling gases, fumes, dust, mist, vapor, and aerosols. Avoid contact with skin, eyes, and clothing.Cool closed containers exposed to fire with water spray.Approach fire from upwind to avoid hazardous vapors and toxic decomposition. If material on fire or involved in fire: Do not extinguish fire unless flow can be stopped or safely confined. Use water in flooding quantities as fog. Solid streams of water may spread fire. Cool all affected containers with flooding quantities of water. Apply water from as far a distance as possible.

SECTION 6 : Accidental release measures

Personal precautions, protective equipment and emergency procedures:

Ensure adequate ventilation.Ensure that air-handling systems are operational. Beware of vapours accumulating to form explosive concentrations. Vapours can accumulate in low areas.Remove all sources of ignition.

Environmental precautions:

Should not be released into environment.Prevent from reaching drains, sewer, or waterway.

Methods and material for containment and cleaning up:

Wear protective eyeware, gloves, and clothing. Refer to Section 8.Always obey local regulations.If necessary use trained response staff or contractor. Evacuate personnel to safe areas. Containerize for disposal. Refer to Section 13.Keep in suitable closed containers for disposal.Remove all sources of ignition.Have extinguishing agent available in case of fire. Use non-sparking equipment.

Reference to other sections:

SECTION 7 : Handling and storage

Precautions for safe handling:

Avoid contact with skin, eyes, and clothing.Follow good hygiene procedures when handling chemical materials. Refer to Section 8.Follow proper disposal methods. Refer to Section 13.Do not eat, drink, smoke, or use personal products when handling chemical substances.Use explosion-proof equipment.Keep away from open flames, hot surfaces and sources of ignition.

Conditions for safe storage, including any incompatibilities:

Store in a cool location.Keep away from food and beverages.Protect from freezing and physical damage.Provide ventilation for containers. Keep container tightly sealed. Store away from incompatible materials. Store as flammable. Keep away from sources of ignition.

SECTION 8 : Exposure controls/personal protection



Control Parameters:	108-88-3 , Toluene, ACGIH TLV TWA 20 ppm 108-88-3, Toluene, OSHA PEL TWA 200 ppm
Appropriate Engineering controls:	Emergency eye wash fountains and safety showers should be available in the immediate vicinity of use or handling. Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapor and mists below the applicable workplace exposure limits (Occupational Exposure Limits-OELs) indicated above.Use under a chemical fume hood.Use explosion-proof equipment.

Respiratory protection:	Where risk assessment shows air-purifying respirators are appropriate use a full-face particle respirator type N100 (US) or type P3 (EN 143) respirator cartridges as a backup to engineering controls.When necessary use NIOSH approved breathing equipment. Use under a chemical fume hood.
Protection of skin:	Select glove material impermeable and resistant to the substance.Select glove material based on rates of diffusion and degradation. Dispose of contaminated gloves after use in accordance with applicable laws and good laboratory practices.Use proper glove removal technique without touching outer surface. Avoid skin contact with used gloves.Wear protective clothing.
Eye protection:	Wear equipment for eye protection tested and approved under appropriate government standards such as NIOSH (US) or EN 166(EU).Safety glasses or goggles are appropriate eye protection.
General hygienic measures:	Perform routine housekeeping.Wash hands before breaks and immediately after handling the product.Avoid contact with skin, eyes, and clothing.Before rewearing wash contaminated clothing.

SECTION 9 : Physical and chemical properties

Appearance (physical state,color):	Clear, colorless liquid	**Explosion limit lower**: **Explosion limit upper**:	7 %(V) 1.2 %(V)
Odor:	Sweet, pungent, benzene-like odor.	**Vapor pressure**:	28.4 mm Hg @ 25 deg C
Odor threshold:	1.03 to 140 ug/cu m	**Vapor density**:	3.1
pH-value:	Not Determined	**Relative density**:	0.865 g/mL at 25 °C (77 °F)
Melting/Freezing point:	95°C (-139°F)	**Solubilities**:	Insoluble in water
Boiling point/Boiling range:	110 - 111 °C (230 - 232 °F)	**Partition coefficient (n-octanol/water)**:	log Kow 2.73
Flash point (closed cup):	4.0 °C (39.2 °F)	**Auto/Self-ignition temperature**:	535.0 °C (995.0 °F)
Evaporation rate:	2.4	**Decomposition temperature**:	Not Determined
Flammability (solid,gaseous):	Highly flammable	**Viscosity**:	a. Kinematic:Not determined b. Dynamic: Not Determined
Density: Not Determined			

SECTION 10 : Stability and reactivity

Reactivity: Nonreactive under normal conditions.Reacts violently with strong oxidants. This generates fire and explosion hazard.
Chemical stability: Stable under normal conditions.
Possible hazardous reactions: None under normal processing.Vapours may form explosive mixture with air.
Conditions to avoid: Incompatible materials.excess heat.Direct Sunlight
Incompatible materials: Oxidizing agents. Acids.

Hazardous decomposition products: Carbon oxides.

SECTION 11 : Toxicological information

Acute Toxicity:		
Dermal:	108-88-3 (Toluene)	LD50 Rabbit: 12,124 mg/kg
Oral:	108-88-3 (Toluene)	LD50 Rat: 5000mg/kg
Inhalation:	108-88-3 (Toluene)	LC50 Rat: 12,500 - 28,800 mg/m3/4 h
Chronic Toxicity: No additional information.		
Corrosion Irritation:		
Dermal:	108-88-3 (Toluene)	Rabbit: Skin Irritation - 24 h
Sensitization:		No additional information.
Single Target Organ (STOT):		No additional information.
Numerical Measures:		No additional information.
Carcinogenicity:		IARC:: Group 3: Not classifiable as to its carcinogenicity to humans (Toluene)
Mutagenicity:		rat Liver DNA damage
Reproductive Toxicity:		Suspected human reproductive toxicant. rat - Inhalation Paternal Effects: Spermatogenesis (including genetic material, sperm morphology,motility, and count).rat - Oral Effects on Embryo or Fetus: Fetotoxicity (except death, e.g., stunted fetus).

SECTION 12 : Ecological information

Ecotoxicity

Fish LC50 - Oncorhynchus mykiss (rainbow trout) - 7.63 mg/l - 96 h: 108-88-3 (Toluene)

Invertebrates EC50 - Daphnia magna (Water flea) - 6 mg/l - 48 h: 108-88-3 (Toluene)

Persistence and degradability: Readily biodegradable
Bioaccumulative potential: bioconcentration in aquatic organisms is low to moderate
Mobility in soil: toluene is expected to have high to moderate mobility in soil.2.65 log Pow
Other adverse effects:

SECTION 13 : Disposal considerations

Waste disposal recommendations:

Contact a licensed professional waste disposal service to dispose of this material.Dispose of empty containers as unused product.Product or containers must not be disposed together with household garbage. It is the responsibility of the waste generator to properly characterize all waste materials according to applicable regulatory entities (US 40CFR262.11). Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. Chemical waste generators must also consult local, regional, and national hazardous waste regulations. Ensure complete and accurate classification.

SECTION 14 : Transport information

UN-Number

1294

UN proper shipping name

Toluene

Transport hazard class(es)

Class:
3 Flammable liquids

Packing group:II
Environmental hazard:
Transport in bulk:
Special precautions for user:

SECTION 15 : Regulatory information

United States (USA)

SARA Section 311/312 (Specific toxic chemical listings):

Acute, Chronic, Fire

SARA Section 313 (Specific toxic chemical listings):

None of the ingredients is listed

RCRA (hazardous waste code):

108-88-3 Toluene - U220

TSCA (Toxic Substances Control Act):

All ingredients are listed.

CERCLA (Comprehensive Environmental Response, Compensation, and Liability Act):

108-88-3 Toluene 1000 lb

Proposition 65 (California):

Chemicals known to cause cancer:

None of the ingredients is listed

Chemicals known to cause reproductive toxicity for females:

None of the ingredients is listed

Chemicals known to cause reproductive toxicity for males:

None of the ingredients is listed

Chemicals known to cause developmental toxicity:

108-88-3 Toluene

Canada

Canadian Domestic Substances List (DSL):

All ingredients are listed.

Canadian NPRI Ingredient Disclosure list (limit 0.1%):

None of the ingredients is listed

Canadian NPRI Ingredient Disclosure list (limit 1%):

108-88-3 Toluene

SECTION 16 : Other information

This product has been classified in accordance with hazard criteria of the Controlled Products Regulations and the SDS contains all the information required by the Controlled Products Regulations. Note: . The responsibility to provide a safe workplace remains with the user. The user should consider the health hazards and safety information contained herein as a guide and should take those precautions required in an individual operation to instruct employees and develop work practice procedures for a safe work environment.The information contained herein is, to the best of our knowledge and belief, accurate. However, since the conditions of handling and use are beyond our control, we make no guarantee of results, and assume no liability for damages incurred by the use of this material. It is the responsibility of the user to comply with all applicable laws and regulations applicable to this material.

GHS Full Text Phrases:

Abbreviations and acronyms:

Effective date : 01.31.2015
Last updated : 03.19.2015

SAFETY DATA SHEET

Creation Date 15-Jun-2010 **Revision Date** 15-May-2019 **Revision Number** 6

1. Identification

Product Name **o-Xylene**

Cat No. : **O5081-4; O5081-4LC; O5081-500; O5081FB-200; DO5081-500**

CAS-No 95-47-6
Synonyms 1,2-Dimethylbenzene (Certified)

Recommended Use Laboratory chemicals.
Uses advised against Food, drug, pesticide or biocidal product use

Details of the supplier of the safety data sheet

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

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

2. Hazard(s) identification

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

Flammable liquids	Category 3
Acute dermal toxicity	Category 4
Acute Inhalation Toxicity - Vapors	Category 4
Skin Corrosion/irritation	Category 2
Serious Eye Damage/Eye Irritation	Category 2
Specific target organ toxicity (single exposure)	Category 3
Target Organs - Respiratory system, Central nervous system (CNS).	
Specific target organ toxicity - (repeated exposure)	Category 2
Target Organs - Liver.	
Aspiration Toxicity	Category 1

Label Elements

Signal Word
Danger

Hazard Statements

Flammable liquid and vapor
May be fatal if swallowed and enters airways
Harmful in contact with skin
Causes skin irritation
Causes serious eye irritation
Harmful if inhaled
May cause respiratory irritation
May cause drowsiness or dizziness
May cause damage to organs through prolonged or repeated exposure

Precautionary Statements
Prevention
Wear protective gloves/protective clothing/eye protection/face protection
Use only outdoors or in a well-ventilated area
Wash face, hands and any exposed skin thoroughly after handling
Do not breathe dust/fume/gas/mist/vapors/spray
Keep away from heat/sparks/open flames/hot surfaces. - No smoking
Keep container tightly closed
Ground/bond container and receiving equipment
Use explosion-proof electrical/ventilating/lighting/equipment
Use only non-sparking tools
Take precautionary measures against static discharge
Keep cool
Response
Get medical attention/advice if you feel unwell
Inhalation
IF INHALED: Remove victim to fresh air and keep at rest in a position comfortable for breathing
Call a POISON CENTER or doctor/physician if you feel unwell
Skin
Call a POISON CENTER or doctor/physician if you feel unwell
If skin irritation occurs: Get medical advice/attention
IF ON SKIN (or hair): Take off immediately all contaminated clothing. Rinse skin with water/shower
Wash contaminated clothing before reuse
Eyes
IF IN EYES: Rinse cautiously with water for several minutes. Remove contact lenses, if present and easy to do. Continue rinsing
If eye irritation persists: Get medical advice/attention
Ingestion
IF SWALLOWED: Immediately call a POISON CENTER or doctor/physician
Do NOT induce vomiting
Fire
In case of fire: Use CO2, dry chemical, or foam for extinction
Storage
Store locked up
Store in a well-ventilated place. Keep container tightly closed
Disposal
Dispose of contents/container to an approved waste disposal plant
Hazards not otherwise classified (HNOC)
Harmful to aquatic life with long lasting effects

3. Composition/Information on Ingredients

Component	CAS-No	Weight %
o-Xylene	95-47-6	>95

4. First-aid measures

General Advice If symptoms persist, call a physician.

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

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

Inhalation 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 and effects Breathing difficulties. Symptoms of overexposure may be 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 Do not use a solid water stream as it may scatter and spread fire

Flash Point 31 °C / 87.8 °F

Method - No information available

Autoignition Temperature 465 °C / 869 °F

Explosion Limits

Upper 6.7 vol %

Lower 0.9 vol %

Sensitivity to Mechanical Impact No information available

Sensitivity to Static Discharge No information available

Specific Hazards Arising from the Chemical

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

Hazardous Combustion Products

Carbon monoxide (CO) Carbon dioxide (CO_2)

Protective Equipment and Precautions for Firefighters

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

NFPA

Health	Flammability	Instability	Physical hazards
3	3	0	N/A

6. Accidental release measures

Personal Precautions Use personal protective equipment. Ensure adequate ventilation. Remove all sources of ignition. Take precautionary measures against static discharges.

Environmental Precautions Should not be released into the environment. See Section 12 for additional ecological information. Avoid release to the environment. Collect spillage. Do not flush into surface water or sanitary sewer system.

Methods for Containment and Clean Up Soak up with inert absorbent material. Keep in suitable, closed containers for disposal. Remove all sources of ignition. Use spark-proof tools and explosion-proof equipment.

7. Handling and storage

Handling Wear personal protective equipment. Do not get in eyes, on skin, or on clothing. Avoid ingestion and inhalation. Ensure adequate ventilation. Keep away from open flames, hot surfaces and sources of ignition. Use only non-sparking tools. Take precautionary measures against static discharges.

Storage Keep containers tightly closed in a dry, cool and well-ventilated place. Keep away from heat and sources of ignition. Flammables area.

8. Exposure controls / personal protection

Exposure Guidelines

Component	ACGIH TLV	OSHA PEL	NIOSH IDLH	Mexico OEL (TWA)
o-Xylene	TWA: 100 ppm STEL: 150 ppm		IDLH: 900 ppm TWA: 100 ppm TWA: 435 mg/m^3 STEL: 150 ppm STEL: 655 mg/m^3	TWA: 100 ppm STEL: 150 ppm

Legend

ACGIH - American Conference of Governmental Industrial Hygienists
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. Ensure adequate ventilation, especially in confined areas. Use explosion-proof electrical/ventilating/lighting/equipment.

Personal Protective Equipment

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

Skin and body protection 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	No information available

pH	Not applicable
Melting Point/Range	-25 °C / -13 °F
Boiling Point/Range	143 - 145 °C / 289.4 - 293 °F
Flash Point	31 °C / 87.8 °F
Evaporation Rate	0.7
Flammability (solid,gas)	Not applicable
Flammability or explosive limits	
Upper	6.7 vol %
Lower	0.9 vol %
Vapor Pressure	882 Pa @ 25 °C
Vapor Density	3.7
Specific Gravity	0.884
Solubility	No information available
Partition coefficient; n-octanol/water	No data available
Autoignition Temperature	465 °C / 869 °F
Decomposition Temperature	No information available
Viscosity	No information available
Molecular Formula	C8 H10
Molecular Weight	106.17

10. Stability and reactivity

Reactive Hazard None known, based on information available

Stability Stable under normal conditions.

Conditions to Avoid Incompatible products. Excess heat. Keep away from open flames, hot surfaces and sources of ignition.

Incompatible Materials Strong oxidizing agents, Strong acids

Hazardous Decomposition Products Carbon monoxide (CO), Carbon dioxide (CO_2)

Hazardous Polymerization Hazardous polymerization does not occur.

Hazardous Reactions None under normal processing.

11. Toxicological information

Acute Toxicity

Product Information

Component Information

Component	LD50 Oral	LD50 Dermal	LC50 Inhalation
o-Xylene	LD50 = 3608 mg/kg (Rat)	14100 mg/kg (Rabbit)	LC50 = 4330 ppm (Rat) 6 h

Toxicologically Synergistic Products No information available

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

Irritation Irritating to skin

Sensitization No information available

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

Component	CAS-No	IARC	NTP	ACGIH	OSHA	Mexico
o-Xylene	95-47-6	Not listed	Not listed	Not listed	Not listed	Not listed

Mutagenic Effects No information available

Reproductive Effects No information available.

Developmental Effects No information available.

Teratogenicity No information available.

STOT - single exposure Respiratory system Central nervous system (CNS)
STOT - repeated exposure Liver

Aspiration hazard No information available

Symptoms / effects,both acute and delayed Symptoms of overexposure may be headache, dizziness, tiredness, nausea and vomiting

Endocrine Disruptor Information No information available

Other Adverse Effects The toxicological properties have not been fully investigated.

