

**CPB SITE
QUEENS COUNTY
FAR ROCKAWAY, NEW YORK**

SITE MANAGEMENT PLAN

NYSDEC Site Number: BCP # C241158

Prepared for:

Corporation of the Presiding Bishop (CPB) of The
Church of Jesus Christ of Latter-day Saints, a Utah Corporation Sole

Prepared by:

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Revisions to Final Approved Site Management Plan:

Revision No.	Date Submitted	Summary of Revision	NYSDEC Approval Date

AUGUST 2016

CERTIFICATION STATEMENT

I NIDAL RABAH certify that I am currently a [NYS registered professional engineer admitted by reciprocity as in defined in 6 NYCRR Part 375] and that this Site Management Plan was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

 P.E. #082813-1
8/31/2016 DATE

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List of Acronyms

AS	Air Sparging
ASP	Analytical Services Protocol
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
CERCLA	Comprehensive Environmental Response, Compensation and Liability Act
CAMP	Community Air Monitoring Plan
C/D	Construction and Demolition
CFR	Code of Federal Regulation
CLP	Contract Laboratory Program
COC	Certificate of Completion
CO2	Carbon Dioxide
CP	Commissioner Policy
DER	Division of Environmental Remediation
EC	Engineering Control
ECL	Environmental Conservation Law
ELAP	Environmental Laboratory Approval Program
ERP	Environmental Restoration Program
GHG	Green House Gas
GWE&T	Groundwater Extraction and Treatment
HASP	Health and Safety Plan
IC	Institutional Control
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
NYCRR	New York Codes, Rules and Regulations
O&M	Operations and Maintenance
OM&M	Operation, Maintenance and Monitoring
OSHA	Occupational Safety and Health Administration
OU	Operable Unit
PID	Photoionization Detector
PRP	Potentially Responsible Party
PRR	Periodic Review Report
QA/QC	Quality Assurance/Quality Control
QAPP	Quality Assurance Project Plan
RAO	Remedial Action Objective
RAWP	Remedial Action Work Plan
RCRA	Resource Conservation and Recovery Act
RI/FS	Remedial Investigation/Feasibility Study
ROD	Record of Decision
RP	Remedial Party
RSO	Remedial System Optimization
SAC	State Assistance Contract
SCG	Standards, Criteria and Guidelines
SCO	Soil Cleanup Objective

SMP	Soil Management Plan
SOP	Standard Operating Procedures
SOW	Statement of Work
SPDES	State Pollutant Discharge Elimination System
SSD	Sub-slab Depressurization
SSDS	Sub-Slab Depressurization System
SVE	Soil Vapor Extraction
SVI	Soil Vapor Intrusion
SVMS	Soil Vapor Mitigation System
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leachate Procedure
USEPA	United States Environmental Protection Agency
UST	Underground Storage Tank
VCA	Voluntary Cleanup Agreement
VCP	Voluntary Cleanup Program

ES EXECUTIVE SUMMARY

The following provides a brief summary of the controls implemented for the Site, as well as the inspections, monitoring, maintenance and reporting activities required by this Site Management Plan:

Site Identification: C241158 CPB Site, Far Rockaway, New York

Institutional Controls:	1. The property may be used for restricted residential use;	
	2. An Environmental Easement has been established for the Site.	
	3. All Engineering Controls (ECs) must be inspected at a frequency and in a manner defined in the Site Management Plan.	
Engineering Controls:	1. Cover system	
	2. Vapor Barrier / Sub-slab Depressurization System (SSDS).	
Inspections:		Frequency
1. Cover inspection		Annually
2. Vapor Barrier/SSDS (would only apply for SSDS)		Monthly
Monitoring:		
1.		
2.		
Maintenance:		
1. SSDS		As Needed
Reporting:		
1. EC Reporting		Annually
2.		

Further descriptions of the above requirements are provided in detail in the latter sections of this Site Management Plan.

1.0 INTRODUCTION

1.1 General

This Site Management Plan (SMP) is a required element of the remedial program for the CPB Site located in Far Rockaway, New York (hereinafter referred to as the “Site”). See Figure 1. The Site is currently in the New York State (NYS) Brownfield Cleanup Program (BCP) Site No. C241158 which is administered by New York State Department of Environmental Conservation (NYSDEC).

Corporation of the Presiding Bishop of The Church of Jesus Christ of Latter-day Saints, a Utah Corporation Sole (CPB) entered into a Brownfield Cleanup Agreement (BCA) on May 30, 2014 with the NYSDEC to remediate the site. A figure showing the boundaries (property line) of this site are provided in Figure 2. The boundaries of the site are more fully described in the metes and bounds site description that is part of the Environmental Easement provided in Appendix 3.

After completion of the remedial work, some contamination was left at this site, which is hereafter referred to as “remaining contamination”. Institutional and Engineering Controls (ICs and ECs) have been incorporated into the site remedy to control exposure to remaining contamination to ensure protection of public health and the environment. An Environmental Easement granted to the NYSDEC, and recorded with the Queens County Clerk, requires compliance with this SMP and all ECs and ICs placed on the site.

This SMP was prepared to manage remaining contamination at the site until the Environmental Easement is extinguished in accordance with ECL Article 71, Title 36. This plan has been approved by the NYSDEC, and compliance with this plan is required by the grantor of the Environmental Easement and the grantor’s successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

It is important to note that:

- This SMP details the site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the Environmental Easement, which is grounds for revocation of the Certificate of Completion (COC);
- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6NYCRR Part 375 and the BCA; Site #C241158 for the site, and thereby subject to applicable penalties.

All reports associated with the site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State. A list of contacts for persons involved with the site is provided in Appendix 1 of this SMP.

This SMP was prepared by TRC Environmental Corporation (TRC), on behalf of CPB, in accordance with the requirements of the NYSDEC's DER-10 ("Technical Guidance for Site Investigation and Remediation"), dated May 3, 2010, and the guidelines provided by the NYSDEC. This SMP addresses the means for implementing the ICs and ECs that are required by the Environmental Easement for the site.

1.2 Revisions

Revisions to this plan will be proposed in writing to the NYSDEC's project manager. Revisions will be necessary upon, but not limited to, the following occurring: a change in media monitoring requirements, upgrades to or shut-down of a remedial system, post-remedial removal of contaminated sediment or soil, or other significant change to the site conditions. In accordance with the Environmental Easement for the site, the NYSDEC will provide a notice of any approved changes to the SMP, and append these notices to the SMP that is retained in its files.

1.3 Notifications

Notifications will be submitted by the property owner to the NYSDEC, as needed, in accordance with NYSDEC's DER – 10 for the following reasons:

- 60-day advance notice of any proposed changes in site use that are required under the terms of the BCA, 6NYCRR Part 375 and/or Environmental Conservation Law.
- 7-day advance notice of any field activity associated with the remedial program.
- 15-day advance notice of any proposed ground-intrusive activity pursuant to the Excavation Work Plan.
- Notice within 48-hours of any damage or defect to the foundation, structures or EC that reduces or has the potential to reduce the effectiveness of an EC, and likewise, any action to be taken to mitigate the damage or defect.
- Verbal notice by noon of the following day of any emergency, such as a fire; flood; or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the site, with written confirmation within 7 days that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.
- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action submitted to the NYSDEC within 45 days describing and documenting actions taken to restore the effectiveness of the ECs.

Any change in the ownership of the site or the responsibility for implementing this SMP will include the following notifications:

- At least 60 days prior to the change, the NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser/Remedial Party has been provided with a copy of the BCA, and all approved work plans and reports, including this SMP.
- Within 15 days after the transfer of all or part of the site, the new owner's name, contact representative, and contact information will be confirmed in writing to the NYSDEC.

Table 1 on the following page includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix 1.

Table 1: Notifications*

Name	Contact Information
Christopher Magee	(518) 402-9813 christopher.magee@dec.ny.gov
Regional Remediation Engineer, Region 2	(718) 482-4995
NYSDEC Site Control	(518) 402-9553

* Note: Notifications are subject to change and will be updated as necessary.

2.0 SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS

As described below, the site has undergone multiple stages of Remedial Investigations and Remedial Actions to date. A detailed description of the site history is provided below, as well as the current state of soil, groundwater and soil gas contamination remaining on-site.

2.1 Site Location and Description

The site is located in Far Rockaway, Queens County, New York and is identified as Section 60 Block 15950 and Lot 29 on the New York City Tax Map (see Figure 2). The site is an approximately 1.14-acre area and is bounded by Far Rockaway Boulevard to the north, Rockaway Freeway to the south, Lot 42R to the east, and Lot 24 to the west (see Figure 2– Site Plan). The boundaries of the site are more fully described in the metes and bounds description included in Appendix 3. The owner of the site parcel at the time of issuance of this SMP is:

Corporation of the Presiding Bishop of The Church of Jesus Christ of Latter-day Saints, a Utah Corporation Sole (CPB).

2.2 Physical Setting

2.2.1 Land Use

The site is zoned residential (R6) with a commercial (C2-4) overlay. It is a vacant lot, with no site occupants.

The properties adjoining the Site and in the neighborhood surrounding the Site primarily include commercial and residential properties. The properties immediately south of the Site are residential properties; the properties immediately north are commercial properties; and the properties immediately east and west are vacant.

2.2.2 Geology

The site geology has previously been characterized to a maximum depth of 90 feet (ft.). Lithologic information was collected during the advancement of soil borings conducted across the site in April 2008. Three distinct geologic units have been encountered at the site, as described below. A more complete description of the site geology is provided in the In-Situ Thermal Treatment (ISTT) Work Plan (TRC 6). A generalized cross section is provided as Figure 3.

Shallow Zone

The Shallow Zone is approximately 20 ft. thick. Fill material occurs from the ground surface to approximately 5 to 8 ft. below ground surface (bgs). This fill material consists of brown fine to coarse sand and gravel with varying portions of wood, metal and concrete debris.

The fill material is underlain by loose fine gray sand with small amounts of coarse sand. The thickness of this layer ranges from approximately 5 to 10 ft.

Discontinuous, organic silty clay to clayey silt lenses (1 to 4 ft. thick) occur at the base of the Shallow Zone, below the fill and sand units. These clay lenses separate the Shallow and Intermediate Zones and locally act as a semi-confining unit. These silty clay lenses contain small amounts of fibrous organic material (peat) in thin laminations. Trace amounts of shell fragments are also found within these silty clay lenses. While these clay layers have been observed in all soil borings conducted at the site, the depth, composition and thickness of the individual clay lenses vary greatly across the site. The depth at which the clay lenses are encountered ranges from 11 and 20 ft. bgs.

Intermediate Zone

The Intermediate Zone consists of two lithologic units. A light brown-green coarse to fine sand with gravel and varying amounts of silt and clay is encountered at a depth of

approximately 20 ft. bgs. The silt and clay content increases with depth at 30 ft. bgs. A clay unit (approximately 17 ft. thick) occurs at a depth of approximately 37 ft. bgs and consists of dark gray soft clay with interbedded sand or silt laminations and trace shell fragments. The lower clay layer serves as an aquitard or confining/semi-confining unit that separates the Intermediate and Deep Zones. This clay layer appears to be continuous and consistent throughout the site.

Deep Zone

The Deep Zone consists of a brown-gray, fine to medium sand layer with a thickness greater than 40 ft. and occurs below the second clay unit at a depth of approximately 54 ft. bgs. The sand layer was observed to be loose to medium dense.

[A geologic cross section is shown in Figure 3.](#)

2.2.3 Hydrogeology

Three water-bearing units have been identified at the site and are described below. The ISTT Work Plan (TRC 6) and the In-Situ Chemical Oxidation Pilot Test Report (TRC 3) contain a more complete discussion of site hydrogeology. [Updated groundwater flow direction maps for the Shallow and Intermediate Zones are provided as Figures 4 and 5, respectively.](#) These maps present groundwater elevations measured on April 3, 2015. [Groundwater elevation data is provided in Table 5.](#) [Groundwater monitoring well construction logs are provided in Appendix 4.](#)

Shallow Zone

The Shallow Zone is a thin water bearing unit that is unconfined. The depth to water in this zone is approximately 6 to 8 ft. bgs. The water table is present within the fill or sand. Groundwater elevations in the Shallow Zone typically ranged from approximately 3.42 to 2.68 ft. above mean sea level (AMSL). The lateral groundwater flow direction within this unit is northwesterly towards Jamaica Bay with local variations due to local surface water features (*i.e.*, drainage swale). The results of a tidal study conducted by TRC indicate

groundwater level fluctuations were only observed in the intermediate wells (MW-1i and PZ-3), and water levels at the Shallow Zone wells exhibited no response to tidal fluctuations during the study (TRC 3). The silty clay lenses at the base of the Shallow Zone locally act as a semi-confining unit and retard the downward vertical groundwater flow and hydraulic connectivity between the Shallow and Intermediate Zones.

The lateral hydraulic gradient varied from approximately 0.00178 ft./ft. to 0.0055 ft./ft., with an average of 0.002 ft./ft. The lateral hydraulic conductivity in the Shallow Zone was estimated to vary locally from approximately 44 to 87 ft./day.

Intermediate Zone

Groundwater in the Intermediate Zone is considered to be under confined/semi-confined conditions due to the presence of the organic clay lenses. Groundwater elevations in the Intermediate Zone typically range from approximately 1.49 to 1.34 ft. AMSL. The horizontal groundwater flow direction in this unit has been observed to vary between westerly and northerly. The overall flow direction observed during the April 3, 2015 well gauging event was predominantly to the north with some potential for radial flow to the east from a mound observed at MW-8i. The lateral hydraulic gradient ranged from approximately 0.00147 to 0.00063 ft./ft., with an average of approximately 0.0015 ft./ft.

Groundwater levels within this unit appear to be influenced by tidal fluctuations in nearby surface water bodies. Groundwater elevations in monitoring wells MW-1i and PZ-3 were observed to fluctuate by approximately 0.1 ft. to 0.3 ft. during a tidal cycle, during the previous TRC tidal study. These observed fluctuations did not seem to cause a change in the overall westerly groundwater flow direction.

The lateral hydraulic conductivity in the Intermediate Zone varied locally from approximately 3 to 10 ft./day, with an average of approximately 7 ft./day.

The vertical groundwater flow potential between the Shallow and Intermediate Zones on-site appears to be predominantly downward from the Shallow Zone to the

Intermediate Zone. This trend may vary locally due to a combined effect of tidal fluctuations and water level changes in response to precipitation. Available data suggest that the Shallow and Intermediate Zones are not hydraulically connected locally.

Deep Zone

The lower clay layer serves as an aquitard separating the Intermediate and Deep Zones and appears to act as a confining/semi-confining unit between both Zones. No hydraulic assessment has been conducted for the Deep Zone.

2.3 Investigation and Remedial History

The following narrative provides a remedial history timeline and a brief summary of the available project records to document key investigative and remedial milestones for the Site. Full titles for each of the reports referenced below are provided in Section 8.0 - References.

Previous Site Investigations (SI) indicated that a structure or building was formerly located in the southwestern portion of the Site (Anson 2). The structure was reportedly used as a garage and plumbing supply house. In connection with its pre-purchase due diligence in 2002 the CPB uncovered evidence of a pre-existing release of petroleum product (heating oil) on-site. The petroleum release was reported to the NYSDEC. As a result, NYSDEC assigned Spill # 02-07599 to the site.

In March 2003, the CPB submitted a corrective action plan (CAP), to NYSDEC to address the on-site impacts (CPB 1). The March 2003 CAP proposed the excavation and disposal of impacted soils and subsequent groundwater monitoring. NYSDEC approved the March 2003 CAP on April 25, 2003 (NYSDEC 1).

Between June and November 2004, Anson Environmental, Ltd. (Anson) of Huntington, New York implemented the NYSDEC-approved soil excavation at the site. During the soil excavation, two underground storage tanks (USTs), 1,500 and 300 gallons

in capacity, were uncovered and removed. Upon inspection, the USTs were determined not to be leaking (Anson Feb 2005 Soil Remediation Report). However, based on observations of petroleum stains and odor, the excavation area was expanded to an area of approximately 11,000 square feet (ft.²) and to a depth of approximately 8 ft. bgs. An impacted area of chlorinated volatile organic compounds (CVOCs) was observed during the excavation near the southwestern property quadrant. The CVOC impacted soils were also excavated. In 2004, CPB excavated and disposed a total of 13,882 tons of petroleum impacted soils, 12,430 gallons of an oil-water mixture, and 418 tons of CVOC impacted soils. A report summarizing the 2004 excavation work was submitted to NYSDEC (Anson 2).

On October 6, 2005, CPB submitted a CAP addendum for the following activities: (1) installation of three additional monitoring wells, (2) soil and groundwater post-excavation sampling, (3) on-site soil gas survey, (4) off-site soil gas survey, and (5) a long term monitoring plan (CPB 2). NYSDEC approved the CAP Addendum on October 12, 2005 (NYSDEC 2). A report summarizing the 2005 CAP Addendum work was submitted to NYSDEC on July 5, 2006 (CPB 3). The post-excavation sampling around the perimeter of the excavation indicated that soil impacts were below the NYSDEC restricted soil cleanup objectives (RSCO). Groundwater petroleum and CVOC impacts, however, remained above NYSDEC standards.

On October 4, 2006, NYSDEC and the CPB met to discuss the next steps for addressing the remaining environmental impacts at the site (Anson 3). As a result of this meeting, NYSDEC requested that the CPB prepare a Work Plan to further investigate on-site and off-site groundwater CVOC impacts. A Work Plan was submitted by Anson on October 26, 2006 (Anson 4), which NYSDEC subsequently approved.

On-site ground water samples were collected on November 28 and 29, 2006 and off-site groundwater samples were collected on January 24 and 25, 2007. The sampling results indicated groundwater impacts on-site to a depth of 60 ft. bgs, and groundwater

impacts off-site to a depth of 10 ft. bgs (Anson 3). A report summarizing the 2006-2007 groundwater investigation was submitted to the NYSDEC on March 14, 2007.

On May 7, 2007, NYSDEC requested that the CPB focus the remediation on the removal of the CVOC source (NYSDEC 3). As explained by NYSDEC: “Once the source is gone, the processes of dilution, dispersion and biodegradation that are already evident at this site should attenuate the aqueous plume that has developed downgradient of the soil contamination.” (NYSDEC 3). The CPB agreed to comply with NYSDEC’s request (CPB 4).

On September 11, 2007, the CPB submitted a CAP Addendum to NYSDEC. This CAP Addendum proposed addressing groundwater impacts using a combination of in-situ chemical oxidation (ISCO) and enhanced in-situ bioremediation (EISB) (Anson 3). NYSDEC approved the 2007 CAP addendum on November 16, 2007 and required the installation of a monitoring well on the adjacent property to the west by December 3, 2007 (NYSDEC 4). On November 29, 2007, the adjacent property owner denied the CPB access to his property, which prevented the installation of the required monitoring well. Access was not granted to the adjacent property until October 16, 2008.

In February 2008, TRC proceeded to characterize the site lithology, delineate the extent of trichloroethylene (TCE) impacts in the groundwater and assist in the implementation of the remedial program proposed in the 2007 CAP Addendum. To evaluate the suitability of ISCO and collect design parameters for a full-scale program, TRC submitted an ISCO Pilot Test Work Plan to NYSDEC on May 30, 2008 (TRC 2). NYSDEC approved the Work Plan on July 3, 2008 (NYSDEC 5).

In August 2008, TRC conducted the ISCO pilot test using percarbonate (Regenox™) and activator compounds provided by Regenesis in an area of approximately 200 ft.². Two temporary points were used to inject the activated percarbonate into an area upgradient of the elevated CVOC impacts within the Shallow and Intermediate Zones. Groundwater extraction was conducted from two wells downgradient from the treatment area to establish hydraulic control during the testing program. The pilot test results

demonstrated that the effectiveness of ISCO was limited due to the high and variable oxidant demand and short active oxidation timeframe. These limitations did not allow for complete degradation of CVOC, despite the relatively high oxidant dosage within the treatment area. This limitation was manifested by the transient increase in TCE concentration at downgradient well PZ-3 following the cessation of hydraulic control. As a result, TRC concluded that a combination of ISCO and EISB would potentially be the most effective way to remediate groundwater impacts. A report detailing the pilot test results and a Work Plan to implement the ISCO/EISB remedy were submitted in December 2008 (TRC 3, 4). NYSDEC approved the ISCO/EISB Work Plan on January 26, 2009 (NYSDEC 6).

Also in 2008, an investigation program was implemented to determine the extent of on-site petroleum impacts observed in shallow monitoring well PZ-2 during the ISCO pilot test. This observation was noted in the December 2008 Work Plan, along with the acknowledgement that the apparent minor residual product would have to be addressed prior to the implementation of the Work Plan (TRC 4).

In March and April 2009, TRC conducted additional investigation activities to further evaluate and address the petroleum impacts in the area of well PZ-2. As a result of these activities, TRC observed petroleum accumulations in shallow monitoring well PZ-2 and intermediate monitoring well MW-4i in thicknesses of up to 2.12 ft. and 0.15 ft., respectively (March 2009). In response, in March 2009, TRC excavated 80 tons of petroleum impacted soils and removed approximately 445 gallons of a petroleum/water mixture. In April 2009, TRC excavated 20 tons of petroleum impacted soils and removed 1,830 gallons of a petroleum/water mixture. In May 2009, TRC completed a supplemental soil boring program to delineate the spatial extent of petroleum hydrocarbons within and below the Shallow Zone. A letter report detailing the 2009 investigation and remediation of petroleum impacts was submitted to NYSDEC on May 22, 2009 (TRC 5).

The results of the product investigation and delineation program prompted a reconsideration of the proposed December 2008 ISCO/EISB In-Situ Treatment Work Plan.

An alternative approach consisting of an electrical resistive heating (ERH) ISTT system was discussed and submitted to NYSDEC.

The ISTT program was conducted at the site from November 2010 to August 2011. The program was successful in removing VOC contamination from the soil and groundwater, as described in the Remedial Action Report, dated August 24, 2012 (TRC 14). As described in the report, approximately 3,200 lbs. of VOCs were removed, of which 2,800 lbs. were TCE. This TCE mass is equivalent to approximately 230 gallons of pure TCE. Concentration decreases in monitoring wells were observed to be over 99.99% in the source area wells (MW-4s and MW-4i).

2.4 Remedial Action Objectives

The Remedial Action Objectives (RAOs) for the Site as will be listed in the Decision Document (DD) as follows:

2.4.1. Groundwater

RAOs for Public Health Protection

- Prevent ingestion of groundwater with contaminant levels exceeding drinking water standards.
- Prevent contact with, or inhalation of, volatiles from contaminated groundwater.

RAOs for Environmental Protection

- Restore ground water aquifer to pre-disposal/pre-release conditions, to the extent practicable.
- Prevent the discharge of contaminants to surface water.
- Remove the source of ground or surface water contamination.

2.4.2 Soil

RAOs for Public Health Protection

- Prevent ingestion/direct contact with contaminated soil.
- Prevent inhalation of or exposure from contaminants volatilizing from contaminants in soil.

RAOs for Environmental Protection

- Prevent migration of contaminants that would result in groundwater or surface water contamination.
- Prevent impacts to biota from ingestion/direct contact with soil causing toxicity or impacts from bioaccumulation through the terrestrial food chain.

2.4.3 Soil Vapor

RAOs for Public Health Protection

- Mitigate impacts to public health resulting from existing, or the potential for, soil vapor intrusion (SVI) into buildings at a site.

2.5 **Remaining Contamination**

2.5.1 Soil

In accordance with DER-10, Section 3.5.1(b), surface soil samples were collected from a depth of 0 to 2 feet below the surface at three intervals, 0-2", 2-12" and 12-24". The samples were collected to assess potential human exposure to soil through incidental soil ingestion. The human exposure pathway is applicable, although not complete and there are no current receptors, because the lot is vacant. The area is zoned for residential use (R6), with a commercial use overlay (C2-4).

The soil samples were analyzed for the Target Compound List (TCL) VOCs, and semi-volatile organic compounds (SVOCs), Target Analyte List (TAL) Metals, and

polychlorinated biphenyls (PCBs)/pesticides. The VOC analysis also included the following compounds: n-butylbenzene, sec-butylbenzene, tert-butylbenzene, isopropylbenzene, p-isopropyltoluene, n-propylbenzene, 1,2,4-trimethylbenzene and 1,3,5-trimethylbenzene.

The samples were collected by hand clearing a location to the 2 ft. target depth and collecting discrete samples from the side wall of the excavation. VOC samples were collected directly into Encore samplers. Samples for other parameters were collected with laboratory provided scoopulas from several locations on the exposed side walls from each depth horizon, composited in a steel bowl and placed directly into laboratory provided sample jars.

A total of 27 soil samples were collected from nine locations. The approximate locations of the sample collection points and Restricted Residential Use Exceedances are provided on Figure 6.

The results for all VOC, pesticide and PCB compounds were below the RSCO concentrations. Metal compounds were found to exceed the Restricted Residential Use RSCOs at two sample locations, SS-3 and SS-8. Manganese was detected at location SS-3 at the 2-12" depth interval at a concentration of 2,250 mg/kg, marginally exceeding the Restricted Residential Use RSCO criteria of 2,000 mg/kg. The results from the 0-2" and 12-24" depth horizon were significantly below the Restricted Residential Use RSCO, at concentrations of 122 and 153 mg/kg, respectively, indicating that the manganese contamination is isolated. Mercury was detected at sample location SS-8 at the 2-12" and 12-24" depth horizon at concentrations of 1.5 and 1.9 mg/kg, respectively, exceeding the Restricted Residential Use RSCO criteria of 0.81 mg/kg.

SVOC compounds were detected at sample location SS-9, at concentrations marginally exceeding the Restricted Residential Use RSCOs, at the 12-24" sample horizon. The compounds that exceeded the Restricted Residential Use RSCO included benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, indeno(1,2,3-cd)pyrene and

dibenzo(a,h)anthracene. A summary of the soil sample results compared to the Restricted Residential Use Soil Cleanup Objectives (RSCO) is presented in Table 2 and in Figure 6.

A summary of the remaining soil exceedances above the Unrestricted Use Soil Cleanup Objectives (USCO) is presented in Table 3 and in Figure 7. Approximately 390 cubic yards of impacted soil (approximately 590 tons) remains on-site in two areas. Asphalt caps have been constructed over these areas to prevent direct contact with the impacted soils. They have been constructed with a colored geotextile layer, four inches of recycled concrete aggregate (from a NYSDEC approved facility) and two inches of asphalt. The two capped areas and detail of the cap construction are presented on Figure 8. Currently, there are no known active utility lines below grade at the Site.

2.5.2 [Groundwater](#)

2.5.2.1 Temporary Well Point Samples

Groundwater samples were collected from temporary well points installed in close proximity to each soil gas sampling location. The temporary well point samples were collected to provide a correlation between the groundwater concentration at a location and the soil gas composition. The temporary wells were also used to gain a better understanding of groundwater quality at locations where permanent wells had not been installed, including off-site locations. The well points were constructed with 5 ft. of PVC screen, connected to 5 ft. of PVC riser. No PVC primers or glues were used in the well point construction. The well points were sampled using a narrow diameter bailer.

While temporary well points offer a more convenient method for collecting groundwater data at multiple locations, temporary well points are typically less indicative of actual groundwater quality than samples collected from monitoring wells. The loss of accuracy can be attributed to the inclusion of suspended solids in the groundwater samples (due to the inability to construct an adequate filter pack) and from the limited ability to purge a significant amount of groundwater prior to sampling. The use of permanent

monitoring wells also provides a benefit in the reproducibility of a sample from a specific location.

A total of ten on-site and five off-site temporary well points were installed and sampled between January 23 and January 30, 2015. A second groundwater sample was collected at an offset location approximately 5 feet from SG-10. The offset location was installed due to a very turbid sample from the original location. One off-site location, SG-11 was installed and sampled on March 27, 2015, due to access limitations and conflicts at the sample location. Figure 9 presents the approximate location of the temporary well point locations.

The samples were collected as grab samples. Purging of the wells was not conducted due to the limited yield of the temporary points; however geochemical parameters were collected from each well point. The initial sampling plan had included collecting samples for VOCs, SVOCs, PCBs/pesticides and TAL metals analyses. The SVOCs, PCBs/pesticides and TAL metal analyses were inadvertently omitted. However, analyses for these parameters was conducted on the monitoring well samples.

On-Site Temporary Wells

The NYSDEC Technical and Operational Guidance Series (TOGS), Class GA Groundwater Quality Standards (GWQS) were used as a conservative standard to assess groundwater quality. The groundwater in the vicinity of the site is not used as a source of potable water and, as such, the standards should be considered conservative. The on-site temporary well sampling results are provided in Table 4, and are depicted on Figure 9.

Several VOCs were detected above the GWQS, including benzene, cis-1,2 dechloroethylene (DCE), vinyl chloride (VC), TCE and toluene. Benzene was observed to marginally exceed the GWQS of 1 µg/L in one sample location, SG-10, at a concentration of 1.4 µg/L; however concentrations at an off-site location approximately five feet from SG-10 were below the GWQS. Only one temporary well sample, SG-2, contained cis-1,2 DCE concentrations above the GWQS, at a concentration of 14.8 µg/L. VC concentrations

were observed to exceed the GWQS at one on-site location, SG-10, at a concentration of 4.1 µg/L. TCE was found to exceed the GWQS at one location, SG-2, at a concentration of 50.5 µg/L. Toluene exceedances of the GWQS were observed at locations SG-6 and SG-8 at concentrations of 23.4 and 32.7 µg/L.

The pH of the on-site temporary well samples were all near neutral. Oxidation-Reduction potential readings collected at the on-site temporary wells were positive, indicating oxidizing conditions in the most shallow groundwater at all locations, except for SG-9 and SG-7, which were found to be reducing. Dissolved oxygen readings were relatively high, ranging from 9.97 µg/L at SG-2 to 3.71 µg/L at SG-9. The elevated dissolved oxygen readings are not unexpected, due to the shallow depth of the samples (near the water table) and the unpaved surface across the site allowing for a free exchange of soil gas and atmospheric air and the infiltration of rain water. The turbidity of all temporary wells samples, except for SG-1, were beyond the range of the water quality meter, indicating that the samples were very turbid.

Off-Site Temporary Wells

Groundwater samples were collected from five off-site temporary well locations, SG-11 through SG-15. The results are presented in the Remedial Investigation Report (RIR) (TRC 15).