12. Ecological information

Ecotoxicity

Toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment. Do not empty into drains. The product contains following substances which are hazardous for the environment.

Component	Freshwater Algae	Freshwater Fish	Microtox	Water Flea
o-Xylene	EC50: = 4.2 mg/L, 192h (Pseudokirchneriella subcapitata) EC50: = 4.7 mg/L, 72h static (Pseudokirchneriella subcapitata)	LC50: 16.1 mg/L/96h (Lepomis macrochirus) LC50: 13 mg/L/24h (Carassius auratus)	EC50 = 0.0084 mg/L 24 h	EC50: 2.61 - 5.59 mg/L, 48h Flow through (Daphnia magna) EC50: 0.78 - 2.51 mg/L, 48h Static (Daphnia magna) EC50: = 3.2 mg/L, 48h (Daphnia magna)

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

Bioaccumulation/ Accumulation No information available.

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

Component	log Pow
o-Xylene	3.12

13. Disposal considerations

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

14. Transport information

DOT

UN-No UN1307
Proper Shipping Name XYLENES
Hazard Class 3
Packing Group III

TDG

UN-No UN1307
Proper Shipping Name XYLENES
Hazard Class 3
Packing Group III

IATA

UN-No UN1307
Proper Shipping Name Xylenes
Hazard Class 3

Packing Group III

IMDG/IMO

UN-No UN1307
Proper Shipping Name Xylenes
Hazard Class 3
Packing Group III

15. Regulatory information

United States of America Inventory

Component	CAS-No	TSCA	TSCA Inventory notification - Active/Inactive	TSCA - EPA Regulatory Flags
o-Xylene	95-47-6	X	ACTIVE	-

Legend:
TSCA - Toxic Substances Control Act, (40 CFR Part 710)
X - Listed
'-' - Not Listed

TSCA 12(b) - Notices of Export Not applicable

International Inventories
Canada (DSL/NDSL), Europe (EINECS/ELINCS/NLP), Philippines (PICCS), Japan (ENCS), Australia (AICS), China (IECSC), Korea (ECL).

Component	CAS-No	DSL	NDSL	EINECS	PICCS	ENCS	AICS	IECSC	KECL
o-Xylene	95-47-6	X	-	202-422-2	X	X	X	X	KE-35429

U.S. Federal Regulations

SARA 313

Component	CAS-No	Weight %	SARA 313 - Threshold Values %
o-Xylene	95-47-6	>95	1.0

SARA 311/312 Hazard Categories See section 2 for more information

CWA (Clean Water Act)

Component	CWA - Hazardous Substances	CWA - Reportable Quantities	CWA - Toxic Pollutants	CWA - Priority Pollutants
o-Xylene	X	-	-	-

Clean Air Act

Component	HAPS Data	Class 1 Ozone Depletors	Class 2 Ozone Depletors
o-Xylene	X		-

OSHA - Occupational Safety and Health Administration Not applicable

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

Component	Hazardous Substances RQs	CERCLA EHS RQs
o-Xylene	1000 lb	-

California Proposition 65 This product does not contain any Proposition 65 chemicals

U.S. State Right-to-Know Regulations

Component	Massachusetts	New Jersey	Pennsylvania	Illinois	Rhode Island

o-Xylene	X	X	X	X	-

U.S. Department of Transportation
Reportable Quantity (RQ): N
DOT Marine Pollutant N
DOT Severe Marine Pollutant N

U.S. Department of Homeland Security This product does not contain any DHS chemicals.

Other International Regulations

Mexico - Grade No information available

16. Other information

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

Creation Date 15-Jun-2010
Revision Date 15-May-2019
Print Date 15-May-2019
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

Zinc

Print

SAFETY DATA SHEET

1 PRODUCT AND SUPPLIER IDENTIFICATION

Product Name: Zinc - shot, sheet, foil, wire, rod, pellets, target

Formula: Zn

Supplier: ESPI Metals

1050 Benson Way

Ashland, OR 97520

Telephone: 800-638-2581

Fax: 541-488-8313

Email: sales@espimetals.com

Emergency: Infotrac 800-535-5053 (US) or 352-323-3500 (24 hour)

Recommended Uses: Scientific Research

2 HAZARDS IDENTIFICATION

GHS Classification (29 CFR 1910.1200): Not classified as hazardous

GHS Label Elements:

Signal Word: N/A

Hazard Statements: N/A

Precautionary Statements: N/A

3 COMPOSITION/INFORMATION ON INGREDIENTS

Ingredient: Zinc

CAS#: 7440-66-6

%: 100

EC#: 231-175-3

4 FIRST AID MEASURES

General Measures: No special requirements.

INHALATION: Remove to fresh air, keep warm and quiet, give oxygen if breathing is difficult. Seek medical attention.

INGESTION: Rinse mouth with water. Do not induce vomiting. Seek medical attention. Never induce vomiting or give anything by mouth to an unconscious person.

SKIN: Remove contaminated clothing, brush material off skin, wash affected area with soap and water. Seek medical attention if symptoms develop or persist.

EYES: Flush eyes with lukewarm water, including under upper and lower eyelids, for at least 15 minutes. Seek medical attention if symptoms develop or persist.

Most Important Symptoms/Effects, Acute and Delayed: May cause irritation. See section 11 for more information.

Indication of Immediate Medical Attention and Special Treatment: No other relevant information available.

5 FIREFIGHTING MEASURES

Extinguishing Media: Use suitable extinguishing media for surrounding material and type of fire.

Unsuitable Extinguishing Media: Do not use water, carbon dioxide or halogenated extinguishers on molten or burning metal.

Specific Hazards Arising from the Material: This product does not present fire or explosion hazards as shipped. Dust from processing, dispersed in air in sufficient concentrations, and in the presence of an ignition source, is a weak dust explosion hazard. May emit toxic metal oxide fumes under fire conditions.

Special Protective Equipment and Precautions for Firefighters: Full face, self-contained breathing apparatus and full protective clothing when necessary.

6 ACCIDENTAL RELEASE MEASURES

Personal Precautions, Protective Equipment, and Emergency Procedures: Wear appropriate respiratory and protective equipment specified in section 8. Isolate spill area and provide ventilation. Avoid breathing dust or fume. Avoid contact with skin and eyes. Eliminate all sources of ignition.

Methods and Materials for Containment and Cleaning Up: Avoid dust formation. Sweep or scoop up. Place in properly labeled closed container for further handling and disposal.

Environmental Precautions: Do not allow to be released to the environment.

7 HANDLING AND STORAGE

Precautions for Safe Handling: Avoid creating dust as dusts may present a fire hazard. Avoid breathing dust or fumes. Provide adequate ventilation if dusts are created. Avoid contact with skin and eyes. Wash thoroughly before eating or smoking. See section 8 for information on personal protection equipment.

Conditions for Safe Storage: Store in a cool, dry area. Store away from oxidizers. See section 10 for more information on incompatible materials.

8 EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits: Zinc

OSHA/PEL: No exposure limit established

ACGIH/TLV: No exposure limit established

Engineering Controls: Ensure adequate ventilation to maintain exposures below occupational limits. Whenever possible the use of local exhaust ventilation or other engineering controls is the preferred method of controlling exposure to airborne dust and fume to meet established occupational exposure limits. Use good housekeeping and sanitation practices. Do not allow dusts to accumulate as they may present a fire hazard. Do not use tobacco or food in work area. Wash thoroughly before eating or smoking. Do not blow dust off clothing or skin with compressed air.

Respiratory Protection: If permissible levels are exceeded, use NIOSH approved dust respirator.

Eye Protection: Safety glasses

Skin Protection: Wear impermeable gloves, protective work clothing as necessary.

9 PHYSICAL AND CHEMICAL PROPERTIES

Appearance:

Form: Solid in various forms

Color: Silver gray metallic

Odor: Odorless

Odor Threshold: Not determined

pH: N/A

Melting Point: 419.58 ^{o}C

Boiling Point: 907 ^{o}C

Flash Point: N/A

Evaporation Rate: N/A

Flammability: No data

Upper Flammable Limit: No data

Lower Flammable Limit: No data

Vapor Pressure: 1 mm Hg @ 487 ^{o}C

Vapor Density: N/A

Relative Density (Specific Gravity): 7.14 g/cc

Solubility in H_2O: Insoluble

Partition Coefficient (n-octanol/water): Not determined

Autoignition Temperature: No data

Decomposition Temperature: No data

Viscosity: N/A

10 STABILITY AND REACTIVITY

Reactivity: No data

Chemical Stability: Stable under recommended storage conditions.

Possibility of Hazardous Reactions: Zinc metal will react with acids and strong alkalis to generate hydrogen gas.

Conditions to Avoid: Avoid creating or accumulating fines or dusts.

Incompatible Materials: Strong oxidizing agents such as chlorine, fluorine, bromine, sodium potassium or barium peroxide, sodium or potassium chlorate, chromium trioxide and fused ammonium nitrate. Elemental sulfur dust, halogenated hydrocarbons or chlorinated solvents and chlorinated rubber.

Hazardous Decomposition Products: Zinc oxide fume.

11 TOXICOLOGICAL INFORMATION

Likely Routes of Exposure: Inhalation, skin, eyes.

Symptoms of Exposure: May cause irritation if dusts or fumes are inhaled or swallowed. Fines/dusts may irritate skin and eyes.

Acute and Chronic Effects: Zinc is an essential trace element and necessary for human health. It is involved in the synthesis and metabolism of nutrients, cell and organ structure and integrity, cell division, immune function and wound healing. Acute ingestion of high amounts of zinc may cause nausea, vomiting, loss of appetite, abdominal cramps, diarrhea and headaches. Chronic ingestion of high amounts may cause copper deficiency, altered iron function and reduced immune function. Pure zinc powder, dust and fume are relatively nontoxic to humans by inhalation. Inhalation of fumes containing zinc oxide may cause metal fume fever. Symptoms include cough, shortness of breath, sore throat, chest pain, headache and fever.

Acute Toxicity: No data

Carcinogenicity: **NTP**: Not identified as carcinogenic **IARC**: Not identified as carcinogenic

To the best of our knowledge the chemical, physical and toxicological characteristics of the substance are not fully known.

12 ECOLOGICAL INFORMATION

Ecotoxicity: No data

Persistence and Degradability: No data

Bioaccumulative Potential: No data

Mobility in Soil: No data

Other Adverse Effects: Do not allow material to be released to the environment without proper governmental permits. No further relevant information available.

13 DISPOSAL CONSIDERATIONS

Waste Disposal Method:

Product: Dispose of in accordance with Federal, State and Local regulations.

Packaging: Dispose of in accordance with Federal, State and Local regulations.

14 TRANSPORT INFORMATION

Shipping Regulations: Not regulated

UN Number: N/A

UN Proper Shipping Name: N/A

Transport Hazard Class: N/A

Packing Group: N/A

Marine Pollutant: No

15 REGULATORY INFORMATION

TSCA Listed: All components are listed.

Regulation (EC) No 1272/2008 (CLP): Hazardous to the aquatic environment - acute hazard, category 1, Hazardous to the aquatic environment - chronic hazard, category 1.

Canada WHMIS Classification (CPR, SOR/88-66): N/A

HMIS Ratings: **Health**: 0 **Flammability**: 0 **Physical**: 0

NFPA Ratings: **Health**: 0 **Flammability**: 0 **Instability**: 0

Chemical Safety Assessment: A chemical safety assessment has not been carried out.

16 OTHER INFORMATION

The information contained in this document is based on the state of our knowledge at the time of publication and is believed to be correct, but does not purport to be all inclusive and shall be used only as a guide. ESPI Metals makes no representation, warranty, or guarantee of any kind with respect to the information contained in this document or any use of the product based on this information. ESPI Metals shall not be held liable for any damages resulting from handling or from contact with the above product. Users should satisfy themselves that they have all current data relevant to their particular use.

Prepared by: ESPI Metals

Revised/Reviewed: July 2015

HEALTH & SAFETY PLAN

APPENDIX B

ONSITE SAFETY MEETING FORMS

Stantec

FIELD LEVEL RISK ASSESSMENT (FIT FOR DUTY), 1 DAY – RMS 2

Project: _____ Project No: _____

Client: _____

Location: _____

Start Date: _____

Work Description

Provide a general description of the work to be conducted.

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.**

Personal Protective Equipment

List specific PPE as needed. Verify type and inspect condition.

☐ Head Protection Type: _____	☐ Hearing Protection: _____	☐ Gloves Type: _____
☐ Foot Protection Type: _____	☐ Respiratory Protection: _____	☐ Water Safety Gear: _____
☐ Eye Protection Type: _____	☐ Fire Retardant Coveralls: _____	☐ _____
☐ High Visibility Vest: _____	☐ Fall Protection: _____	☐ _____

Tools and Equipment

List specific equipment to be used. Verify type and inspect condition.

☐	☐	☐
☐	☐	☐

Stantec

FIELD LEVEL RISK ASSESSMENT (FIT FOR DUTY), 1 DAY – RMS 2

Daily Tailgate Discussions/Subcontractor Input

Start	Time:	Weather:
Mid-Day	Time:	Weather:
Post-Day	Time:	Weather:

I know the hazards:

By signing here, you are stating the following:

1. I have been involved in the Job Safety Analysis 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 no jobs or work (that is not risk-assessed) is to be performed.
4. I am aware of my obligation to "**Stop Work**" (*See Stop Work Section).*

I arrived and departed fit for duty:

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) or fatigue issue I may have to the attention of the Crew Lead.
8. I signed out uninjured unless I have otherwise informed the Crew Lead.

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	Time:	Time:	Time:

I will STOP the job any time anyone is concerned or uncertain about safety.

I will STOP the job 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 THE JOB**, 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:** _____

Stantec

FIELD LEVEL RISK ASSESSMENT (FIT FOR DUTY), 5 DAY – RMS 2

Project: _____ Project No: _____

Client: _____

Location: _____

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.

☐ Head Protection Type: _____	☐ Hearing Protection: _____	☐ Gloves Type: _____
☐ Foot Protection Type: _____	☐ Respiratory Protection: _____	☐ Water Safety Gear: _____
☐ Eye Protection Type: _____	☐ Fire Retardant Coveralls: _____	☐ _____
☐ High Visibility Vest: _____	☐ Fall Protection: _____	☐ _____

Tools and Equipment

List specific equipment to be used. Verify type and inspect condition.

☐	☐	☐
☐	☐	☐

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		

Incidents involving injury, potential injury, or report of pain, soreness, or discomfort must be reported immediately (within one hour) to a supervisor. Supervisors will then immediately contact their HSE representative to develop a plan for assessment and care. This form must be completed and **submitted within 24 hours** of any incident. Do not delay submission waiting for signatures. **Email to hse@stantec.com or fax unsigned report to (780) 969-2030** and file locally in compliance with the corporate records retention policy and practices once all signatures have been obtained.

This document contains privileged and confidential information prepared at the request of Stantec's Legal Counsel. The contents of this report are restricted to HR personnel, Risk Management Representatives, Project Manager and PC Leader, and Stantec's Insurer, Adjuster and Legal Counsel. Information collected will be used solely for the purpose of meeting the requirements of Stantec's HSE and insurance programs, complying with applicable legislation, and will be used in accordance with any governing privacy legislation. The information collected will be maintained electronically and may be included in required reports.

SECTION 1: GENERAL INFORMATION			
Office location:		PC number:	
Location of incident:			
Incident date and time:		Date and time reported:	
Project name:		Project number:	
Client Name:			
Person in charge:		Person in Charge Phone:	

SECTION 2: STANTEC EMPLOYEE INFORMATION (if more than one identify extras in incident details below)			
Name:		Phone:	
Job position:		Group name:	
Time employee began work:		Job Experience (in years)	
Type of employment:	Full Time ☐ ; Visitor ☐ ; Contract ☐ ; Volunteer ☐ ; Seasonal ☐		
Supervisor:		Supervisor Phone:	

SECTION 3: INCIDENT DETAILS

Type of Incident: *incident types marked with an asterisk, please complete pages 1 and 4 only

See StanNet for a list of Incident Type Definitions

☐ **Report Only*	☐ ****Hazard Identification***	☐ ****Near Miss***
☐ First Aid	☐ Motor Vehicle Incident	☐ 3rd Party Incident (i.e., Public)
☐ Medical Aid – No Lost Time	☐ Property Damage - Vehicle	☐ Spill or Release
☐ Restricted Work	☐ Property Damage - Other	☐ Utility Strike
☐ Lost Time	☐ Theft	☐ Fire/Explosion/Flood
☐ Fatality	☐ Contractor Recordable Incident	☐ Stop Work Authority
☐ Violence or Harassment	☐ Non-compliance	☐ Other (specify details below)

Describe incident in detail: (include any issues related to people, equipment, materials, environment, and processes)

Immediate corrective actions taken:

CE (Atlantic) – Neil Clements (506-639-2961); CE (Ontario/Quebec) – Jim Elkins (613-404-8508);
CW (AB ECR/BC) – Yvonne Beattie (780-616-8909); CW (AB South, North & Central/SK/MB) – Shawna Robichaud (587-894-2635);
International – Kev Metcalfe (780-231-2185); US East (New England, Tri-State & Mid-Atlantic) – Fred Miller (610-235-7315);
US East (Great Lakes, South & Southeast) - Keith Kuhlmann (740-816-6170); US West – Fred Miller and Keith Kuhlmann

SECTION 4: MEDICAL INFORMATION																					
Name of first aid attendant:																					
Injury recorded in first aid log? Yes ☐ No ☐ N/A ☐																					
Description of first aid or medical treatment administered:																					
Clinic/hospital sent to:																					
Attending physician/paramedic (if known):																					
Area of Injury – Please check all that apply:																					
☐ Head	☐ Teeth	☐ Upper back	Left	Right	Left	Right	Left	Right	Left	Right											
☐ Face	☐ Neck	☐ Lower back	☐ Shoulder	☐	☐ Wrist	☐	☐ Hip	☐	☐ Ankle	☐											
☐ Eye(s)	☐ Chest	☐ Abdomen	☐ Arm	☐	☐ Hand	☐	☐ Thigh	☐	☐ Foot	☐											
☐ Ear(s)		☐ Pelvis	☐ Elbow	☐	☐ Finger(s)	☐	☐ Knee	☐	☐ Toe(s)	☐											
☐ Other	Specify		☐ Forearm	☐			☐ Lower Leg	☐													
Has the injured employee had a previous similar injury or disability?																	Yes ☐		No ☐		

SECTION 5: PROPERTY OR VEHICLE DAMAGE: STANTEC																					
Ownership Details (choose one):	☐ Rented (attach rental agreement)						☐ Stantec Owned						☐ Personal (employee vehicle)								
Year, Make, and Model of Vehicle:							Vehicle ID # (VIN)														
Nature of damage:							Estimated cost of damage:						$								
Description of damaged property:																					
Attending police officer (if known):							Badge #:														
Copy of police report received	Yes ☐ No ☐ If yes, file number: (attach copy of police report)																				
PROPERTY OR VEHICLE DAMAGE: 3RD PARTY																					
Name of owner and contact number:																					
Year, Make, and Model of Vehicle:							License Plate Number:														
Insurer and Policy Number:																					
Injured parties? Yes ☐ No ☐	If yes, describe Injuries:																				
Diagram or photographs attached?	Yes ☐ No ☐																				

WITNESS INFORMATION - #1																					
Name:							Phone Number:														
Witness statement provided?	Yes (attached) ☐						No ☐														

WITNESS INFORMATION - #2																					
Name:							Phone Number:														
Witness statement provided?	Yes (attached) ☐						No ☐														

SECTION 6: SPILL OR RELEASE																					
Substance:																					
Quantity:							Employee(s) exposed via:						☐ Inhalation ☐ Contact ☐ Ingestion ☐ n/a								
Off-site impacts observed or anticipated?	Yes ☐ No ☐ If yes, describe:																				
Name of regulatory agencies contacted:																					
Contact name, number, date and time of call:																					

CE (Atlantic) – Neil Clements (506-639-2961); CE (Ontario/Quebec) – Jim Elkins (613-404-8508);
CW (AB ECR/BC) – Yvonne Beattie (780-616-8909); CW (AB South, North & Central/SK/MB) – Shawna Robichaud (587-894-2635);
International – Kev Metcalfe (780-231-2185); US East (New England, Tri-State & Mid-Atlantic) – Fred Miller (610-235-7315);
US East (Great Lakes, South & Southeast) - Keith Kuhlmann (740-816-6170); US West – Fred Miller and Keith Kuhlmann

SECTION 7: ANALYSIS

IMMEDIATE/DIRECT CAUSES

A. **UNSAFE ACTIONS** (check off as many as necessary)

- ☐ Operating equipment without authority
- ☐ Failure to warn
- ☐ Failure to secure
- ☐ Operating at improper speed
- ☐ Making safety devices inoperative
- ☐ Removing safety devices
- ☐ Using defective/improper equipment
- ☐ Using equipment improperly
- ☐ Failing to use personal protective equipment properly
- ☐ Improper loading
- ☐ Improper placement
- ☐ Improper lifting or handling
- ☐ Improper position for a task
- ☐ Servicing equipment in operation
- ☐ Horseplay
- ☐ Failure to follow procedure, policy or practice
- ☐ Failure to identify hazard or risk
- ☐ Inattention
- ☐ Failure to communicate
- ☐ Other: Specify

B. **UNSAFE CONDITIONS** (check off as many as necessary)

- ☐ Inadequate guards/barriers
- ☐ Improper/inadequate PPE
- ☐ Defective tools or equipment
- ☐ Congested work area
- ☐ Inadequate warning system
- ☐ Fire and explosion hazards
- ☐ Poor housekeeping; disorder
- ☐ Noise exposure
- ☐ Radiation exposure
- ☐ High or low temperature exposures
- ☐ Inadequate or excess illumination
- ☐ Inadequate ventilation
- ☐ Presence of harmful materials
- ☐ Inadequate instructions/procedures
- ☐ Hazardous environmental conditions; gases, dusts, smokes, fumes, vapours
- ☐ Inadequate information/data
- ☐ Inadequate preparation/planning
- ☐ Inadequate support/assistance
- ☐ Road conditions
- ☐ Weather conditions
- ☐ Other: Specify

BASIC/ROOT CAUSES

C. PERSONAL FACTORS (check off as many as necessary)

- ☐ Inadequate physical capability
- ☐ Physical stress
- ☐ Mental stress
- ☐ Lack of skill
- ☐ Lack of knowledge
- ☐ Other: Specify

D. JOB FACTORS (check off as many as necessary)

- ☐ Inadequate leadership or supervision
- ☐ Inadequate engineering
- ☐ Inadequate purchasing
- ☐ Abuse or misuse
- ☐ Inadequate maintenance (scheduled or preventative)
- ☐ Inadequate tools or equipment
- ☐ Inadequate work standards
- ☐ Other: Specify
- ☐ Excessive wear and tear
- ☐ Inadequate communications
- ☐ Improper motivation

SECTION 8: FOLLOW-UP

Short-term:	Corrective Action	Assigned To	Target Date	Completion Date

Long-term:	Corrective Action	Assigned To	Target Date	Completion Date

CE (Atlantic) – Neil Clements (506-639-2961); CE (Ontario/Quebec) – Jim Elkins (613-404-8508);
CW (AB ECR/BC) – Yvonne Beattie (780-616-8909); CW (AB South, North & Central/SK/MB) – Shawna Robichaud (587-894-2635);
International – Kev Metcalfe (780-231-2185); US East (New England, Tri-State & Mid-Atlantic) – Fred Miller (610-235-7315);
US East (Great Lakes, South & Southeast) - Keith Kuhlmann (740-816-6170); US West – Fred Miller and Keith Kuhlmann

REVIEW COMMENTS		
Involved Employee Comments:		
Signature: Job Title:	Print Name:	Date:
Lead Investigator Comments:		
Signature: Job Title:	Print Name:	Date:
Supervisor/Project Manager:		
Signature: Job Title:	Print Name:	Date:
HSE Representative (OSEC/JH&S Committee/RSEC/HSE Manager):		
Signature: Job Title:	Print Name:	Date:
Management Review:		
Signature: Job Title:	Print Name:	Date:
Client Review (if required):		
Signature: Job Title:	Print Name:	Date:
Additional Comments:		

Stantec

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:** _____

Remember to
1. Stop and think
2. Look around
3. Assess risk
4. Control risks
5. Begin/resume work

Stantec

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

1. Work area clean ☐
2. Material storage identified ☐
3. Dust/Mist/Fume ☐
4. Noise in area ☐
5. Extreme temperatures ☐
6. Spill potential ☐
7. Waste containers needed ☐
8. Waste properly disposed ☐
9. Waste plan identified ☐
10. Excavation permit required ☐
11. Other workers in area ☐
12. Weather conditions ☐
13. MSDS reviewed ☐

Ergonomic Hazards

14. Awkward body position ☐
15. Over extension ☐
16. Prolonged twisting/bending motion ☐
17. Working in a tight area ☐
18. Lift too heavy/awkward to lift ☐
19. Parts of body in line of fire ☐
20. Repetitive motion ☐
21. Hands not in line of sight ☐
22. Working above your head ☐

Access/Egress Hazards

23. Aerial life/Man basket (inspected & tagged) ☐
24. Scaffold (inspected & tagged) ☐
25. Ladders (tied off) ☐
26. Slips & trips ☐
27. Hoisting (tools, equipment) ☐
28. Evacuation (alarms, routes, ph. #) ☐
29. Confined space entry permit required ☐

Overhead Hazards

30. Barricades & signs in place ☐
31. Hole coverings identified ☐
32. Harness/lanyard inspected ☐
33. 100% Tie-off with harness ☐
34. Tie off points identified ☐
35. Falling items ☐
36. Foreign bodies in eyes ☐
37. Hoisting or moving loads overhead ☐

Rigging & Hoisting Hazards

38. Lift study required ☐
39. Proper tools used ☐
40. Tools inspected ☐
41. Equipment inspected ☐
42. Slings inspected ☐
43. Others working overhead/below ☐
44. Critical lift permit ☐

Electrical Hazards

45. GFI test ☐
46. Lighting levels too low ☐
47. Working on/near energized equipment ☐
48. Electrical cords condition ☐
49. Electrical tools condition ☐
50. Fire extinguisher ☐
51. Hot work or electrical permit required ☐

Personal Limitations/Hazards

52. Procedure not available for task ☐
53. Confusing instructions ☐
54. No training for task or tools to be used ☐
55. First time performing the task ☐
56. Micro break (stretching/flexing) ☐
57. Report **all injuries** to your supervisor ☐

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: _____

Stantec

FIELD LEVEL RISK ASSESSMENT (FIT FOR DUTY), 1 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

1. Work area clean ☐
2. Material storage identified ☐
3. Dust/Mist/Fume ☐
4. Noise in area ☐
5. Extreme temperatures ☐
6. Spill potential ☐
7. Waste containers needed ☐
8. Waste properly disposed ☐
9. Waste plan identified ☐
10. Excavation permit required ☐
11. Other workers in area ☐
12. Weather conditions ☐
13. MSDS reviewed ☐

Ergonomic Hazards

14. Awkward body position ☐
15. Over extension ☐
16. Prolonged twisting/bending motion ☐
17. Working in a tight area ☐
18. Lift too heavy/awkward to lift ☐
19. Parts of body in line of fire ☐
20. Repetitive motion ☐
21. Hands not in line of sight ☐
22. Working above your head ☐

Access/Egress Hazards

23. Aerial life/Man basket (inspected & tagged) ☐
24. Scaffold (inspected & tagged) ☐
25. Ladders (tied off) ☐
26. Slips & trips ☐
27. Hoisting (tools, equipment) ☐
28. Evacuation (alarms, routes, ph. #) ☐
29. Confined space entry permit required ☐

Overhead Hazards

30. Barricades & signs in place ☐
31. Hole coverings identified ☐
32. Harness/lanyard inspected ☐
33. 100% Tie-off with harness ☐
34. Tie off points identified ☐
35. Falling items ☐
36. Foreign bodies in eyes ☐
37. Hoisting or moving loads overhead ☐

Rigging & Hoisting Hazards

38. Lift study required ☐
39. Proper tools used ☐
40. Tools inspected ☐
41. Equipment inspected ☐
42. Slings inspected ☐
43. Others working overhead/below ☐
44. Critical lift permit ☐

Electrical Hazards

45. GFI test ☐
46. Lighting levels too low ☐
47. Working on/near energized equipment ☐
48. Electrical cords condition ☐
49. Electrical tools condition ☐
50. Fire extinguisher ☐
51. Hot work or electrical permit required ☐

Personal Limitations/Hazards

52. Procedure not available for task ☐
53. Confusing instructions ☐
54. No training for task or tools to be used ☐
55. First time performing the task ☐
56. Micro break (stretching/flexing) ☐
57. Report **all injuries** to your supervisor ☐

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: _____

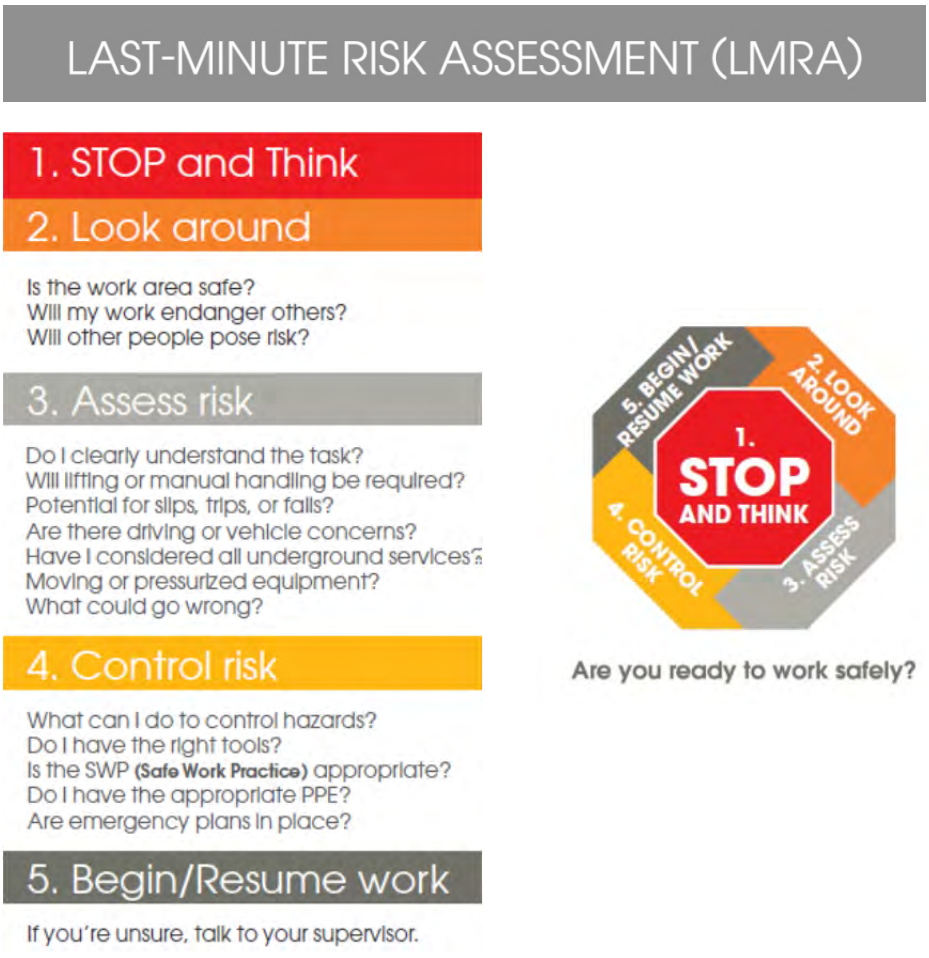
Fit for Duty

Safety is influenced by many factors, but the most important is the health and well-being of Stantec's employees and partners. Physical and mental health are just as important as good tools, good practices, and good job planning.

This card is designed to help you do a quick self-assessment of your physical and mental health. Any concerns resulting from your assessment regarding your ability to carry out your job responsibilities safely and in good health need to be discussed with your supervisor before starting work.

- Am I feeling good today and ready to work at my typical level of physical activity and responsibility?
- Do I have any sprains/strains, areas of weakness or soreness?
- Am I managing multiple sources of stress?
- Am I well hydrated?
- Any physically-demanding activities recently (chores, sports, hobbies)?
- Am I well-rested with a good energy level? When did I eat last?
- Am I taking any medications that can make me drowsy or adversely affect my safe performance?
- Any cuts/scrapes are clean and bandaged?
- Did I remember to bring with me my health maintenance medications (blood pressure, diabetes, cholesterol, heart, etc.)?

If your answers to any of the questions above indicate that you may not be ready to work, contact your supervisor immediately to discuss a plan of action.