2.5.2.2 Monitoring Well Samples

Groundwater samples were collected at five monitoring well locations, as shown in Figure 9. Samples were collected from MW-4s, MW-4i, MW-6s, MW-8s, and MW-9s. Monitoring well construction details for these wells are provided in Table 8. These wells were sampled for TCL, VOCs, SVOCs, TAL metals, PCBs/pesticides, natural attenuation (NA) parameters and dissolved gases (including methane, ethane and ethene). The NA parameter analysis included alkalinity, chloride, nitrate, phosphorus and sulfide.

In addition, samples collected from monitoring wells MW-4s and MW-4i were analyzed for the presence of the Dehalococcoides (DHC) bacteria. The analysis of biological samples and NA parameters is best suited for samples collected within the treatment zone, as the concentrations of the DHC bacteria are likely to be very low in areas without CVOC contamination. The DHC bacteria has been confirmed to potentially completely degrade PCE and TCE to ethene and provides strong evidence that biodegradation is on-going.

VOC Analysis

The NYSDEC Technical and Administrative Guidance Memorandums (TAGMs) GWQS were used to assess the VOC results. These standards are conservative, as the local groundwater is not used as a source of drinking water. VOC analysis indicated that several compounds exceeded the GWQS in monitoring wells MW-4i, MW-6s and MW-9s. These compounds included benzene, cis-1,2 DCE, trans-1,2 DCE, TCE and VC. Concentrations of TCE only exceeded the GWQS at one well, MW-6, at a concentration of 6.5 µg/L. Benzene was present in two wells, MW-4i and MW-9s at concentrations of 3.6 and 1.7 µg/L, marginally exceeding the GWQS. Concentrations of cis-1,2 DCE exceeded the GWQS in MW-4i and MW-9s. The cis-1,2 DCE exceedance in MW-9s was found to be 5.4 µg/L, slightly above the GWQS of 5 µg/L for this compound.

While TCE was not detected in MW-4i, the daughter breakdown products cis-1,2 DCE and VC were detected at concentrations of 167 µg/L and 151 µg/L, respectively. The presence of these breakdown products suggests that natural bioremediation is still occurring in this area. The absence of any VOCs at concentrations above the GWQS in MW-4s also substantiates that NA/bioremediation is occurring at the site.

TAL Metals Analysis

The NY TAGM Groundwater Quality Standards/Criteria were used to assess the TAL metals results. Exceedances of the GWQS for iron and sodium were noted in all on-site wells. Exceedances of the GWQS for manganese were also observed in MW-4i. These compounds are typically associated with saline or brackish water and given the site's

proximity to both the Atlantic Ocean and Jamaica Bay, are not indicative of contamination. Filtered samples were also analyzed for iron and manganese, to determine if these compounds were dissolved in the water, or were present as suspended solids. The filtered sample results indicate that both iron and manganese are present, predominantly as dissolved metals. Generally, the presence of dissolved iron and manganese in groundwater indicate that reducing conditions are prevalent, as the reduced valence state of these metal compounds are more soluble than the oxidized valence states.

SVOC, PCB and Pesticide Analysis

The monitoring well samples were analyzed for SVOCs, PCBs and pesticide compounds. The NY TAGM Groundwater Quality Standards/Criteria were used to assess these results. No SVOCs, PCBs or pesticide compounds were detected above the GWQS in any of the sampled wells.

Dissolved Gases and NA Analysis

The monitoring well samples were analyzed for alkalinity, chloride, nitrate, nitrite, phosphorus, sulfate and sulfide to assess the potential for continued NA of chlorinated solvents in the on-site groundwater. Concentrations of dissolved methane, ethane and ethene were also assessed in the sampled wells, as a potential line of evidence for reducing conditions or active reductive dechlorination.

The alkalinity levels measured at all wells were observed to be greater than 300 µg/L (as CaCO₃), indicating that the groundwater has a moderate buffering capacity and should remain at near neutral pH conditions, which are most conducive for reductive dechlorination. Chloride was detected in all wells, with the highest concentration observed at MS-4i, in the former source area. Additionally, the highest concentration of methane, ethane and ethene were detected at MW-4i indicating that reductive dechlorination is either on-going or that appropriate geochemical conditions are present at the well to support reductive dechlorination. The presence of ethene at 25 µg/L is a strong indication of on-going reductive dechlorination in the vicinity of MW-4i.

Concentrations of sulfate, sulfide, nitrate and nitrite observed at these wells are inconsistent with a reducing environment. The oxidized forms of sulfur and nitrogen (nitrate and sulfate) were found at higher concentrations than the reduced forms of these compounds (nitrite and sulfide). This would indicate that the geochemical conditions favor an oxidizing state; however, the presence of high dissolved iron and manganese concentrations suggest that the geochemical state is more reducing and favorable for continued NA of the CVOC compounds. The low concentrations of TCE remaining on-site support that NA and reductive dechlorination continued after the ISTT operations ceased and is further supported by the presence of cis-1,2 DCE and VC in the former source area wells.

Microbial Community Evaluation

Quantitative polymerase chain reaction (QPCR) is a quantitative analysis that tracks specific Deoxyribonucleic Acid (DNA) targets of single species or groups of microorganisms. It is utilized to monitor the microbial consortium purportedly involved in CVOC degradation through specific DNA targets. Many dechlorinating organisms have been recently discovered and research is ongoing to identify the full capabilities of these organisms to remediate other contaminants. The DHC species of bacteria are the only “known” group of bacteria capable of dechlorinating PCE and/or TCE completely to ethene. Consequently, DHC was analyzed as the QPCR target.

Monitoring wells MW-4s and MW-4i were analyzed for the presence of DHC by Microbial Insights, of Knoxville, Tennessee. The results indicate that DHC is present in MW-4s and MW-4i at concentrations of 6.6×10^4 and 3.1×10^4 cells/mL. Both concentrations are greater than the 1×10^4 concentrations suggested by the lab as the threshold that will result in “generally useful” reductive dechlorination rates. These concentrations are higher than the pre- and post-thermal treatment results for the same compounds, indicating that a microbial population capable of degrading the chlorinated compounds has effectively been re-established at the site.

Significant evidence of NA has been found at the site during the RI, and the contaminant levels have continued to decrease after the successful implementation of the

thermal remediation program. Because the contaminant concentrations are near the quality standards and are expected to improve due to further biodegradation and natural attenuation, further monitoring of groundwater is not needed. The local groundwater is not used for potable or commercial purposes and the only potential hazard related to contaminated groundwater is from exposure to soil gas. The RI showed that soil gas concentration off-site, to the north, east and west are very low. Soil gas concentrations south of the site, in the area of SG-11 are high; however groundwater contamination has been found at that location. The groundwater contamination at SG-11 has been shown to be discontinuous with the on-site impacts and continued on-site monitoring will not provide a significant benefit to assessing soil gas exposure south of the site.

Table 4 and Figure 9 summarize the results of all samples of groundwater that exceed the standards, criteria and guidance (SCGs) after completion of the remedial action.

2.5.3 Soil Vapor

In accordance with the Remedial Investigation Work Plan (RIWP), a total of fifteen (15) soil gas samples were collected from on- and off-site. Summit Drilling, of Bridgewater, New Jersey conducted the drilling and obtained the necessary permits and utility clearances. Figure 10 shows the approximate on-site sampling locations. A description of the sampling locations is provided below. No indoor air or sub-slab soil gas samples were collected, as there are no structures located on-site.

Soil Gas/Ambient Air Sampling Locations

- One sample was collected near the midpoint of the northern property line (SG-7);
- One sample was collected near the midpoint of the southern property line (SG-4);
- One sample was collected from each corner of the property (SG-1, SG-3, SG-5, and SG-6, noting that SG-3 is within the ISTT zone);
- Four samples were collected from central locations: one point in the treatment (SG-10) area and three points outside of treatment area (SG-2, SG-8, and SG-9);
- One ambient air sample was collected at surface level within the sampling area.

The sample locations were selected to evaluate current soil gas concentrations throughout the site. To that end, sample locations placed in the area of MW-4i and MW-

4s were intended to represent the worst case scenario for soil gas concentrations since these locations coincide with the highest historical groundwater VOC levels.

Off-site soil gas samples were located within street right of ways and were accessed with a New York City Department of Transportation (NYC DOT) permit. The drilling contractor obtained the permits for these locations.

Prior to sample collection, an independent private utility locating company, NOVA Geophysical, of Forest Hills, New York, conducted a utility survey to ensure no unmarked utilities were located in the sample collection area. The soil gas and ambient air samples were sent to Accutest Laboratories of Dayton, NJ and were analyzed for VOCs using EPA method TO-15 (VIG p. 30). The laboratory is certified by NYSDEC (certification # 10983). All sample containers and flow controllers were provided by Accutest.

On-Site Soil Gas Samples

Analytical results from on-site soil gas sampling locations SG-1 through SG-10 are presented on Figure 10. Total VOC concentrations ranged from 0.023 ppmv ($56 \mu\text{g}/\text{m}^3$) at sample location SG-6, located near the northeast property boundary, to a high of 0.404 ppmv ($2,047 \mu\text{g}/\text{m}^3$) at sample location SG-2, located north of the former source area. All total VOC detections on-site were found to be less than 1 ppmv in the soil gas.

The highest detection found on-site was for TCE at sample location SG-2, with a concentration of 0.338 ppmv ($1,820 \mu\text{g}/\text{m}^3$). TCE concentrations in SG-2 accounted for nearly 90% of all VOC mass in that sample. Duplicate samples were collected from location SG-10, approximately 10 ft. from former source area well MW-4s, returning TCE concentrations of 0.0332 ppmv ($178 \mu\text{g}/\text{m}^3$) and 0.0312 ppmv ($168 \mu\text{g}/\text{m}^3$). The average TCE concentration in on-site samples was found to be 0.039 ppmv ($209 \mu\text{g}/\text{m}^3$). The data indicates that significant TCE impacts to soil gas are relatively limited to the former source area, represented by sample locations SG-2 and SG-10.

Multiple compounds were detected in the soil gas samples; however, most compounds were detected at very low concentrations. TCE was detected at the highest concentrations, as described above. Other compounds detected in the on-site soil gas include propylene, cis-1,2 DCE, benzene and acetone. Propylene was detected at a maximum concentration of 0.171 ppmv ($294 \mu\text{g}/\text{m}^3$) at location SG-7, by the northern property line. The maximum concentration of cis-1,2 DCE was 0.0233 ppmv ($92.4 \mu\text{g}/\text{m}^3$) found at sample location SG-2, north of the former source area. Benzene was detected at a maximum concentration of 0.0214 ppmv ($68.4 \mu\text{g}/\text{m}^3$) at location SG-8, near the center of the property. Acetone was detected at concentrations ranging from 0.0076 ppmv ($18 \mu\text{g}/\text{m}^3$) at location SG-3 to 0.0293 ppmv ($69.6 \mu\text{g}/\text{m}^3$) at location SG-1.

Off-Site Soil Gas Samples

Off-site soil gas samples were collected east (SG-12) north (SG-13, SG-14), west (SG-15) and south (SG-11) of the site. The results of the off-site soil gas samples are presented in the RIR (TRC 15).

Table 6 and Figure 10 summarize the results of all samples of soil vapor results. No continued monitoring of on-site soil gas concentrations is proposed.

3.0 INSTITUTIONAL AND ENGINEERING CONTROL PLAN

3.1 General

Since remaining contamination exists at the site, Institutional Controls (ICs) and Engineering Controls (ECs) are required to protect human health and the environment. This IC/EC Plan describes the procedures for the implementation and management of all IC/ECs at the site. The IC/EC Plan is one component of the SMP and is subject to revision by the NYSDEC.

This plan provides:

- A description of all IC/ECs on the site;
- The basic implementation and intended role of each IC/EC;
- A description of the key components of the ICs set forth in the Environmental Easement;
- A description of the controls to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of IC/ECs, such as the implementation of the Excavation Work Plan (EWP) (as provided in Appendix 2) for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the site; and
- Any other provisions necessary to identify or establish methods for implementing the IC/ECs required by the site remedy, as determined by the NYSDEC.

3.2 Institutional Controls

A series of ICs is required by the Decision Document to: (1) implement, maintain and monitor the Engineering Controls; (2) prevent future exposure to remaining contamination; and, (3) limit the use and development of the site to restricted residential uses only. Adherence to these ICs on the site is required by the Environmental Easement

and will be implemented under this SMP. ICs identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement. The IC boundaries are shown on Figure 11. These ICs are:

An environmental easement has been established for the site. The environmental easement covers the entire extent of the property, and has been filed with the municipal and county clerks. A copy of the environmental easement has been provided in Appendix 3. The environmental easement establishes the restrictions placed on the site for future uses.

- The property may be used for : restricted residential use;
- All ECs must be operated and maintained as specified in this SMP;
- All ECs must be inspected at a frequency and in a manner defined in the SMP.
- The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the New York City Department of Health and Mental Hygiene to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department.
- Data and information pertinent to site management must be reported at the frequency and in a manner as defined in this SMP;
- All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP;
- Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this SMP;
- Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by the Environmental Easement.
- The potential for vapor intrusion (VI) must be evaluated for any buildings developed in the area within the IC boundaries noted on Figure 11, and any potential impacts that are identified must be monitored or mitigated; and
- Vegetable gardens and farming on the site are prohibited;

3.3 Engineering Controls

3.3.1 Cap

Exposure to remaining contamination at the site is prevented by a cover system placed over two areas of the site. This cover system is comprised of a minimum of 6 inches of asphalt pavement and base material. Figure 8 presents the location of the cover system and applicable demarcation layers. The Excavation Work Plan (EWP) provided in Appendix 2 outlines the procedures required to be implemented in the event the cover system is breached, penetrated or temporarily removed, and any underlying remaining contamination is disturbed. Procedures for the inspection of this cover are provided in the Monitoring and Sampling Plan included in Section 4.0 of this SMP. Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in a Health and Safety Plan (HASP) and associated Community Air Monitoring Plan (CAMP) prepared for the site and provided in Appendix 7.

3.3.2 Sub-slab Depressurization System

No buildings are currently present on the site. A sub-slab depressurization system (SSDS) will be required if a building is constructed within the area depicted on Figure 11. The size and construction techniques used in erecting the building will influence the design and installation of the SSDS. At a minimum, 6 inches of permeable base material shall be installed below the building slab, with a vapor barrier directly below the slab. The permeable layer will constitute the venting layer. Horizontal conveyance pipes will be installed in the venting layer, and these pipes will be connected to one or more headers, which will rise to a height of at least 2 feet above the building roof line. The system shall be designed to be adaptive in use, with passive and active venting options. The need for a blower on the SSDS should be assessed at the design stage, while the building foundation is being designed. To the extent possible, the blower should be mounted outside, near the discharge location, to minimize any potential for breaks in the discharge piping to effect indoor air quality. If a passive SSDS is to be considered, its effectiveness must be

demonstrated by the volunteer (CPB) or their successor, through testing of the indoor air during the heating season.

Design parameters for the SSDS will include the following:

- The thickness and specification (permeability, average diameter) of the venting layer material;
- The spacing and sizing of conveyance piping (pipe diameter, % openings, off-center distance between vent pipes);
- Blower location and sizing; and
- Finishing of the discharge stack (vertically or horizontally aligned).

Generalized procedures for operating and maintaining the SSDS are documented in the Operation and Maintenance Plan (Section 5.0 of this SMP). As built drawings, signed and sealed by a professional engineer, are not available at this time, as no building is currently located on the property. Figure 8 shows the location of the ECs for the site.

3.3.3 Criteria for Completion of Remediation/Termination of Remedial Systems

Generally, remedial processes are considered completed when monitoring indicates that the remedy has achieved the remedial action objectives identified by the decision document. The framework for determining when remedial processes are complete is provided in Section 6.4 of NYSDEC DER-10.

3.3.3.1 Cap

The composite cover system is a permanent control and the quality and integrity of this system will be inspected at defined, regular intervals in accordance with this SMP in perpetuity.

3.3.3.2 - Sub-Slab Depressurization (SSD) System

The active/passive SSDS will not be discontinued unless prior written approval is granted by the NYSDEC and the NYSDOH. If a passive SSDS is to be considered, its effectiveness must be demonstrated by the volunteer (CPB) or their successor, through

testing of the indoor air during the heating season. In the event that monitoring data indicates that the SSDS may no longer be required, a proposal to discontinue the system will be submitted by the remedial party to the NYSDEC and NYSDOH.

4.0 MONITORING AND SAMPLING PLAN

4.1 General

No further sampling is proposed for the site. If a building is constructed within the footprint of the site (Figure 11), and a SSDS is included, then soil gas and indoor air samples will be collected. A Quality Assurance Project Plan (QAPP) will be developed should a SSDS be required. The only current EC at the site is two protective caps, which will require monitoring, but no sampling.

This Monitoring and Sampling Plan describes the measures for evaluating the overall performance and effectiveness of the remedy. This Monitoring and Sampling Plan may only be revised with the approval of the NYSDEC. Details regarding the sampling procedures, data quality usability objectives, analytical methods, etc. for all samples collected as part of site management for the site will be included in the QAPP to be provided in Appendix 6. The QAPP will be developed only if a SSDS is installed as part of future development activities.

This Monitoring and Sampling Plan describes the methods to be used for:

- Sampling and analysis of all appropriate media (e.g., indoor air, soil vapor);
- Assessing compliance with applicable NYSDEC SCGs; and
- Evaluating site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment;

To adequately address these issues, this Monitoring and Sampling Plan will provide information on:

- Sampling locations, protocol and frequency;
- Information on all designed monitoring systems;

- Analytical sampling program requirements; and
- Annual inspection and periodic certification.

Reporting requirements are provided in Section 7.0 of this SMP.

4.2 Site – wide Inspection

Site-wide inspections of the caps will be performed annually. If a SSDS is installed at a later date, that system will be inspected monthly. Modification to the frequency or duration of the inspections will require approval from the NYSDEC. Site-wide inspections will also be performed after all severe weather conditions that may affect ECs or monitoring devices. During these inspections, an inspection form will be completed as provided in Appendix 8 – Site Management Forms. The form will compile sufficient information to assess the following:

- Compliance with all ICs, including site usage;
- An evaluation of the condition and continued effectiveness of the EC;
- General site conditions at the time of the inspection;
- The site management activities being conducted including, where appropriate, confirmation sampling and a health and safety inspection; and
- Confirm that site records are up to date.

Inspections of all remedial components installed at the site will be conducted. A comprehensive site-wide inspection will be conducted and documented according to the SMP schedule, regardless of the frequency of the Periodic Review Report. The inspections will determine and document the following:

- Whether ECs continue to perform as designed;
- If these controls continue to be protective of human health and the environment;

- Compliance with requirements of this SMP and the Environmental Easement;
- Achievement of remedial performance criteria; and
- If site records are complete and up to date; and

Reporting requirements are outlined in Section 7.0 of this plan.

Inspections will also be performed in the event of an emergency. If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs that reduces or has the potential to reduce the effectiveness of ECs in place at the site, verbal notice to the NYSDEC must be given by noon of the following day. In addition, an inspection of the site will be conducted within 5 days of the event to verify the effectiveness of the IC/ECs implemented at the site by a qualified environmental professional, as determined by the NYSDEC. Written confirmation must be provided to the NYSDEC within 7 days of the event that includes a summary of actions taken, or to be taken, and the potential impact to the environment and the public.

4.3 Treatment System Monitoring and Sampling

4.3.1 Remedial System Monitoring

Monitoring of the cap will be performed on a routine basis, as identified in Table 7 Remedial System Monitoring Requirements and Schedule (see below). Modification to the frequency or sampling requirements will require approval from the NYSDEC. A visual inspection of the complete system will be conducted during each monitoring event. Unscheduled inspections and/or sampling may take place when a suspected failure of the cap has been reported or an emergency occurs that is deemed likely to affect the operation of the system. Cap components to be monitored include, but are not limited to, the components included in Table 7 below.

Table 7 – Remedial System Monitoring Requirements and Schedule

Remedial System Component	Monitoring Parameter	Operating Range	Monitoring Schedule
Cap Materials	Integrity	Not Applicable	Annual

A complete list of components to be inspected is provided in the Inspection Checklist, provided in Appendix 8 - Site Management Forms. The SSDS inspection checklist will be developed if the SSDS is installed at a later date. If any equipment readings are not within their specified operation range, any equipment is observed to be malfunctioning or the system is not performing within specifications; maintenance and repair, as per the Operation and Maintenance Plan, is required immediately.

4.3.2 Remedial System Sampling

No sampling is required to monitor the cap.

4.4 Post-Remediation Media Monitoring and Sampling

4.4.1 Media Sampling

No post-remediation sampling is required.

4.4.2 Monitoring and Sampling Protocol

All sampling activities will be recorded in a field book and associated sampling log as provided in Appendix 8 - Site Management Forms. Other observations (e.g., site use, site condition, etc.) will be noted on the sampling log. The monitoring log will serve as the inspection form for the monitoring network.

5.0 OPERATION AND MAINTENANCE PLAN

5.1 General

The RI identified Areas of Potential Vapor Intrusion Concern (Figure 11). Any buildings subsequently constructed on the site within this footprint may require a SSDS. When a building requiring a SSDS is constructed, a complete Operation and Maintenance Plan will be provided.

If required, this Operation and Maintenance Plan will provide a brief description of the measures necessary to operate, monitor and maintain the mechanical components of the remedy selected for the site. This Operation and Maintenance Plan:

- Will include the procedures necessary to allow individuals unfamiliar with the site to operate and maintain the SSDS;
- Will be updated periodically to reflect changes in site conditions or the manner in which the SSDSs are operated and maintained.

Further detail regarding the Operation and Maintenance of the SSDS will be developed when a building and SSDS is constructed. The Operation and Maintenance Plan will be developed and incorporated into this document in Appendix 9 - Operation and Maintenance Manual. A copy of this Operation and Maintenance Manual, along with the complete SMP, will be maintained at the site. This Operation and Maintenance Plan is not to be used as a stand-alone document, but as a component document of this SMP.

5.2 Remedial System (SSDS) Performance Criteria

The performance criteria of the SSDS will be developed during the system design. At a minimum, the SSDS will be designed to induce a vacuum field beneath the building slab to prevent VI into the building.

5.3 Operation and Maintenance of Sub-slab Depressurization System

The following sections provide a description of the operation and maintenance of a SSDS, if needed. Cut-sheets and as-built drawings for the SSDS will be provided in Appendix 9 - Operations and Maintenance Manual, as needed.

5.3.1 System Start-Up and Testing

If a SSDS is required and installed, a start-up and testing procedure will be implemented. The start-up and testing procedure will be developed based on the system design and manufacturer's recommendations. At a minimum, the start-up and testing program will include the following:

- Pre-start-up inspection;
- Baseline measurements;
- Testing methods:
 - o Checks for leaks;
 - o Checks of seals;
 - o Check of backdrafts;
 - o Pressure tests;
 - o System balancing;
 - o Warning devices; and
 - o Sampling.

The system testing described above will be conducted if, in the course of the SSDS lifetime, the system goes down for a significant duration or significant changes are made to the system and it must be restarted.

5.3.2 Routine System Operation and Maintenance

An Operation and Maintenance program will be developed if and when the SSDS is designed and installed. The operation and maintenance program of the SSDS will include the following:

- Manufacturer's recommendations;
- Troubleshooting guide;

- Adjustment and repairs;
- Operation schedule.
- Inspections; and
- Routine maintenance activities and minimum schedules.

5.3.3 Non-Routine Operation and Maintenance

If installed, the SSDS will include a warning device to notify the maintenance personnel that the vacuum on the system is not operating. Additionally, the inspection program described in the SMP and the O&M Manual will include routine monitoring which will assess the system performance. If the SSDS is not performing within the specified range, the O&M Manual will include non-routine O&M activities to troubleshoot and repair the system.

5.3.4 System Monitoring Devices and Alarms

The SSDS will have a warning device to indicate that the system is not operating properly. In the event that warning device is activated, applicable maintenance and repairs will be conducted, as specified in the Operation and Maintenance Plan, and the SSDS will be restarted. Operational problems will be noted in the Periodic Review Report to be prepared for that reporting period.

6.0 PERIODIC ASSESSMENTS/EVALUATIONS

6.1 Climate Change Vulnerability Assessment

Increases in both the severity and frequency of storms/weather events, an increase in sea level elevations along with accompanying flooding impacts, shifting precipitation patterns and wide temperature fluctuations, resulting from global climactic change and instability, have the potential to significantly impact the performance, effectiveness and protectiveness of a given site and associated remedial systems. Vulnerability assessments provide information so that the site and associated remedial systems are prepared for the impacts of the increasing frequency and intensity of severe storms/weather events and associated flooding.

This section provides a summary of vulnerability assessments that will be conducted for the site during periodic assessments, and briefly summarizes the vulnerability of the site and/or engineering controls to severe storms/weather events and associated flooding.

The asphalt cap and SSDS ECs described in this document are not significantly vulnerable to impacts related to climate change. Future development plans for the use of the site, including building construction, should include an assessment of possible impacts from climate change. The operational functionality of a direct contact cap, such as the asphalt caps depicted in Figure 8, or a future SSDS, will not be impacted by increased rain fall or water level increases.

The site is located in a flood area, with portions of the site in the Special Flood Hazard Area subject to inundation by the 100 year floodplain. The bulk of the site is located in Zone X, which has a lower potential for flooding than the 100 year floodplain. Building construction options, such as elevating the first floor of the building, can be considered to reduce impacts of future flood events, and will also assist in reducing the potential for VI into the structure.

The asphalt caps will need to be inspected after any flood events or significant storms, to ensure their integrity and protectiveness.

The potential for power outages may impact the operation of an active SSDS. TRC proposes that any SSDS designed for future operations be able to operate effectively in both passive and active mode, allowing for protectiveness if a prolonged power outage occurs. The installation of wind turbines on the caps of the discharge pipe can allow for wind powered venting during power outages. If a passive SSDS is to be considered, its effectiveness must be demonstrated by the volunteer (CPB) or their successor, through testing of the indoor air during the heating season.

6.2 Green Remediation Evaluation

NYSDEC's DER-31 Green Remediation requires that green remediation concepts and techniques be considered during all stages of the remedial program including site management, with the goal of improving the sustainability of the cleanup and summarizing the net environmental benefit of any implemented green technology. This section of the SMP provides a summary of any green remediation evaluations to be completed for the site during site management, and as reported in the Periodic Review Report (PRR).

6.2.1 Timing of Green Remediation Evaluations

For major remedial system components, green remediation evaluations and corresponding modifications will be undertaken as part of a formal Remedial System Optimization (RSO), or at any time that the Project Manager considers it appropriate, e.g. during significant maintenance events or in conjunction with storm recovery activities.

A green remediation evaluation will be conducted during the design of any SSDS. Additional evaluations may be needed if future revisions to the system are needed.

Modifications resulting from green remediation evaluations will be routinely implemented and scheduled to occur during planned/routine operation and maintenance activities. Reporting of these modifications will be presented in the PRR.

6.2.2. Remedial Systems

The asphalt caps will include recycled concrete aggregate (RCA) as a base construction material. The RCA will be obtained from the Section 375 permitted facility. The use of the RCA will minimize the consumption of natural resources during the cap installation.

Remedial systems will be operated/maintained properly, considering the current site conditions, to conserve materials and resources to the greatest extent possible. It is not anticipated that any spent materials, requiring recycling or disposal, will routinely be generated during normal operation.

The full assessment for Green and Sustainable remediation techniques will be conducted when a building is proposed, and an SSDS is designed.

6.2.3 Building Operations

Structures including buildings and sheds will be operated and maintained to provide for the most efficient operation of the remedy, while minimizing energy, waste generation and water consumption.

Future on-site buildings will be designed to be compatible with an SSDS and capping system. Slab penetrations will be adequately sealed to minimize VI into the building, and the slab construction will incorporate the venting layer, required vapor conveyance piping, and a vapor barrier. The buildings will also be constructed with modern building techniques minimizing outdoor air exchange, resulting in lower heating system operations in the winter, which may increase the potential for VI due to the “chimney effect”.

Outdoor air exchange may be beneficial, provided the indoor air evacuated is replaced with outdoor air, avoiding negative pressure.

6.2.4 Frequency of System Checks, Sampling and Other Periodic Activities

Transportation to and from the site and use of consumables in relation to visiting the site in order to conduct system checks and/or collect samples and shipping samples to a laboratory for analyses have direct and/or inherent energy costs. The schedule and/or means of these periodic activities have been prepared so that these tasks can be accomplished in a manner that does not impact remedy protectiveness but reduces expenditure of energy or resources.

A SSDS will be equipped with a warning device that will notify the maintenance personnel of a loss of vacuum during periods of active operation. This warning device will allow for less frequent site visits, which may be conducted on a monthly or quarterly frequency. The frequency of the SSDS inspections will be dependent on the system design and the building location, and cannot be determined at this time. If the building is used for institutional or commercial purposes (on the first floor, or in its entirety), then employees or occupants could be trained to conduct the routine inspections. The inspection forms for the system will be developed when the system is designed, and the level of complexity of the system is determined.

6.2.5 Metrics and Reporting

The only potential active EC on the site would be a SSDS. Therefore, the monitoring of green and sustainable metrics will only be necessary if a SSDS is subsequently required. While the decision to operate the system in an active or passive mode will be partly made with a consideration for power consumption, the overall protection of the building occupants will be the overriding factor for determining the operational state of the SSDS. If a passive SSDS is to be considered, its effectiveness must be demonstrated by the volunteer (CPB) or their successor, through testing of the indoor air during the heating season.

6.3 Remedial System Optimization

A Remedial Site Optimization (RSO) study will be conducted any time that the NYSDEC or the remedial party requests in writing that an in-depth evaluation of the remedy is needed. An RSO may be appropriate if any of the following occur:

- The remedial actions have not met or, are not expected to meet, RAOs in the time frame estimated in the Decision Document;
- The management and operation of the remedial system is exceeding the estimated costs;
- The remedial system is not performing as expected or as designed;
- Previously unidentified source material may be suspected;
- Plume shift has potentially occurred;
- Site conditions change due to development, change of use, change in groundwater use, etc.;
- There is an anticipated transfer of the site management to another remedial party or agency; and
- A new and applicable remedial technology becomes available.

An RSO will provide a critique of a site's conceptual model, give a summary of past performance, document current cleanup practices, summarize progress made toward the site's cleanup goals, gather additional performance or media specific data and information and provide recommendations for improvements to enhance the ability of the present system to reach RAOs or to provide a basis for changing the remedial strategy.

7.0. REPORTING REQUIREMENTS

7.1 Site Management Reports

All site management inspection, maintenance and monitoring events will be recorded on the appropriate site management forms provided in Appendix 8. These forms are subject to NYSDEC revision.