APPENDIX D

Quality Assurance Project Plan

Appendix D

Quality Assurance Project Plan
Alternatives Analysis Report and
Remedial Action Work Plan
Canal Street Manufacturing Site
Brownfield Cleanup Program Site
#C828206

67 & 89 Canal Street
Rochester, Monroe County, New York

Prepared for:
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August 2019

APPENDIX D
QUALITY ASSURANCE PROJECT PLAN
ALTERNATIVES ANALYSIS REPORT AND
REMEDIAL ACTION WORK PLAN
CANAL STREET MANUFACTURING SITE
67 & 89 CANAL STREET, ROCHESTER, MONROE COUNTY, NEW YORK

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Abbreviations

AAR	Alternative Analysis Report
ASP	Analytical Services Protocol
ASTM	American Society for Testing and Materials
CLP	Contract Laboratory Program
DUSR	Data Usability Summary Report
DVS	Data Validation Services
EDD	electronic data deliverable
ELAP	Environmental Laboratory Accreditation Program
FER	Final Engineering Report
GC	gas chromatography
GC-MS	gas chromatography-mass spectrometry
HASP	Health and Safety Plan
MS/MSD	Matrix Spike/Matrix Spike Duplicate
NBS	National Bureau of Standards
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
PM	Project Manager
QA	Quality Assurance
QC	Quality Control
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RAWP	Remedial Action Work Plan
RPD	relative percent difference
TestAmerica	Eurofin TestAmerica Laboratories, Inc.
USDOT	United States Department of Transportation
USEPA	United States Environmental Protection Agency

APPENDIX D
QUALITY ASSURANCE PROJECT PLAN
ALTERNATIVES ANALYSIS REPORT AND
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1.0 INTRODUCTION

This Quality Assurance Project Plan (QAPP) is to be used in conjunction with the Alternatives Analysis Report (AAR) and Remedial Action Work Plan (RAWP) for the Canal Street Site located at 67 & 89 Canal Street in Rochester, Monroe County, New York (the "Site"; see Figure 1). This QAPP presents the policies, organization, objectives, functional activities, and specific quality assurance and quality control activities to ensure the validity of data generated during implementation of the RAWP. The purpose of this QAPP program is to ensure that technical data generated are both accurate and representative.

Quality assurance (QA) is a management system for ensuring that information, data, and decisions resulting from investigation and environmental monitoring programs are technically sound, and properly documented. Quality control (QC) is the functional mechanism through which quality assurance achieves its goals. Quality control programs, for example, define the frequency and methods of checks, audits, and reviews necessary to identify problems and dictate corrective actions to resolve these problems, thus ensuring high quality data. As such, a quality assurance and quality control program pertains to data collection, evaluation, and review activities which are part of the investigation.

Quality assurance and quality control (QA/QC) procedures will be in accordance with applicable professional technical standards, government regulations and guidelines, and specific project goals and requirements. This QAPP has been prepared in accordance with New York State Department of Environmental Conservation (NYSDEC) and United States Environmental Protection Agency (USEPA) Region II guidance documents.

The QAPP incorporates the following activities:

- Sample collection, control, chain-of-custody, and analysis;
- Document control;
- Laboratory instrumentation, analysis, and control; and
- Review of project reports.

Laboratory analysis of project samples will be performed by a laboratory with the experience and certifications appropriate to the analyses to be performed. Analyses will be performed by laboratories accredited pursuant to the New York State Department of Health (NYSDOH) Environmental Laboratory Accreditation Program (ELAP) for the category of parameters to be analyzed by the laboratory. It is anticipated that Eurofins TestAmerica Laboratories, Inc. (TestAmerica) in Amherst, NY or Alpha Analytical in Westborough, MA will be utilized during the Remedial Actions (RA).

Duplicates, replicates, and spiked samples will be used to identify the quality of the analytical data. Field audits may be conducted to verify that proper sampling techniques and chain-of-custody procedures are followed. Field data compilation, tabulation, and analysis will be checked for accuracy. Calculations and

other post-field tasks will be reviewed by senior project personnel. Equipment used to take field measurements will be maintained and calibrated in accordance with established procedures. Records of calibration and maintenance will be kept by assigned personnel. Field testing and data acquisition will be performed following guidelines as described herein.

Document control procedures will be used to coordinate the distribution, coding, storage, retrieval, and review of data collected during sampling tasks.

A Data Usability Summary Report (DUSR) will be prepared for analytical results from each sampling and/or monitoring activity, with the exception of sampling data utilized for screening, waste characterization, and survey purposes only. These screening, waste characterization, and survey samples are specified in the RAWP. The DUSR will be prepared by an independent consultant with the required experience, in accordance with NYSDEC's "Guidance for the Development of Data Usability Summary Reports," revised 1997 and NYSDEC's DER-10 "Technical Guidance for Site Investigation and Remediation," May 2010 (DER-10). It is anticipated that Data Validation Services (DVS) will conduct the RA data quality review and prepare the DUSR for Stantec.

2.0 PROJECT DESCRIPTION

This QAPP pertains to the completion of field activities and subsequent laboratory and data analysis associated with the proposed RAs at the Canal Street Manufacturing Site located at 67 & 89 Canal Street in Rochester, NY. A description of the Site and the RAs planned is presented in the RAWP to which this QAPP is attached as an appendix. The RAWP also describes the previous environmental investigations performed at the Site.

3.0 PROJECT ORGANIZATION AND RESPONSBIILITY

This QAPP provides for designated qualified personnel to review products and provide guidance on QA matters. This QAPP also outlines the approach to be followed to ensure that products of sufficient quality are obtained. This structure will provide for direct and constant operational responsibility, clear lines of authority, and the integration of QA activities. The QA-related functions of the project positions are as follows:

Project Manager

The project manager (PM) will have overall responsibility for ensuring that the project meets the objectives and quality standards as presented in the RAWP and this QAPP. The PM will be responsible for implementing the project and will have the authority to commit the resources necessary to meet project objectives and requirements. The PM's primary function is to ensure that technical, financial, and scheduling objectives are achieved successfully. The project manager will provide the major point of contact and control for matters concerning the project. In addition, the PM will be responsible for technical quality control and project oversight.

Team Leaders

The project manager will be supported by a team leader or leaders who will be responsible for leading and coordinating the day-to-day activities of the various resource specialists under their supervision. The team leader is a highly experienced environmental professional who will report directly to the project manager.

Technical Staff

The technical staff (team members) for this project will be drawn from corporate resources and appropriately qualified subcontractors. The technical staff will be used to gather and analyze data, and to prepare various task reports and support materials. The designated team members will be experienced professionals who possess the degree of specialization and technical competence required to effectively and efficiently perform the required work.

Project QA Director

The Project QA Director will be responsible for maintaining QA for the project.

Laboratory Director

The laboratory director will be responsible for analytical work and works in conjunction with the QA unit. The laboratory director maintains liaison with the QA officer regarding QA and custody requirements.

Laboratory Manager

The laboratory manager will maintain liaison with the laboratory director regarding QA elements of specific sample analyses tasks. The laboratory manager will report to the laboratory director and work in conjunction with the laboratory QA unit.

Laboratory QA Coordinator

The laboratory QA coordinator will be responsible for overseeing the QA program within the laboratory and for maintaining QC documentation. The laboratory QA coordinator reports directly to the laboratory director.

Laboratory Staff

Each member of the laboratory staff will perform an assigned QA or analytical function that is pertinent to and within the scope of his or her knowledge, experience, training, and aptitude. An individual will be assigned the responsibility for checking, reviewing, or otherwise verifying that a sample analysis activity has been correctly performed.

Laboratory Facilities

Laboratory work will be performed in accordance with guidelines established by NYSDEC, NYSDOH, USEPA, and/or the American Society for Testing and Materials (ASTM). In case of conflict, these guidelines and protocols will be considered in the order shown (i.e., NYSDEC criteria is of primary precedence). In addition, QA/QC programs will be maintained for the instruments and the analytical procedures used. A NYSDOH ELAP certified laboratory capable of providing NYSDEC Analytical Services Protocol (ASP) Category B deliverables will be identified to provide laboratory services for this project. It is anticipated that TestAmerica in Amherst, NY or Alpha Analytical in Westborough, MA will be the provider of laboratory services for the RI.

With the exception of data collected solely for screening, waste characterization, and survey purposes, data will be reported with a NYSDEC ASP Category B deliverable.

4.0 QA OBJECTIVES FOR DATA MEASUREMENT

Measurements will be made to ensure that analytical results are representative of the media and conditions measured. Unless otherwise specified, data will be calculated and reported in units consistent with other organizations who report similar data to allow comparability of databases among organizations.

4.1 KEY CONSIDERATIONS

The key considerations for the QA assessment of generated data are accuracy, precision, completeness, representativeness, and comparability. These characteristics are defined below:

Accuracy: Accuracy is the degree of agreement of a measurement or average of measurements with an accepted reference or "true" value and is a measure of bias in the system.

Precision: Precision is the degree of mutual agreement among individual measurements of a given parameter.

Completeness: Completeness is a measure of the amount of valid data obtained from a measurement system compared to the amount expected to be obtained under correct normal conditions.

Representativeness: Representativeness expresses the degree to which data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition.

Comparability: Comparability expresses the confidence with which one data set can be compared to another.

Refer to Section 13.0 for additional detail regarding the metrics listed above.

4.2 GOALS

The QA/QC goals will focus on controlling measurement error within the limits established and will ultimately provide a database for estimating the actual uncertainty in the measurement data.

Target values for detection limit, percent spike recovery and percent "true" value of known check standards, and relative percent difference (RPD) of duplicates/replicates are provided in the referenced analytical procedures. It should be noted that target values are not always attainable. Instances may arise where high sample concentrations, non-homogeneity of samples, or matrix interferences preclude achievement of target detection limits or other quality control criteria. In such instances, the laboratory will report reasons for deviations from these detection limits or noncompliance with quality control criteria.

5.0 SAMPLING PROCEDURES

The sampling of various environmental media will be completed as part of the RAs. The RAWP presents the location, type, and analytical requirements of samples to be collected as part of the RAs.

5.1 SAMPLING PROGRAM

The sampling and field procedures for the components of the RAs are described in the RAWP.

The sample containers, preservation, and holding times that will be used are identified in Table 1. The sample containers will be labeled in accordance with Section 6.2. Sample handling, packaging and shipping procedures are presented in Section 6.3.

5.2 FIELD QUALITY CONTROL SAMPLES

Field quality control samples will consist of field duplicates, trip blanks, rinsate blanks, and matrix spikes/matrix spike duplicates (MS/MSD), as shown on Table 2.

5.2.1 Trip Blanks

Trip blanks will be used to assess whether aqueous samples have been exposed to volatile constituents during sample storage and transport. The trip blanks will consist of a container filled by the laboratory with analyte-free water. One trip blank will be analyzed for each cooler containing aqueous VOC samples. The trip blanks will remain unopened throughout the sampling event and will only be analyzed for volatile organics. The trip blanks will be collected as shown in Table 2.

5.2.2 Rinsate Blanks

Rinsate blanks will be used to assess decontamination procedures for non-dedicated equipment. Rinsate blanks will be collected as shown in Table 2.

5.2.3 Field Duplicates

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, as shown in Table 2.

5.2.4 Matrix Spike/Matrix Spike Duplicates

MS/MSDs will be obtained to determine if the matrix is interfering with the sample analysis. MS/MSDs will be collected at a rate of one per 20 original field samples, as shown on Table 2.

5.2.5 Laboratory Quality Control Checks

Internal laboratory quality control checks will be used to monitor data integrity. These checks include method (equipment) blanks, spike blanks, internal standards, surrogate samples, calibration standards, and reference standards.

5.3 SAMPLE CONTAINERS

The volumes and containers required for the sampling activities are included in Table 1. Pre-washed sample containers will be provided by the laboratory. All bottles are to be prepared in accordance with USEPA bottle washing procedures.

5.4 DECONTAMINATION

Dedicated and/or disposable sampling equipment will be used to the extent possible to minimize decontamination requirements and the possibility of cross-contamination.

Excavator bucket, shovels, hand augers, and sediment samplers are examples of sampling equipment that could be used at more than one location.

The non-dedicated samplers used for soil sampling in excavations will be decontaminated with a bucket wash consisting of a low-phosphate detergent wash followed by potable water rinse and/or using a high-pressure steam. Steam cleaning will be performed in a designated on-Site decontamination area. The heavy equipment will also be cleaned upon completion of each excavation area and prior to departure from the Site using the following methods:

- Initial cleaning of foreign matter; and
- Wash down with high-pressure wash.

Throughout and after the cleaning processes, direct contact between the equipment and the ground surface will not be permitted. Decontamination wastewater will be containerized for later characterization and disposal.

5.5 LEVELS OF PROTECTION/SITE SAFETY

Sampling will be conducted under a written Health and Safety Plan (HASP). On the basis of air monitoring, the level of protection may be downgraded or upgraded at the discretion of the Site safety officer or team lead. Work will initially be conducted in Level D (refer to HASP, Appendix C of the RAWP). Air purifying respirators (APRs) will be available if monitoring indicates an upgrade to Level C is appropriate. Crew members will stand upwind of open boreholes or wellheads during the collection of samples, when possible.

6.0 SAMPLE CUSTODY

This section describes standard operating procedures for sample identification and chain-of-custody to be used for field activities. The purpose of these procedures is to ensure that the quality of the samples is maintained during collection, transportation, storage, and analysis. Chain-of-custody requirements comply with standard operating procedures indicated in USEPA and NYSDEC sample-handling protocol.

Sample identification documents must be carefully prepared so that sample identification and chain-of-custody can be maintained and sample disposition controlled. Sample identification documents include:

- Field sampling records (field notebook and/or field logs);
- Sample labels;
- Custody seals; and
- Chain-of-custody records.

6.1 CHAIN-OF-CUSTODY

The primary objective of the chain-of-custody procedures is to provide an accurate written or computerized record that can be used to trace the possession and handling of a sample from collection to completion of required analyses.

6.1.1 Sample Labels

Sample labels attached to, or affixed around, the sample container must be used to properly identify samples collected in the field. To the extent possible, the sample labels are to be placed on the bottles so as not to obscure any QA/QC lot numbers on the bottles. Sample information must be printed in a legible manner using waterproof ink. Field identification must be sufficient to enable cross-reference with the field sampling records (field notebook and/or field logs). For chain-of-custody purposes, QC samples are subject to the same custodial procedures and documentation as original or parent samples.

6.1.2 Custody Seals

Custody seals are pre-printed adhesive-backed seals often with security slots which are designed to break if the seals are disturbed. Sample shipping containers (coolers, cardboard boxes, etc., as appropriate) are sealed in as many places as necessary to ensure security. Seals must be signed and dated before use. On receipt at the laboratory, the custodian must check (and certify, by completing logbook entries) that seals on shipping containers are intact. Strapping tape should be placed over the seals to ensure that seals on shipping containers are not accidentally broken during shipment.

6.1.3 Chain-Of-Custody Record

The chain-of-custody record must be completed at least in duplicate by the field personnel designated by the PM as being responsible for sample shipment to the appropriate laboratory for analysis. In addition, if samples are known to require rapid turnaround in the laboratory because of project time constraints or

analytical concerns (e.g., extraction time or sample retention period limitations, etc.), the person completing the chain-of-custody record should note these constraints in the designated section of the custody record. The field personnel who shipped the samples will review the sample log-in information sent by the lab to confirm sample ID, sample date, sample time, required analyses, and turnaround time. If any discrepancies are identified, the individual will contact the laboratory to correct those inconsistencies.

6.1.4 Field Custody Procedures

The following field custody procedures will be implemented:

- As few parties as possible should handle samples.
- 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.
- The sample collector is responsible for the care and custody of samples collected until they are transferred to another person or dispatched properly under chain-of-custody rules.
- The sample collector will record sample data in a controlled field notebook and/or on appropriate field sampling logs.
- The Site team leader will determine whether proper custody procedures were followed during the fieldwork and decide if additional samples are required.

6.2 DOCUMENTATION

6.2.1 Sample Identification

Collected samples will be identified using the following format on a label or tag fixed to the sample container:

CNL-xxxx-Z, where:

- "CNL" - This shorthand indicates the project located at the **C**a**n**a**l** Street Site (67-89 Canal Street in Rochester, NY).
- "xxxx" - These characters (alpha-numeric) will be individual sample-specific. The number of characters may vary depending on the sample location and type. Sample identifications and locations will be recorded on the sampling record. If possible, slashes will be avoided. Field duplicates and rinsate blanks will be assigned unique sample numbers.
- "Z" - This initial will identify the sample matrix in accordance with the following abbreviations:
    - S – Soil Sample

- W – Water Sample

Each sample will be labeled, chemically preserved, if required, and sealed immediately after collection. To minimize handling of sample containers, labels will be filled out prior to sample collection to the extent possible. The sample label will be filled out using waterproof ink and will be firmly affixed to the sample containers. The sample label will give the following information:

- Name or initials of sampler(s);
- Date and time of collection;
- Sample identification;
- Intended analysis; and
- Preservation.

6.2.2 Daily Logs

Daily log entries in the project-dedicated field notebook and field data log forms are necessary to provide sufficient data and observations to enable participants to reconstruct events that occurred during the project. Daily logs will be kept in a project-dedicated notebook, with the pages/entries consecutively numbered. Entries will be made in waterproof ink, dated, and signed. Sampling data will be recorded in the sampling records (may be separate field logs). Information will be completed in waterproof ink, where possible. Corrections will be made using a single strike-through with the editor's initials.

6.3 SAMPLE HANDLING, PACKAGING, AND SHIPPING

The 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. Regulations for packaging, marking, labeling, and shipping hazardous materials are promulgated by the United States Department of Transportation (USDOT) in the Code of Federal Regulations, 49 CFR 171 through 177.

All chain-of-custody requirements must comply with standard operating procedures in the NYSDEC and USEPA sample handling protocol. Field personnel will make arrangements for transportation of samples to the laboratory. When custody is relinquished to a shipper, field personnel will ensure that the laboratory custodian or project manager is aware of the expected time of arrival of the sample shipment and of any time constraints on sample analysis(es). Samples will be delivered to the laboratory in a timely manner to help ensure that holding times are followed.

7.0 CALIBRATION PROCEDURES AND FREQUENCY

Instruments and equipment used during sampling and analysis will be operated, calibrated, and maintained according to the manufacturer's guidelines and recommendations as well as criteria set forth in the applicable analytical methodology references.

7.1 FIELD INSTRUMENTS

A calibration program will be implemented to ensure that routine calibration is performed on field instruments. Calibration will typically be performed on a daily basis unless manufacturer's instructions indicate differently. More frequent calibrations may be performed as necessary to maintain analytical integrity. If possible, bump tests shall be performed at the end of the workday. Field personnel familiar with the calibration and operations of the equipment will maintain proficiency and perform the prescribed calibration procedures outlined in the operation manuals accompanying the respective instruments. Calibration records for each field instrument used on the project will be maintained in the project files.

7.2 LABORATORY INSTRUMENTS

Laboratory calibration procedures are addressed in detail in the laboratories' Quality Assurance Manual which is available upon request. Calibration procedures will be consistent with the method used for analysis.

8.0 ANALYTICAL PROCEDURES

8.1 FIELD

On-Site procedures for analysis of organic vapor via PID are addressed in the RAWP.

8.2 LABORATORY

Specific analytical methods for constituents of interest in soil and groundwater are listed in Table 1. The laboratory will maintain and have available for the appropriate operators Standard Operating Procedures relating to sample preparation and analysis according to the methods stipulated in Table 1. Laboratory SOPs and target reporting and detection limits are available upon request.

9.0 DATA REDUCTION AND REPORTING

QA/QC requirements will be strictly adhered to during sampling and analytical work. Data generated will be reviewed by comparing and interpreting results from chromatograms (responses, stability of retention times), accuracy (mean percent recovery of spiked samples), and precision (reproducibility of results).

Data storage and documentation will be maintained using logbooks and data sheets that will be kept on file. Analytical QC will be documented and included in the analytical testing report. A central file will be maintained for the sampling and analytical effort after the final laboratory report is issued.

Calculations and data manipulations are included in the appropriate methodology references. Control charts and calibration curves will be used to review the data and identify outlying results. Prior to the submission of the report to the client, data will be evaluated for precision, accuracy, and completeness. Sections 4.0, and 13.0 of this document include some of the QC criteria to be used in the data evaluation process.

Laboratory reports will be reviewed by the laboratory supervisor, the project QA director, laboratory manager and/or director, and the PM. Analytical reports will contain a data tabulation of results. Supporting QC information will also be provided in the laboratory reports. Raw data will be available for later inspection, if required, and maintained in the control job file. With the exception of data collected solely for screening, waste characterization, and survey purposes, data will be reported in NYSDEC ASP Category B deliverable format.

Finalized data will be provided to NYSDEC in an electronic data deliverable (EDD) format, in accordance with DER-10 and NYSDEC's "Electronic Data Deliverable Manual" (v.4, November 2018). The EDD will reflect DUSR-related modifications, as appropriate.

10.0 INTERNAL QUALITY CONTROL CHECKS

QC data are necessary to determine precision and accuracy and to demonstrate the absence of interferences and/or contamination of glassware and reagents. The procedures to be followed for internal quality control checks are consistent with NYSDEC ASP protocols.

11.0 PERFORMANCE AND SYSTEM AUDITS

11.1 FIELD AUDITS

The Project QA Director may conduct episodic audits of the operations at the Site to ensure that work is being performed in accordance with the work plan and associated standard operating practice. The audit will cover, but not necessarily be limited to, such areas as:

- Conformance to standard operating procedures;
- Completeness and accuracy of documentation;
- Chain-of-custody procedures; and
- Construction specifications.

11.2 LABORATORY AUDITS

In addition to any audits required by the NYSDEC, the Project QA Director may choose to audit the laboratory. These additional audits may take the form of performance evaluation samples or on-Site inspections of the laboratory. Performance evaluation samples may be either blind samples or samples of known origin to the laboratory. Reasonable notice will be provided if the audit is to include an on-Site inspection of the laboratory.

12.0 PREVENTATIVE MAINTENANCE

12.1 FIELD

Field personnel assigned to complete the work will be responsible for preventative maintenance of field instruments. The field sampling personnel will protect the field instruments by placing them in portable boxes and/or protective cases, and by minimizing their exposure to precipitation to the extent practicable.

Field equipment will be subject to a routine maintenance program, prior to and after each use. The routine maintenance program for each piece of equipment will be in accordance with the manufacturer's operations and maintenance manual. Equipment will be cleaned and checked for integrity after each use. Necessary repairs will be performed immediately after any defects are observed, and before the item of equipment is used again. Equipment parts with a limited life (such as batteries, membranes, sensors and some electronic components) will be periodically checked and replaced or recharged as necessary according to the manufacturer's specifications.

12.2 LABORATORY

The laboratory's preventative maintenance procedures are provided in the laboratory's Quality Assurance Manual (available upon request).

13.0 DATA ASSESSMENT PROCEDURE

Performance of the following calculations will be completed to evaluate the accuracy, precision and completeness of collected measurement data.

13.1 PRECISION

Precision of a particular analysis is measured by assessing its performance with duplicate or replicate samples. Duplicate samples are pairs of samples taken in the field and transported to the laboratory as distinct samples. Their identity as duplicates is sometimes not known to the laboratory and usually not known to bench analysts, so their usefulness for monitoring analytical precision at bench level is limited. For most purposes, precision is determined by the analysis of replicate pairs (i.e., two samples prepared at the laboratory from one original sample). Often in replicate analysis the sample chosen for replication does not contain target analytes so that quantification of precision is impossible. Replicate pairs of spiked samples, known as MS/MSDs, are used for precision studies. This has the advantage that two real positive values for a target analyte can be compared.

Precision is calculated in terms of RPD, which is expressed as follows:

$$RPD = \frac{(x_1 - x_2) \times 100}{(x_1 + x_2)/2}$$

where $x_1 - x_2$ represent the individual values found for the target analyte in the two replicate analyses or in the MS/MSD analyses.

RPDs must be compared to the method RPD for the analysis. The analyst or analyst supervisor must investigate the cause of RPDs outside stated acceptance limits. This may include a visual inspection of the sample for non-homogeneity, analysis of check samples, etc. Follow-up action may include sample re-analysis or flagging of the data as suspect if problems cannot be resolved.

13.2 ACCURACY

Accuracy of a particular analysis is measured by assessing its performance with "known" samples. These "knowns" can take the form of USEPA or National Bureau of Standards (NBS) traceable standards (usually spiked into a pure water matrix); or laboratory prepared solutions of target analytes into a pure water or sample matrix; or, in the case of gas chromatography (GC) or gas chromatography-mass spectrometry (GC-MS) analyses, solutions of surrogate compounds which can be spiked into every sample and are designed to mimic the behavior of target analytes without interfering with their determination.

In each case the recovery of the analyte is measured as a percentage, corrected for analytes known to be present in the original sample if necessary, as in the case of a matrix spike analysis. For USEPA or NBS supplied known solutions, this recovery is compared to the published data that accompany the solution. For prepared solutions, the recovery is compared to USEPA-developed data or historical data as

available. For surrogate compounds, recoveries are compared to USEPA Contract Laboratory Program (CLP) acceptable recovery tables. If recoveries do not meet required criteria, then the analytical data for the batch (or, in the case of surrogate compounds, for the individual sample) are considered potentially inaccurate.

For highly contaminated samples, recovery of matrix spike may depend on sample homogeneity. As a rule, analyses are not corrected for recovery of matrix spike or surrogate compounds.

13.3 COMPLETENESS

Completeness is a measure of the amount of valid data obtained from a measurement system compared to the total amount expected to be obtained under normal conditions. Completeness for each parameter is calculated as:

$$Completeness = \frac{Number\ of\ Successful\ Analyses\ \times 100}{Number\ of\ Requested\ Analyses}$$

Target value for completeness for parameters is 100%. A completeness value of 95% will be considered acceptable. Incomplete results will be reported to the PM.

13.4 REPRESENTATIVENESS

The characteristic of representativeness is not quantifiable. Subjective factors to consider include:

- The degree of homogeneity of the Site;
- The degree of homogeneity of a sample taken from one point in a Site; and
- The available information on which a sampling plan is based.

To maximize representativeness of results, sampling techniques and sample locations will be carefully chosen so that they provide laboratory samples representative of the Site and the specific area sampled.

14.0 QUALITY ASSURANCE REPORTS

Upon completion of the RA sampling effort, with the exception of sampling efforts conducted solely for screening, waste characterization, and survey purposes, analytical and QC data will be included in a DUSR that summarizes the work and provides a data evaluation. A discussion of the usability of the results in the context of QA/QC procedures will be prepared for the Final Engineering Report (FER) and will also include a summary of the QA/QC activity. The DUSR will be performed in accordance with the DEC's "Guidance for the Development of Data Usability Summary Reports," revised 1997, and DER-10.

As described in the following section, serious analytical problems will be reported, and appropriate corrective measures taken.

15.0 CORRECTIVE ACTION

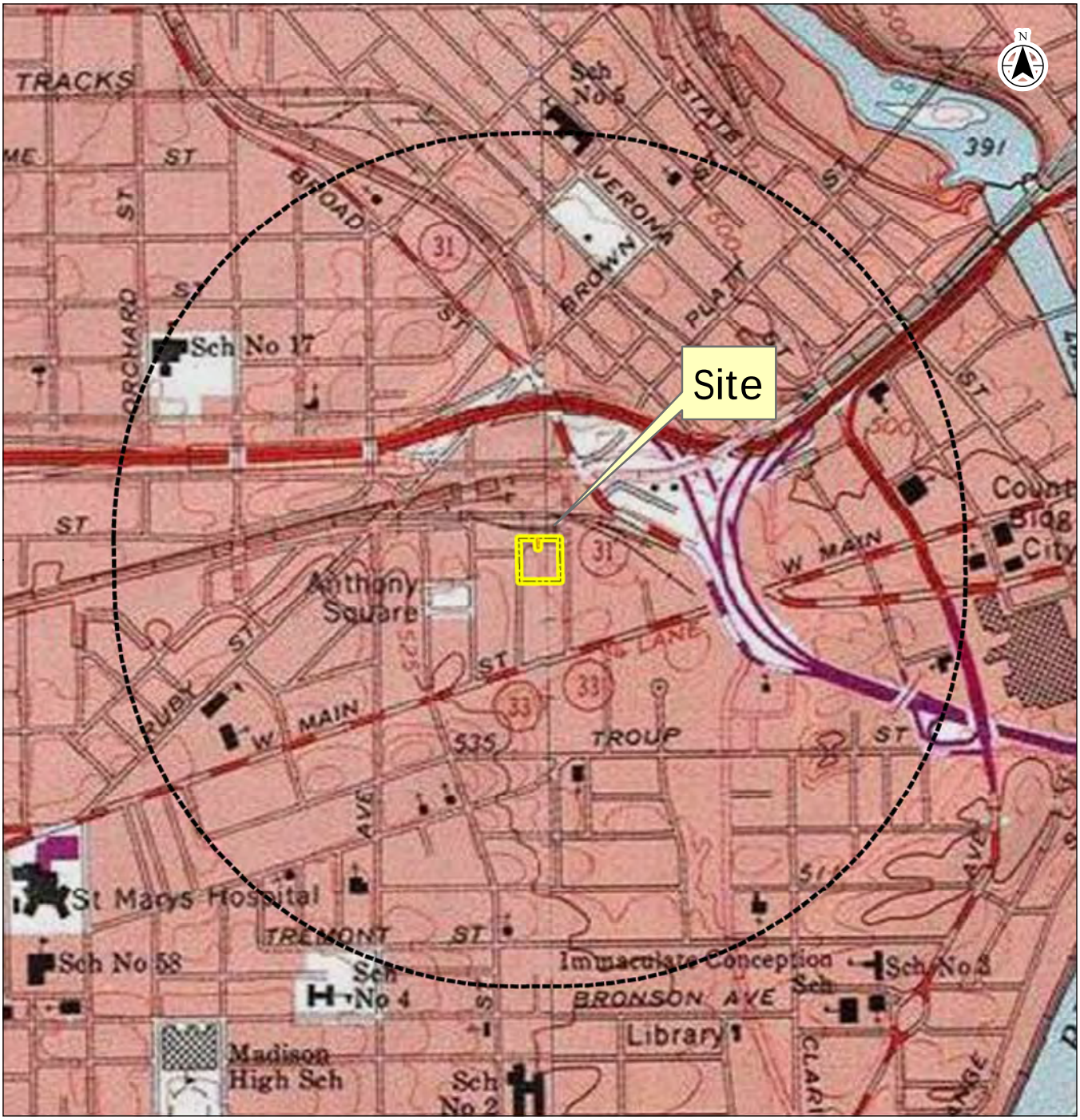
Corrective actions can be initiated as a result of performance and system audits, laboratory and inter-field comparison studies, data validation, and/or a QA program audit. They may also be required as a result of a request from project representatives. Corrective action necessary to resolve analytical problems will be implemented.

Time and type of corrective action, if needed, will depend on the severity of the problem and relative overall project importance. Corrective actions may include altering procedures in the field, conducting subsequent audits, or modifying project/laboratory protocol. Corrective action will be implemented after notification of project representatives. The PM is responsible for initiating corrective action and the team leader is responsible for its implementation in the correction of field non-conformance corrective actions. Success or failure of corrective actions will be reported to project representatives, and addressed within the FER, including an estimate of effect on data quality, if any.

APPENDIX D
QUALITY ASSURANCE PROJECT PLAN
ALTERNATIVES ANALYSIS REPORT AND
REMEDIAL ACTION WORK PLAN
CANAL STREET MANUFACTURING SITE
67 & 89 CANAL STREET, ROCHESTER, MONROE COUNTY, NEW YORK

FIGURES

Stantec



Legend

- Property Outline
- City of Rochester ROW*
- 1/2-mile Site Buffer

0 400 800 1,200 Feet

1:12,000 (at original document size of 8.5x11)

Notes
1. Coordinate System: NAD 1983 StatePlane New York West FIPS 3103 Feet
2. ArcGIS Basemaps: USA Topo Maps (main frame) and World Street Map (key map).
3. *The City of Rochester ROW is anticipated to become part of the Canal Street Site upon abandonment by the City of Rochester.