All applicable inspection forms and other records, including media sampling data and system maintenance reports, generated for the site during the reporting period will be provided in electronic format to the NYSDEC in accordance with the requirements of Table 7 and summarized in the PRR.

Table 9: Schedule of Interim Monitoring/Inspection Reports

Task/Report	Reporting Frequency*
Inspection Report	Annually (Quarterly, if a SSDS is installed)
Periodic Review Report	Every Second Year, or as otherwise determined by the Department

* The frequency of events will be conducted as specified until otherwise approved by the NYSDEC.

All interim monitoring/inspections reports will include, at a minimum:

- Date of event or reporting period;
- Name, company, and position of person(s) conducting monitoring/inspection activities;
- Description of the activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet);
- Type of samples collected (e.g., sub-slab vapor, indoor air, outdoor air, etc.);

- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation, etc.);
- Sampling results in comparison to appropriate standards/criteria;
- A figure illustrating sample type and sampling locations;
- Copies of all laboratory data sheets and the required laboratory data deliverables required for all points sampled (to be submitted electronically in the NYSDEC-identified format);
- Any observations, conclusions, or recommendations; and
- A determination as to whether contaminant conditions have changed since the last reporting event.

Routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting maintenance activities;
- Description of maintenance activities performed;
- Any modifications to the system;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet); and,
- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc., (attached to the checklist/form).

Non-routine maintenance event reporting forms will include, at a minimum:

- Date of event;
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities;
- Description of non-routine activities performed;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet); and

- Other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc. (attached to the checklist/form).

Data will be reported in digital format as determined by the NYSDEC. Currently, data is to be supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link <http://www.dec.ny.gov/chemical/62440.html>.

7.2 Periodic Review Report

A Periodic Review Report (PRR) will be submitted to the Department beginning sixteen (16) months after the Certificate of Completion is issued. After submittal of the initial PRR, the next PRR shall be submitted every second year to the Department or at another frequency as may be required by the Department. In the event that the site is subdivided into separate parcels with different ownership, a single PRR will be prepared that addresses the site described in Appendix 3 -Environmental Easement. The report will be prepared in accordance with NYSDEC's DER-10 and submitted within 30 days of the end of each certification period. Media sampling results will also be incorporated into the PRR. The report will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the site.
- Results of the required annual site inspections and severe condition inspections, if applicable.
- All applicable site management forms and other records generated for the site during the reporting period in the NYSDEC-approved electronic format, if not previously submitted.
- A summary of any discharge monitoring data and/or information generated during the reporting period, with comments and conclusions.
- Data summary tables and graphical representations of contaminants of concern by media (groundwater, soil vapor, etc.), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances

highlighted. These will include a presentation of past data as part of an evaluation of contaminant concentration trends.

- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted in digital format as determined by the NYSDEC. Currently, data is supplied electronically and submitted to the NYSDEC EQuIS™ database in accordance with the requirements found at this link: <http://www.dec.ny.gov/chemical/62440.html>.
- A site evaluation, which includes the following:
 - The compliance of the remedy with the requirements of the site-specific RAWP, ROD or Decision Document;
 - The operation and the effectiveness of all treatment units, etc., including identification of any needed repairs or modifications;
 - Any new conclusions or observations regarding site contamination based on inspections or data generated by the Monitoring and Sampling Plan for the media being monitored;
 - Recommendations regarding any necessary changes to the remedy and/or Monitoring and Sampling Plan; and
 - Trends in contaminant levels in the affected media will be evaluated to determine if the remedy continues to be effective in achieving remedial goals as specified by the Decision Document.
 - The overall performance and effectiveness of the remedy.
- A performance summary for all treatment systems at the site during the calendar year, including information such as:
 - The number of days the system operated for the reporting period;
 - A description of breakdowns and/or repairs along with an explanation for any significant downtime;
 - A description of the resolution of performance problems;
 - Alarm conditions;
 - Trends in equipment failure;

- A summary of the performance, effluent and/or effectiveness monitoring; and
- Comments, conclusions, and recommendations based on data evaluation.

7.2.1 Certification of Institutional and Engineering Controls

Following the last inspection of the reporting period, a Professional Engineer licensed to practice in New York State will prepare, and include in the PRR, the following certification as per the requirements of NYSDEC DER-10:

“For each institutional or engineering control identified for the site, I certify that all of the following statements are true:

- *The inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction;*
- *The institutional control and/or engineering control employed at this site is unchanged from the date the control was put in place, or last approved by the Department;*
- *Nothing has occurred that would impair the ability of the control to protect the public health and environment;*
- *Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control;*
- *Access to the site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;*
- *If a financial assurance mechanism is required under the oversight document for the site, the mechanism remains valid and sufficient for the intended purpose under the document;*
- *Use of the site is compliant with the environmental easement;*
- *The engineering control systems are performing as designed and are effective;*
- *To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program and generally accepted engineering practices; and*

- *The information presented in this report is accurate and complete.*

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class “A” misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as [Owner/Remedial Party or Owner’s/Remedial Party’s Designated Site Representative]for the site.”

At the end of each certifying period, as determined by the NYSDEC, the following certification will be provided to the Department:

“For each institutional identified for the site, I certify that all of the following statements are true:

- *The institutional control employed at this site is unchanged from the date the control was put in place, or last approved by the Department;*
- *Nothing has occurred that would impair the ability of the control to protect the public health and environment;*
- *Nothing has occurred that would constitute a violation or failure to comply with any site management plan for this control;*
- *Access to the site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;*
- *If a financial assurance mechanism is required under the oversight document for the site, the mechanism remains valid and sufficient for the intended purpose under the document;*
- *Use of the site is compliant with the environmental easement.*
- *The information presented in this report is accurate and complete.*

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class “A” misdemeanor,

pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as [Owner or Owner's Designated Site Representative] for the site."

Every two years the following certification will be added:

- *The assumptions made in the qualitative exposure assessment remain valid.*

The signed certification will be included in the Periodic Review Report.

The Periodic Review Report will be submitted, in electronic format, to the NYSDEC Central Office, Regional Office in which the site is located and the NYSDOH Bureau of Environmental Exposure Investigation. The PRR may need to be submitted in hard-copy format, as requested by the NYSDEC project manager.

7.3 Corrective Measures Work Plan

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an institutional or engineering control, a Corrective Measures Work Plan will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the Corrective Measures Work Plan until it has been approved by the NYSDEC.

7.4 Remedial Site Optimization Report

In the event that an RSO is to be performed (see Section 6.3), upon completion of an RSO, an RSO report must be submitted to the Department for approval. A general outline for the RSO report is provided in Appendix 10. The RSO report will document the research/ investigation and data gathering that was conducted, evaluate the results and facts obtained, present a revised conceptual site model and present recommendations. RSO recommendations are to be implemented upon approval from the NYSDEC. Additional

work plans, design documents, HASPs etc., may still be required to implement the recommendations, based upon the actions that need to be taken. A final engineering report and update to the SMP may also be required.

The RSO report will be submitted, in electronic format, to the NYSDEC Central Office, Regional Office in which the site is located, Site Control and the NYSDOH Bureau of Environmental Exposure Investigation.

8.0 REFERENCES

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NYSDEC, 1998. Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations Division of Water Technical and Operational Guidance Series (TOGS) 1.1.1. June 1998 (April 2000 addendum).

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CPB 3, CPB, Summary of 2005 CAP Addendum work, CPB-Property, Edgemere, New York- July 5, 2006.

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CPB 5, CPB. Email for Notification of Installation of Monitoring Wells to NYSDEC, CPB-Property, Edgemere, New York- July 8, 2010.

CPB 6, CPB. Email for Notification of Installation of Electrode and TMPs to NYSDEC, CPB-Property, Edgemere, New York- July 8, 2010.

CPB 7, CPB. Email for Notification of Air Permit Approval from NYSDEC, CPB-Property, Edgemere, New York- November 12, 2010.

CPB 8, CPB. Email for Notification of System Mobilization, CPB-Property, Edgemere, New York- January 11, 2011.

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NYSDEC 4, NYSDEC. Approval letter for 2007 CAP Addendum, CPB-Property, Edgemere, New York- November 16, 2007

NYSDEC 5, NYSDEC. Approval letter for In Situ Chemical Oxidation (ISCO) Pilot Test Work Plan (WP), CPB-Property, Edgemere, New York- July 3, 2008.

NYSDEC 6, NYSDEC. Approval letter for In Situ Chemical Oxidation (ISCO) and Enhanced In-Situ Bioremediation (EISB) Work Plan (WP), CPB-Property, Edgemere, New York- January 26, 2009.

NYSDEC 7, NYSDEC. Approval Letter for ISTT Work Plan, CPB-Property, Edgemere, New York- November 25, 2009.

NYSDEC 8, NYSDEC. Approval Letter for Suspension of Heating to Shallow Electrodes, CPB-Property, Edgemere, New York- May 12, 2011.

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TRC 3, TRC Environmental, Inc. In Situ Chemical Oxidation Pilot Test Report, CPB-Property, Edgemere, New York- December 22, 2008.

TRC 4, TRC Environmental, Inc. In Situ Chemical Oxidation Full Scale Design, CPB-Property, Edgemere, New York- December 2008.

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- TRC 8, TRC Environmental, Inc. In-Situ Thermal Treatment (ISTT) Work Plan- revised Figure 7, CPB-Property, Edgemere, New York- November 7, 2009.
- TRC 9, TRC Environmental, Inc. Email to CPB for Approval from NYSDEC to Operate System, CPB- Property, Edgemere, New York- November 22, 2010.
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- TRC 11, TRC Environmental, Inc. Letter requesting the Suspension of Heating at Shallow Electrodes, CPB- Property, Edgemere, New York- April 20, 2011.
- TRC 12, TRC Environmental, Inc. Phone Call to NYSDEC: 30 Day Post Treatment Ground Water Samples – November 14, 2011.
- TRC 13, TRC Environmental, Inc. Phone Call to NYSDEC: 90 Day Post Treatment Ground Water Samples – January 19, 2012.
- TRC 14, TRC Environmental Inc. In-Situ Thermal Treatment (ISTT) Remedial Action Report – August 24, 2012
- TRC 15, TRC Environmental, Inc. Remedial Investigation Report (RIR) – August 10, 2015

FIGURES



0 1,500 FT.
APPROXIMATE SCALE



TRC ENVIRONMENTAL CORP.
41 Spring Street
New Providence, New Jersey 07974

SITE LOCATION MAP

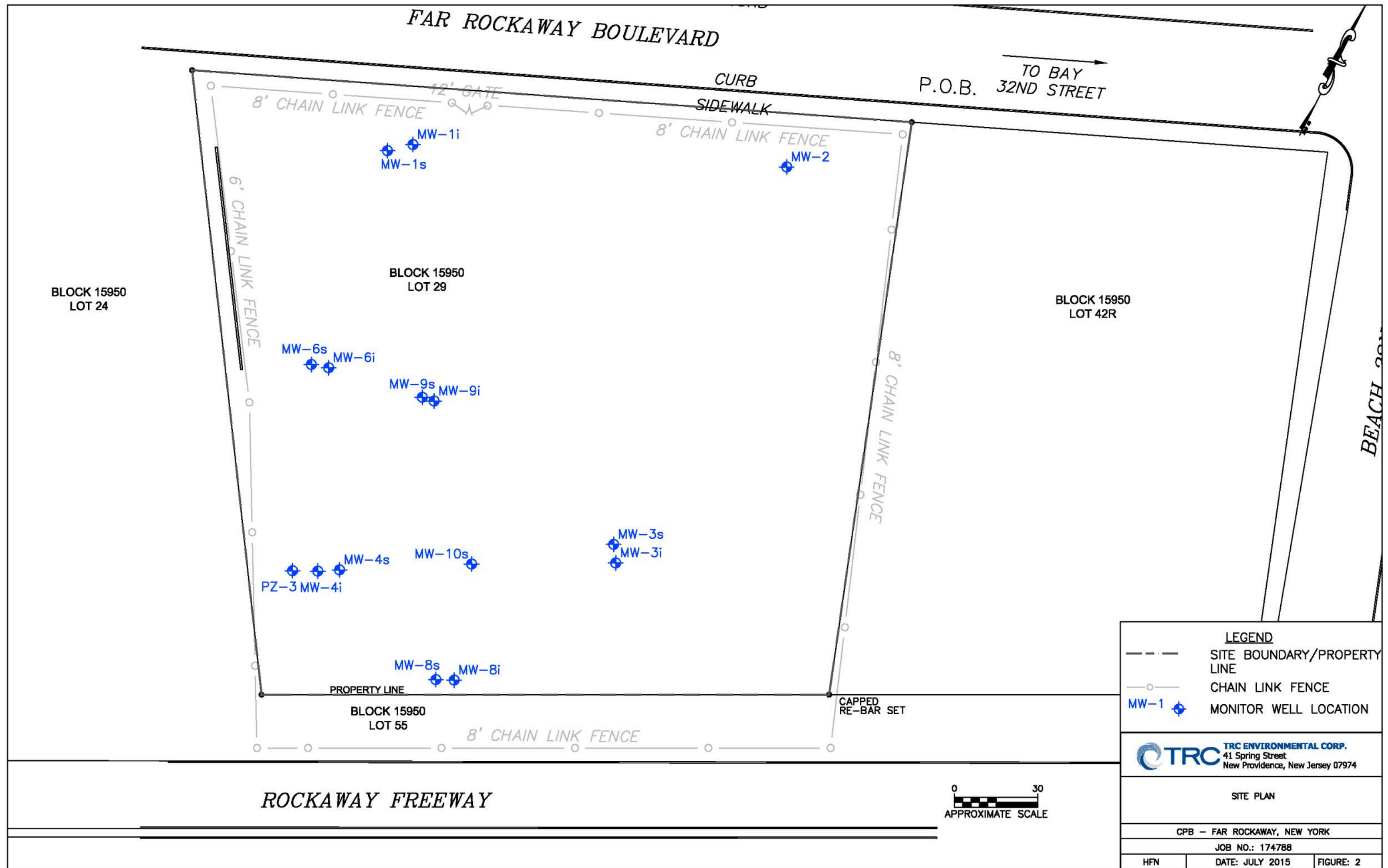
CPB - EDMERE, NEW YORK

JOB NO.: 174788

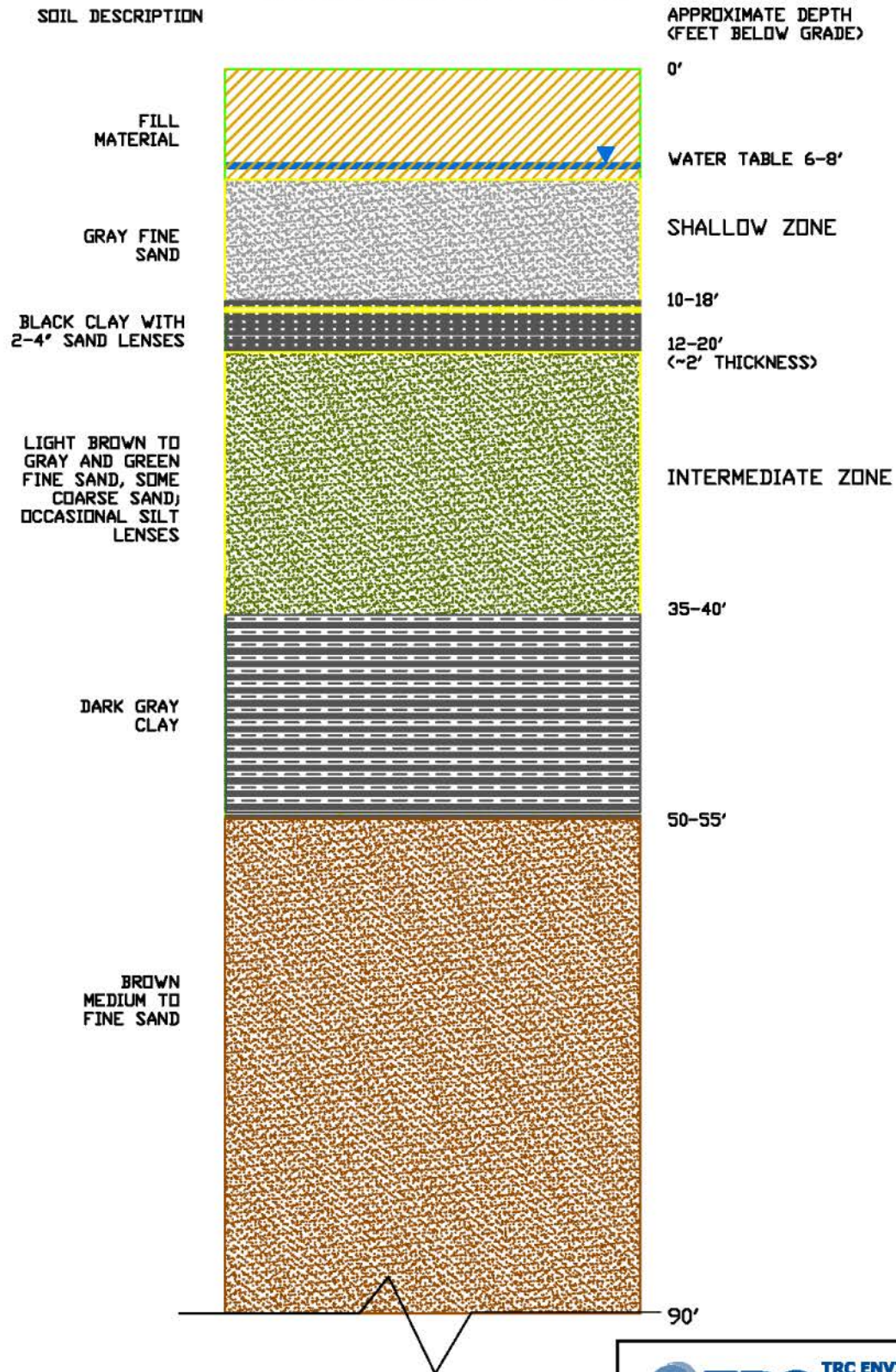
HN

DATE: OCTOBER 15, 2008

FIGURE: 1



GENERALIZED CROSS SECTION BLOCK 15950, LOT 29



SCALE: NOT TO SCALE

TRC ENVIRONMENTAL CORP.
41 Spring Street
New Providence, New Jersey 07974

GENERALIZED CROSS SECTION

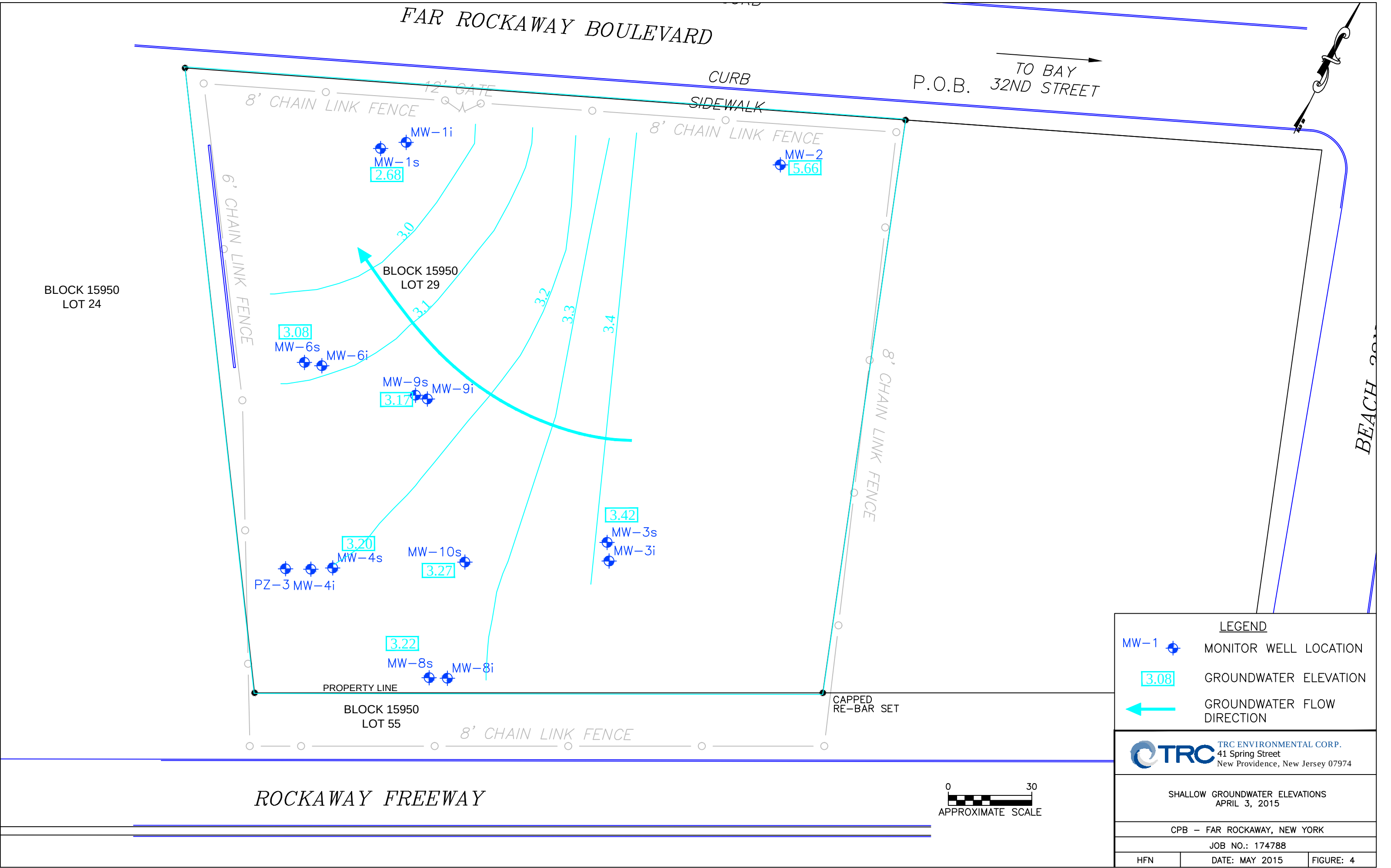
CPB - FAR ROCKAWAY, NEW YORK

JOB NO.: 174788

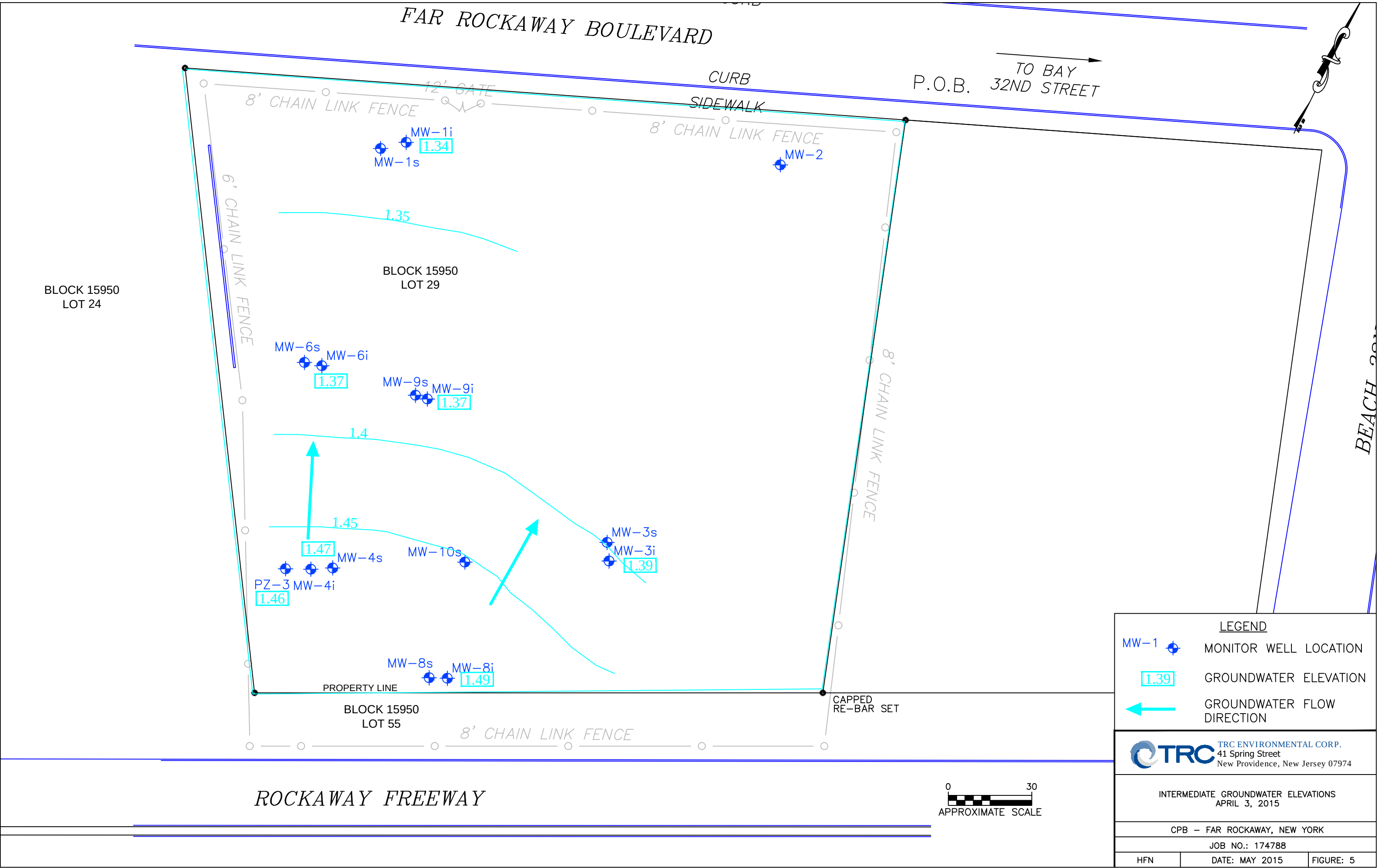
HFN

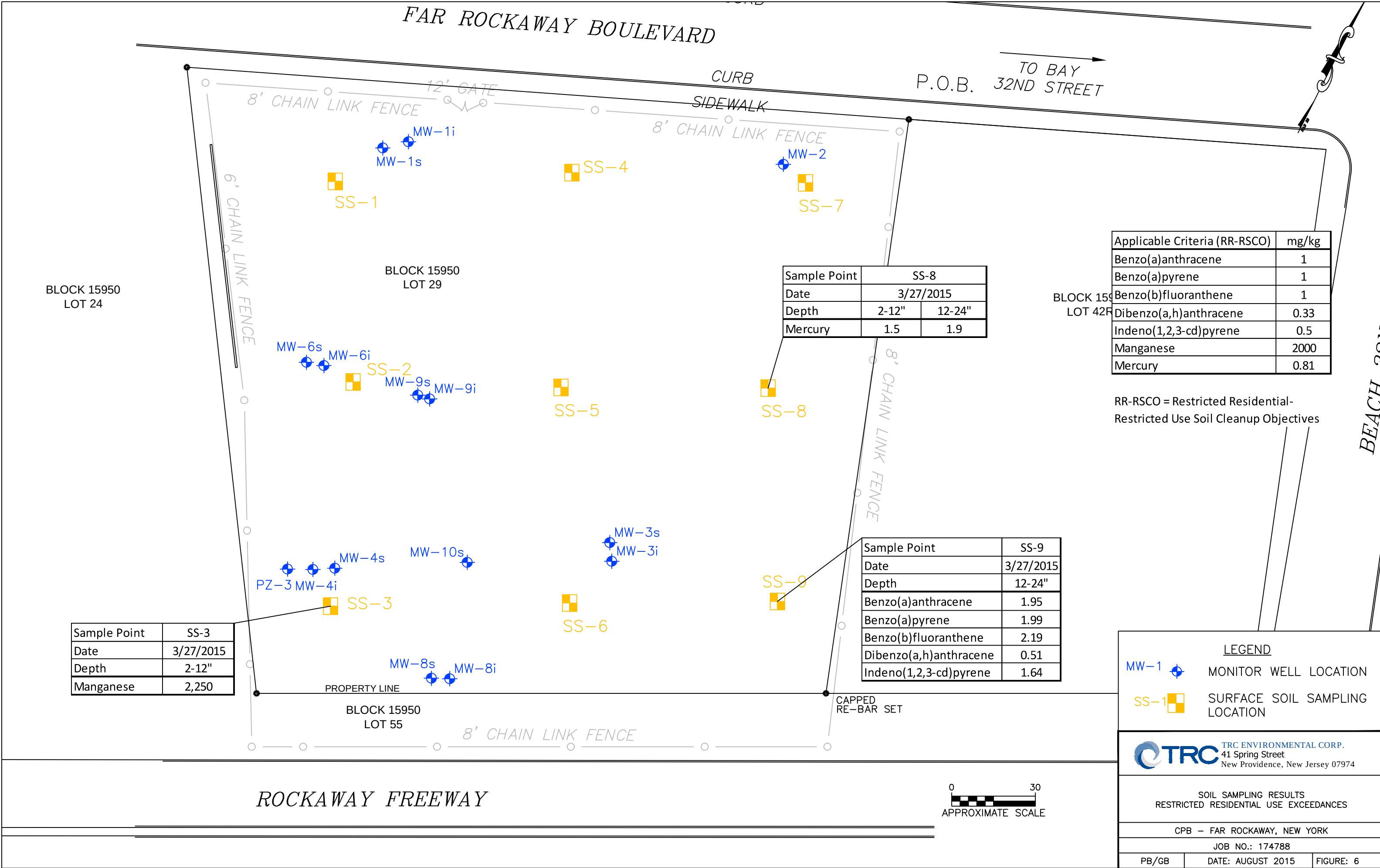
DATE: JULY 2015

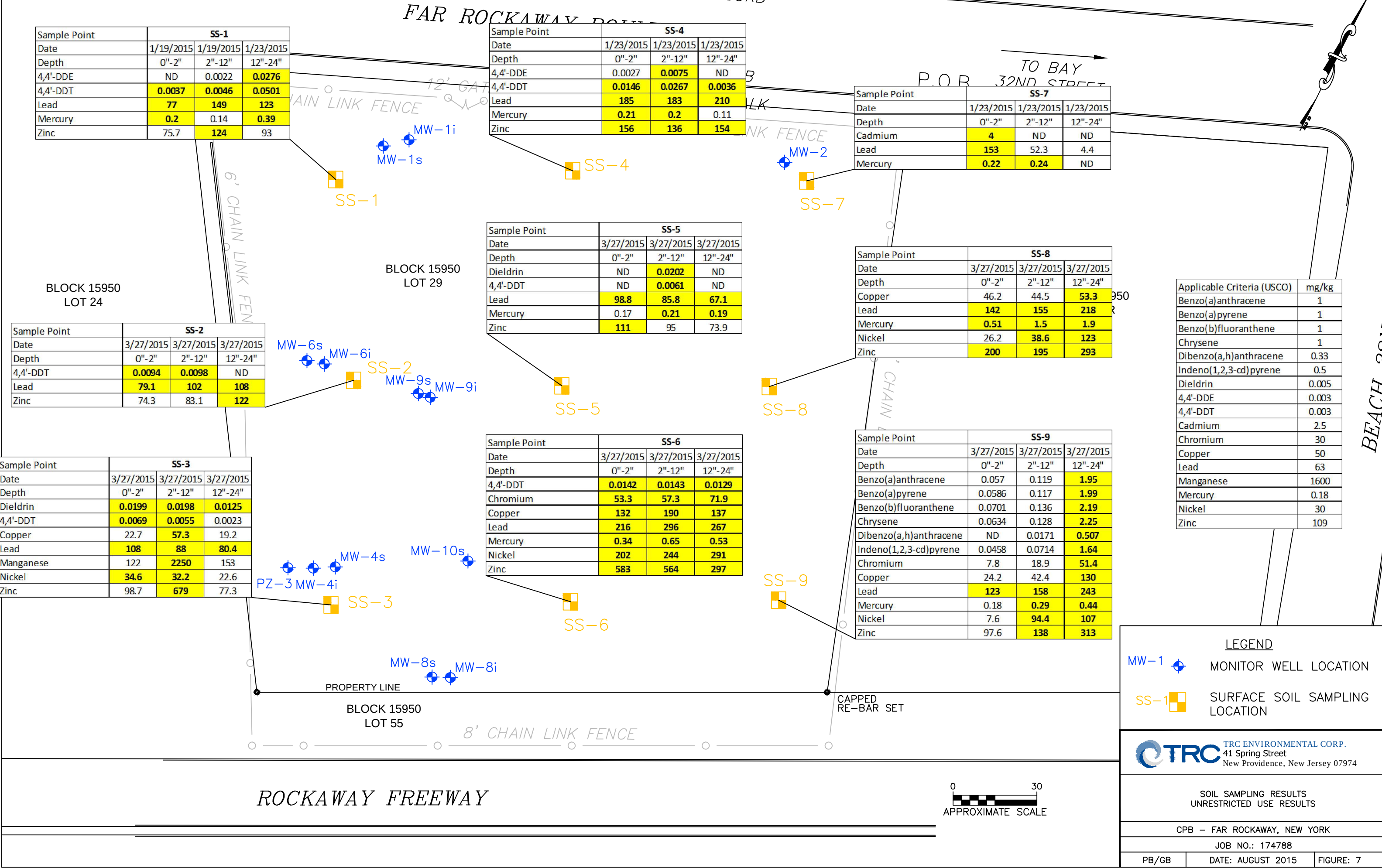
FIGURE: 3

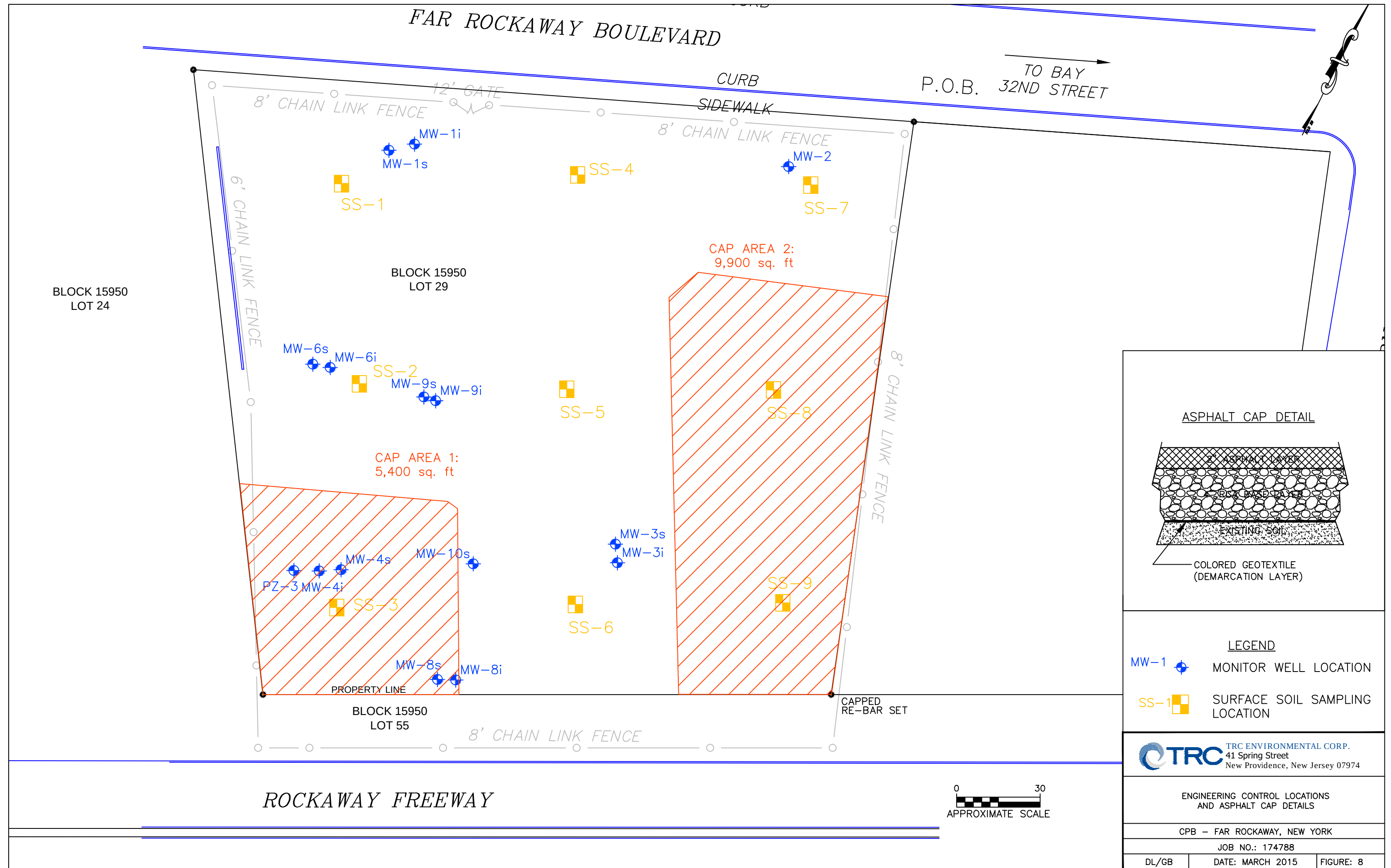


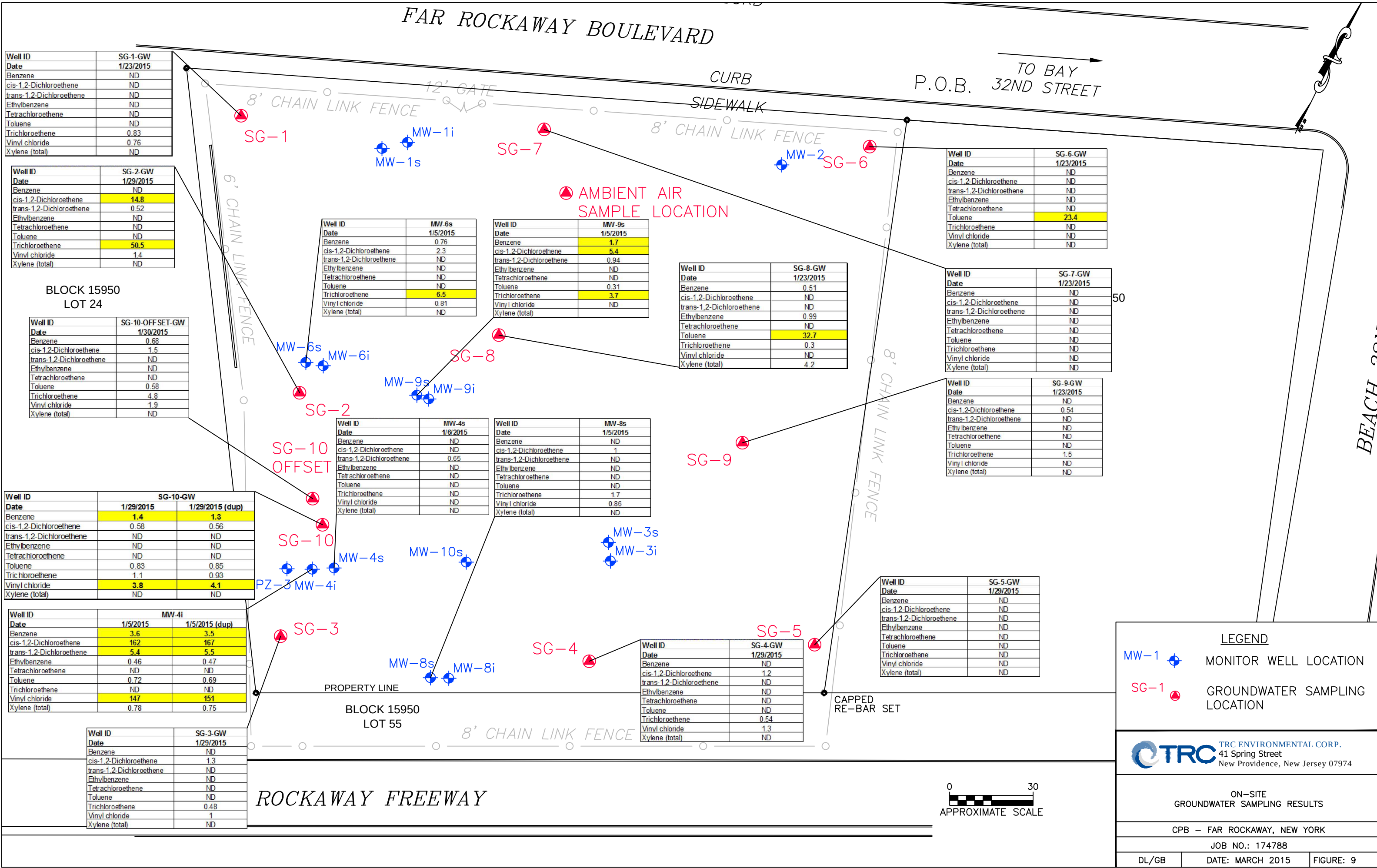
LEGEND		
MW-1		MONITOR WELL LOCATION
3.08		GROUNDWATER ELEVATION
		GROUNDWATER FLOW DIRECTION
TRC ENVIRONMENTAL CORP. 41 Spring Street New Providence, New Jersey 07974		
SHALLOW GROUNDWATER ELEVATIONS APRIL 3, 2015		
CPB - FAR ROCKAWAY, NEW YORK		
JOB NO.: 174788		
HFN	DATE: MAY 2015	FIGURE: 4











Well ID	SG-1-GW
Date	1/23/2015
Benzene	ND
cis-1,2-Dichloroethene	ND
trans-1,2-Dichloroethene	ND
Ethylbenzene	ND
Tetrachloroethene	ND
Toluene	ND
Trichloroethene	0.83
Vinyl chloride	0.76
Xylene (total)	ND

Well ID	SG-2-GW
Date	1/29/2015
Benzene	ND
cis-1,2-Dichloroethene	14.8
trans-1,2-Dichloroethene	0.52
Ethylbenzene	ND
Tetrachloroethene	ND
Toluene	ND
Trichloroethene	50.5
Vinyl chloride	1.4
Xylene (total)	ND

BLOCK 15950
LOT 24

Well ID	SG-10-OFF SET-GW
Date	1/30/2015
Benzene	0.68
cis-1,2-Dichloroethene	1.5
trans-1,2-Dichloroethene	ND
Ethylbenzene	ND
Tetrachloroethene	ND
Toluene	0.58
Trichloroethene	4.8
Vinyl chloride	1.9
Xylene (total)	ND

Well ID	SG-10-GW	
Date	1/29/2015	1/29/2015 (dup)
Benzene	1.4	1.3
cis-1,2-Dichloroethene	0.58	0.56
trans-1,2-Dichloroethene	ND	ND
Ethylbenzene	ND	ND
Tetrachloroethene	ND	ND
Toluene	0.83	0.85
Trichloroethene	1.1	0.93
Vinyl chloride	3.8	4.1
Xylene (total)	ND	ND

Well ID	MW-4i	
Date	1/5/2015	1/5/2015 (dup)
Benzene	3.6	3.5
cis-1,2-Dichloroethene	162	167
trans-1,2-Dichloroethene	5.4	5.5
Ethylbenzene	0.46	0.47
Tetrachloroethene	ND	ND
Toluene	0.72	0.69
Trichloroethene	ND	ND
Vinyl chloride	147	151
Xylene (total)	0.78	0.75

Well ID	SG-3-GW
Date	1/29/2015
Benzene	ND
cis-1,2-Dichloroethene	1.3
trans-1,2-Dichloroethene	ND
Ethylbenzene	ND
Tetrachloroethene	ND
Toluene	ND
Trichloroethene	0.48
Vinyl chloride	1
Xylene (total)	ND

Well ID	MW-6s
Date	1/5/2015
Benzene	0.78
cis-1,2-Dichloroethene	2.3
trans-1,2-Dichloroethene	ND
Ethylbenzene	ND
Tetrachloroethene	ND
Toluene	ND
Trichloroethene	6.5
Vinyl chloride	0.81
Xylene (total)	ND

Well ID	MW-9s
Date	1/5/2015
Benzene	1.7
cis-1,2-Dichloroethene	5.4
trans-1,2-Dichloroethene	0.94
Ethylbenzene	ND
Tetrachloroethene	ND
Toluene	0.31
Trichloroethene	3.7
Vinyl chloride	ND
Xylene (total)	ND

Well ID	MW-4s
Date	1/6/2015
Benzene	ND
cis-1,2-Dichloroethene	ND
trans-1,2-Dichloroethene	0.65
Ethylbenzene	ND
Tetrachloroethene	ND
Toluene	ND
Trichloroethene	ND
Vinyl chloride	ND
Xylene (total)	ND

Well ID	MW-8s
Date	1/5/2015
Benzene	ND
cis-1,2-Dichloroethene	1
trans-1,2-Dichloroethene	ND
Ethylbenzene	ND
Tetrachloroethene	ND
Toluene	ND
Trichloroethene	1.7
Vinyl chloride	0.86
Xylene (total)	ND

Well ID	SG-4-GW
Date	1/29/2015
Benzene	ND
cis-1,2-Dichloroethene	1.2
trans-1,2-Dichloroethene	ND
Ethylbenzene	ND
Tetrachloroethene	ND
Toluene	ND
Trichloroethene	0.54
Vinyl chloride	1.3
Xylene (total)	ND

Well ID	SG-6-GW
Date	1/23/2015
Benzene	ND
cis-1,2-Dichloroethene	ND
trans-1,2-Dichloroethene	ND
Ethylbenzene	ND
Tetrachloroethene	ND
Toluene	23.4
Trichloroethene	ND
Vinyl chloride	ND
Xylene (total)	ND

Well ID	SG-7-GW
Date	1/23/2015
Benzene	ND
cis-1,2-Dichloroethene	ND
trans-1,2-Dichloroethene	ND
Ethylbenzene	ND
Tetrachloroethene	ND
Toluene	ND
Trichloroethene	ND
Vinyl chloride	ND
Xylene (total)	ND

Well ID	SG-9-GW
Date	1/23/2015
Benzene	ND
cis-1,2-Dichloroethene	0.54
trans-1,2-Dichloroethene	ND
Ethylbenzene	ND
Tetrachloroethene	ND
Toluene	ND
Trichloroethene	1.5
Vinyl chloride	ND
Xylene (total)	ND

Well ID	SG-5-GW
Date	1/29/2015
Benzene	ND
cis-1,2-Dichloroethene	ND
trans-1,2-Dichloroethene	ND
Ethylbenzene	ND
Tetrachloroethene	ND
Toluene	ND
Trichloroethene	ND
Vinyl chloride	ND
Xylene (total)	ND

LEGEND

MW-1

MONITOR WELL LOCATION

SG-1

GROUNDWATER SAMPLING LOCATION

TRC

TRC ENVIRONMENTAL CORP.
41 Spring Street
New Providence, New Jersey 07974

ON-SITE
GROUNDWATER SAMPLING RESULTS

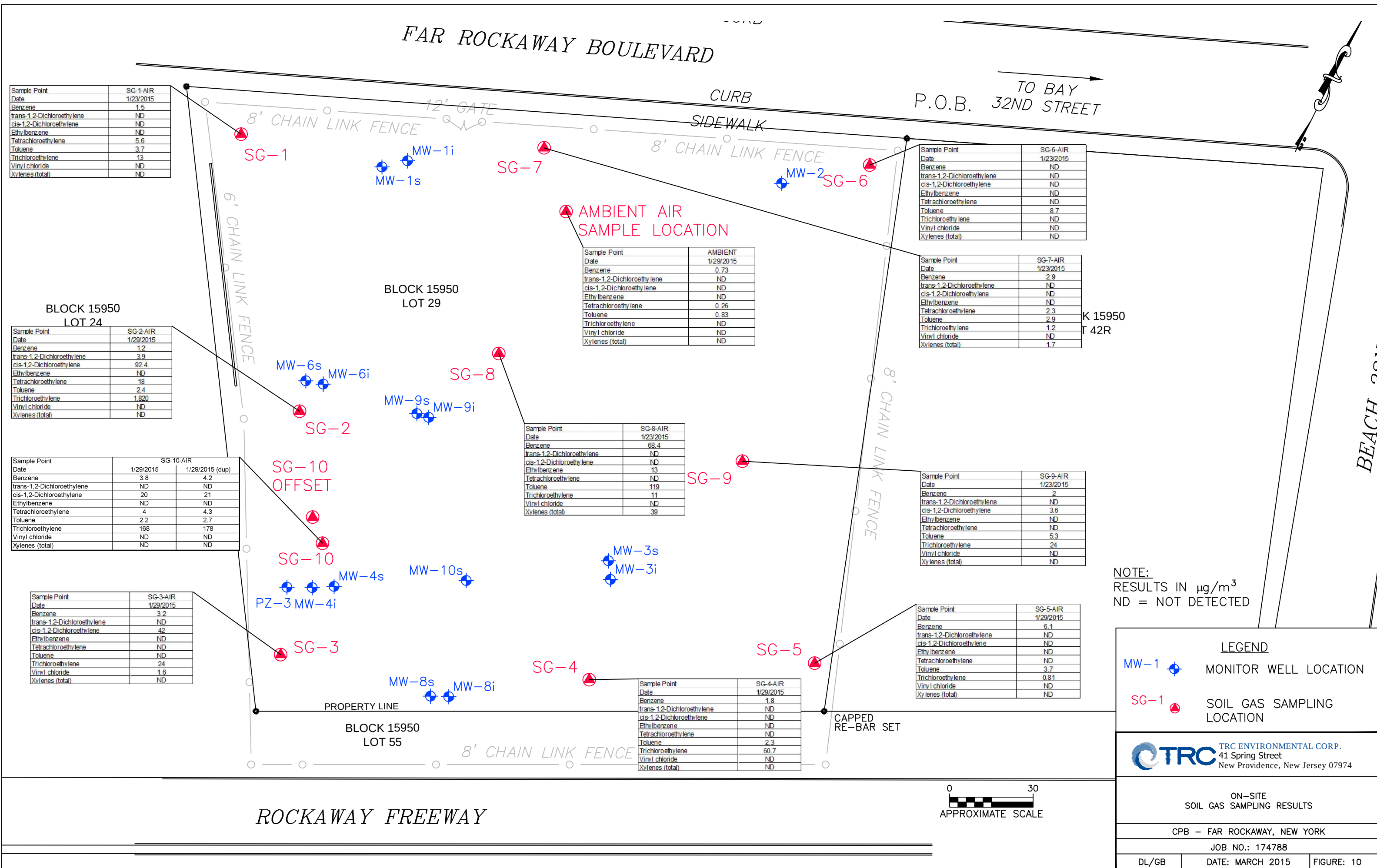
CPB - FAR ROCKAWAY, NEW YORK

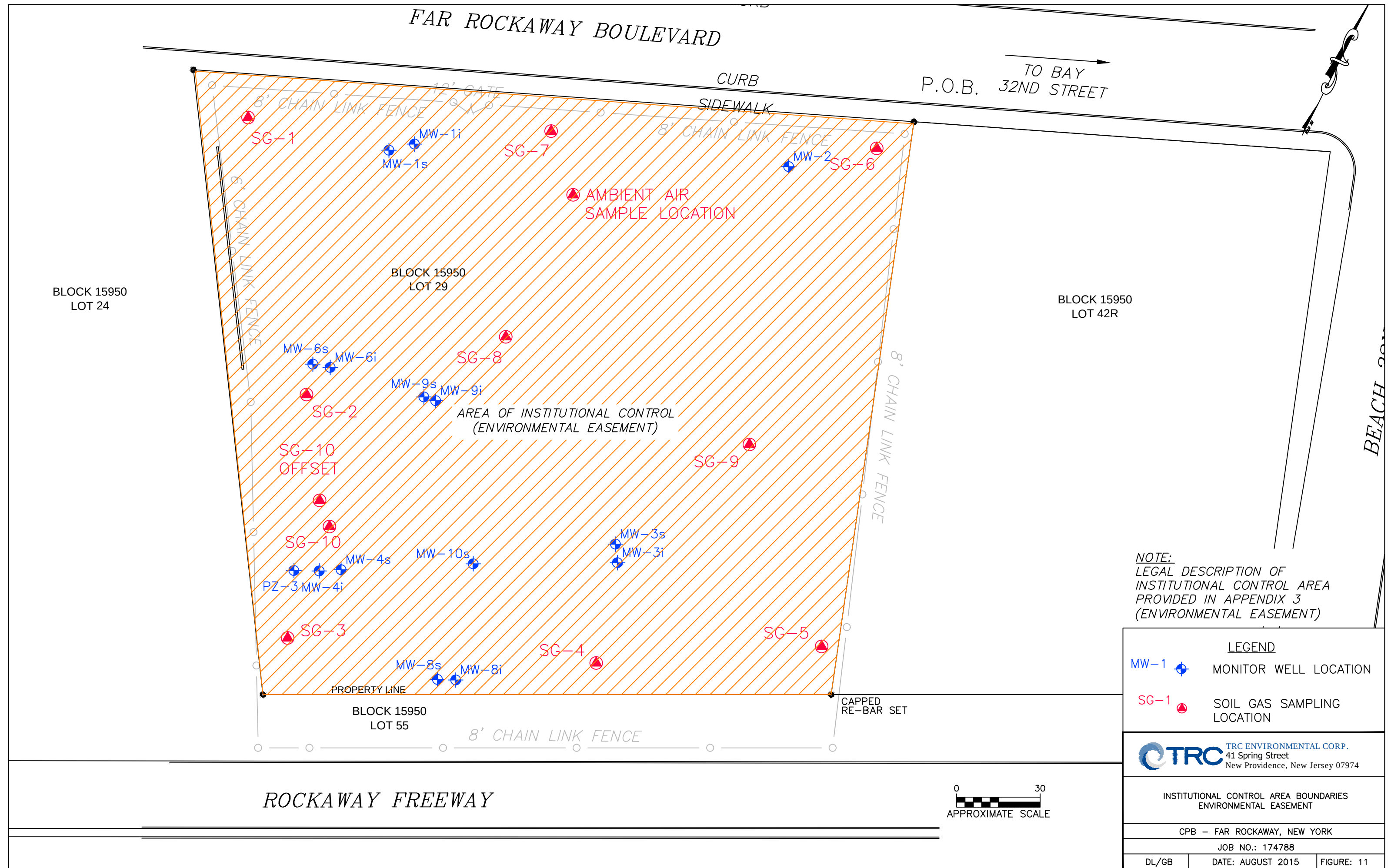
JOB NO.: 174788

DL/GB

DATE: MARCH 2015

FIGURE: 9





TABLES

Table 2
Volatile Organic Compounds in Soil (Restricted Use)
CPB Site
Far Rockaway, NY

	TRC Sample No.:	SS-1 (0-2")	SS-1 (2-12")	SS-1 (12-24")	SS-2 (0"-2")	SS-2 (12"-24")	SS-2 (2"-12")	SS-3 (0"-2")	SS-3 (12"-24")	SS-3 (2"-12")	SS-4 (0-2")	SS-4 (12-24")	SS-4 (2-12")	SS-5 (0"-2")	SS-5 (12"-24")	SS-5 (2"-12")
	Date Sampled: Lab Sample ID: Laboratory:	1/19/2015 JB86729-1 Accutest	1/19/2015 JB86729-2 Accutest	1/23/2015 JB87101-6 Accutest	3/27/2015 JB91085-2 Accutest	3/27/2015 JB91085-4 Accutest	3/27/2015 JB91085-3 Accutest	3/27/2015 JB91085-8 Accutest	3/27/2015 JB91085-10 Accutest	3/27/2015 JB91085-9 Accutest	1/23/2015 JB87101-7 Accutest	1/23/2015 JB87101-9 Accutest	1/23/2015 JB87101-8 Accutest	3/27/2015 JB91085-5 Accutest	3/27/2015 JB91085-7 Accutest	3/27/2015 JB91085-6 Accutest
VOCs by GCMS (mg/kg)	RR-RSCO															
Acetone	100	ND	ND	ND	ND	ND	ND	ND	ND	0.0193	ND	ND	ND	ND	ND	ND
Benzene	4.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Butylbenzene	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
sec-Butylbenzene	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	2.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	49	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cyclohexane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	49	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	26	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	3.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	100	ND	ND	ND	ND	ND	ND	ND	ND	0.00094	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	41	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Freon 113	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Isopropyltoluene	-	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl Acetate	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylcyclohexane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl Tert Butyl Ether	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone(MIBK)	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0017	J	0.0019
n-Propylbenzene	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	21	ND	0.00058	J	0.0024	J	0.00065	J	0.0062	0.0022	0.0013	0.0018	0.0098	ND	0.00022	J
Trichlorofluoromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	52	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	52	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	0.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
m,p-Xylene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
o-Xylene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylene (total)	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total	-	0	0.00058	0.0024	0.00065	0.0062	0.0022	0.0013	0.0018	0.03004	0	0.00022	0	0.0017	0	0.0019
Total VOC TICs	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total VOCs	-	0	0.00058	0.0024	0.00065	0.0062	0.0022	0.0013	0.0018	0.03004	0	0.00022	0	0.0017	0	0.0019

Notes:
ND = not detected.
NA = not analyzed.
J = estimated concentration detected below the Method Detection Limit.
RR-RSCO = Restricted Residential Restricted Use Soil Cleanup Objectives
Bold & Highlighted indicates concentration above RR-RSCO.