Stantec

Project Location
67 & 89 Canal Street
C. of Rochester, Monroe Co., NY

190500965
Prepared by LB on 2017-12-13
Technical Review by KN on 2018-01-19
Independent Review by MPS on 2018-01-30

Client/Project
Canal Street Manufacturing Site
AAR and RAWP
Quality Assurance Project Plan

Figure No.
1

Title
Site Location Map

APPENDIX D
QUALITY ASSURANCE PROJECT PLAN
ALTERNATIVES ANALYSIS REPORT AND
REMEDIAL ACTION WORK PLAN
CANAL STREET MANUFACTURING SITE
67 & 89 CANAL STREET, ROCHESTER, MONROE COUNTY, NEW YORK

TABLES

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Table 1
Sample Specifications
Quality Assurance Project Plan
Canal Street Manufacturing Site
67 & 89 Canal Street, Rochester, NY

Media	Type of Analysis	Method	Required Container	Preferred Sample Volume	Preservation	Maximum Holding Time from Collection
Soil[A]	TCL plus CP-51 VOCs + TICs	EPA 8260C	2 oz. wm	2 oz.	Cool 4°C	14 days
	TCL SVOCs + TICs and 1,4-dioxane	EPA 8270D	(2) 4 oz. wm	8 oz.	Cool 4°C	7 days
	TCL Pesticides	EPA 8081B			Cool 4°C	
	TCL PCBs	EPA 8082A			Cool 4°C	
	TAL Metals	EPA 6010C/7000 Series	4 oz. wm	4 oz.	Cool 4°C	6 months; 28 days for mercury
	PFAS	EPA Method 537.1 (modified)	4 oz. wm	4 oz.	Cool 4°C	14 day for Extract; 40 day for Analysis
Groundwater	TCL plus CP-51 VOCs + TICs	EPA 8260C	(3) 40 ml glass vials	120 ml	pH < 2, HCl	14 days if acidified with HCl
	TCL SVOCs + TICs	EPA 8270D	(2) 250 ml amber glass jars	500 ml	Cool 4°C	7 day/40 day[B]
	TOC	SM5310D	(2) 40 ml glass vials	80 ml	pH < 2, HCl	28 days
	Total Na and Fe	EPA 6010C	(1) 250 ml plastic	250 ml	HNO_3	180 days
	Dissolved Mn and As	EPA 6010C	(1) 250 ml plastic	250 ml	Filtered; HNO_3	180 days
	Nitrate, Nitritie and Sulfate	353.2/D516	(1) 125 ml plastic	125 ml	Cool 4°C	48 hours/28 days[C]

Key:

CP-51	NYSDEC Commissioner Policy (CP)-51
wm	wide mouth jar
EPA	U.S. Environmental Protection Agency
HCl	hydrochloric acid
ml	milliliter
HNO_3	nitric acid
PCBs	Polychlorinated biphenyls
PFAS	Per- and Polyfluoroalkyl Substances
SVOCs	semivolatile organic compounds
TCL	USEPA's Target Compound List
TOC	Total Organic Carbon
TIC	tentatively identified compound
VOCs	volatile organic compounds
oz.	ounces

Notes:
[A] Also includes matrix for fill.
[B] Holding time is 7 days from collection to extraction and 40 days from extraction to analysis.
[C] Holding time is 48 hours from collection to extraction and 28 days from extraction to analysis.

Table 2
Summary of Field Quality Control Checks
Quality Assurance Project Plan
Canal Street Manufacturing Site
67 & 89 Canal Street, Rochester, NY

Analysis Parameters	Analysis Method (USEPA SW846 method number)	Estimated Number of Site Samples	QA/QC Samples				Total Number of Samples
			Field Duplicates[3]	Trip Blanks[4]	Rinsate Blanks[5]	MS/MSD[6]	
Soil Sampling[1]							
TCL VOCs	8260C	28	2	0	5	2 / 2	39
TCL SVOCs	8270D	28	2	0	5	2 / 2	39
Imported Fill or Excavated Materials for on-Site Reuse							
TCL VOCs	8260C	As needed in accordance with DER-10					
TCL SVOCs and 1,4-dioxane	8270D						
TCL PCBs	8082A						
TCL Pesticides	8081B						
TAL Metals	6010C/7000 series						
PFAS	EPA Method 537.1 (modified)						
Groundwater Sampling[2]							
TCL VOCs	8260C	9	1	2	0	1 / 1	14
TCL SVOCs	8270D	3	1	0	0	1 / 1	6
TOC[7]	SM5310D	4	0	0	0	0	4
Total Na and Fe[7]	6010C	4	0	0	0	0	4
Dissolved Mn and As[7]	6010C	4	0	0	0	0	4
Nitrate, Nitritie and Sulfate[7]	353.2/D516	6	0	0	0	0	6

Key:

MS/MSD	Matrix Spike/Matrix Spike Duplicate
QA/QC	Quality Assurance/Quality Control
PCBs	Polychlorinated biphenyls
PFAS	Per- and Polyfluoroalkyl Substances
SVOCs	TCL semivolatile organic compounds plus up to 20 TICs
TCL	USEPA's Target Compound List
TICs	tentatively identified compounds
USEPA	United States Environmental Protection Agency
VOCs	TCL volatile organic compounds plus additional NYSDEC CP-51 VOCs plus up to 10 TICs (except for Passive Soil Gas samples which will be analyzed for TCL VOCs only)

Notes:

[1] Includes subsurface soils and matrix for fill

[2] This table reflects anticipated QA/QC sample requirements for each separate groundwater sampling event.

[3] Field duplicates will be collected at a frequency of 1 per 20 samples for each sample medium.

[4] Trip blanks will be collected at a frequency of 1 per cooler containing aqueous samples to be analyzed for VOCs.

[5] Rinsate blanks will be collected at a frequency of 1 per mobilization for each sampling method using non-dedicated equipment.

[6] MS/MSDs will be collected at a frequency of 1 per 20 samples for each sample medium.

[7] QA/QC samples will not be collected for remediation-related parameters.

APPENDIX E

Community Air Monitoring Plan

Appendix J
New York State Department of Health
Generic Community Air Monitoring Plan

Overview

A Community Air Monitoring Plan (CAMP) requires real-time monitoring for volatile organic compounds (VOCs) and particulates (i.e., dust) at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The CAMP is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels specified herein require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, the CAMP helps to confirm that work activities did not spread contamination off-site through the air.

The generic CAMP presented below will be sufficient to cover many, if not most, sites. Specific requirements should be reviewed for each situation in consultation with NYSDOH to ensure proper applicability. In some cases, a separate site-specific CAMP or supplement may be required. Depending upon the nature of contamination, chemical- specific monitoring with appropriately-sensitive methods may be required. Depending upon the proximity of potentially exposed individuals, more stringent monitoring or response levels than those presented below may be required. Special requirements will be necessary for work within 20 feet of potentially exposed individuals or structures and for indoor work with co-located residences or facilities. These requirements should be determined in consultation with NYSDOH.

Reliance on the CAMP should not preclude simple, common-sense measures to keep VOCs, dust, and odors at a minimum around the work areas.

Community Air Monitoring Plan

Depending upon the nature of known or potential contaminants at each site, real-time air monitoring for VOCs and/or particulate levels at the perimeter of the exclusion zone or work area will be necessary. Most sites will involve VOC and particulate monitoring; sites known to be contaminated with heavy metals alone may only require particulate monitoring. If radiological contamination is a concern, additional monitoring requirements may be necessary per consultation with appropriate DEC/NYSDOH staff.

Continuous monitoring will be required for all ground intrusive activities and during the demolition of contaminated or potentially contaminated structures. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pitting or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be required during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. “Periodic” monitoring during sample collection might reasonably consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or

overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. In some instances, depending upon the proximity of potentially exposed individuals, continuous monitoring may be required during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) must be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis or as otherwise specified. Upwind concentrations should be measured at the start of each workday and periodically thereafter to establish background conditions, particularly if wind direction changes. The monitoring work should be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment should be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment should be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

1. If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities must be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities can resume with continued monitoring.

2. If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.

3. If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shutdown.

4. All 15-minute readings must be recorded and be available for State (DEC and NYSDOH) personnel to review. Instantaneous readings, if any, used for decision purposes should also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations should be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate monitoring should be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment must be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

1. If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques must be employed. Work may continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed 150 mcg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.

2. If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than 150 mcg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within 150 mcg/m^3 of the upwind level and in preventing visible dust migration.

3. All readings must be recorded and be available for State (DEC and NYSDOH) and County Health personnel to review.

December 2009

Appendix 1B
Fugitive Dust and Particulate Monitoring

A program for suppressing fugitive dust and particulate matter monitoring at hazardous waste sites is a responsibility on the remedial party performing the work. These procedures must be incorporated into appropriate intrusive work plans. The following fugitive dust suppression and particulate monitoring program should be employed at sites during construction and other intrusive activities which warrant its use:

1. Reasonable fugitive dust suppression techniques must be employed during all site activities which may generate fugitive dust.

2. Particulate monitoring must be employed during the handling of waste or contaminated soil or when activities on site may generate fugitive dust from exposed waste or contaminated soil. Remedial activities may also include the excavation, grading, or placement of clean fill. These control measures should not be considered necessary for these activities.

3. Particulate monitoring must be performed using real-time particulate monitors and shall monitor particulate matter less than ten microns (PM10) with the following minimum performance standards:

(a) Objects to be measured: Dust, mists or aerosols;
(b) Measurement Ranges: 0.001 to 400 mg/m3 (1 to 400,000 :ug/m3);
(c) Precision (2-sigma) at constant temperature: +/- 10 :g/m3 for one second averaging; and +/- 1.5 g/m3 for sixty second averaging;
(d) Accuracy: +/- 5% of reading +/- precision (Referred to gravimetric calibration with SAE fine test dust (mmd= 2 to 3 :m, g= 2.5, as aerosolized);
(e) Resolution: 0.1% of reading or 1g/m3, whichever is larger;
(f) Particle Size Range of Maximum Response: 0.1-10;
(g) Total Number of Data Points in Memory: 10,000;
(h) Logged Data: Each data point with average concentration, time/date and data point number
(i) Run Summary: overall average, maximum concentrations, time/date of maximum, total number of logged points, start time/date, total elapsed time (run duration), STEL concentration and time/date occurrence, averaging (logging) period, calibration factor, and tag number;
(j) Alarm Averaging Time (user selectable): real-time (1-60 seconds) or STEL (15 minutes), alarms required;
(k) Operating Time: 48 hours (fully charged NiCd battery); continuously with charger;
(l) Operating Temperature: -10 to 50^{o} C (14 to 122^{o} F);
(m) Particulate levels will be monitored upwind and immediately downwind at the working site and integrated over a period not to exceed 15 minutes.

4. In order to ensure the validity of the fugitive dust measurements performed, there must be appropriate Quality Assurance/Quality Control (QA/QC). It is the responsibility of the remedial party to adequately supplement QA/QC Plans to include the following critical features: periodic instrument calibration, operator training, daily instrument performance (span) checks, and a record keeping plan.

5. The action level will be established at 150 ug/m3 (15 minutes average). While conservative,

this short-term interval will provide a real-time assessment of on-site air quality to assure both health and safety. If particulate levels are detected in excess of 150 ug/m3, the upwind background level must be confirmed immediately. If the working site particulate measurement is greater than 100 ug/m3 above the background level, additional dust suppression techniques must be implemented to reduce the generation of fugitive dust and corrective action taken to protect site personnel and reduce the potential for contaminant migration. Corrective measures may include increasing the level of personal protection for on-site personnel and implementing additional dust suppression techniques (see paragraph 7). Should the action level of 150 ug/m3 continue to be exceeded work must stop and DER must be notified as provided in the site design or remedial work plan. The notification shall include a description of the control measures implemented to prevent further exceedances.

6. It must be recognized that the generation of dust from waste or contaminated soil that migrates off-site, has the potential for transporting contaminants off-site. There may be situations when dust is being generated and leaving the site and the monitoring equipment does not measure PM10 at or above the action level. Since this situation has the potential to allow for the migration of contaminants off-site, it is unacceptable. While it is not practical to quantify total suspended particulates on a real-time basis, it is appropriate to rely on visual observation. If dust is observed leaving the working site, additional dust suppression techniques must be employed. Activities that have a high dusting potential--such as solidification and treatment involving materials like kiln dust and lime--will require the need for special measures to be considered.

7. The following techniques have been shown to be effective for the controlling of the generation and migration of dust during construction activities:

(a) Applying water on haul roads;
(b) Wetting equipment and excavation faces;
(c) Spraying water on buckets during excavation and dumping;
(d) Hauling materials in properly tarped or watertight containers;
(e) Restricting vehicle speeds to 10 mph;
(f) Covering excavated areas and material after excavation activity ceases; and
(g) Reducing the excavation size and/or number of excavations.

Experience has shown that the chance of exceeding the 150ug/m3 action level is remote when the above-mentioned techniques are used. When techniques involving water application are used, care must be taken not to use excess water, which can result in unacceptably wet conditions. Using atomizing sprays will prevent overly wet conditions, conserve water, and provide an effective means of suppressing the fugitive dust.

8. The evaluation of weather conditions is necessary for proper fugitive dust control. When extreme wind conditions make dust control ineffective, as a last resort remedial actions may need to be suspended. There may be situations that require fugitive dust suppression and particulate monitoring requirements with action levels more stringent than those provided above. Under some circumstances, the contaminant concentration and/or toxicity may require additional monitoring to protect site personnel and the public. Additional integrated sampling and chemical analysis of the dust may also be in order. This must be evaluated when a health and safety plan is developed and when appropriate suppression and monitoring requirements are established for protection of health and the environment.

APPENDIX F

Citizens Participation Plan

NEW YORK STATE OF OPPORTUNITY. Department of Environmental Conservation

Brownfield Cleanup Program

Citizen Participation Plan
for
Canal Street Manufacturing Site

June 2020

BCP C828206
67 & 89 Canal Street
City of Rochester
Monroe County, New York

Contents

* * * * *

Note: The information presented in this Citizen Participation Plan was current as of the date of its approval by the New York State Department of Environmental Conservation. Portions of this Citizen Participation Plan may be revised during the site's investigation and cleanup process.

Applicant: **East House Canal Street LLC ("Applicant")**
Site Name: **Canal Street Manufacturing Site ("Site")**
Site Address: **67 & 89 Canal Street, City of Rochester, NY 14608**
Site County: **Monroe**
Site Number: C828206

1. What is New York's Brownfield Cleanup Program?

New York's Brownfield Cleanup Program (BCP) works with private developers to encourage the voluntary cleanup of contaminated properties known as "brownfields" so that they can be reused and developed. These uses include recreation, housing, and business.

A *brownfield* is any real property that is difficult to reuse or redevelop because of the presence or potential presence of contamination. A brownfield typically is a former industrial or commercial property where operations may have resulted in environmental contamination. A brownfield can pose environmental, legal, and financial burdens on a community. If a brownfield is not addressed, it can reduce property values in the area and affect economic development of nearby properties.

The BCP is administered by the New York State Department of Environmental Conservation (NYSDEC) which oversees Applicants who conduct brownfield site investigation and cleanup activities. An Applicant is a person who has requested to participate in the BCP and has been accepted by NYSDEC. The BCP contains investigation and cleanup requirements, ensuring that cleanups protect public health and the environment. When NYSDEC certifies that these requirements have been met, the property can be reused or redeveloped for the intended use.

For more information about the BCP, go online at:
http://www.dec.ny.gov/chemical/8450.html .

2. Citizen Participation Activities

Why NYSDEC Involves the Public and Why It Is Important

NYSDEC involves the public to improve the process of investigating and cleaning up contaminated sites, and to enable citizens to participate more fully in decisions that affect their health, environment, and social well-being. NYSDEC provides opportunities for citizen involvement and encourages early two-way communication with citizens before decision makers form or adopt final positions.

Involving citizens affected and interested in site investigation and cleanup programs is important for many reasons. These include:

- Promoting the development of timely, effective site investigation and cleanup programs that protect public health and the environment

- Improving public access to, and understanding of, issues and information related to a particular site and that site's investigation and cleanup process

- Providing citizens with early and continuing opportunities to participate in NYSDEC's site investigation and cleanup process

- Ensuring that NYSDEC makes site investigation and cleanup decisions that benefit from input that reflects the interests and perspectives found within the affected community

- Encouraging dialogue to promote the exchange of information among the affected/interested public, State agencies, and other interested parties that strengthens trust among the parties, increases understanding of site and community issues and concerns, and improves decision making.

This Citizen Participation (CP) Plan provides information about how NYSDEC will inform and involve the public during the investigation and cleanup of the site identified above. The public information and involvement program will be carried out with assistance, as appropriate, from the Applicant.

Project Contacts

Appendix A identifies NYSDEC project contact(s) to whom the public should address questions or request information about the site's investigation and cleanup program. The public's suggestions about this CP Plan and the CP program for the site are always welcome. Interested people are encouraged to share their ideas and suggestions with the project contacts at any time.

Locations of Reports and Information

The locations of the reports and information related to the site's investigation and cleanup program also are identified in Appendix A. These locations provide convenient access to important project documents for public review and comment. Some documents may be placed on the NYSDEC web site. If this occurs, NYSDEC will inform the public in fact sheets distributed about the site and by other means, as appropriate.