Table 2
Volatile Organic Compounds in Soil (Restricted Use)
CPB Site
Far Rockaway, NY

TRC Sample No.: Date Sampled: Lab Sample ID:		SS-6 (0"-2") 3/27/2015 JB91085-11	SS-6 (12"-24") 3/27/2015 JB91085-13	SS-6 (2"-12") 3/27/2015 JB91085-12	SS-7 (0-2") 1/23/2015 JB87101-10	SS-7 (0-2")(A) 1/23/2015 JB87101-11	SS-7 (12-24") 3/27/2015 JB87101-14	SS-7 (2-12") 1/23/2015 JB87101-12	SS-7 (2-12")(A) 1/23/2015 JB87101-13	SS-8 (0"-2") 3/27/2015 JB91085-17	SS-8 (12"-24") 3/27/2015 JB91085-19	SS-8 (2"-12") 3/27/2015 JB91085-18	SS-9 (0"-2") 3/27/2015 JB91085-14	SS-9 (12"-24") 3/27/2015 JB91085-16	SS-9 (2"-12") 3/27/2015 JB91085-15	
Laboratory:		Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	
VOCs by GCMS (mg/kg)		RR-RSCO														
Acetone	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Benzene	4.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Bromochloromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Bromodichloromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Bromoform	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Bromomethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
2-Butanone (MEK)	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
n-Butylbenzene	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
sec-Butylbenzene	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
tert-Butylbenzene	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Carbon disulfide	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Carbon tetrachloride	2.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Chlorobenzene	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Chloroethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Chloroform	49	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Chloromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Cyclohexane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
1,2-Dibromo-3-chloropropane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Dibromochloromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
1,2-Dibromoethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
1,2-Dichlorobenzene	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
1,3-Dichlorobenzene	49	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
1,4-Dichlorobenzene	13	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Dichlorodifluoromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
1,1-Dichloroethane	26	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
1,2-Dichloroethane	3.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
1,1-Dichloroethene	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
cis-1,2-Dichloroethene	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
trans-1,2-Dichloroethene	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
1,2-Dichloropropane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
cis-1,3-Dichloropropene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
trans-1,3-Dichloropropene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Ethylbenzene	41	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Freon 113	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
2-Hexanone	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Isopropylbenzene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
p-Isopropyltoluene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Methyl Acetate	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Methylcyclohexane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Methyl Tert Butyl Ether	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
4-Methyl-2-pentanone(MIBK)	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Methylene chloride	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
n-Propylbenzene	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Styrene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
1,1,2,2-Tetrachloroethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Tetrachloroethene	19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Toluene	100	ND	0.00055	J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
1,2,3-Trichlorobenzene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
1,2,4-Trichlorobenzene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
1,1,1-Trichloroethane	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
1,1,2-Trichloroethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Trichloroethene	21	ND	0.003	0.00063	J	ND	ND	ND	ND	ND	ND	ND	ND	0.0027	0.00042	J
Trichlorofluoromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
1,2,4-Trimethylbenzene	52	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
1,3,5-Trimethylbenzene	52	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Vinyl chloride	0.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
m,p-Xylene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
o-Xylene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Xylene (total)	100	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Total	-	0	0.00355	0.00063	0	0	0	0	0	0	0	0	0	0.0027	0.00042	
Total VOC TICs	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	
Total VOCs	-	0	0.00355	0.00063	0	0	0	0	0	0	0	0	0	0.0027	0.00042	

Notes:
ND = not detected.
NA = not analyzed.
J = estimated concentration detected below the M
RR-RSCO = Restricted Residential Restricted Us
Bold & Highlighted indicates concentration above

Table 2
Pesticide Compounds in Soil (Restricted Use)
CPB Site
Far Rockaway, NY

TRC Sample No.: Date Sampled: Lab Sample ID: Laboratory:		SS-1 (0-2") 1/19/2015 JB86729-1 Accutest	SS-1 (2-12") 1/19/2015 JB86729-2 Accutest	SS-1 (12-24") 1/23/2015 JB87101-6 Accutest	SS-2 (0"-2") 3/27/2015 JB91085-2 Accutest	SS-2 (12"-24") 3/27/2015 JB91085-4 Accutest	SS-2 (2"-12") 3/27/2015 JB91085-3 Accutest	SS-3 (0"-2") 3/27/2015 JB91085-8 Accutest	SS-3 (12"- 3/27/2015 JB91085-10 Accutest	SS-3 (2"-12") 3/27/2015 JB91085-9 Accutest	SS-4 (0-2") 1/23/2015 JB87101-7 Accutest	SS-4 (12-24") 1/23/2015 JB87101-9 Accutest	SS-4 (2-12") 1/23/2015 JB87101-8 Accutest	SS-5 (0"-2") 3/27/2015 JB91085-5 Accutest	SS-5 (12"-24") 3/27/2015 JB91085-7 Accutest	SS-5 (2"-12") 3/27/2015 JB91085-6 Accutest																
Pesticides by GC (mg/kg)	RR-RSCO																															
Aldrin	0.097	ND		ND		ND		ND		ND		ND		ND		ND		ND														
alpha-BHC	0.48	ND		ND		ND		ND		ND		ND		ND		ND		ND														
beta-BHC	0.36	ND		ND		ND		ND		ND		ND		ND		ND		ND														
delta-BHC	100	ND		ND		ND		ND		ND		ND		ND		ND		ND														
gamma-BHC (Lindane)	1.3	ND		ND		ND		ND		ND		ND		ND		ND		ND														
alpha-Chlordane	4.2	ND		ND		ND	0.0052	a	0.005	a	0.0125	a	0.0113	a	0.007	a	0.0112	a	0.0036	a	ND		0.002	a	0.003	a	0.0082		0.0124	a		
gamma-Chlordane	-	ND		ND		ND	0.0048		0.0052		0.0095		0.0109		0.007		0.0108		0.0018	a	ND		0.0011		0.0021		0.0076		0.0118			
Dieldrin	0.2	ND		ND		ND	0.0025		ND		ND		0.0199		0.0125		0.0198		ND		ND		ND		ND		ND		ND		0.0202	
4,4'-DDD	13	ND		ND		ND	ND		ND		ND		ND		0.00072		0.00089		ND		ND		ND		ND		ND		ND		ND	
4,4'-DDE	8.9	ND		0.0022		0.0276	ND		ND		ND		0.0011	a	0.0013	a	0.0013	a	0.0027	a	ND		0.0075		ND		ND		ND		0.0013	a
4,4'-DDT	7.9	0.0037	a	0.0046		0.0501	0.0094		ND		0.0098		0.0069		0.0023		0.0055		0.0146		0.0036		0.0267		ND		ND		ND		0.0061	
Endrin	11	ND		ND		ND	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Endosulfan sulfate	24	ND		ND		ND	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Endrin aldehyde	-	ND		ND		ND	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Endosulfan-I	24	ND		ND		ND	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Endosulfan-II	24	ND		ND		ND	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Heptachlor	2.1	ND		ND		ND	ND		ND		ND		0.0011		ND		0.0012		ND		ND		ND		ND		ND		ND		0.0013	
Heptachlor epoxide	-	ND		ND		ND	0.00084		ND		ND		0.0013		0.00069		0.0012		0.0008		ND		ND		ND		ND		ND		0.0014	
Methoxychlor	-	ND		ND		ND	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Endrin ketone	-	ND		ND		ND	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Toxaphene	-	ND		ND		ND	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Total	-	0.0037		0.0068		0.0777	0.02274		0.0102		0.0318		0.0525		0.03151		0.05189		0.0235		0.0036		0.0373		0.0051		0.0158		0.0545			

Notes:
ND = not detected.
a = more than 40% RPD for detected concentrations between the two GC columns.
RR-RSCO = Restricted Residential Restricted Use Soil Cleanup Objectives
Bold & Highlighted indicates concentration above RR-RSCO.

Table 2
Pesticide Compounds in Soil (Restricted Use)
CPB Site
Far Rockaway, NY

TRC Sample No.: Date Sampled: Lab Sample ID: Laboratory:		SS-6 (0"-2")		SS-6 (12"-24")		SS-6 (2"-12")		SS-7 (0-2")		SS-7 (0-2")(A)		SS-7 (12-24")		SS-7 (2-12")		SS-7 (2-12")(A)		SS-8 (0"-2")		SS-8 (12"-		SS-8 (2"-12")		SS-9 (0"-2")		SS-9 (12"-24")		SS-9 (2"-12")	
		3/27/2015		3/27/2015		3/27/2015		1/23/2015		1/23/2015		1/23/2015		1/23/2015		1/23/2015		3/27/2015		3/27/2015		3/27/2015		3/27/2015		3/27/2015		3/27/2015	
		JB91085-11		JB91085-13		JB91085-12		JB87101-10		JB87101-11		JB87101-14		JB87101-12		JB87101-13		JB91085-17		JB91085-19		JB91085-18		JB91085-14		JB91085-16		JB91085-15	
		Accutest		Accutest		Accutest		Accutest		Accutest		Accutest		Accutest		Accutest		Accutest		Accutest		Accutest		Accutest		Accutest		Accutest	
Pesticides by GC (mg/kg)	RR-RSCO																												
Aldrin	0.097	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
alpha-BHC	0.48	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
beta-BHC	0.36	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
delta-BHC	100	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
gamma-BHC (Lindane)	1.3	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
alpha-Chlordane	4.2	0.003	a	0.004	a	0.0052	a	ND		ND		ND		ND		ND		ND		0.0036		0.0013		ND		ND		ND	
gamma-Chlordane	-	0.0027		0.0041		0.0051		ND		ND		ND		ND		ND		ND		0.0037		0.0013		ND		ND		ND	
Dieldrin	0.2	0.0012	a	0.0019	a	0.0029	a	ND		ND		ND		ND		ND		ND		0.0012		ND		ND		ND		ND	
4,4'-DDD	13	ND		0.0019		0.0013	a	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
4,4'-DDE	8.9	0.002	a	0.0031	a	0.0015	a	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
4,4'-DDT	7.9	0.0142		0.0129		0.0143		0.0023		0.0014		ND		ND		ND		0.003		0.0032		0.0016		0.0015		ND		0.0027	
Endrin	11	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Endosulfan sulfate	24	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Endrin aldehyde	-	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Endosulfan-I	24	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Endosulfan-II	24	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Heptachlor	2.1	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Heptachlor epoxide	-	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Methoxychlor	-	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Endrin ketone	-	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Toxaphene	-	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Total	-	0.0231		0.0279		0.0303		0.0023		0.0014		0		0		0		0.003		0.0117		0.0042		0.0015		0		0.0027	

Notes:
ND = not detected.
a = more than 40% RPD for detected concentra
RR-RSCO = Restricted Residential Restricted l
Bold & Highlighted indicates concentration abo

Table 2
PCB Compounds in Soil (Restricted Use)
CPB Site
Far Rockaway, NY

TRC Sample No.: Date Sampled: Lab Sample ID: Laboratory:		SS-1 (0-2") 1/19/2015 JB86729-1 Accutest	SS-1 (2-12") 1/19/2015 JB86729-2 Accutest	SS-1 (12-24") 1/23/2015 JB87101-6 Accutest	SS-2 (0"-2") 3/27/2015 JB91085-2 Accutest	SS-2 (12"- 3/27/2015 JB91085-4 Accutest	SS-2 (2"-12") 3/27/2015 JB91085-3 Accutest	SS-3 (0"-2") 3/27/2015 JB91085-8 Accutest	SS-3 (12"- 3/27/2015 JB91085-10 Accutest	SS-3 (2"-12") 3/27/2015 JB91085-9 Accutest	SS-4 (0-2") 1/23/2015 JB87101-7 Accutest	SS-4 (2-12") 1/23/2015 JB87101-8 Accutest	SS-4 (12-24") 1/23/2015 JB87101-9 Accutest	SS-5 (0"-2") 3/27/2015 JB91085-5 Accutest	SS-5 (12"- 3/27/2015 JB91085-7 Accutest	SS-5 (2"-12") 3/27/2015 JB91085-6 Accutest
PCBs by GC (mg/kg)	RSCO															
Aroclor 1016	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	-	ND	ND	ND	ND	0.0647	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1268	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1262	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total	1	0	0	0	0	0.0647	0	0	0	0	0	0	0	0	0	0

Notes:
ND = not detected.
RR-RSCO = Restricted Residential Restricted Use Soil Cleanup Objectives

Table 2
PCB Compounds in Soil (Restricted Use)
CPB Site
Far Rockaway, NY

TRC Sample No.: Date Sampled: Lab Sample ID: Laboratory:		SS-6 (0"-2")	SS-6 (12"-	SS-6 (2"-12")	SS-7 (0-2")	SS-7 (0-2")(A)	SS-7 (2-12")	SS-7 (2-12")(A)	SS-7 (12-24")	SS-8 (0"-2")	SS-8 (12"-	SS-8 (2"-12")	SS-9 (0"-2")	SS-9 (12"-	SS-9 (2"-12")
		3/27/2015	3/27/2015	3/27/2015	1/23/2015	1/23/2015	1/23/2015	1/23/2015	1/23/2015	3/27/2015	3/27/2015	3/27/2015	3/27/2015	3/27/2015	3/27/2015
		JB91085-11	JB91085-13	JB91085-12	JB87101-10	JB87101-11	JB87101-12	JB87101-13	JB87101-14	JB91085-17	JB91085-19	JB91085-18	JB91085-14	JB91085-16	JB91085-15
		Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest
PCBs by GC (mg/kg)	RSCO														
Aroclor 1016	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1268	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1262	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total	1	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:
ND = not detected.
RR-RSCO = Restricted Residential Restricted Use

Table 2
Metal Compoinds in Soil (Restricted Use)
CPB Site
Far Rockaway, NY

	TRC Sample No.: Date Sampled: Lab Sample ID: Laboratory:		SS-1 (0-2") 1/19/2015 JB86729-1 Accutest	SS-1 (2-12") 1/19/2015 JB86729-2 Accutest	SS-1 (12-24") 1/23/2015 JB87101-6 Accutest	SS-2 (0"-2") 3/27/2015 JB91085-2 Accutest	SS-2 (12"-24") 3/27/2015 JB91085-4 Accutest	SS-2 (2"-12") 3/27/2015 JB91085-3 Accutest	SS-3 (0"-2") 3/27/2015 JB91085-8 Accutest	SS-3 (12"-24") 3/27/2015 JB91085-10 Accutest	SS-3 (2"-12") 3/27/2015 JB91085-9 Accutest	SS-4 (0-2") 1/23/2015 JB87101-7 Accutest	SS-4 (2-12") 1/23/2015 JB87101-8 Accutest	SS-4 (12-24") 1/23/2015 JB87101-9 Accutest	SS-5 (0"-2") 3/27/2015 JB91085-5 Accutest	SS-5 (12"-24") 3/27/2015 JB91085-7 Accutest	SS-5 (2"-12") 3/27/2015 JB91085-6 Accutest															
Metals (mg/kg)	RR-RSCO	C-RSCO																														
Aluminum	-	-	1,870		2,920		2,950		3,020		3,600		4,080		4,670		4,560		6,410		2,560		2,340		2,500		4,400		3,890		4,920	
Antimony	-	-	ND		2.9		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Arsenic	16	16	ND		11.8		4.1		2.4		3.5		2.6		3		3.2		11.1		4.2		3.3		3.8		4		3.2		4.6	
Barium	400	400	23.7		56.9		40.7		39.4		37		42.2		59.1		53.8		107		61.5		56.4		74.2		52.9		32.7		40.9	
Beryllium	72	590	ND		ND		ND		ND		ND		0.24		ND		ND		0.61		ND		ND		ND		0.22		ND		ND	
Cadmium	4.3	9.3	ND		0.52		0.91		ND		ND		ND		ND		ND		ND		0.7		0.59		0.59		ND		ND		ND	
Calcium	-	-	1,110		1,250		7,220		6,530		9,200		9,340		16,900		20,400		26,700		56,000		4,580		1,950		26,700		14,100		23,700	
Chromium	110	400	6		21.5		9.8		11.4		10.9		14.6		16.9		15.3		17.9		9.5		10.5		9.5		19.1		8.3		12.5	
Cobalt	-	-	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Copper	270	270	10		25.3		18.8		16.7		20.7		18.5		22.7		19.2		57.3		24.8		24.8		28.8		28.5		17.9		30.6	
Iron	-	-	3,560		13,400		4,880		5,270		6,800		6,930		8,770		8,950		15,300		6,220		5,660		9,170		10,600		6,720		8,630	
Lead	400	1000	77		149		123		79.1		108		102		108		80.4		88		185		183		210		98.8		67.1		85.8	
Magnesium	-	-	786		560		982		1,630		3,410		2,390		2,940		4,360		4,680		3,610		897		641		8,490		1,960		6,340	
Manganese	2000	10000	58.3		75.7		62.4		78.4		70.5		83.4		122		153		2,250		112		70.1		69.8		117		90.6		94.9	
Mercury	0.81	2.8	0.2		0.14		0.39		0.14		0.097		0.16		0.17		0.12		0.13		0.21		0.2		0.11		0.17		0.19		0.21	
Nickel	310	310	ND		6.3		8.1		8.6		8.4		11		34.6		22.6		32.2		11.3		11.5		7.7		29		9.1		29.1	
Potassium	-	-	ND		ND		ND		ND		ND		ND		ND		ND		1040		ND		ND		ND		ND		ND		ND	
Selenium	180	1500	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Silver	180	1500	ND		ND		ND		ND		ND		ND		ND		ND		1.1		ND		ND		ND		ND		ND		ND	
Sodium	-	-	ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND		ND	
Thallium	-	-	ND		ND		ND		ND		ND		ND		ND		ND		<3.0	b	ND		ND		ND		ND		ND		ND	
Vanadium	-	-	7.1		30.8		9.7		10.6		15.4		16.1		21.7		16.3		22.5		11.3		10		10		21		16.1		18.3	
Zinc	10000	10000	75.7		124		93		74.3		122		83.1		98.7		77.3		679		156		136		154		111		73.9		95	
General Chemistry (%)																																
Solids, Percent			88.1		94.5		92		87		92.1		90.4		87.6		90.5		96.4		96.8		88.6		92.5		86.7		90.8		87.5	

Notes:
ND = not detected.
RR-RSCO = Restricted Residential Restricted Use Soil Cleanup Objectives
C-RSCO = Commercial Restricted Use Soil Cleanup Objectives
Bold & Highlighted indicates concentration above RR-RSCO.
b - Elevated detection limit due to dilution required for high interfering element.

Table 2
Metal Compounds in Soil (Restricted Use)
CPB Site
Far Rockaway, NY

	TRC Sample No.: Date Sampled: Lab Sample ID: Laboratory:		SS-6 (0"-2")	SS-6 (12"-24")	SS-6 (2"-12")	SS-7 (0-2")	SS-7 (0-2")(A)	SS-7 (2-12")	SS-7 (2-12")(A)	SS-7 (12-24")	SS-8 (0"-2")	SS-8 (12"-24")	SS-8 (2"-12")	SS-9 (0"-2")	SS-9 (12"-24")	SS-9 (2"-12")
			JB91085-11	JB91085-13	JB91085-12	JB87101-10	JB87101-11	JB87101-12	JB87101-13	JB87101-14	JB91085-17	JB91085-19	JB91085-18	JB91085-14	JB91085-16	JB91085-15
			Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest
Metals (mg/kg)	RR-RSCO	C-RSCO														
Aluminum	-	-	4,570	4,050	3,970	2,300	2,340	1,800	1,730	1,160	3,450	4,920	3,760	3,820	3,140	3,540
Antimony	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	16	16	4	4.8	5	2.5	2.5	ND	ND	ND	3.2	4.1	2.9	2.7	4.3	2.8
Barium	400	400	107	130	82.4	33.2	ND	23.1	24.9	ND	54.6	93.4	65.1	42.2	80.6	41.2
Beryllium	72	590	0.59	0.24	0.47	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	4.3	9.3	ND	ND	ND	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calcium	-	-	10,400	9,780	14,000	1,140	1,000	ND	611	ND	2,560	8,310	5,760	1,660	28,700	1,470
Chromium	110	400	53.3	71.9	57.3	15.6	7.9	6.1	5.1	3.6	13.6	21.9	12	7.8	51.4	18.9
Cobalt	-	-	ND	ND	5.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	270	270	132	137	190	28.1	20.7	11.6	8.8	ND	46.2	53.3	44.5	24.2	130	42.4
Iron	-	-	10,100	9,770	14,700	7,080	5,450	3,920	2,980	2,000	7,520	9,680	6,190	10,100	12,700	6,400
Lead	400	1000	216	267	296	134	153	52.3	49.8	4.4	142	218	155	123	243	158
Magnesium	-	-	2,410	1,470	1,770	730	675	ND	ND	ND	1,110	2,640	1,290	1,290	8,800	743
Manganese	2000	10000	119	89.6	130	55.5	49	34.5	32.0	21.7	69.6	83.8	63	126	88.1	106
Mercury	0.81	2.8	0.34	0.53	0.65	0.17	0.22	0.24	0.074	ND	0.51	1.9	1.5	0.18	0.44	0.29
Nickel	310	310	202	291	244	8.4	7.8	ND	ND	ND	26.2	123	38.6	7.6	107	94.4
Potassium	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	180	1500	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silver	180	1500	ND	ND	ND	ND	ND	ND	ND	ND	0.62	1.2	1.2	<0.54	0.59	<0.54
Sodium	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thallium	-	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	-	-	19.9	29.7	23.1	17	9	6.4	6	ND	11.6	17.5	17.7	10.9	11.4	11
Zinc	10000	10000	583	297	564	102	99.1	47.2	49.7	17	200	293	195	97.6	313	138
General Chemistry (%)																
Solids, Percent			93.9	84.4	90.5	96.1	94.9	95.4	95.6	97.8	84.5	88	87.3	90.2	84.3	89.2

Notes:
ND = not detected.
RR-RSCO = Restricted Residential Restricted Use Soil Clea
C-RSCO = Commercial Restriced Use Soil Cleanup Objectiv
Bold & Highlighted indicates concentration above RR-RSCC
b - Elevated detection limit due to dilution required for high in

Table 3
Volatile Organic Compounds in Soil (Unrestricted Use)
CPB Site
Far Rockaway, NY

TRC Sample No.: Date Sampled: Lab Sample ID: Laboratory:		SS-1 (0'-2") 1/19/2015 JB86729-1 Accutest	SS-1 (2'-12") 1/19/2015 JB86729-2 Accutest	SS-1 (12'-24") 1/23/2015 JB87101-6 Accutest	SS-2 (0'-2") 3/27/2015 JB91085-2 Accutest	SS-2 (12'-24") 3/27/2015 JB91085-4 Accutest	SS-2 (2'-12") 3/27/2015 JB91085-3 Accutest	SS-3 (0'-2") 3/27/2015 JB91085-8 Accutest	SS-3 (12'-24") 3/27/2015 JB91085-10 Accutest	SS-3 (2'-12") 3/27/2015 JB91085-9 Accutest	SS-4 (0'-2") 1/23/2015 JB87101-7 Accutest	SS-4 (12'-24") 1/23/2015 JB87101-9 Accutest	SS-4 (2'-12") 1/23/2015 JB87101-8 Accutest	SS-5 (0'-2") 3/27/2015 JB91085-5 Accutest	SS-5 (12'-24") 3/27/2015 JB91085-7 Accutest	SS-5 (2'-12") 3/27/2015 JB91085-6 Accutest	SS-6 (0'-2") 3/27/2015 JB91085-11 Accutest	SS-6 (12'-24") 3/27/2015 JB91085-13 Accutest	SS-6 (2'-12") 3/27/2015 JB91085-12 Accutest
VOCs by GCMS (mg/kg)		USCO																	
Acetone	0.05	ND	ND	ND	ND	ND	ND	ND	ND	0.0193	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	0.06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	0.12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Butylbenzene	12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
sec-Butylbenzene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	5.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	0.76	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	1.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	0.37	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cyclohexane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	1.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	2.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	1.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	0.25	ND	ND	ND	ND	ND	ND	ND	ND	0.00094	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	0.19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Freon 113	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Isopropyltoluene	-	NA	NA	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl Acetate	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylcyclohexane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl Tert Butyl Ether	0.93	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone(MIBK)	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0017	J	ND	0.0019	J	ND
n-Propylbenzene	3.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	1.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	0.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.00055	J
1,2,3-Trichlorobenzene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	0.68	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	0.47	ND	0.00058	J	0.0024	J	0.00065	J	0.0062	0.0022	0.0013	0.0018	0.0098	ND	0.00022	J	ND	ND	0.003
Trichlorofluoromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	3.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	8.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
m,p-Xylene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
o-Xylene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylene (total)	0.26	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total	-	0	0.00058		0.0024		0.00065		0.0062	0.0022	0.0013	0.0018	0.03004	0	0.00022	0	0.0017	0	0.00355
Total VOC TICs	-	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0
Total VOCs	-	0	0.00058		0.0024		0.00065		0.0062	0.0022	0.0013	0.0018	0.03004	0	0.00022	0	0.0017	0	0.00355

Notes:
ND = not detected.
NA = not analyzed.
J = estimated concentration detected below the Method Detection Limit.
USCO = Unrestricted Use Soil Cleanup Objectives
Bold & Highlighted indicates concentration above USCO.

Table 3
Volatile Organic Compounds in Soil (Unrestricted Use)
CPB Site
Far Rockaway, NY

TRC Sample No.: Date Sampled: Lab Sample ID: Laboratory:		SS-7 (0-2") 1/23/2015 JB87101-10 Accutest	SS-7 (0-2")(A) 1/23/2015 JB87101-11 Accutest	SS-7 (12-24") 1/23/2015 JB87101-14 Accutest	SS-7 (2-12") 1/23/2015 JB87101-12 Accutest	SS-7 (2-12")(A) 1/23/2015 JB87101-13 Accutest	SS-8 (0"-2") 3/27/2015 JB91085-17 Accutest	SS-8 (12"-24") 3/27/2015 JB91085-19 Accutest	SS-8 (2"-12") 3/27/2015 JB91085-18 Accutest	SS-9 (0"-2") 3/27/2015 JB91085-14 Accutest	SS-9 (12"-24") 3/27/2015 JB91085-16 Accutest	SS-9 (2"-12") 3/27/2015 JB91085-15 Accutest
VOCs by GCMS (mg/kg)	USCO											
Acetone	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzene	0.06	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromochloromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromodichloromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromoform	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Bromomethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Butanone (MEK)	0.12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Butylbenzene	12	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
sec-Butylbenzene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
tert-Butylbenzene	5.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon disulfide	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbon tetrachloride	0.76	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chlorobenzene	1.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloroform	0.37	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chloromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cyclohexane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromo-3-chloropropane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibromochloromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dibromoethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	1.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3-Dichlorobenzene	2.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	1.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dichlorodifluoromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloroethane	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1-Dichloroethene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	0.25	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	0.19	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2-Dichloropropane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
cis-1,3-Dichloropropene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Ethylbenzene	1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Freon 113	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Hexanone	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Isopropylbenzene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
p-Isopropyltoluene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl Acetate	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylcyclohexane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methyl Tert Butyl Ether	0.93	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Methyl-2-pentanone(MIBK)	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methylene chloride	0.05	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
n-Propylbenzene	3.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Styrene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	0.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Tetrachloroethene	1.3	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toluene	0.7	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,3-Trichlorobenzene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,1-Trichloroethane	0.68	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Trichloroethene	0.47	ND	ND	ND	ND	ND	ND	ND	ND	ND	0.0027	0.00042 J
Trichlorofluoromethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	3.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	8.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vinyl chloride	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
m,p-Xylene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
o-Xylene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Xylene (total)	0.26	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total	-	0	0	0	0	0	0	0	0	0	0.0027	0.00042
Total VOC TICs	-	0	0	0	0	0	0	0	0	0	0	0
Total VOCs	-	0	0	0	0	0	0	0	0	0	0.0027	0.00042

Notes:
ND = not detected.
NA = not analyzed.
J = estimated concentration detected below the
USCO = Unrestricted Use Soil Cleanup Objecti
Bold & Highlighted indicates concentration abo

Table 3
Semi-Volatile Organic Compounds in Soil (Unrestricted Use)
CPB Site
Far Rockaway, NY

TRC Sample No.: Date Sampled: Lab Sample ID: Laboratory:		SS-1 (0'-2") 1/19/2015 JB86729-1 Accutest	SS-1 (2'-12") 1/19/2015 JB86729-2 Accutest	SS-1 (12'-24") 1/23/2015 JB87101-6 Accutest	SS-2 (0'-2") 3/27/2015 JB91085-2 Accutest	SS-2 (12'-24") 1/23/2015 JB91085-4 Accutest	SS-2 (2'-12") 1/23/2015 JB91085-3 Accutest	SS-3 (0'-2") 3/27/2015 JB91085-8 Accutest	SS-3 (12'-24") 3/27/2015 JB91085-10 Accutest	SS-3 (2'-12") 3/27/2015 JB91085-9 Accutest	SS-4 (0'-2") 1/23/2015 JB87101-7 Accutest	SS-4 (12'-24") 1/23/2015 JB87101-9 Accutest	SS-4 (2'-12") 1/23/2015 JB87101-8 Accutest	SS-5 (0'-2") 3/27/2015 JB91085-5 Accutest	SS-5 (12'-24") 3/27/2015 JB91085-7 Accutest	SS-5 (2'-12") 3/27/2015 JB91085-6 Accutest	
SVOCs by GCMS (mg/kg)		USCO															
2-Chlorophenol	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Chloro-3-methyl phenol	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dichlorophenol	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dimethylphenol	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrophenol	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,6-Dinitro-o-cresol	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylphenol	0.33	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3&4-Methylphenol	0.33	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Nitrophenol	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Nitrophenol	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Pentachlorophenol	0.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenol	0.33	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,3,4,6-Tetrachlorophenol	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Acenaphthene	20	ND	ND	0.0216	J	ND	0.0142	J	0.0488	0.0194	J	ND	ND	0.0151	J	ND	ND
Acenaphthylene	100	ND	ND	0.0224	J	0.0233	J	0.0332	J	0.0634	0.0459	0.061	0.0531	0.0216	J	0.0468	0.0714
Acetophenone	-	ND	ND	ND	ND	ND	ND	0.0256	J	ND	ND	ND	0.0301	J	ND	ND	ND
Anthracene	100	0.015	J	ND	0.0363	0.0323	J	0.0652	0.167	0.13	0.0597	0.0796	0.0684	0.0297	J	0.0513	0.124
Atrazine	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzo(a)anthracene	1	0.0857	0.0629	0.146	0.154	0.212	0.392	0.448	0.225	0.325	0.295	0.16	0.238	0.33	0.19	0.284	0.284
Benzo(a)pyrene	1	0.101	0.069	0.165	0.181	0.268	0.421	0.522	0.293	0.412	0.347	0.187	0.308	0.4	0.209	0.313	0.313
Benzo(b)fluoranthene	1	0.12	0.0957	0.202	0.22	0.316	0.488	0.614	0.345	0.477	0.422	0.239	0.365	0.449	0.246	0.383	0.383
Benzo(g,h,i)perylene	100	0.0714	0.0611	0.133	0.151	0.215	0.299	0.401	0.286	0.334	0.302	0.16	0.283	0.324	0.156	0.228	0.228
Benzo(k)fluoranthene	0.8	0.0468	0.029	J	0.0684	0.0709	0.0955	0.185	0.212	0.125	0.177	0.17	0.077	0.148	0.178	0.0761	0.118
4-Bromophenyl phenyl ether	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Butyl benzyl phthalate	-	ND	0.0407	J	ND	ND	ND	ND	0.223	ND	ND	0.128	ND	0.0777	ND	ND	ND
1,1'-Biphenyl	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Benzaldehyde	-	ND	ND	ND	ND	ND	0.0191	J	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Chloronaphthalene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Chloroaniline	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Carbazole	-	ND	ND	0.0217	J	ND	0.0246	J	0.0477	J	0.0299	J	0.0178	J	0.0296	J	ND
Caprolactam	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Chrysene	1	0.096	0.0726	0.165	0.157	0.228	0.407	0.459	0.232	0.343	0.347	0.19	0.284	0.355	0.193	0.295	0.295
bis(2-Chloroethoxy)methane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
bis(2-Chloroethyl)ether	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
bis(2-Chloroisopropyl)ether	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Chlorophenyl phenyl ether	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3,3'-Dichlorobenzidine	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
1,4-Dioxane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dibenzo(a,h)anthracene	0.33	0.0176	J	0.0145	J	0.031	J	0.0383	0.0531	0.0793	0.0943	0.0614	0.0778	0.0685	0.0386	0.0639	0.0796
Dibenzofuran	7	ND	ND	0.0202	J	ND	ND	0.0327	J	ND	ND	ND	ND	ND	ND	ND	ND
Di-n-butyl phthalate	-	ND	ND	0.0493	J	ND	ND	ND	ND	ND	ND	0.0494	J	ND	0.047	J	ND
Di-n-octyl phthalate	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Diethyl phthalate	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Dimethyl phthalate	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
bis(2-Ethylhexyl)phthalate	-	ND	0.0817	1.62	0.0678	J	0.0867	0.0625	J	0.174	0.117	ND	0.306	ND	0.176	0.0783	0.187
Fluoranthene	100	0.128	0.0931	0.305	0.233	0.376	0.795	0.747	0.255	0.402	0.523	0.251	0.387	0.58	0.303	0.506	0.506
Fluorene	30	ND	ND	0.0207	J	ND	ND	0.0485	0.0229	J	ND	ND	0.0177	J	ND	ND	0.0175
Hexachlorobenzene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorobutadiene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Hexachloroethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	0.5	0.071	0.0557	0.123	0.137	0.215	0.304	0.384	0.244	0.315	0.275	0.153	0.259	0.305	0.144	0.229	0.229
Isophorone	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Methylnaphthalene	-	ND	ND	0.0572	J	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
2-Nitroaniline	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
3-Nitroaniline	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4-Nitroaniline	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Naphthalene	12	ND	ND	0.0297	J	ND	ND	0.0197	J	ND	ND	ND	ND	ND	ND	ND	ND
Nitrobenzene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitroso-di-n-propylamine	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Phenanthrene	100	0.0553	0.0302	J	0.248	0.0946	0.183	0.553	0.338	0.0668	0.112	0.215	0.109	0.163	0.258	0.119	0.213
Pyrene	100	0.149	0.106	0.284	0.232	0.346	0.676	0.688	0.277	0.399	0.492	0.249	0.39	0.57	0.309	0.467	0.467
1,2,4,5-Tetrachlorobenzene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total	-	0.9568	0.8122	3.7695	1.7922	2.7315	5.1185	5.5699	2.6328	3.5322	4.1539	1.8649	3.3098	4.1792	2.3095	3.4225	3.4225
Total SVOC TICs	-	1.47	J	1.54	J	0.55	J	1.13	J	2.19	J	1.91	J	1.29	J	3.52	J
Total SVOCs	-	2.43		1.98		5.31		2.34		3.86		8.83		7.76		4.54	

Notes:
ND = not detected.
J = estimated concentration detected below the Method Detection Limit.
USCO = Unrestricted Use Soil Cleanup Objectives
Bold & Highlighted indicates concentration above USCO.