Site Contact List

Appendix B contains the site contact list. This list has been developed to keep the community informed about, and involved in, the site's investigation and cleanup process. The site contact list will be used periodically to distribute fact sheets that provide updates about the status of the project. These will include notifications of upcoming activities at the site (such as fieldwork), as well as availability of project documents and announcements about public comment periods.
The site contact list includes, at a minimum:

- chief executive officer and planning board chairperson of each county, city, town and village in which the site is located;
- residents, owners, and occupants of the site and properties adjacent to the site;
- the public water supplier which services the area in which the site is located;
- any person who has requested to be placed on the site contact list (*note*: at the time this CPP was prepared, no additional parties or persons had requested to be included on the contact list);
- the administrator of any school or day care facility located on or near the site for purposes of posting and/or dissemination of information at the facility;
- location(s) of reports and information.

The site contact list will be reviewed periodically and updated as appropriate. Individuals and organizations will be added to the site contact list upon request. Such requests should be submitted to the NYSDEC project contact(s) identified in Appendix A. Other additions to the site contact list may be made at the discretion of the NYSDEC project manager, in consultation with other NYSDEC staff as appropriate.

Note: The first site fact sheet (usually related to the draft Remedial Investigation Work Plan) is distributed both by paper mailing through the postal service and through DEC Delivers, its email listserv service. The fact sheet includes instructions for signing up with the appropriate county listserv to receive future notifications about the site. See http://www.dec.ny.gov/chemical/61092.html .

Subsequent fact sheets about the site will be distributed exclusively through the listserv, except for households without internet access that have indicated the need to continue to receive site information in paper form. Please advise the NYSDEC site project manager identified in Appendix A if that is the case. Paper mailings may continue during the investigation and cleanup process for some sites, based on public interest and need.

CP Activities

The table at the end of this section identifies the CP activities, at a minimum, that have been and will be conducted during the site's investigation and cleanup program. The flowchart in Appendix D shows how these CP activities integrate with the site

investigation and cleanup process. The public is informed about these CP activities through fact sheets and notices distributed at significant points during the program. Elements of the investigation and cleanup process that match up with the CP activities are explained briefly in Section 5.

- **Notices and fact sheets** help the interested and affected public to understand contamination issues related to a site, and the nature and progress of efforts to investigate and clean up a site.

- **Public forums, comment periods and contact with project managers** provide opportunities for the public to contribute information, opinions and perspectives that have potential to influence decisions about a site's investigation and cleanup.

The public is encouraged to contact project staff at any time during the site's investigation and cleanup process with questions, comments, or requests for information.

This CP Plan may be revised due to changes in major issues of public concern identified in Section 3 or in the nature and scope of investigation and cleanup activities. Modifications may include additions to the site contact list and changes in planned citizen participation activities.

Technical Assistance Grant

NYSDEC must determine if the site poses a significant threat to public health or the environment. This determination generally is made using information developed during the investigation of the site, as described in Section 5.

If the site is determined to be a significant threat, a qualifying community group may apply for a Technical Assistance Grant (TAG). The purpose of a TAG is to provide funds to the qualifying group to obtain independent technical assistance. This assistance helps the TAG recipient to interpret and understand existing environmental information about the nature and extent of contamination related to the site and the development/implementation of a remedy.

An eligible community group must certify that its membership represents the interests of the community affected by the site, and that its members' health, economic well-being or enjoyment of the environment may be affected by a release or threatened release of contamination at the site.

As of the date the declaration (page 2) was signed by the NYSDEC project manager, the significant threat determination for the site had not yet been made. To verify the significant threat status of the site, the interested public may contact the NYSDEC project manager identified in Appendix A.

For more information about TAGs, go online at
http://www.dec.ny.gov/regulations/2590.html

Note: The table identifying the citizen participation activities related to the site's investigation and cleanup program follows on the next page:

Citizen Participation Activities	Timing of CP Activity(ies)
Application Process:	
• Prepare site contact list • Establish document repository(ies)	At time of preparation of application to participate in the BCP.
• Publish notice in Environmental Notice Bulletin (ENB) announcing receipt of application and 30-day public comment period • Publish above ENB content in local newspaper • Mail above ENB content to site contact list • Conduct 30-day public comment period	When NYSDEC determines that BCP application is complete. The 30-day public comment period begins on date of publication of notice in ENB. End date of public comment period is as stated in ENB notice. Therefore, ENB notice, newspaper notice, and notice to the site contact list should be provided to the public at the same time.
After Execution of Brownfield Site Cleanup Agreement (BCA):	
• Prepare Citizen Participation (CP) Plan	Before start of Remedial Investigation **Note:** Applicant must submit CP Plan to NYSDEC for review and approval within 20 days of the effective date of the BCA.
Before NYSDEC Approves Remedial Investigation (RI) Work Plan:	
• Distribute fact sheet to site contact list about proposed RI activities and announcing 30-day public comment period about draft RI Work Plan • Conduct 30-day public comment period	Before NYSDEC approves RI Work Plan. If RI Work Plan is submitted with application, public comment periods will be combined and public notice will include fact sheet. Thirty-day public comment period begins/ends as per dates identified in fact sheet.
After Applicant Completes Remedial Investigation:	
• Distribute fact sheet to site contact list that describes RI results	Before NYSDEC approves RI Report
Before NYSDEC Approves Remedial Work Plan (RWP):	
• Distribute fact sheet to site contact list about draft RWP and announcing 45-day public comment period • Public meeting by NYSDEC about proposed RWP (if requested by affected community or at discretion of NYSDEC project manager) • Conduct 45-day public comment period	Before NYSDEC approves RWP. Forty-five day public comment period begins/ends as per dates identified in fact sheet. Public meeting would be held within the 45-day public comment period.
Before Applicant Starts Cleanup Action:	
• Distribute fact sheet to site contact list that describes upcoming cleanup action	Before the start of cleanup action.
After Applicant Completes Cleanup Action:	
• Distribute fact sheet to site contact list that announces that cleanup action has been completed and that NYSDEC is reviewing the Final Engineering Report • Distribute fact sheet to site contact list announcing NYSDEC approval of Final Engineering Report and issuance of Certificate of Completion (COC)	At the time the cleanup action has been completed. **Note:** The two fact sheets are combined when possible if there is not a delay in issuing the COC.

3. Major Issues of Public Concern

This section of the CP Plan identifies major issues of public concern that relate to the site. Additional major issues of public concern may be identified during the course of the site's investigation and cleanup process.

Previous investigation results have indicated that soil and/or groundwater at the site are impacted by petroleum-related volatile organic compounds (VOCs) and chlorinated VOCs. Note that groundwater is prohibited from use as a potable water supply within the City of Rochester limits. These contaminants may also be present in soil vapor due to the volatility of the compounds.

Because the site is located in an urban setting, and based on knowledge of subsurface materials encountered elsewhere in the City of Rochester, it is possible that historical urban fill material containing heavy metals and semi-volatile organic compounds (SVOCs) known as polycyclic aromatic hydrocarbons (PAHs) will likewise be encountered in the shallow overburden (unconsolidated soil) onsite.

A Community Air Monitoring Plan (CAMP) will be implemented during ground-intrusive activities during the investigation. The CAMP is intended to monitor the levels of dust and VOCs (if any) that may be generated during digging and drilling activities such that particulates and vapors migrating offsite (if any) do not exceed unsafe levels as determined by regulatory criteria. Should downgradient measurements meet or exceed the CAMP criteria, corrective action will be taken, or work will be postponed until such time that appropriate controls can be implemented.

During and after the investigation, there is potential for increased noise and traffic. However, it is not anticipated that these factors will be significant issues given the current surrounding land use.

There is currently one existing Right-of-Way (ROW) and one existing easement that could limit remediation in these areas. A City of Rochester ROW, the former Hyland Alley, interjects into the site from Wiley Street (north of the site) approximately 60 ft as shown on the Site Location Map included in Appendix C. Currently this ROW is not included in the Brownfield Cleanup Program site area; however, the Volunteer intends to pursue acquisition of this ROW. Should the City abandon this ROW and title be obtained by the Volunteer, an amendment to the BCP application will be issued to include the former Hyland Alley. There is also an RG&E steam line easement in the southern portion of the former manufacturing building.

The site and adjoining properties are located in the Center City District and design district Cascade-Canal (CCD-C). The design theme for the CCD-C is to promote its industrial warehouse character. The site and adjoining properties to the west and south are also located within the Susan B. Anthony historic preservation district which is one of the oldest residential areas in Rochester

(www.cityofrochester.gov/SusanBAnthonyCAPStudy.aspx). The 2008 Vision Plan for the Susan B Anthony neighborhood for Plan E Broad Street Area (https://archive.org/details/SusanBAnthonyNeighborhoodCommunityVisionPlancreating Connections-) encouraged the re-development of the on-site building (referenced as the Volunteers of America building) with the vision that the building would be used as a mixed use, mixed income development with commercial, community and residential components.

Planned redevelopment of the site involves renovating the former manufacturing building into affordable apartment units, of which approximately half will be Office of Mental Health (OMH) supported units. The program will meet OMH standards for living and support space. Construction is expected to commence as early as Fall of 2019.

4. Site Information

Appendix C contains a map identifying the location of the site.

Site Description

The site includes two contiguous parcels, 67 Canal Street and 89 Canal Street, totaling approximately 1.7 acres. The site is located in the downtown area of the City of Rochester in Monroe County, New York. The site consists of a former manufacturing and storage building with a garage/shop building currently used by Buckingham Properties. The garage is used to store vehicles, maintenance equipment, supplies, and perform routine vehicle maintenance. The intended future use of the site is planned to change to residential. Land uses in the surrounding urban area include commercial and industrial facilities as well as residential properties.

The site is bounded to the north by Wiley Street, to the east by Canal Street, to the south by two properties (RG&E substation located at 30 Litchfield Street and a vacant former manufacturing building located at 53 Canal Street), and to the west by Litchfield Street. Adjacent properties include:

Direction	Adjacent Properties
North	Wiley Street, then 115 Canal Street: a private parking lot/CSX Railyard (Commercial/Industrial)
Northeast	90 Canal Street: Small World grocery (Commercial)
East	390 West Main Street: W.B. Morse lumber yard (Commercial/Industrial)
South	53 Canal Street: vacant building 30 Litchfield Street: RG&E electrical substation #35 (Commercial/Industrial)
West	33 Litchfield Street: Carriage Factory Apartments (Residential)
Northwest	48 King Street: data storage warehouse (Industrial)

History of Site Use, Investigation, and Cleanup

Historical records indicate that the site was utilized for multiple residential dwellings from the mid-1870s to the early 1900s. The manufacturing building was originally constructed in the early 1900s and since that time has been occupied for a variety of industrial, manufacturing, commercial, and storage uses. Following construction of the main/manufacturing building, the site was occupied by J.T Cunningham (carriage manufacturers) followed by Utz and Dunn Co. (shoe manufacturers), Kanty Paper Boxes (box manufacturer), a macaroni manufacturer, a storage company, a studio, a graphics company, a woodworking company, general contractors, Fowler & Webster Inc., and Volunteers of America (VOA). As stated above, the site is currently used by Buckingham Properties for maintenance equipment storage.

A Phase II Environmental Site Assessment (Phase II ESA) was completed in 2014 to investigate potential soil and groundwater contamination from former petroleum underground storage tanks onsite, and to investigate potential groundwater contamination from adjacent sites with demonstrated chlorinated and petroleum impacts to groundwater. The project involved installation of thirteen soil borings and two monitoring wells, and collection of five soil samples and three groundwater samples; one groundwater sample was collected from an existing well installed as part of the RG&E Manufactured Gas Plant (MGP) Canal Street Site (MW-9 located adjacent to the site on Canal Street). Results of the 2014 Phase II ESA confirmed the presence of petroleum compounds in soil and petroleum compounds and chlorinated solvents (such as trichloroethene) in groundwater.

In 2018, Stantec conducted a Phase I Environmental Site Assessment (Phase I ESA) and identified several Recognized Environmental Conditions (RECs). The RECs include: historical industrial site uses; historical petroleum tanks and reported spills; tank/drum storage with unknown contents; documented onsite petroleum impacts to soil and groundwater (2014 Phase II ESA); former storage of paint and observed staining in area; historical storage of pesticides and observed staining/floor drum ring indentations

in the “pesticide room”; potential presence of urban fill in shallow soil containing heavy metals and semi-volatile organic compounds; and area-wide wide low-level CVOCs in groundwater documented beneath the western adjacent property (33 Litchfield Street, Carriage Factory Apartments Brownfield Cleanup Program Site) and observed migration offsite potentially impacting both groundwater and soil vapor.

The property adjacent to the east, 90 Canal Street, was the location of a former RG&E Canal Street MGP operated in the late 1800s with subsequent industrial operations since that time. A Site Characterization Report for the former RG&E Canal Street MGP site was completed in 2008. As part of the investigation, groundwater samples were collected in 2008 from monitoring wells throughout the facility including MW-9 which is adjacent to the site on Canal Street. Several VOCs, including some petroleum-related compounds, were detected in this well. These results compared to results collected from other wells on the RG&E site suggested an offsite source of contamination in the area (compounds in groundwater observed in MW-9 are not necessarily originating from the RG&E site).

5. Investigation and Cleanup Process

Application

The Applicant has applied for the New York’s Brownfield Cleanup Program as a Volunteer. If approved, this means that the Applicant will not be responsible for the disposal or discharge of the contaminants or whose ownership or operation of the site took place after the discharge or disposal of contaminants. The Volunteer must fully characterize the nature and extent of contamination onsite, and must conduct a “qualitative exposure assessment,” a process that characterizes the actual or potential exposures of people, fish and wildlife to contaminants on the site and to contamination that has migrated from the site.

The Applicant in its Application proposes that the site will be used for restricted purposes.

To achieve this goal, the Applicant will conduct investigation, and potentially subsequent cleanup**,** activities at the site with oversight provided by NYSDEC. The Brownfield Cleanup Agreement executed by NYSDEC and the Applicant sets forth the responsibilities of each party in conducting these activities at the site.

Investigation

The Applicant will conduct an investigation of the site officially called a “remedial investigation” (RI). This investigation will be performed with NYSDEC oversight. The Applicant must develop a remedial investigation workplan, which is subject to public comment.

The site investigation has several goals:

1) define the nature and extent of contamination in soil, surface water, groundwater and any other parts of the environment that may be affected;
2) identify the source(s) of the contamination;
3) assess the impact of the contamination on public health and the environment; and
4) provide information to support the development of a proposed remedy to address the contamination or the determination that cleanup is not necessary.

The Applicant submits a draft “Remedial Investigation Work Plan” to NYSDEC for review and approval. NYSDEC makes the draft plan available to the public review during a 30-day public comment period.

When the investigation is complete, the Applicant will prepare and submit a report that summarizes the results. This report also will recommend whether cleanup action is needed to address site-related contamination. The investigation report is subject to review and approval by NYSDEC.

NYSDEC will use the information in the investigation report to determine if the site poses a significant threat to public health or the environment. If the site is a “significant threat,” it must be cleaned up using a remedy selected by NYSDEC from an analysis of alternatives prepared by the Applicant and approved by NYSDEC. If the site does not pose a significant threat, the Applicant may select the remedy from the approved analysis of alternatives.

Interim Remedial Measures

An Interim Remedial Measure (IRM) is an action that can be undertaken at a site when a source of contamination or exposure pathway can be effectively addressed before the site investigation and analysis of alternatives are completed. If an IRM is likely to represent all or a significant part of the final remedy, NYSDEC will require a 30-day public comment period.

Remedy Selection

When the investigation of the site has been determined to be complete, the project likely would proceed in one of two directions:

1. The Applicant may recommend in its investigation report that no action is necessary at the site. In this case, NYSDEC would make the investigation report available for public comment for 45 days. NYSDEC then would complete its review, make any necessary revisions, and, if appropriate, approve the investigation report. NYSDEC would then issue a "Certificate of Completion" (described below) to the Applicant.

or

2. The Applicant may recommend in its investigation report that action needs to be taken to address site contamination. After NYSDEC approves the investigation report, the Applicant may then develop a cleanup plan, officially called a "Remedial Work Plan". The Remedial Work Plan describes the Applicant's proposed remedy for addressing contamination related to the site.

When the Applicant submits a draft Remedial Work Plan for approval, NYSDEC would announce the availability of the draft plan for public review during a 45-day public comment period.