Table 3
Semi-Volatile Organic Compounds in Soil (Unrestricted Use)
CPB Site
Far Rockaway, NY

TRC Sample No.: Date Sampled: Lab Sample ID: Laboratory:		SS-6 (0"-2") 3/27/2015 JB91085-11 Accutest	SS-6 (12"-24") 3/27/2015 JB91085-13 Accutest	SS-6 (2"-12") 3/27/2015 JB91085-12 Accutest	SS-7 (0-2") 1/23/2015 JB87101-10 Accutest	SS-7 (0-2")(A) 1/23/2015 JB87101-11 Accutest	SS-7 (12-24") 1/23/2015 JB87101-14 Accutest	SS-7 (2-12") 1/23/2015 JB87101-12 Accutest	SS-7 (2-12")(A) 1/23/2015 JB87101-13 Accutest	SS-8 (0"-2") 3/27/2015 JB91085-17 Accutest	SS-8 (12"-24") 3/27/2015 JB91085-19 Accutest	SS-8 (2"-12") 3/27/2015 JB91085-18 Accutest	SS-9 (0"-2") 3/27/2015 JB91085-14 Accutest	SS-9 (12"-24") 3/27/2015 JB91085-16 Accutest	SS-9 (2"-12") 3/27/2015 JB91085-15 Accutest		
SVOCs by GCMS (mg/kg)	USCO																
2-Chlorophenol	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
4-Chloro-3-methyl phenol	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
2,4-Dichlorophenol	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
2,4-Dimethylphenol	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
2,4-Dinitrophenol	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
4,6-Dinitro-o-cresol	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
2-Methylphenol	0.33	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
3&4-Methylphenol	0.33	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
2-Nitrophenol	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
4-Nitrophenol	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Pentachlorophenol	0.8	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Phenol	0.33	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
2,3,4,6-Tetrachlorophenol	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
2,4,5-Trichlorophenol	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
2,4,6-Trichlorophenol	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Acenaphthene	20	0.0152	J	ND	0.0188	J	ND	0.0091	J	ND	0.151	ND	ND	0.0196	J	ND	
Acenaphthylene	100	0.0455		0.041	0.0355		0.0197	J	0.0218	J	ND	ND	0.021	J	0.0237	J	
Acetophenone	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Anthracene	100	0.0779		0.0737	0.0847		0.0259	J	0.0333		ND	0.24	ND	0.0257	J	0.0292	
Atrazine	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Benzo(a)anthracene	1	0.28		0.233	0.287		0.126		0.149		ND	0.5	0.0542		0.137		
Benzo(a)pyrene	1	0.318		0.246	0.286		0.156		0.193		ND	0.396	0.0646		0.161		
Benzo(b)fluoranthene	1	0.372		0.301	0.343		0.197		0.229		ND	0.494	0.0846		0.205		
Benzo(g,h,i)perylene	100	0.264		0.199	0.216		0.138		0.173		ND	0.199	0.0559		0.128		
Benzo(k)fluoranthene	0.8	0.135		0.0856	0.116		0.0653		0.0833		ND	0.173	0.0321	J	0.067		
4-Bromophenyl phenyl ether	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Butyl benzyl phthalate	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
1,1'-Biphenyl	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Benzaldehyde	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
2-Chloronaphthalene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
4-Chloroaniline	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Carbazole	-	0.0281	J	0.0224	J	0.0332	J	ND	0.0159	J	ND	0.157	ND	ND	0.0352	J	
Caprolactam	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Chrysene	1	0.308		0.246	0.297		0.136		0.169		ND	0.541	0.0662		0.154		
bis(2-Chloroethoxy)methane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
bis(2-Chloroethyl)ether	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
bis(2-Chloroisopropyl)ether	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
4-Chlorophenyl phenyl ether	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
2,4-Dinitrotoluene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
2,6-Dinitrotoluene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
3,3'-Dichlorobenzidine	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
1,4-Dioxane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Dibenzo(a,h)anthracene	0.33	0.0557		0.0465	0.0565		0.0358		0.0465		ND	0.0663	0.0143	J	0.0335	J	
Dibenzofuran	7	ND	ND	ND	ND	ND	ND	ND	0.0879		ND	ND	ND	0.0191	J	ND	
Di-n-butyl phthalate	-	0.0918		0.0709	J	21.7	ND	ND	ND	ND	ND	ND	ND	ND	0.28		
Di-n-octyl phthalate	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Diethyl phthalate	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Dimethyl phthalate	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
bis(2-Ethylhexyl)phthalate	-	0.473		0.636	0.802		0.0911		0.0885		ND	ND	0.14		0.0823		
Fluoranthene	100	0.502		0.391	0.496		0.211		0.256		ND	1.18	0.0896		0.257		
Fluorene	30	0.0153	J	ND	0.0178	J	ND	ND	ND	0.15	ND	ND	ND	0.0262	J	ND	
Hexachlorobenzene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Hexachlorobutadiene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Hexachlorocyclopentadiene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Hexachloroethane	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Indeno(1,2,3-cd)pyrene	0.5	0.234		0.174	0.206		0.133		0.164		ND	0.227	0.056		0.123		
Isophorone	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
2-Methylnaphthalene	-	0.0245	J	0.0295	J	0.0277	J	ND	ND	ND	0.0375	J	ND	ND	ND	ND	
2-Nitroaniline	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
3-Nitroaniline	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
4-Nitroaniline	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Naphthalene	12	0.0384		0.0224	J	0.0219	J	ND	ND	0.023	J	ND	ND	0.0224	J	ND	
Nitrobenzene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
N-Nitroso-di-n-propylamine	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
N-Nitrosodiphenylamine	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Phenanthrene	100	0.218		0.185	0.274		0.0889		0.115		ND	1.42	0.0373		0.0919		
Pyrene	100	0.491		0.409	0.476		0.211		0.248		ND	1.06	0.0877		0.222		
1,2,4,5-Tetrachlorobenzene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Total	-	3.9874		3.412	25.7951		1.6347		1.9944		0	7.1027	0.6425		1.7661		
Total SVOC TICs	-	3.09	J	1.31	J	1.97	J	2.46	J	3.1	J	0.26	J	1.12	J	2.57	J
Total SVOCs	-	7.08		4.72		27.77		4.09		5.09		0.26		8.91		1.76	

Notes:
ND = not detected.
J = estimated concentration detected below the
USCO = Unrestricted Use Soil Cleanup Objectiv
Bold & Highlighted indicates concentration abo

Table 3
Pesticide Compounds in Soil (Unrestricted Use)
CPB Site
Far Rockaway, NY

TRC Sample No.: Date Sampled: Lab Sample ID: Laboratory:		SS-1 (0-2") 1/19/2015 JB86729-1 Accutest	SS-1 (2-12") 1/19/2015 JB86729-2 Accutest	SS-1 (12-24") 1/23/2015 JB87101-6 Accutest	SS-2 (0"-2") 3/27/2015 JB91085-2 Accutest	SS-2 (12"-24") 3/27/2015 JB91085-4 Accutest	SS-2 (2"-12") 3/27/2015 JB91085-3 Accutest	SS-3 (0"-2") 3/27/2015 JB91085-8 Accutest	SS-3 (12"- 3/27/2015 JB91085-10 Accutest	SS-3 (2"-12") 3/27/2015 JB91085-9 Accutest	SS-4 (0-2") 1/23/2015 JB87101-7 Accutest	SS-4 (12-24") 1/23/2015 JB87101-9 Accutest	SS-4 (2-12") 1/23/2015 JB87101-8 Accutest	SS-5 (0"-2") 3/27/2015 JB91085-5 Accutest	SS-5 (12"-24") 3/27/2015 JB91085-7 Accutest	SS-5 (2"-12") 3/27/2015 JB91085-6 Accutest											
Pesticides by GC (mg/kg)	USCO																										
Aldrin	0.005	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND											
alpha-BHC	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND											
beta-BHC	0.036	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND											
delta-BHC	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND											
gamma-BHC (Lindane)	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND											
alpha-Chlordane	0.91	ND	ND	ND	0.0052	a	0.005	a	0.0125	a	0.0113	a	0.007	a	0.0112	a	0.0036	a	ND	0.002	a	0.003	a	0.0082	0.0124	a	
gamma-Chlordane	-	ND	ND	ND	0.0048		0.0052		0.0095		0.0109		0.007		0.0108		0.0018	a	ND	0.0011		0.0021		0.0076	0.0118		
Dieldrin	0.005	ND	ND	ND	0.0025		ND		ND		0.0199		0.0125		0.0198		ND		ND	ND		ND		ND	0.0202		
4,4'-DDD	0.0033	ND	ND	ND	ND		ND		ND		0.00072		0.00089		ND		ND		ND	ND		ND		ND	ND		
4,4'-DDE	0.0033	ND	0.0022	0.0276	ND		ND		ND		0.0011	a	0.0013	a	0.0013	a	0.0027	a	ND	0.0075		ND		ND	0.0013	a	
4,4'-DDT	0.0033	0.0037	a	0.0046	0.0501		0.0094		ND		0.0098		0.0069		0.0023		0.0055		0.0146		0.0036		0.0267		ND	0.0061	
Endrin	0.014	ND	ND	ND	ND		ND		ND		ND		ND		ND		ND		ND	ND		ND		ND	ND		
Endosulfan sulfate	2.4	ND	ND	ND	ND		ND		ND		ND		ND		ND		ND		ND	ND		ND		ND	ND		
Endrin aldehyde	-	ND	ND	ND	ND		ND		ND		ND		ND		ND		ND		ND	ND		ND		ND	ND		
Endosulfan-I	2.4	ND	ND	ND	ND		ND		ND		ND		ND		ND		ND		ND	ND		ND		ND	ND		
Endosulfan-II	2.4	ND	ND	ND	ND		ND		ND		ND		ND		ND		ND		ND	ND		ND		ND	ND		
Heptachlor	0.042	ND	ND	ND	ND		ND		ND		0.0011		ND		0.0012		ND		ND	ND		ND		ND	0.0013		
Heptachlor epoxide	-	ND	ND	ND	0.00084		ND		ND		0.0013		0.00069		0.0012		0.0008		ND	ND		ND		ND	0.0014		
Methoxychlor	-	ND	ND	ND	ND		ND		ND		ND		ND		ND		ND		ND	ND		ND		ND	ND		
Endrin ketone	-	ND	ND	ND	ND		ND		ND		ND		ND		ND		ND		ND	ND		ND		ND	ND		
Toxaphene	-	ND	ND	ND	ND		ND		ND		ND		ND		ND		ND		ND	ND		ND		ND	ND		
Total	-	0.0037		0.0068	0.0777		0.02274		0.0102		0.0318		0.0525		0.03151		0.05189		0.0235		0.0036		0.0373		0.0051	0.0158	0.0545

Notes:
ND = not detected.
a = more than 40% RPD for detected concentrations between the two GC columns.
USCO = Unrestricted Use Soil Cleanup Objectives
Bold & Highlighted indicates concentration above uSCO.

Table 3
Pesticide Compounds in Soil (Unrestricted Use)
CPB Site
Far Rockaway, NY

TRC Sample No.: Date Sampled: Lab Sample ID: Laboratory:		SS-6 (0"-2")	SS-6 (12"-24")	SS-6 (2"-12")	SS-7 (0-2")	SS-7 (0-2")(A)	SS-7 (12-24")	SS-7 (2-12")	SS-7 (2-12")(A)	SS-8 (0"-2")	SS-8 (12"-	SS-8 (2"-12")	SS-9 (0"-2")	SS-9 (12"-24")	SS-9 (2"-12")
		3/27/2015 JB91085-11 Accutest	3/27/2015 JB91085-13 Accutest	3/27/2015 JB91085-12 Accutest	1/23/2015 JB87101-10 Accutest	1/23/2015 JB87101-11 Accutest	1/23/2015 JB87101-14 Accutest	1/23/2015 JB87101-12 Accutest	1/23/2015 JB87101-13 Accutest	3/27/2015 JB91085-17 Accutest	3/27/2015 JB91085-19 Accutest	3/27/2015 JB91085-18 Accutest	3/27/2015 JB91085-14 Accutest	3/27/2015 JB91085-16 Accutest	3/27/2015 JB91085-15 Accutest
Pesticides by GC (mg/kg)	USCO														
Aldrin	0.005	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
alpha-BHC	0.02	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
beta-BHC	0.036	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
delta-BHC	0.04	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
gamma-BHC (Lindane)	0.1	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
alpha-Chlordane	0.91	0.003	a 0.004	a 0.0052	a ND	ND	ND	ND	ND	ND	0.0036	0.0013	ND	ND	ND
gamma-Chlordane	-	0.0027	0.0041	0.0051	ND	ND	ND	ND	ND	ND	0.0037	0.0013	ND	ND	ND
Dieldrin	0.005	0.0012	a 0.0019	a 0.0029	a ND	ND	ND	ND	ND	ND	0.0012	ND	ND	ND	ND
4,4'-DDD	0.0033	ND	0.0019	0.0013	a ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDE	0.0033	0.002	a 0.0031	a 0.0015	a ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
4,4'-DDT	0.0033	0.0142	0.0129	0.0143	0.0023	0.0014	ND	ND	ND	0.003	0.0032	0.0016	0.0015	ND	0.0027
Endrin	0.014	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan sulfate	2.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin aldehyde	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan-I	2.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endosulfan-II	2.4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor	0.042	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Heptachlor epoxide	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Methoxychlor	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Endrin ketone	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Toxaphene	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total	-	0.0231	0.0279	0.0303	0.0023	0.0014	0	0	0	0.003	0.0117	0.0042	0.0015	0	0.0027

Notes:
ND = not detected.
a = more than 40% RPD for detected concentratio
USCO = Unrestricted Use Soil Cleanup Objectiv
Bold & Highlighted indicates concentration abo

Table 3
PCB Compounds in Soil (Unrestricted Use)
CPB Site
Far Rockaway, NY

TRC Sample No.:		SS-1 (0-2")		SS-1 (2-12")		SS-1 (12-24")		SS-2 (0"-2")		SS-2 (12"-		SS-2 (2"-12")		SS-3 (0"-2")		SS-3 (12"-		SS-3 (2"-12")		SS-4 (0-2")		SS-4 (2-12")		SS-4 (12-24")		SS-5 (0"-2")		SS-5 (12"-		SS-5 (2"-12")	
Date Sampled:		1/19/2015		1/19/2015		1/23/2015		3/27/2015		3/27/2015		3/27/2015		3/27/2015		3/27/2015		3/27/2015		1/23/2015		1/23/2015		1/23/2015		3/27/2015		3/27/2015		3/27/2015	
Lab Sample ID:		JB86729-1		JB86729-2		JB87101-6		JB91085-2		JB91085-4		JB91085-3		JB91085-8		JB91085-10		JB91085-9		JB87101-7		JB87101-8		JB87101-9		JB91085-5		JB91085-7		JB91085-6	
Laboratory:		Accutest		Accutest		Accutest		Accutest		Accutest		Accutest		Accutest		Accutest		Accutest		Accutest		Accutest		Accutest		Accutest		Accutest		Accutest	
PCBs by GC (mg/kg)		USCO																													
Aroclor 1016		-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1221		-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1232		-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1242		-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1248		-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1254		-	ND	ND	ND	ND	ND	0.0647	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1260		-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1268		-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Aroclor 1262		-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Total		0.1	0	0	0	0	0	0.0647	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0	0

Notes:
ND = not detected.
USCO = Unrestricted Use Soil Cleanup Objectives

Table 3
PCB Compounds in Soil (Unrestricted Use)
CPB Site
Far Rockaway, NY

TRC Sample No.: Date Sampled: Lab Sample ID: Laboratory:		SS-6 (0"-2") 3/27/2015 JB91085-11 Accutest	SS-6 (12"- 3/27/2015 JB91085-13 Accutest	SS-6 (2"-12") 3/27/2015 JB91085-12 Accutest	SS-7 (0-2") 1/23/2015 JB87101-10 Accutest	SS-7 (0-2")(A) 1/23/2015 JB87101-11 Accutest	SS-7 (2-12") 1/23/2015 JB87101-12 Accutest	SS-7 (2-12")(A) 1/23/2015 JB87101-13 Accutest	SS-7 (12-24") 1/23/2015 JB87101-14 Accutest	SS-8 (0"-2") 3/27/2015 JB91085-17 Accutest	SS-8 (12"- 3/27/2015 JB91085-19 Accutest	SS-8 (2"-12") 3/27/2015 JB91085-18 Accutest	SS-9 (0"-2") 3/27/2015 JB91085-14 Accutest	SS-9 (12"- 3/27/2015 JB91085-16 Accutest	SS-9 (2"-12") 3/27/2015 JB91085-15 Accutest	
PCBs by GC (mg/kg)	USCO															
Aroclor 1016	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Aroclor 1221	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Aroclor 1232	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Aroclor 1242	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Aroclor 1248	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Aroclor 1254	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Aroclor 1260	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Aroclor 1268	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Aroclor 1262	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	
Total	0.1	0	0	0	0	0	0	0	0	0	0	0	0	0	0	

Notes:
ND = not detected.
USCO = Unrestricted Use Soil Cleanup Objecti

Table 3
Metal Compounds in Soil (Unrestricted Use)
CPB Site
Far Rockaway, NY

TRC Sample No.: Date Sampled: Lab Sample ID: Laboratory:		SS-1 (0'-2") 1/19/2015 JB86729-1 Accutest	SS-1 (2'-12") 1/19/2015 JB86729-2 Accutest	SS-1 (12'-24") 1/23/2015 JB87101-6 Accutest	SS-2 (0'-2") 3/27/2015 JB91085-2 Accutest	SS-2 (12"-24") 3/27/2015 JB91085-4 Accutest	SS-2 (2"-12") 3/27/2015 JB91085-3 Accutest	SS-3 (0'-2") 3/27/2015 JB91085-8 Accutest	SS-3 (12"-24") 3/27/2015 JB91085-10 Accutest	SS-3 (2"-12") 3/27/2015 JB91085-9 Accutest	SS-4 (0'-2") 1/23/2015 JB87101-7 Accutest	SS-4 (2'-12") 1/23/2015 JB87101-8 Accutest	SS-4 (12'-24") 1/23/2015 JB87101-9 Accutest	SS-5 (0'-2") 3/27/2015 JB91085-5 Accutest	SS-5 (12"-24") 3/27/2015 JB91085-7 Accutest	SS-5 (2"-12") 3/27/2015 JB91085-6 Accutest
Metals (mg/kg)	USCO															
Aluminum	-	1,870	2,920	2,950	3,020	3,600	4,080	4,670	4,560	6,410	2,560	2,340	2,500	4,400	3,890	4,920
Antimony	-	ND	2.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	13	ND	11.8	4.1	2.4	3.5	2.6	3	3.2	11.1	4.2	3.3	3.8	4	3.2	4.6
Barium	350	23.7	56.9	40.7	39.4	37	42.2	59.1	53.8	107	61.5	56.4	74.2	52.9	32.7	40.9
Beryllium	7.2	ND	ND	ND	ND	ND	ND	0.24	ND	0.61	ND	ND	ND	0.22	ND	ND
Cadmium	2.5	ND	0.52	0.91	ND	ND	ND	ND	ND	ND	0.7	0.59	0.59	ND	ND	ND
Calcium	-	1,110	1,250	7,220	6,530	9,200	9,340	16,900	20,400	26,700	56,000	4,580	1,950	26,700	14,100	23,700
Chromium	30	6	21.5	9.8	11.4	10.9	14.6	16.9	15.3	17.9	9.5	10.5	9.5	19.1	8.3	12.5
Cobalt	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	50	10	25.3	18.8	16.7	20.7	18.5	22.7	19.2	57.3	24.8	24.8	28.8	28.5	17.9	30.6
Iron	-	3,560	13,400	4,880	5,270	6,800	6,930	8,770	8,950	15,300	6,220	5,660	9,170	10,600	6,720	8,630
Lead	63	77	149	123	79.1	108	102	108	80.4	88	185	183	210	98.8	67.1	85.8
Magnesium	-	786	560	982	1,630	3,410	2,390	2,940	4,360	4,680	3,610	897	641	4,490	1,960	6,340
Manganese	1600	58.3	75.7	62.4	78.4	70.5	83.4	122	153	2250	112	70.1	69.8	117	90.6	94.9
Mercury	0.18	0.2	0.14	0.39	0.14	0.097	0.16	0.17	0.12	0.13	0.21	0.2	0.11	0.17	0.19	0.21
Nickel	30	ND	6.3	8.1	8.6	8.4	11	34.6	22.6	32.2	11.3	11.5	7.7	29	9.1	29.1
Potassium	-	ND	ND	ND	ND	ND	ND	ND	ND	1040	ND	ND	ND	ND	ND	ND
Selenium	3.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silver	2	ND	ND	ND	ND	ND	ND	ND	ND	1.1	ND	ND	ND	ND	ND	ND
Sodium	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thallium	-	ND	ND	ND	ND	ND	ND	ND	ND	<3.0	b	ND	ND	ND	ND	ND
Vanadium	-	7.1	30.8	9.7	10.6	15.4	16.1	21.7	16.3	22.5	11.3	10	10	21	16.1	18.3
Zinc	109	75.7	124	93	74.3	122	83.1	98.7	77.3	679	156	136	154	111	73.9	95
General Chemistry (%)																
Solids, Percent		88.1	94.5	92	87	92.1	90.4	87.6	90.5	96.4	96.8	88.6	92.5	86.7	90.8	87.5

Notes:
ND = not detected.
USCO = Unrestricted Use Soil Cleanup Objectives
Bold & Highlighted indicates concentration above USCO.
b - Elevated detection limit due to dilution required for high interfering element.

Table 3
Metal Compounds in Soil (Unrestricted Use)
CPB Site
Far Rockaway, NY

TRC Sample No.: Date Sampled: Lab Sample ID: Laboratory:		SS-6 (0"-2")	SS-6 (12"-24")	SS-6 (2"-12")	SS-7 (0-2")	SS-7 (0-2")(A)	SS-7 (2-12")	SS-7 (2-12")(A)	SS-7 (12-24")	SS-8 (0"-2")	SS-8 (12"-24")	SS-8 (2"-12")	SS-9 (0"-2")	SS-9 (12"-24")	SS-9 (2"-12")
		3/27/2015	3/27/2015	3/27/2015	1/23/2015	1/23/2015	1/23/2015	1/23/2015	1/23/2015	3/27/2015	3/27/2015	3/27/2015	3/27/2015	3/27/2015	3/27/2015
		JB91085-11	JB91085-13	JB91085-12	JB87101-10	JB87101-11	JB87101-12	JB87101-13	JB87101-14	JB91085-17	JB91085-19	JB91085-18	JB91085-14	JB91085-16	JB91085-15
		Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest
Metals (mg/kg)	USCO														
Aluminum	-	4,570	4,050	3,970	2,300	2,340	1,800	1,730	1,160	3,450	4,920	3,760	3,820	3,140	3,540
Antimony	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Arsenic	13	4	4.8	5	2.5	2.5	ND	ND	ND	3.2	4.1	2.9	2.7	4.3	2.8
Barium	350	107	130	82.4	33.2	ND	23.1	24.9	ND	54.6	93.4	65.1	42.2	80.6	41.2
Beryllium	7.2	0.59	0.24	0.47	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Cadmium	2.5	ND	ND	ND	4	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Calcium	-	10,400	9,780	14,000	1,140	1,000	ND	611	ND	2,560	8,310	5,760	1,660	28,700	1,470
Chromium	30	53.3	71.9	57.3	15.6	7.9	6.1	5.1	3.6	13.6	21.9	12	7.8	51.4	18.9
Cobalt	-	ND	ND	5.6	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Copper	50	132	137	190	28.1	20.7	11.6	8.8	ND	46.2	53.3	44.5	24.2	130	42.4
Iron	-	10,100	9,770	14,700	7,080	5,450	3,920	2,980	2,000	7,520	9,680	6,190	10,100	12,700	6,400
Lead	63	216	267	296	134	153	52.3	49.8	4.4	142	218	155	123	243	158
Magnesium	-	2,410	1,470	1,770	730	675	ND	ND	ND	1,110	2,640	1,290	1,290	8,800	743
Manganese	1600	119	89.6	130	55.5	49	34.5	32.0	21.7	69.6	83.8	63	126	88.1	106
Mercury	0.18	0.34	0.53	0.65	0.17	0.22	0.24	0.074	ND	0.51	1.9	1.5	0.18	0.44	0.29
Nickel	30	202	291	244	8.4	7.8	ND	ND	ND	26.2	123	38.6	7.6	107	94.4
Potassium	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Selenium	3.9	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Silver	2	ND	ND	ND	ND	ND	ND	ND	ND	0.62	1.2	1.2	<0.54	0.59	<0.54
Sodium	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Thallium	-	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
Vanadium	-	19.9	29.7	23.1	17	9	6.4	6	ND	11.6	17.5	17.7	10.9	11.4	11
Zinc	109	583	297	564	102	99.1	47.2	49.7	17	200	293	195	97.6	313	138
General Chemistry (%)															
Solids, Percent		93.9	84.4	90.5	96.1	94.9	95.4	95.6	97.8	84.5	88	87.3	90.2	84.3	89.2

Notes:
ND = not detected.
USCO = Unrestricted Use Soil Cleanup Objecti
Bold & Highlighted indicates concentration abo
b - Elevated detection limit due to dilution requir

Table 4
Groundwater Sampling Results
CPB Site
Far Rockaway, NY
Page 2 of 8

TRC Project No.:	MW-4i	MW-4i(A)	MW-4s	MW - 6s	MW - 8s	MW- 9s	FB010615
Date Sampled:	01/05/15	01/05/15	01/06/15	01/05/15	01/05/15	01/05/15	01/06/15
Lab Sample No.:	JB85736-3/F	JB85736-4/F	JB85827-1/1F	JB85736-2/2F	JB85736-6/6F	JB85736-5/5F	JB85827-2
Laboratory:	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest
SVOCs (ppb)	GWQS¹	GWQS²	Duplicate Sample		Field Blank		
2-Chlorophenol	-	50	ND	ND	ND	ND	ND
4-Chloro-3-methyl phenol	-	5	ND	ND	ND	ND	ND
2,4-Dichlorophenol	1	1	ND	ND	ND	ND	ND
2,4-Dimethylphenol	1	-	ND	ND	ND	ND	ND
2,4-Dinitrophenol	1	5	ND	ND	ND	ND	ND
4,6-Dinitro-o-cresol	-	-	ND	ND	ND	ND	ND
2-Methylphenol	-	5	ND	ND	ND	ND	ND
3&4-Methylphenol	-	-	ND	ND	7.3	ND	ND
2-Nitrophenol	-	5	ND	ND	ND	ND	ND
4-Nitrophenol	-	5	ND	ND	ND	ND	ND
Pentachlorophenol	1	1	ND	ND	ND	ND	ND
Phenol	1	1	ND	ND	ND	ND	ND
2,3,4,6-Tetrachlorophenol	-	-	ND	ND	ND	ND	ND
2,4,5-Trichlorophenol	-	1	ND	ND	ND	ND	ND
2,4,6-Trichlorophenol	-	-	ND	ND	ND	ND	ND
Acenaphthene	-	20	0.48	0.47	0.61	0.69	ND
Acenaphthylene	-	20	ND	ND	ND	ND	ND
Acetophenone	-	-	ND	ND	ND	ND	ND
Anthracene	-	50	ND	ND	ND	ND	ND
Atrazine	7.5	-	ND	ND	ND	ND	ND
Benzaldehyde	-	-	ND	ND	ND	ND	ND
Benzo(a)anthracene	-	0.002	ND	ND	ND	ND	ND
Benzo(a)pyrene	ND	0.002	ND	ND	ND	ND	ND
Benzo(b)fluoranthene	-	0.002	ND	ND	ND	ND	ND
Benzo(g,h,i)perylene	-	5	ND	ND	ND	ND	ND
Benzo(k)fluoranthene	-	0.002	ND	ND	ND	ND	ND
4-Bromophenyl phenyl ether	-	-	ND	ND	ND	ND	ND
Butyl benzyl phthalate	-	50	ND	ND	ND	ND	ND
1,1'-Biphenyl	5	-	ND	ND	ND	ND	ND
2-Chloronaphthalene	-	-	ND	ND	ND	ND	ND
4-Chloroaniline	5	5	ND	ND	ND	ND	ND
Carbazole	-	-	ND	ND	ND	ND	ND
Caprolactam	-	-	ND	ND	ND	ND	ND
Chrysene	-	0.002	ND	ND	ND	ND	ND
bis(2-Chloroethoxy)methane	5	-	ND	ND	ND	ND	ND
bis(2-Chloroethyl)ether	1	-	ND	ND	ND	ND	ND
bis(2-Chloroisopropyl)ether	5	-	ND	ND	ND	ND	ND
4-Chlorophenyl phenyl ether	-	-	ND	ND	ND	ND	ND
2,4-Dinitrotoluene	5	-	ND	ND	ND	ND	ND
2,6-Dinitrotoluene	5	5	ND	ND	ND	ND	ND
3,3'-Dichlorobenzidine	5	-	ND	ND	ND	ND	ND
1,4-Dioxane	-	-	ND	ND	ND	ND	ND
Dibenzo(a,h)anthracene	-	50	ND	ND	ND	ND	ND
Dibenzofuran	-	5	ND	ND	ND	ND	ND
Di-n-butyl phthalate	50	50	ND	ND	ND	ND	ND
Di-n-octyl phthalate	-	50	ND	ND	ND	ND	ND
Diethyl phthalate	-	50	ND	ND	ND	ND	ND
Dimethyl phthalate	-	50	ND	ND	ND	ND	ND
bis(2-Ethylhexyl)phthalate	5	50	3.3	ND	ND	ND	ND
Fluoranthene	-	50	ND	ND	ND	ND	ND
Fluorene	-	50	ND	ND	0.45	ND	ND
Hexachlorobenzene	0.04	0.35	ND	ND	ND	ND	ND
Hexachlorobutadiene	0.5	-	ND	ND	ND	ND	ND
Hexachlorocyclopentadiene	5	-	ND	ND	ND	ND	ND
Hexachloroethane	5	-	ND	ND	ND	ND	ND
Indeno(1,2,3-cd)pyrene	-	0.002	ND	ND	ND	ND	ND
Isophorone	-	50	ND	ND	ND	ND	ND
2-Methylnaphthalene	-	50	ND	ND	ND	ND	ND
2-Nitroaniline	5	5	ND	ND	ND	ND	ND
3-Nitroaniline	5	5	ND	ND	ND	ND	ND
4-Nitroaniline	5	-	ND	ND	ND	ND	ND
Naphthalene	-	10	ND	ND	ND	ND	ND
Nitrobenzene	0.4	5	ND	ND	ND	ND	ND
N-Nitroso-di-n-propylamine	-	-	ND	ND	ND	ND	ND
N-Nitrosodiphenylamine	-	-	ND	ND	ND	ND	ND
Phenanthrene	-	50	ND	ND	ND	ND	ND
Pyrene	-	50	ND	ND	ND	ND	ND
1,2,4,5-Tetrachlorobenzene	5	-	ND	ND	ND	ND	ND
Total	-	-	3.78	0.47	0	1.06	0.69

Notes:

ND = Not Detected.