Cleanup Action

NYSDEC will consider public comments, and revise the draft cleanup plan if necessary, before approving the proposed remedy. The New York State Department of Health (NYSDOH) must concur with the proposed remedy. After approval, the proposed remedy becomes the selected remedy. The selected remedy is formalized in the site Decision Document.

The Applicant may then design and perform the cleanup action to address the site contamination. NYSDEC and NYSDOH oversee the activities. When the Applicant completes cleanup activities, it will prepare a final engineering report that certifies that cleanup requirements have been achieved or will be achieved within a specific time frame. NYSDEC will review the report to be certain that the cleanup is protective of public health and the environment for the intended use of the site.

Certificate of Completion

When NYSDEC is satisfied that cleanup requirements have been achieved or will be achieved for the site, it will approve the final engineering report. NYSDEC then will issue a Certificate of Completion (COC) to the Applicant. The COC states that cleanup goals have been achieved, and relieves the Applicant from future liability for site-related contamination, subject to certain conditions. The Applicant would be eligible to

redevelop the site after it receives a COC.

Site Management

The purpose of site management is to ensure the safe reuse of the property if contamination will remain in place. Site management is the last phase of the site cleanup program. This phase begins when the COC is issued. Site management incorporates any institutional and engineering controls required to ensure that the remedy implemented for the site remains protective of public health and the environment. All significant activities are detailed in a Site Management Plan.

An *institutional control* is a non-physical restriction on use of the site, such as a deed restriction that would prevent or restrict certain uses of the property. An institutional control may be used when the cleanup action leaves some contamination that makes the site suitable for some, but not all uses.

An *engineering control* is a physical barrier or method to manage contamination. Examples include: caps, covers, barriers, fences, and treatment of water supplies.

Site management also may include the operation and maintenance of a component of the remedy, such as a system that pumps and treats groundwater. Site management continues until NYSDEC determines that it is no longer needed.

Appendix A -
Project Contacts and Locations of Reports and Information

Project Contacts

For information about the site's investigation and cleanup program, the public may contact any of the following project staff:

New York State Department of Environmental Conservation (NYSDEC):

Todd Caffoe, P.E.
Project Manager
NYSDEC Region 8
Division of Environmental Remediation
6274 East Avon-Lima Road
Avon, NY 14414
Phone: 585-226-5315

Regina Willis
Citizen Participation Specialist
NYSDEC Region 8
6274 East Avon-Lima Road
Avon, NY 14414
Phone: 585-226-5324

New York State Department of Health (NYSDOH):

Daniel Tucholski
Project Manager
NYSDOH
Empire State Plaza, Corning Tower,
Room 1787
Albany, New York 12237
(518) 402-7860

Locations of Reports and Information

The facilities identified below are being used to provide the public with convenient access to important project documents:

City of Rochester Public Library
(Rundel Building)
115 South Avenue,
Rochester, NY 14604
Attn: Ms. Florence Morris
Phone: 585-428-7300
Hours: Mon./Wed. 10 AM – 8:30 PM
Tues./Fri. 10 AM – 6 PM
Thursday 11 AM – 6 PM
Saturday 10 AM – 5 PM
Sunday CLOSED

NYSDEC Region 8
6274 East Avon-Lima Road
Avon, NY 14414
Attn: Todd Caffoe, P.E.
Phone: 585-226-2466
Hours: M-F 8:30 AM – 4:45 PM
Call for appointment

Appendix B - Site Contact List

Agency Officials

Todd Caffoe, P.E., NYSDEC Region 8
6274 East Avon-Lima Road
Avon, NY 14414

David Pratt, NYSDEC Region 8
6274 East Avon-Lima Road
Avon, NY 14414

Regina Willis, Regional Public Participation Specialist, NYSDEC
6274 East Avon-Lima Road
Avon, NY 14414

Michael Cruden, Director of Remedial Bureau E, Division of Environmental Remediation, NYSDEC
6274 East Avon-Lima Road
Avon, NY 14414

Daniel Tucholski
NYSDOH
Corning Tower
Empire State Plaza
Albany, NY 12237

Michael Mendoza, MD. – Commissioner of Public Health, Monroe County Health Department
111 Westfall Road, Room 952
Rochester, NY 14620

Federal Government Officials

Senator Charles E. Schumer
United States Senate
100 State Street, Room 3040
Rochester, NY 14614

Senator Kristen Gillibrand
United States Senate
100 State Street, Room 4195
Rochester, NY 14614

Representative Joseph Morelle
United States Congress
100 State Street, Room 3120
Rochester, NY 14614

State Government Officials

Assembly Member David F. Gantt
New York State Assembly District 137
107 Liberty Pole Way
Rochester, NY 14604

Senator Joseph E. Robach
New York State Senate District 56
2300 West Ridge Road
Rochester, NY 14626

Monroe County Government Officials

Adam Bello, County Executive
110 County Office Building
39 West Main Street

Ana Liss, Director
Department of Planning and Development
8100 City Place

Rochester, NY 14614

Jamie Romeo, County Clerk
101 County Office Building
39 West Main Street
Rochester, NY 14614

Todd Baxter, County Sheriff
130 South Plymouth Avenue
Rochester, NY 14614

John Lightfoot, County Legislature 25th District
52 Dr. Samuel McCree Way
Rochester, NY 14608

50 West Main Street
Rochester, NY 14614

Dr. Joe Carbone, Monroe County Legislature, President
410 County Office Building
39 West Main Street
Rochester, NY 14614

Rachel Johnson, Environmental Management Council, MCDOH
111 Westfall Road, Room 916
Rochester, NY 14620

City of Rochester Officials

Lovely Warren, Mayor
City Hall
30 Church Street
Rochester, NY 14614

Hazel Washington, City Clerk
City Hall, Room 300A
30 Church Street
Rochester, NY 14614

La'Ron D. Singletary, Police Chief
Public Safety Building
185 Exchange Boulevard
Rochester, NY 14614

Loretta C. Scott, City Council, President
City Hall, Room 301A
30 Church Street
Rochester, NY 14614

Mitchell D. Gruber, City Council Member
10 King Street
Rochester, NY 14608

Jacklyn Ortiz, City Council Member
27 Grassmere park
Rochester, NY 14612

James H. Demps III, Administrator,
Southwest Neighborhood Service Center
923 Genesee Street
Rochester, NY 14611

Tyrese Bryant, Zoning Board, Chair
City Hall, Room 125B
30 Church Street
Rochester, NY 14614

Will Jackson, Fire Chief
Public Safety Building
185 Exchange Boulevard
Rochester, NY 14614

Willie J. Lightfoot, City Council Member
147 Trafalgar Street
Rochester, NY 14619

Malik D. Evans, City Council Member
115 Nunda Boulevard
Rochester, NY 14610

Public Water Supplier

Monroe County Water Authority
Nicholas Noce, Executive Director
475 Norris Drive
Rochester, NY 14610

Current Site Tenant

Rich Finley, Buckingham Properties, LLC
259 Alexander Street
Rochester, NY 14607

Nearby School and Day Care Facility Administrators (within ½ mile of the Site)

Sunshine Village Daycare Center
Valerie Nix, Executive Director
284 Allen Street
Rochester, NY 14608

Monroe Community College (MCC)
Downtown Campus
321 State Street
Rochester, NY 14608

Enrico Fermi School No. 17 ES
Caterina Leone-Mannino, Principal
158 Orchard Street
Rochester, NY 14611

George Mather Forbes School No. 4 ES
Karon A. Jackson, Principal
198 Dr. Samuel McCree Way
Rochester, NY 14611

Community Child Care Center
Mischele Terrell, Program Supervisor
170 Troup Street
Rochester, NY 14608

Hochstein School of Music and Dance
Dr. Margaret Quackenbush, President
50 Plymouth Avenue North
Rochester, NY 14614

John Williams School No. 5 ES
Terrilyn Hammond, Principal
555 North Plymouth Avenue
Rochester, NY 14608

Adjacent and Nearby Property Owners

Buffalo Rochester & Pitt-CSX Transportation
(Owner of 115 Canal Street)
500 Water Street
Jacksonville, FL 32202

William B. Morse Lumber Co.
(Owner of 390 West Main Street)
340 West Main Street
Rochester, NY 14608

Maguire Properties Inc.
(Owner of 90 Canal Street)
770 Rock Beach Road
Rochester, NY 14617

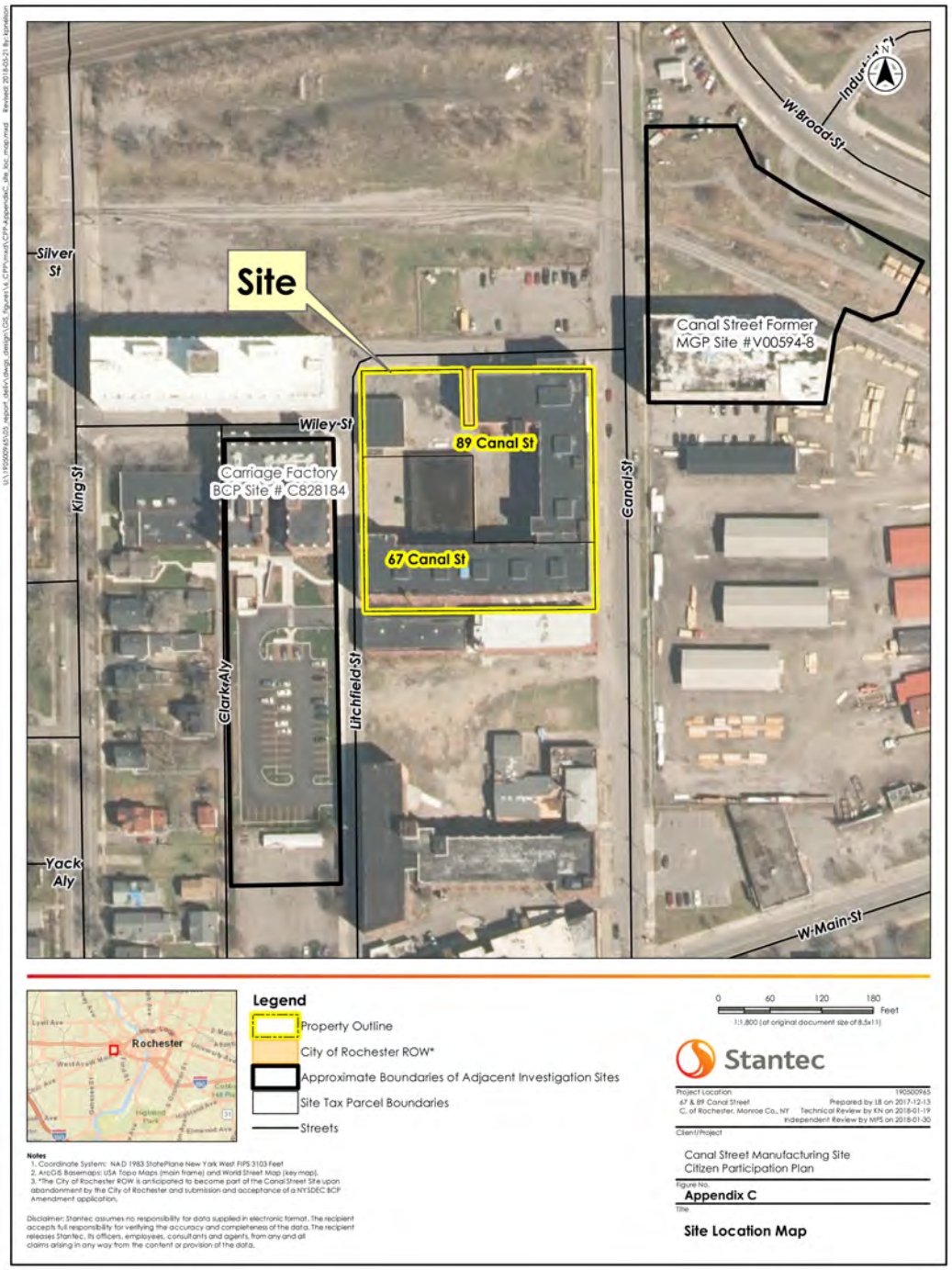
Michael Macaluso Jr.
(Owner of 53 Canal Street)
7 Canal Street
Rochester, NY 14608

Rochester Gas & Electric
(Owner of 30 Litchfield Street)
One City Center, 5th Floor
Portland, ME 04101

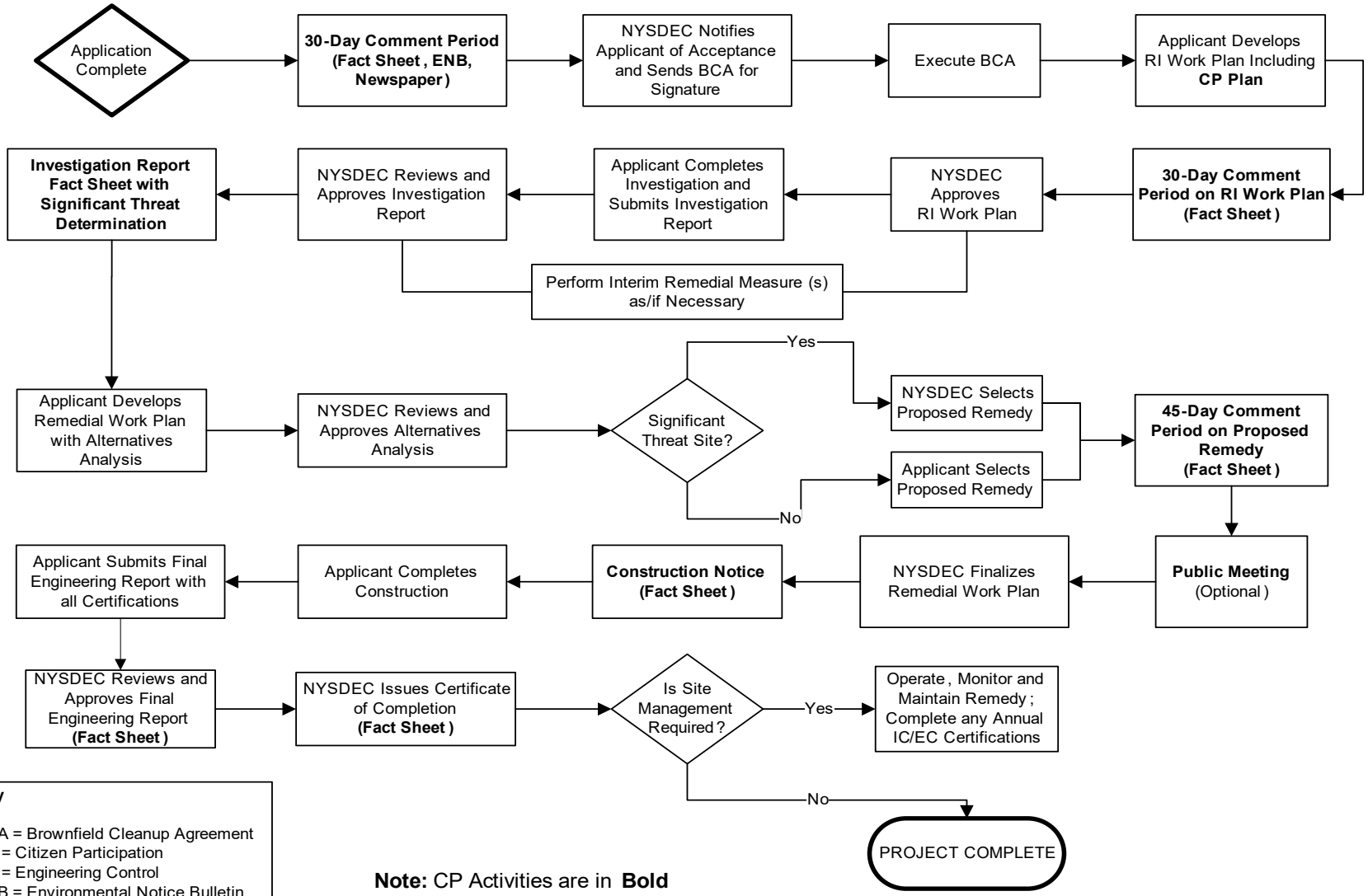
King Street Storage LLC
(Owner of 48 King Street)
9 S 151 Skylane Drive
Naperville, IL 60564

CFSN Housing Development Fund Co.
(Owner of 33 Litchfield Street)
1931 Buffalo Road
Rochester, NY14624

Appendix C - Site Location Map



Appendix D– Brownfield Cleanup Program Process



Key

BCA = Brownfield Cleanup Agreement
CP = Citizen Participation
EC = Engineering Control
ENB = Environmental Notice Bulletin
IC = Institutional Control
RI = Remedial Investigation

Note: CP Activities are in **Bold**