GWQS¹ = NY TOGS Class GA Ground Water Quality Standards

GWQS² = NY TAGM Ground Water Quality Standards/Criteria

Bold and shaded indicates concentration above GWQS.

Table 4
Groundwater Sampling Results
CPB Site
Far Rockaway, NY
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TRC Project No.:		MW-4i		MW-4i(A)		MW-4s		MW - 6s		MW - 8s		MW- 9s					
Date Sampled:		01/05/15		01/05/15		01/06/15		01/05/15		01/05/15		01/05/15					
Lab Sample No.:		JB85736-3/3F		JB85736-4/4F		JB85827-1/1F		JB85736-2/2F		JB85736-6/6F		JB85736-5/5F					
Laboratory:		Accutest		Accutest		Accutest		Accutest		Accutest		Accutest					
Dissolved Gases (ppb)		GWQS ¹		GWQS ²		Duplicate											
Methane		-		-		12,000		NA		1,170		5,790		2,550		9,200	
Ethane		-		-		17.9		NA		0.31		2.5		1.3		6	
Ethene		-		-		25		NA		ND		ND		0.18		1.2	
Total		-		-		12,043		NA		1,170		5,793		2,551		9,207	

Notes:

ND = Not Detected.

NA = Not Analyzed

GWQS¹ = NY TOGS Class GA Ground Water Quality Standards

GWQS² = NY TAGM Ground Water Quality Standards/Criteria

Bold and shaded indicates concentration above GWQS.

Table 4
Groundwater Sampling Results
CPB Site
Far Rockaway, NY
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TRC Sample No.:	MW-4i	MW-4i(A)	MW-4s	MW - 6s	MW - 8s	MW- 9s	FB010615
Date Sampled:	01/05/15	01/05/15	01/06/15	01/05/15	01/05/15	01/05/15	01/06/15
Lab Sample No.:	JB85736-3/3F	JB85736-4/4F	JB85827-1/1F	JB85736-2/2F	JB85736-6/6F	JB85736-5/5F	JB85827-2
Laboratory:	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest
Dissolved Gases (ppb)	GWQS¹	GWQS²	Duplicate				Field Blank
Aldrin	0.01	0.01	ND	ND	ND	ND	ND
alpha-BHC	0.05	0.05	ND	ND	ND	ND	ND
beta-BHC	0.05	0.05	ND	ND	ND	ND	ND
delta-BHC	0.05	0.05	ND	ND	ND	ND	ND
gamma-BHC (Lindane)	0.05	0.05	ND	ND	ND	ND	ND
alpha-Chlordane	-	-	ND	ND	ND	ND	ND
gamma-Chlordane	0.1	0.1	ND	ND	ND	ND	ND
Dieldrin	0.01	0.01	ND	ND	ND	ND	ND
4,4'-DDD	0.01	0.01	ND	ND	ND	ND	ND
4,4'-DDE	0.01	0.01	ND	ND	ND	ND	ND
4,4'-DDT	0.01	0.01	ND	ND	ND	ND	ND
Endrin	0.01	0.01	ND	ND	ND	ND	ND
Endosulfan sulfate	0.1	0.1	ND	ND	ND	ND	ND
Endrin aldehyde	-	-	ND	ND	ND	ND	ND
Endrin ketone	-	-	ND	ND	ND	ND	ND
Endosulfan-I	0.1	0.1	ND	ND	ND	ND	ND
Endosulfan-II	0.1	0.1	ND	ND	ND	ND	ND
Heptachlor	0.01	0.01	ND	ND	ND	ND	ND
Heptachlor epoxide	0.01	0.01	ND	ND	ND	ND	ND
Methoxychlor	35	35	ND	ND	ND	ND	ND
Toxaphene	-	-	ND	ND	ND	ND	ND
Total	-	-	0	0	0	0	0

Notes:

ND = Not Detected.

GWQS¹ = NY TOGS Class GA Ground Water Quality Standards

GWQS² = NY TAGM Ground Water Quality Standards/Criteria

Bold and shaded indicates concentration above GWQS.

Table 4
Groundwater Sampling Results
CPB Site
Far Rockaway, NY
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TRC Sample No.:		MW-4i	MW-4i(A)	MW-4s	MW - 6s	MW - 8s	MW- 9s	FB010615
Date Sampled:		01/05/15	01/05/15	01/06/15	01/05/15	01/05/15	01/05/15	01/06/15
Lab Sample No.:		JB85736-3/3F	JB85736-4/4F	JB85827-1/1F	JB85736-2/2F	JB85736-6/6F	JB85736-5/5F	JB85827-2
Laboratory:		Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest
PCBs (ppb)	GWQS¹	GWQS²	Duplicate					Field Blank
Aroclor 1016	0.09	0.1	ND	ND	ND	ND	ND	ND
Aroclor 1221	0.09	0.1	ND	ND	ND	ND	ND	ND
Aroclor 1232	0.09	0.1	ND	ND	ND	ND	ND	ND
Aroclor 1242	0.09	0.1	ND	ND	ND	ND	ND	ND
Aroclor 1248	0.09	0.1	ND	ND	ND	ND	ND	ND
Aroclor 1254	0.09	0.1	ND	ND	ND	ND	ND	ND
Aroclor 1260	0.09	0.1	ND	ND	ND	ND	ND	ND
Aroclor 1268	0.09	0.1	ND	ND	ND	ND	ND	ND
Aroclor 1262	0.09	0.1	ND	ND	ND	ND	ND	ND
Total	-	-	0	0	0	0	0	0

Notes:

ND = Not Detected.

GWQS¹ = NY TOGS Class GA Ground Water Quality Standards

GWQS² = NY TAGM Ground Water Quality Standards/Criteria

Bold and shaded indicates concentration above GWQS.

Table 4
Groundwater Sampling Results
CPB Site
Far Rockaway, NY
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TRC Sample No.:		MW-4i	MW-4i(A)	MW-4s	MW - 6s	MW - 8s	MW- 9s	FB010615
Date Sampled:		01/05/15	01/05/15	01/06/15	01/05/15	01/05/15	01/05/15	01/06/15
Lab Sample No.:		JB85736-3/3F	JB85736-4/4F	JB85827-1/1F	JB85736-2/2F	JB85736-6/6F	JB85736-5/5F	JB85827-2
Laboratory:		Accutest	Accutest	Accutest	Accutest	Accutest	Accutest	Accutest
Metals (ppb)	GWQS¹	GWQS²	Duplicate					Field Blank
Aluminum	-	-	568	ND	265	ND	233	ND
Antimony	3	-	ND	ND	ND	ND	ND	ND
Arsenic	25	-	17.9	19.3	ND	ND	ND	7.1
Barium	1000	-	ND	ND	ND	ND	ND	ND
Beryllium	-	-	ND	ND	ND	ND	ND	ND
Cadmium	5	-	ND	ND	ND	ND	ND	ND
Calcium	-	-	232,000	237,000	40,400	135,000	31,400	131,000
Chromium	50	-	ND	ND	37.7	ND	38.3	ND
Cobalt	-	-	ND	ND	ND	ND	ND	ND
Copper	200	-	ND	ND	ND	ND	77.5	ND
Iron	300	-	12,900	13,400	364	869	7,170	733
Dissolved Iron	300	-	12,900	NA	ND	829	4,760	815
Lead	25	-	ND	ND	8.3	ND	4.5	ND
Magnesium	-	-	69,100	70,500	ND	10,700	7,760	9,210
Manganese	300	-	1,340	1,340	ND	121	71.5	95.2
Dissolved Manganese	300	-	1,470	NA	ND	124	64.8	95.7
Mercury	0.7	-	ND	ND	ND	ND	ND	ND
Nickel	100	-	ND	ND	ND	ND	126	ND
Potassium	-	-	38,700	39,700	ND	14,500	11,300	28,400
Selenium	10	-	ND	ND	ND	ND	ND	ND
Silver	50	-	ND	ND	ND	ND	ND	ND
Sodium	20000	-	831,000	822,000	121,000	171,000	161,000	232,000
Thallium	-	-	ND	ND	ND	ND	ND	ND ^a
Vanadium	-	-	ND	ND	ND	ND	ND	ND
Zinc	-	-	162	31	27.3	ND	116	ND

Notes:

ND = Not Detected.

GWQS¹ = NY TOGS Class GA Ground Water Quality Standards

GWQS² = NY TAGM Ground Water Quality Standards/Criteria

^a = Elevated detection limit due to dilution required for high interfering element.

Bold and shaded indicates concentration above GWQS.

Table 4
Groundwater Sampling Results
CPB Site
Far Rockaway, NY
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TRC Sample No.:			MW-4i		MW-4i(A)		MW-4s		MW - 6s		MW - 8s		MW- 9s	
Date Sampled:			01/05/15		01/05/15		01/06/15		01/05/15		01/05/15		01/05/15	
Lab Sample No.:			JB85736-3/3F		JB85736-4/4F		JB85827-1/1F		JB85736-2/2F		JB85736-6/6F		JB85736-5/5F	
Laboratory:			Accutest		Accutest		Accutest		Accutest		Accutest		Accutest	
MNA Parameters (ppm)	GWQS ¹	GWQS ²			Duplicate									
Alkalinity, Total as CaCO3	-	-	575		NA		344		521		309		343	
Chloride	250	-	1,410		NA		35.2		56.8		141		105	
Nitrogen, Nitrate	10	-	ND ^b		NA		ND ^b		1.7 ^b		0.21 ^b		ND ^b	
Nitrogen, Nitrate + Nitrite	10	-	ND		NA		ND		1.7		0.21		ND	
Nitrogen, Nitrite	1	-	ND		NA		ND		ND		ND		ND	
Phosphorus, Total	-	-	0.17		NA		0.23		0.58		0.47		0.14	
Sulfate	250	-	59.2		NA		34		175		19.1		406	
Sulfide	-	-	ND		NA		ND		ND		3.9		ND	

Notes:

ND = Not Detected.

NA = Not Analyzed

GWQS¹ = NY TOGS Class GA Ground Water Quality Standards

GWQS² = NY TAGM Ground Water Quality Standards/Criteria

^b = Calculated as: (Nitrogen, Nitrate + Nitrite) - (Nitrogen, Nitrite)

Bold and shaded indicates concentration above GWQS.

Table 4
Groundwater Sampling Results
CPB Site
Far Rockaway, NY
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TRC Sample No.:			MW-4i	MW-4s
Date Sampled:			01/05/15	01/06/15
Lab Sample No.:			003MA-1	003MA-2
Laboratory:			Microbial Insights	Microbial Insights
Biological (cells/mL)	GWQS¹	GWQS²		
Dehalococcoides	-	-	31,000	66,400

Notes:

GWQS¹ = NY TOGS Class GA Ground Water Quality Standards

GWQS² = NY TAGM Ground Water Quality Standards/Criteria

Table 5
Groundwater Elevations
CPB Site
Far Rockaway, New York

Date:		4/3/2015			
		ROUND 1		ROUND 2	
Monitoring Well	TOC Elevation	DTW	GWE	DTW	GWE
MW-1s	11.35	8.67	2.68	8.67	2.68
MW-1i	12.23	10.89	1.34	10.9	1.33
MW-2	9.26	5.66	3.6	5.67	3.59
MW-3s	11.82	8.4	3.42	8.41	3.41
MW-3i	10.93	9.54	1.39	9.54	1.39
MW-4s	10.85	7.65	3.2	7.65	3.2
MW-4i	10.23	8.76	1.47	8.76	1.47
MW-6s	12.75	9.67	3.08	9.67	3.08
MW-6i	12.71	11.34	1.37	11.35	1.36
MW-8s	9.73	6.51	3.22	6.51	3.22
MW-8i	9.81	8.32	1.49	8.38	1.43
MW-9s	12.02	8.85	3.17	8.85	3.17
MW-9i	11.91	10.54	1.37	10.55	1.36
MW-10	10.5	7.23	3.27	7.25	3.25
PZ-3	10.24	8.78	1.46	8.78	1.46

Note:

- Denotes Shallow Well

Table 8
Summary of Well Construction Details
CPB Site
Far Rockaway, New York

Well Designation	Date Installed	Depth to Water	Casing Type/ Diameter (in)	Total Depth (feet below surface)	Screened or Open Interval (feet below surface)	Hydrogeologic Zone Monitored
On-Site Monitoring Wells						
PZ-3	4/28/2010	6.85	stainless steel/2	38.00	28-38	Deep Overburden
MW-1s	UNK	9.89	PVC/4	17.89	UNK	Shallow Overburden
MW-1i	4/21/2008	11.00	PVC/2	38.51	21 - 36	Deep Overburden
MW-2	UNK	7.57	PVC/4	14.88	UNK	Shallow Overburden
MW-3s	UNK	10.12	PVC/4	14.67	UNK	Shallow Overburden
MW-3iR	4/30/2010	6.39	PVC/2	38.3	28.30-38.30	Deep Overburden
MW-4s	4/28/2010	5.79	stainless steel/2	17.74	2.74-17.74	Shallow Overburden
MW-4i	4/28/2010	6.39	stainless steel/2	38.00	28-38	Deep Overburden
MW-6s	4/27/2010	8.29	PVC/2	12.00	12-Feb	Shallow Overburden
MW-6i	4/29/2010	8.48	PVC/2	38.58	28.58-38.58	Deep Overburden
MW-8s	4/27/2010	4.54	PVC/2	12.07	2.07-12.07	Shallow Overburden
MW-8i	4/30/2010	5.20	PVC/2	35.70	25.70-35.70	Deep Overburden
MW-9s	4/27/2010	6.43	PVC/2	12.98	2.98-12.98	Shallow Overburden
MW-9i	4/29/2010	7.67	PVC/2	37.13	27.13-37.13	Deep Overburden
MW-10s	4/27/2010	5.35	stainless steel/2	16.35	1.35-16.35	Shallow Overburden

Notes:

ft. msl = feet above mean sea level.

UNK = unknown, work completed prior to TRC project oversight

APPENDICES

APPENDIX 1 – LIST OF SITE CONTACTS

Name	Phone/Email Address
Site Owner and Remedial Party CPB – Grant Cooper	(801) 240-4074 coopergs@ldschurch.org
Qualified Environmental Professional Nidal Rabah, PhD, PE, PMP (TRC Environmental)	(908) 988-1703 nrabah@trcsolutions.com
NYSDEC DER Project Manager Christopher Magee	(518) 402-9813 christopher.magee@dec.ny.gov
NYSDEC Regional HW Engineer Division of Environmental Remediation, Regional Remediation Engineer, Region 2	(718) 482-4995
NYSDEC Site Control	(518) 402-9553
Remedial Party Attorney James Ellsworth, Kirton & McConkie	(801) 328-3600 jellsworth@kmclaw.com

APPENDIX 2 – EXCAVATION WORK PLAN (EWP)

2-1 NOTIFICATION

At least 15 days prior to the start of any activity that is anticipated to encounter remaining contamination, the site owner or their representative will notify the NYSDEC. Table 1 includes contact information for the above notification. The information on this table will be updated as necessary to provide accurate contact information. A full listing of site-related contact information is provided in Appendix 1.

Table 1: Notifications*

Christopher Magee	(518) 402-9813 christopher.magee@dec.ny.gov
Regional Remediation Engineer	(718) 482-4995
NYSDEC Site Control	(518) 402-9553

* Note: Notifications are subject to change and will be updated as necessary.

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent of excavation, plans/drawings for site re-grading, intrusive elements or utilities to be installed below the soil cover, estimated volumes of contaminated soil to be excavated and any work that may impact an engineering control;
- A summary of environmental conditions anticipated to be encountered in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling;

- A schedule for the work, detailing the start and completion of all intrusive work;
- A summary of the applicable components of this EWP;
- A statement that the work will be performed in compliance with this EWP and 29 CFR 1910.120;
- A copy of the contractor's health and safety plan (HASP), in electronic format, if it differs from the HASP provided in Appendix 7 of this SMP;
- Identification of disposal facilities for potential waste streams; and
- Identification of sources of any anticipated backfill, along with all required chemical testing results.

2-2 SOIL SCREENING METHODS

Visual, olfactory and instrument-based (e.g. photoionization detector) soil screening will be performed by a qualified environmental professional during all excavations into known or potentially contaminated material (remaining contamination). Soil screening will be performed when invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the COC.

Soils will be segregated based on previous environmental data and screening results into material that requires off-site disposal and material that requires testing to determine if the material can be reused on-site as soil beneath a cover or if the material can be used as cover soil. Further discussion of off-site disposal of materials and on-site reuse is provided in Sections 5 and 6 of this Appendix.

2-3 SOIL STAGING METHODS

Soil stockpiles will be continuously encircled with a berm and/or silt fence. Hay bales will be used as needed near catch basins, surface waters and other discharge points.

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

Stockpiles will be inspected at a minimum once each 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 the NYSDEC.

Stormwater management activities for stockpiles will be consistent with Section 2-11 of this appendix.

2-4 MATERIALS EXCAVATION AND LOAD-OUT

A qualified environmental professional or person under their supervision will oversee all invasive work and the excavation and load-out of all excavated material.

The owner of the property and remedial party (if applicable) and its contractors are responsible for safe execution of all invasive and other work performed under this Plan.

The presence of utilities and easements on the site will be investigated by the qualified environmental professional. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the site.

Loaded vehicles leaving the site containing soil destined for disposal will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements).

A truck wash will be operated on-site, as appropriate. The qualified environmental professional will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the site until the activities performed under this section are complete. Truck wash waters will be collected and disposed of off-site in an appropriate manner.

Locations where vehicles enter or exit the site shall be inspected daily for evidence of off-site soil tracking.

The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the site are clean of dirt and other materials derived from the site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to site-derived materials.

2-5 MATERIALS TRANSPORT OFF-SITE

All 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.

Truck transport routes will be determined if off-site disposal of soil is needed. All trucks loaded with site materials will exit the vicinity of the site using only these approved truck routes. This is the most appropriate route and takes into account: (a) limiting transport through residential areas and past sensitive sites; (b) use of city mapped truck routes; (c) prohibiting off-site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport.

Trucks will be prohibited from stopping and idling in the neighborhood outside the project site.

Egress points for truck and equipment transport from the site will be kept clean of dirt and other materials during site remediation and development.

Queuing of trucks will be performed on-site in order to minimize off-site disturbance. Off-site queuing will be prohibited.

2-6 MATERIALS DISPOSAL OFF-SITE

All material excavated and removed from the site will be treated as contaminated and regulated material and will be transported and disposed in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations. If disposal of material from this site is proposed for unregulated off-site disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC. Unregulated off-site management of materials from this site will not occur without formal NYSDEC approval.

Off-site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, i.e. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, C/D recycling facility, etc. Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report. This documentation will include: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and contaminated soils taken off-site will be handled, at minimum, as a Municipal Solid Waste per 6NYCRR Part 360-1.2. Material that does not meet Unrestricted SCOs is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360-16 Registration Facility).

2-7 MATERIALS REUSE ON-SITE

Any material proposed for re-use on the site will be assessed for its appropriateness in accordance with DER-10, Section 5.4(e)(4). If found to be clean from contaminants (based on screening against the appropriate Restricted Use Soil Clean-up Objective) some soils may be used above a protective cap. If the soils are found to be impacted, they will be assessed for use below a protective cap. All soils proposed for re-use will be segregated into separate stock piles based on their area of origin and the visual, olfactory and instrument-based (e.g. photoionization detector) observations. The stockpiling program will follow the requirements set in Section 2-3 of this Appendix. The size of the stockpiles will be limited to ensure proper access of the site and the stability of the stockpile.

The qualified environmental professional will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material does not remain on-site. Contaminated on-site material, including historic fill and contaminated soil, that is acceptable for reuse on-site will be placed below the demarcation layer or impervious surface, and will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines.

Any demolition material proposed for reuse on-site will be sampled for asbestos and the results will be reported to the NYSDEC for acceptance. Concrete crushing or processing on-site will not be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the site will not be reused on-site.

2-8 FLUIDS MANAGEMENT

All liquids to be removed from the site, including but not limited to, excavation dewatering, decontamination waters and groundwater monitoring well purge and development waters, will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. Dewatering, purge and development fluids

will not be recharged back to the land surface or subsurface of the site, and will be managed off-site, unless prior approval is obtained from NYSDEC.

Discharge of water generated during large-scale construction activities to surface waters (i.e. a local pond, stream or river) will be performed under a SPDES permit.

2-9 COVER SYSTEM RESTORATION

After the completion of soil removal and any other invasive activities the cover system will be restored in a manner that complies with the Decision Document. The existing cover system is comprised of a minimum of 4 inches of RCA and 2 inches of asphalt. The demarcation layer, consisting of colored geotextile will be replaced to provide a visual reference to the top of the remaining contamination zone, the zone that requires adherence to special conditions for disturbance of remaining contaminated soils defined in this SMP. If the type of cover system changes from that which exists prior to the excavation (i.e., a soil cover is replaced by asphalt), this will constitute a modification of the cover element of the remedy and the upper surface of the remaining contamination. A figure showing the modified surface will be included in the subsequent Periodic Review Report and in an updated SMP.

2-10 BACKFILL FROM OFF-SITE SOURCES

All materials proposed for import onto the site will be approved by the qualified environmental professional and will be in compliance with provisions in this SMP prior to receipt at the site. A Request to Import/Reuse Fill or Soil form, which can be found at <http://www.dec.ny.gov/regulations/67386.html>, will be prepared and submitted to the NYSDEC project manager allowing a minimum of 5 business days for review.

Material from industrial sites, spill sites, or other environmental remediation sites or potentially contaminated sites will not be imported to the site.

All imported soils will meet the backfill and cover soil quality standards established in 6NYCRR 375-6.7(d). Based on an evaluation of the land use, protection of groundwater and protection of ecological resources criteria, the resulting soil quality standards are listed in Table 7. Soils 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. Solid waste will not be imported onto the site.

Trucks entering the site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

At a minimum, imported soil will be analyzed for VOC, SVOC, pesticides, PCBs and TAL metals at a frequency indicated in DER-10 Table 5.4(e)10. 500 tons of soil would require 5 grab samples and 2 composite samples, see DER-10, table 5.4(e)10.

2-11 STORMWATER POLLUTION PREVENTION

Barriers and hay bale checks 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 the NYSDEC. All necessary repairs shall be made immediately.

Accumulated sediments will be removed as required to keep the barrier and hay bale check functional.

All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials.

Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

Erosion and sediment control measures identified in the SMP 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.

Silt fencing or hay bales will be installed around the entire perimeter of the construction area.

2-12 EXCAVATION CONTINGENCY PLAN

If underground tanks or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

Sampling will be performed on product, sediment and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for a full list of analytes (TAL metals; TCL volatiles and semi-volatiles, TCL pesticides and PCBs), unless the site history and previous sampling results provide a sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

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. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in the Periodic Review Report.

2-13 OTHER NUISANCES

A plan for rodent control will be developed and utilized by the contractor prior to and during site clearing and site grubbing, and during all remedial work.

A plan will be developed and utilized by the contractor for all remedial work to ensure compliance with local noise control ordinances.

APPENDIX 3 – ENVIRONMENTAL EASEMENT

An Environmental easement is attached below.

**ENVIRONMENTAL EASEMENT GRANTED PURSUANT TO ARTICLE 71, TITLE 36
OF THE NEW YORK STATE ENVIRONMENTAL CONSERVATION LAW**

THIS INDENTURE made this 21st day of October, 2015, between Owner(s) Corporation of the Presiding Bishop of The Church of Jesus Christ of Latter-day Saints, having an office at 50 E. North Temple Street, Salt Lake City, Utah 84150, County of Salt Lake, State of Utah (the "Grantor"), and The People of the State of New York (the "Grantee."), acting through their Commissioner of the Department of Environmental Conservation (the "Commissioner", or "NYSDEC" or "Department" as the context requires) with its headquarters located at 625 Broadway, Albany, New York 12233,

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to encourage the remediation of abandoned and likely contaminated properties ("sites") that threaten the health and vitality of the communities they burden while at the same time ensuring the protection of public health and the environment; and

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to establish within the Department a statutory environmental remediation program that includes the use of Environmental Easements as an enforceable means of ensuring the performance of operation, maintenance, and/or monitoring requirements and the restriction of future uses of the land, when an environmental remediation project leaves residual contamination at levels that have been determined to be safe for a specific use, but not all uses, or which includes engineered structures that must be maintained or protected against damage to perform properly and be effective, or which requires groundwater use or soil management restrictions; and

WHEREAS, the Legislature of the State of New York has declared that Environmental Easement shall mean an interest in real property, created under and subject to the provisions of Article 71, Title 36 of the New York State Environmental Conservation Law ("ECL") which contains a use restriction and/or a prohibition on the use of land in a manner inconsistent with engineering controls which are intended to ensure the long term effectiveness of a site remedial program or eliminate potential exposure pathways to hazardous waste or petroleum; and

WHEREAS, Grantor, is the owner of real property located at the address of 3229 Far Rockaway Boulevard in the City of New York, County of Queens and State of New York, known and designated on the tax map of the New York City Department of Finance as tax map parcel number: Block 15950 Lot 29, being the same as that property conveyed to Grantor by deed dated December 12, 2002 and recorded in the City Register of the City of New York in Instrument No. 2003000032470. The property subject to this Environmental Easement (the "Controlled Property") comprises approximately 1.1447 +/- acres, and is hereinafter more fully described in the Land Title Survey dated May 28, 2015 prepared by Keystone Consulting Engineers, which will be attached to the Site Management Plan. The Controlled Property description is set forth in and attached hereto as Schedule A; and

WHEREAS, the Department accepts this Environmental Easement in order to ensure the protection of public health and the environment and to achieve the requirements for remediation

established for the Controlled Property until such time as this Environmental Easement is extinguished pursuant to ECL Article 71, Title 36; and

NOW THEREFORE, in consideration of the mutual covenants contained herein and the terms and conditions of Brownfield Cleanup Agreement Index Number: C241158, Grantor conveys to Grantee a permanent Environmental Easement pursuant to ECL Article 71, Title 36 in, on, over, under, and upon the Controlled Property as more fully described herein ("Environmental Easement")

1. Purposes. Grantor and Grantee acknowledge that the Purposes of this Environmental Easement are: to convey to Grantee real property rights and interests that will run with the land in perpetuity in order to provide an effective and enforceable means of encouraging the reuse and redevelopment of this Controlled Property at a level that has been determined to be safe for a specific use while ensuring the performance of operation, maintenance, and/or monitoring requirements; and to ensure the restriction of future uses of the land that are inconsistent with the above-stated purpose.

2. Institutional and Engineering Controls. The controls and requirements listed in the Department approved Site Management Plan ("SMP") including any and all Department approved amendments to the SMP are incorporated into and made part of this Environmental Easement. These controls and requirements apply to the use of the Controlled Property, run with the land, are binding on the Grantor and the Grantor's successors and assigns, and are enforceable in law or equity against any owner of the Controlled Property, any lessees and any person using the Controlled Property.

A. (1) The Controlled Property may be used for:

Restricted Residential as described in 6 NYCRR Part 375-1.8(g)(2)(ii), Commercial as described in 6 NYCRR Part 375-1.8(g)(2)(iii) and Industrial as described in 6 NYCRR Part 375-1.8(g)(2)(iv). Notwithstanding, this Environmental Easement does not create a restriction of the potential use of the property for purposes of a church meetinghouse, if such use is consistent with local zoning law and is approved by the New York City Department of City Planning.

(2) All Engineering Controls must be operated and maintained as specified in the Site Management Plan (SMP);

(3) All Engineering Controls must be inspected at a frequency and in a manner defined in the SMP;

(4) The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the New York City Department of Health and Mental Hygiene to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;

(5) Groundwater and other environmental or public health monitoring must be

performed as defined in the SMP;

(6) Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in the SMP;

(7) All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with the SMP;

(8) Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in the SMP;

(9) Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy shall be performed as defined in the SMP;

(10) Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by this Environmental Easement.

B. The Controlled Property shall not be used for Residential purposes as defined in 6NYCRR 375-1.8(g)(2)(i), and the above-stated engineering controls may not be discontinued without an amendment or extinguishment of this Environmental Easement.

C. The SMP describes obligations that the Grantor assumes on behalf of Grantor, its successors and assigns. The Grantor's assumption of the obligations contained in the SMP which may include sampling, monitoring, and/or operating a treatment system, and providing certified reports to the NYSDEC, is and remains a fundamental element of the Department's determination that the Controlled Property is safe for a specific use, but not all uses. The SMP may be modified in accordance with the Department's statutory and regulatory authority. The Grantor and all successors and assigns, assume the burden of complying with the SMP and obtaining an up-to-date version of the SMP from:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, New York 12233
Phone: (518) 402-9553

D. Grantor must provide all persons who acquire any interest in the Controlled Property a true and complete copy of the SMP that the Department approves for the Controlled Property and all Department-approved amendments to that SMP.

E. Grantor covenants and agrees that until such time as the Environmental Easement is extinguished in accordance with the requirements of ECL Article 71, Title 36 of the ECL, the property deed and all subsequent instruments of conveyance relating to the Controlled Property shall state in at least fifteen-point bold-faced type:

This property is subject to an Environmental Easement held by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the Environmental Conservation Law.

F. Grantor covenants and agrees that this Environmental Easement shall be incorporated in full or by reference in any leases, licenses, or other instruments granting a right to use the Controlled Property.

G. Grantor covenants and agrees that it shall, at such time as NYSDEC may require, submit to NYSDEC a written statement by an expert the NYSDEC may find acceptable certifying under penalty of perjury, in such form and manner as the Department may require, that:

(1) the inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under the direction of the individual set forth at 6 NYCRR Part 375-1.8(h)(3).

(2) the institutional controls and/or engineering controls employed at such site:
(i) are in-place;
(ii) are unchanged from the previous certification, or that any identified changes to the controls employed were approved by the NYSDEC and that all controls are in the Department-approved format; and

(iii) that nothing has occurred that would impair the ability of such control to protect the public health and environment;

(3) the owner will continue to allow access to such real property to evaluate the continued maintenance of such controls;

(4) nothing has occurred that would constitute a violation or failure to comply with any site management plan for such controls;

(5) the report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

(6) to the best of his/her knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and

(7) the information presented is accurate and complete.

3. Right to Enter and Inspect. Grantee, its agents, employees, or other representatives of the State may enter and inspect the Controlled Property in a reasonable manner and at reasonable times to assure compliance with the above-stated restrictions. Notwithstanding anything in this Environmental Easement to the contrary, entrance to and inspection of the Controlled Property on Sundays will be limited to emergency situations only.

4. Reserved Grantor's Rights. Grantor reserves for itself, its assigns, representatives, and successors in interest with respect to the Property, all rights as fee owner of the Property, including:

A. Use of the Controlled Property for all purposes not inconsistent with, or limited by the terms of this Environmental Easement;

B. The right to give, sell, assign, or otherwise transfer part or all of the underlying fee interest to the Controlled Property, subject and subordinate to this Environmental Easement;

5. Enforcement

A. This Environmental Easement is enforceable in law or equity in perpetuity by Grantor, Grantee, or any affected local government, as defined in ECL Section 71-3603, against the owner of the Property, any lessees, and any person using the land. Enforcement shall not be defeated because of any subsequent adverse possession, laches, estoppel, or waiver. It is not a defense in any action to enforce this Environmental Easement that: it is not appurtenant to an interest in real property; it is not of a character that has been recognized traditionally at common law; it imposes a negative burden; it imposes affirmative obligations upon the owner of any interest in the burdened property; the benefit does not touch or concern real property; there is no privity of estate or of contract; or it imposes an unreasonable restraint on alienation.

B. If any person violates this Environmental Easement, the Grantee may revoke the Certificate of Completion with respect to the Controlled Property.

C. Grantee shall notify Grantor of a breach or suspected breach of any of the terms of this Environmental Easement. Such notice shall set forth how Grantor can cure such breach or suspected breach and give Grantor a reasonable amount of time from the date of receipt of notice in which to cure. At the expiration of such period of time to cure, or any extensions granted by Grantee, the Grantee shall notify Grantor of any failure to adequately cure the breach or suspected breach, and Grantee may take any other appropriate action reasonably necessary to remedy any breach of this Environmental Easement, including the commencement of any proceedings in accordance with applicable law.

D. The failure of Grantee to enforce any of the terms contained herein shall not be deemed a waiver of any such term nor bar any enforcement rights.

6. Notice. Whenever notice to the Grantee (other than the annual certification) or approval from the Grantee is required, the Party providing such notice or seeking such approval shall identify the Controlled Property by referencing the following information:

County, NYSDEC Site Number, NYSDEC Brownfield Cleanup Agreement, State Assistance Contract or Order Number, and the County tax map number or the Liber and Page or computerized system identification number.

Parties shall address correspondence to: Site Number: C241158
Office of General Counsel
NYSDEC
625 Broadway
Albany New York 12233-5500

With a copy to: Site Control Section
Division of Environmental Remediation

NYSDEC
625 Broadway
Albany, NY 12233

All notices and correspondence shall be delivered by hand, by registered mail or by Certified mail and return receipt requested. The Parties may provide for other means of receiving and communicating notices and responses to requests for approval.

7. Recordation. Grantor shall record this instrument, within thirty (30) days of execution of this instrument by the Commissioner or her/his authorized representative in the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

8. Amendment. Any amendment to this Environmental Easement may only be executed by the Commissioner of the New York State Department of Environmental Conservation or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

9. Extinguishment. This Environmental Easement may be extinguished only by a release by the Commissioner of the New York State Department of Environmental Conservation, or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

10. Joint Obligation. If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

Remainder of Page Intentionally Left Blank

IN WITNESS WHEREOF, Grantor has caused this instrument to be signed in its name.

Corporation of the Presiding Bishop of The Church of Jesus Christ of Latter-day Saints:

By:

Print Name:

Title: **AUTHORIZED AGENT**

Date:



Grantor's Acknowledgment

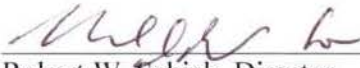
STATE OF ~~NEW YORK~~)
COUNTY OF ~~SALT LAKE~~) ss:

On the 1st day of OCT, in the year 2015, before me, the undersigned, personally appeared BLENN MCKAY, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Notary Public - State of ~~New York~~ UTAH



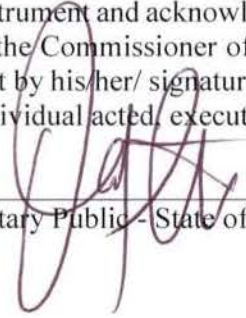
THIS ENVIRONMENTAL EASEMENT IS HEREBY ACCEPTED BY THE PEOPLE OF THE STATE OF NEW YORK, Acting By and Through the Department of Environmental Conservation as Designee of the Commissioner,

By: 
Robert W. Schick, Director
Division of Environmental Remediation

Grantee's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF ALBANY)

On the 21st day of October, in the year 2015, before me, the undersigned, personally appeared Robert W. Schick, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/ executed the same in his/her/ capacity as Designee of the Commissioner of the State of New York Department of Environmental Conservation, and that by his/her/ signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.


Notary Public - State of New York

David J. Chiusano
Notary Public, State of New York
No. 01CH5032146
Qualified in Schenectady County
Commission Expires August 22, 2016

SCHEDULE "A" PROPERTY DESCRIPTION

**Legal Description of Easement Area
CPB Site – Queens, New York
NYSDEC Brownfields Cleanup Program
Site No. C241158**

BEGINNING AT A POINT ON THE SOUTHERLY SIDE OF FAR ROCKAWAY BOULEVARD (AS NOW OPEN AND IN USE, 50 FEET WIDE, 60 FEET FINAL), DISTANT 150.00 FEET WESTERLY FROM A CORNER FORMED BY THE INTERSECTION OF SAID SOUTHERLY SIDE OF FAR ROCKAWAY BOULEVARD AND THE WESTERLY SIDE OF BEACH 32ND STREET (AS NOW OPEN AND IN USE, 50 FEET WIDE, 60 FEET FINAL, A/K/A CHANNEL AVENUE);

RUNNING THENCE SOUTHERLY ALONG A LINE FORMING AN INTERIOR ANGLE OF 85 DEGREES 54 MINUTES 46.4 SECONDS WITH THE SOUTHERLY SIDE OF FAR ROCKAWAY BOULEVARD, 208.03 FEET TO THE NORTHERLY SIDE OF ROCKAWAY FREEWAY (AS NOW AND OPEN IN USE, 50 FEET WIDE, A/K/A LONG ISLAND RAIL ROAD FREEWAY);

THENCE WESTERLY ALONG THE NORTHERLY SIDE OF ROCKAWAY FREEWAY, 204.19 FEET;

THENCE NORTHWESTERLY ALONG A LINE FORMING AN INTERIOR ANGLE OF 96 DEGREES 20 MINUTES 54.1 SECONDS WITH THE LAST MENTIONED LINE, 225.98 FEET TO THE SOUTHERLY SIDE OF FAR ROCKAWAY BOULEVARD;

THENCE EASTERLY ALONG THE SOUTHERLY SIDE OF FAR ROCKAWAY BOULEVARD, 259.58 FEET TO THE POINT OR PLACE OF BEGINNING.

CONTAINING 1.1447 ACRES (49,863 S.F.)

KIRTON | McCONKIE

James E. Ellsworth
jellsworth@kmclaw.com
801.321.4860
Also licensed in DC

December 22, 2015

Environmental Easement Attorney
Bureau of Remediation
Office of General Counsel, 14th Floor
New York State Department of Environmental Conservation
625 Broadway
Albany, NY 12233-1500

RE: Notice to Municipality of Environmental Easement

To Whom It May Concern:

Please see attached letter with attachments sent via certified mail to the New York City Department of City Planning regarding an environmental easement granted to the New York State Department of Environmental Conservation on December 17, 2015.

Please contact James Ellsworth with any comments or concerns.

Sincerely yours,

KIRTON McCONKIE



Pamela Alexander
Legal Assistant to James Ellsworth

Attachments

KIRTON | McCONKIE

James E. Ellsworth
jellsworth@kmclaw.com
801.321.4860
Also licensed in DC

NOTICE TO MUNICIPALITY

December 22, 2015

New York City Department of City Planning
120 Broadway 31st Floor
New York, NY 10271

Re: *Notice to Municipality of Environmental Easement*

Dear Sir or Madam,

Attached please find a copy of an environmental easement granted to the New York State Department of Environmental Conservation ("Department") on December 17, 2015, by Corporation for the Presiding Bishop of The Church of Jesus Christ of Latter-day Saints, for property at 3229 Far Rockaway Boulevard, New York City, Queens County, New York, and Tax Map No. Block 15950 Lot 29, DEC Site No: C241158.

This Environmental Easement restricts future use of the above-referenced property to restricted residential, commercial, and industrial uses. Any on-site activity must be done in accordance with the Environmental Easement and the Site Management Plan which is incorporated into the Environmental Easement. Department approval is also required prior to any groundwater use.

Article 71, Section 71-3607 of the New York State Environmental Conservation Law requires that:

1. Whenever the department is granted an environmental easement, it shall provide each affected local government with a copy of such easement and shall also provide a copy of any documents modifying or terminating such environmental easement; and
2. Whenever an affected local government receives an application for a building permit or any other application affecting land use or development of land that is subject to an environmental easement and that may relate to or impact such easement, the affected local government shall notify the department and refer such application to the department. The department shall

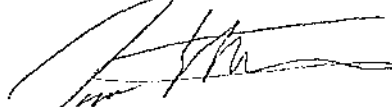
New York City Department of City Planning
December 22, 2015
Page 2

evaluate whether the application is consistent with the environmental easement and shall notify the affected local government of its determination in a timely fashion, considering the time frame for the local government's review of the application. The affected local government shall not approve the application until it receives approval from the department.

An electronic version of every environmental easement that has been accepted by the Department is available to the public at: <http://www.dec.ny.gov/chemical/36045.html>. Please forward this notice to your building and/or planning departments, as applicable, to ensure your compliance with these provisions of New York State Environmental Conservation Law. If you have any questions or comments regarding this matter, please do not hesitate to contact me.

Sincerely yours,

KIRTON McCONKIE

A handwritten signature in black ink, appearing to read 'James Ellsworth', written over a horizontal line.

James Ellsworth

Attachment



Superior Data Services, Inc.
188 Montague Street, 10th Floor
Brooklyn, New York 11201
(718) 625-9949 Fax: (718) 625-9609

New York State Recording Report

Report Date 12/21/2015

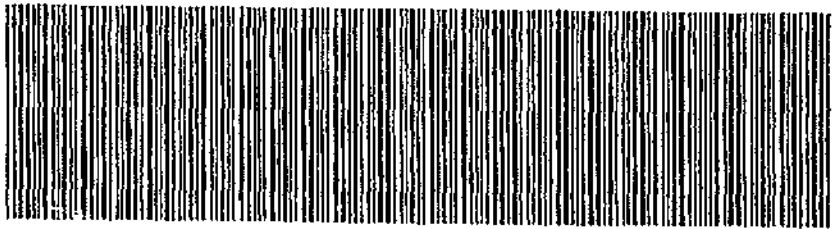
The following documents have been successfully recorded.

Company	Title Number	Ord Date	County	Dist	Sec	Block	Lot	Party 1	Party 2
MCCORMAC	151698608	12/03/15	Queens			25950	29	Corporation of the Pn NYSED	

Document	Number	Amount	Doc ID	Rec Info	Rec Date
Environmental E	107892 \$ 227	107892 \$ 18	Rec'd 12/14	2015-000447636	12/17/2015

**NYC DEPARTMENT OF FINANCE
OFFICE OF THE CITY REGISTER**

This page is part of the instrument. The City Register will rely on the information provided by you on this page for purposes of indexing this instrument. The information on this page will control for indexing purposes in the event of any conflict with the rest of the document.



2015120400114001001E3D14

RECORDING AND ENDORSEMENT COVER PAGE

PAGE 1 OF 10

Document ID: 2015120400114001

Document Date: 10-21-2015

Preparation Date: 12-04-2015

Document Type: EASEMENT

Document Page Count: 9

PRESENTER:

SUPERIOR DATA SERVICES
188 MONTAGUE STREET
STE 1000***HOLD FOR PICKUP SDS*****
BROOKLYN, NY 11201
718-404-0214
JLICARI@SUPERIOR-DATA.COM

RETURN TO:

SUPERIOR DATA SERVICES
188 MONTAGUE STREET
STE 1000***HOLD FOR PICKUP SDS*****
BROOKLYN, NY 11201
718-404-0214
JLICARI@SUPERIOR-DATA.COM

PROPERTY DATA			
Borough	Block	Lot	Unit Address
QUEENS	15950	29	Entire Lot 3229 FAR ROCKAWAY BLVD
Property Type: NON-RESIDENTIAL VACANT LAND			

CROSS REFERENCE DATA

CRFN _____ or DocumentID _____ or _____ Year _____ Reel _____ Page _____ or File Number _____

PARTIES

GRANTOR/SELLER:

CORPORATION OF THE PRESIDING BISHOP OF THE CHURCH
OF JESUS CHRIST OF LATTER-DAY SAINTS, 50 E NORTH TEMPLE STREET

GRANTEE/BUYER:

COMMISSIONER OF THE DEPARTMENT OF ENVIRONMENTAL CONSERVATION, 625 BROADWAY
ALBANY, NY 12233

FEES AND TAXES

Mortgage:

Mortgage Amount: \$ 0.00

Taxable Mortgage Amount: \$ 0.00

Exemption:

TAXES: County (Basic): \$ 0.00

City (Additional): \$ 0.00

Spec (Additional): \$ 0.00

TASF: \$ 0.00

MTA: \$ 0.00

NYCTA: \$ 0.00

Additional MRT: \$ 0.00

TOTAL: \$ 0.00

Recording Fee: \$ 82.00

Affidavit Fee: \$ 0.00

Filing Fee:

\$ 100.00

NYC Real Property Transfer Tax: \$ 0.00

NYS Real Estate Transfer Tax: \$ 0.00

\$ 0.00

\$ 0.00

\$ 0.00

\$ 0.00

\$ 0.00

\$ 0.00

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\$ 0.00

**RECORDED OR FILED IN THE OFFICE
OF THE CITY REGISTER OF THE**

CITY OF NEW YORK

Recorded/Filed 12-17-2015 16:07

City Register File No. (CRFN):

2015000447636

Ganette McMill

City Register Official Signature

**ENVIRONMENTAL EASEMENT GRANTED PURSUANT TO ARTICLE 71, TITLE 36
OF THE NEW YORK STATE ENVIRONMENTAL CONSERVATION LAW**

THIS INDENTURE made this 21st day of October, 2015, between Owner(s) Corporation of the Presiding Bishop of The Church of Jesus Christ of Latter-day Saints, having an office at 50 E. North Temple Street, Salt Lake City, Utah 84150, County of Salt Lake, State of Utah (the "Grantor"), and The People of the State of New York (the "Grantee"), acting through their Commissioner of the Department of Environmental Conservation (the "Commissioner", or "NYSDEC" or "Department" as the context requires) with its headquarters located at 625 Broadway, Albany, New York 12233,

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to encourage the remediation of abandoned and likely-contaminated properties ("sites") that threaten the health and vitality of the communities they burden while at the same time ensuring the protection of public health and the environment; and

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to establish within the Department a statutory environmental remediation program that includes the use of Environmental Easements as an enforceable means of ensuring the performance of operation, maintenance, and/or monitoring requirements and the restriction of future uses of the land, when an environmental remediation project leaves residual contamination at levels that have been determined to be safe for a specific use, but not all uses, or which includes engineered structures that must be maintained or protected against damage to perform properly and be effective, or which requires groundwater use or soil management restrictions; and

WHEREAS, the Legislature of the State of New York has declared that Environmental Easement shall mean an interest in real property, created under and subject to the provisions of Article 71, Title 36 of the New York State Environmental Conservation Law ("ECL") which contains a use restriction and/or a prohibition on the use of land in a manner inconsistent with engineering controls which are intended to ensure the long term effectiveness of a site remedial program or eliminate potential exposure pathways to hazardous waste or petroleum; and

WHEREAS, Grantor, is the owner of real property located at the address of 3229 Far Rockaway Boulevard in the City of New York, County of Queens and State of New York, known and designated on the tax map of the New York City Department of Finance as tax map parcel number: Block 15950 Lot 29, being the same as that property conveyed to Grantor by deed dated December 12, 2002 and recorded in the City Register of the City of New York in Instrument No. 2003000032470. The property subject to this Environmental Easement (the "Controlled Property") comprises approximately 1.1447 +/- acres, and is hereinafter more fully described in the Land Title Survey dated May 28, 2015 prepared by Keystones Consulting Engineers, which will be attached to the Site Management Plan. The Controlled Property description is set forth in and attached hereto as Schedule A; and

WHEREAS, the Department accepts this Environmental Easement in order to ensure the protection of public health and the environment and to achieve the requirements for remediation

established for the Controlled Property until such time as this Environmental Easement is extinguished pursuant to ECL Article 71, Title 36; and

NOW THEREFORE, in consideration of the mutual covenants contained herein and the terms and conditions of Brownfield Cleanup Agreement Index Number: C241158, Grantor conveys to Grantee a permanent Environmental Easement pursuant to ECL Article 71, Title 36 in, on, over, under, and upon the Controlled Property as more fully described herein ("Environmental Easement")

1. Purposes. Grantor and Grantee acknowledge that the Purposes of this Environmental Easement are: to convey to Grantee real property rights and interests that will run with the land in perpetuity in order to provide an effective and enforceable means of encouraging the reuse and redevelopment of this Controlled Property at a level that has been determined to be safe for a specific use while ensuring the performance of operation, maintenance, and/or monitoring requirements; and to ensure the restriction of future uses of the land that are inconsistent with the above-stated purpose.

2. Institutional and Engineering Controls. The controls and requirements listed in the Department approved Site Management Plan ("SMP") including any and all Department approved amendments to the SMP are incorporated into and made part of this Environmental Easement. These controls and requirements apply to the use of the Controlled Property, run with the land, are binding on the Grantor and the Grantor's successors and assigns, and are enforceable in law or equity against any owner of the Controlled Property, any lessees and any person using the Controlled Property.

A. (1) The Controlled Property may be used for:

Restricted Residential as described in 6 NYCRR Part 375-1.8(g)(2)(ii), Commercial as described in 6 NYCRR Part 375-1.8(g)(2)(iii) and Industrial as described in 6 NYCRR Part 375-1.8(g)(2)(iv). Notwithstanding, this Environmental Easement does not create a restriction of the potential use of the property for purposes of a church meetinghouse, if such use is consistent with local zoning law and is approved by the New York City Department of City Planning.

(2) All Engineering Controls must be operated and maintained as specified in the Site Management Plan (SMP);

(3) All Engineering Controls must be inspected at a frequency and in a manner defined in the SMP;

(4) The use of groundwater underlying the property is prohibited without necessary water quality treatment as determined by the NYSDOH or the New York City Department of Health and Mental Hygiene to render it safe for use as drinking water or for industrial purposes, and the user must first notify and obtain written approval to do so from the Department;

(5) Groundwater and other environmental or public health monitoring must be

performed as defined in the SMP;

(6) Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in the SMP;

(7) All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with the SMP;

(8) Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in the SMP;

(9) Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy shall be performed as defined in the SMP;

(10) Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by this Environmental Easement.

B. The Controlled Property shall not be used for Residential purposes as defined in 6NYCRR 375-1.8(g)(2)(i), and the above-stated engineering controls may not be discontinued without an amendment or extinguishment of this Environmental Easement.

C. The SMP describes obligations that the Grantor assumes on behalf of Grantor, its successors and assigns. The Grantor's assumption of the obligations contained in the SMP which may include sampling, monitoring, and/or operating a treatment system, and providing certified reports to the NYSDEC, is and remains a fundamental element of the Department's determination that the Controlled Property is safe for a specific use, but not all uses. The SMP may be modified in accordance with the Department's statutory and regulatory authority. The Grantor and all successors and assigns, assume the burden of complying with the SMP and obtaining an up-to-date version of the SMP from:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, New York 12233
Phone: (518) 402-9553

D. Grantor must provide all persons who acquire any interest in the Controlled Property a true and complete copy of the SMP that the Department approves for the Controlled Property and all Department-approved amendments to that SMP.

E. Grantor covenants and agrees that until such time as the Environmental Easement is extinguished in accordance with the requirements of ECL Article 71, Title 36 of the ECL, the property deed and all subsequent instruments of conveyance relating to the Controlled Property shall state in at least fifteen-point bold-faced type:

This property is subject to an Environmental Easement held by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the Environmental Conservation Law.

F. Grantor covenants and agrees that this Environmental Easement shall be incorporated in full or by reference in any leases, licenses, or other instruments granting a right to use the Controlled Property.

G. Grantor covenants and agrees that it shall, at such time as NYSDEC may require, submit to NYSDEC a written statement by an expert the NYSDEC may find acceptable certifying under penalty of perjury, in such form and manner as the Department may require, that:

(1) the inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under the direction of the individual set forth at 6 NYCRR Part 375-1.8(h)(3).

(2) the institutional controls and/or engineering controls employed at such site:

(i) are in-place;

(ii) are unchanged from the previous certification, or that any identified changes to the controls employed were approved by the NYSDEC and that all controls are in the Department-approved format; and

(iii) that nothing has occurred that would impair the ability of such control to protect the public health and environment;

(3) the owner will continue to allow access to such real property to evaluate the continued maintenance of such controls;

(4) nothing has occurred that would constitute a violation or failure to comply with any site management plan for such controls;

(5) the report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

(6) to the best of his/her knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and

(7) the information presented is accurate and complete.

3. Right to Enter and Inspect. Grantee, its agents, employees, or other representatives of the State may enter and inspect the Controlled Property in a reasonable manner and at reasonable times to assure compliance with the above-stated restrictions. Notwithstanding anything in this Environmental Easement to the contrary, entrance to and inspection of the Controlled Property on Sundays will be limited to emergency situations only.

4. Reserved Grantor's Rights. Grantor reserves for itself, its assigns, representatives, and successors in interest with respect to the Property, all rights as fee owner of the Property, including:

A. Use of the Controlled Property for all purposes not inconsistent with, or limited by the terms of this Environmental Easement;

B. The right to give, sell, assign, or otherwise transfer part or all of the underlying fee interest to the Controlled Property, subject and subordinate to this Environmental Easement;

5. Enforcement

A. This Environmental Easement is enforceable in law or equity in perpetuity by Grantor, Grantee, or any affected local government, as defined in ECL Section 71-3603, against the owner of the Property, any lessees, and any person using the land. Enforcement shall not be defeated because of any subsequent adverse possession, laches, estoppel, or waiver. It is not a defense in any action to enforce this Environmental Easement that: it is not appurtenant to an interest in real property; it is not of a character that has been recognized traditionally at common law; it imposes a negative burden; it imposes affirmative obligations upon the owner of any interest in the burdened property; the benefit does not touch or concern real property; there is no privity of estate or of contract; or it imposes an unreasonable restraint on alienation.

B. If any person violates this Environmental Easement, the Grantee may revoke the Certificate of Completion with respect to the Controlled Property.

C. Grantee shall notify Grantor of a breach or suspected breach of any of the terms of this Environmental Easement. Such notice shall set forth how Grantor can cure such breach or suspected breach and give Grantor a reasonable amount of time from the date of receipt of notice in which to cure. At the expiration of such period of time to cure, or any extensions granted by Grantee, the Grantee shall notify Grantor of any failure to adequately cure the breach or suspected breach, and Grantee may take any other appropriate action reasonably necessary to remedy any breach of this Environmental Easement, including the commencement of any proceedings in accordance with applicable law.

D. The failure of Grantee to enforce any of the terms contained herein shall not be deemed a waiver of any such term nor bar any enforcement rights.

6. Notice. Whenever notice to the Grantee (other than the annual certification) or approval from the Grantee is required, the Party providing such notice or seeking such approval shall identify the Controlled Property by referencing the following information:

County, NYSDEC Site Number, NYSDEC Brownfield Cleanup Agreement, State Assistance Contract or Order Number, and the County tax map number or the Liber and Page or computerized system identification number.

Parties shall address correspondence to: Site Number: C241158
Office of General Counsel
NYSDEC
625 Broadway
Albany New York 12233-5500

With a copy to: Site Control Section
Division of Environmental Remediation

NYSDEC
625 Broadway
Albany, NY 12233

All notices and correspondence shall be delivered by hand, by registered mail or by Certified mail and return receipt requested. The Parties may provide for other means of receiving and communicating notices and responses to requests for approval.

7. Recordation. Grantor shall record this instrument, within thirty (30) days of execution of this instrument by the Commissioner or her/his authorized representative in the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

8. Amendment. Any amendment to this Environmental Easement may only be executed by the Commissioner of the New York State Department of Environmental Conservation or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

9. Extinguishment. This Environmental Easement may be extinguished only by a release by the Commissioner of the New York State Department of Environmental Conservation, or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

10. Joint Obligation. If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

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IN WITNESS WHEREOF, Grantor has caused this instrument to be signed in its name.

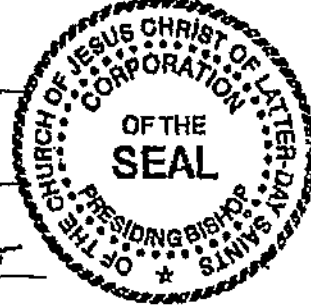
Corporation of the Presiding Bishop of The Church of Jesus Christ of Latter-day Saints:

By: [Signature]

Print Name: Glenn McKay

Title: AUTHORIZED AGENT

Date: 10-1-15



Grantor's Acknowledgment

SEAL

~~STATE OF NEW YORK~~)
UTAH) ss:
COUNTY OF ~~SALT LAKE~~

On the 1st day of OCT, in the year 2015, before me, the undersigned, personally appeared Glenn McKay, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

[Signature]

Notary Public - State of ~~New York~~ UTAH



SEAL

County: Queens Site No: C241158 Brownfield Cleanup Agreement Index : C241158

**THIS ENVIRONMENTAL EASEMENT IS HEREBY ACCEPTED BY THE
PEOPLE OF THE STATE OF NEW YORK, Acting By and Through the Department of
Environmental Conservation as Designee of the Commissioner,**

By:

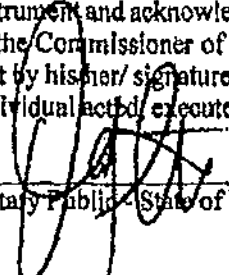


Robert W. Schick, Director
Division of Environmental Remediation

Grantee's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF ALBANY)

On the 21st day of October, in the year 2015, before me, the undersigned, personally appeared Robert W. Schick, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/ executed the same in his/her/ capacity as Designee of the Commissioner of the State of New York Department of Environmental Conservation, and that by his/her/ signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.


Notary Public, State of New York

David J. Chiusano
Notary Public, State of New York
No. 010H5082146
Qualified in Schoenectady County
Commission Expires August 22, 2016

SEAL

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APPENDIX 4 – MONITORING WELL LOGS

Monitoring Well Logs are attached below.

Environmental Corporation 57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006					WELL LOG		WELL NUMBER MW-3i	
PROJECT NAME: CPB LOCATION: 3229 Far Rockaway Boulevard, Edgemere, Queens, NY							WELL PERMIT NUMBER	
PROJECT NO.: 174788.0000.0000 Phase 000002 CONTRACTOR: Summit, Inc.							START DATE: 04/27/10 FINISH DATE: 04/30/10 DRILLER: R.Logel LOGGED BY: A.Safter-Myers	
SAMPLER TYPE/DIA.: split spoon/2" TYPE OF WELL: Monitoring DEPTH TO BEDROCK: N/A DRILLING METHOD: Hollow stem auger/ mud rotary TOTAL DEPTH DRILLED: 38 feet BIT TYPE: Auger bit								
DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS	
0							2.45' stickup above ground surface 0 to 8": Fine Sand,	
2								
4								
6								
8	5,4,4,3	0					8 to 10": N/A- rock in shoe	
10	1/12,1/6,1	24	24				10 to 11': Bronw Grey Fine to Medium SAND with little fine to medium gravel, 11 to 12": Dark Brown Meadowmat, strong organic odor	
12	W.O.R.	21	137				12 to 14': Darlk Brown- Black Meadowmat, strong organic odor.	
14			281					
16								
18								
20								
22								
24								
26								
28								
30								
CASING TYPE/DIAMETER (IN.) INNER: <u>PVC/2</u> OUTER: <u>Steel/4</u>					STATIC WATER LEVEL: <u>6.39 (4/30/2010)</u> feet below surface DEPTH WATER ENCOUNTERED: <u>6.39</u> feet below surface			
SCREENED OR OPEN INTERVAL: <u>28.30 - 38.0</u> (FEET BELOW SURFACE)					MEASURING POINT ELEVATION: _____ ft., msl GROUND SURFACE ELEVATION: _____ ft., msl			



WELL LOG

MW-3i

TRC Raviv Job No. 01C2XXX
/CPB Well 4_26-30_10.xls/Well Log MW-3i

Environmental Corporation 57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006						WELL LOG		WELL NUMBER MW-4i WELL PERMIT NUMBER	
PROJECT NAME: CPB LOCATION: 3229 Far Rockaway Boulevard, Edgemere, Queens, NY								START DATE: 04/27/10 FINISH DATE: 04/30/10 DRILLER: R.Logel LOGGED BY: A.Safter-Myers	
PROJECT NO.: 174788.0000.0000 Phase 000002 CONTRACTOR: Summit, Inc.									
SAMPLER TYPE/DIA.: split spoon/2" DEPTH TO BEDROCK: N/A TOTAL DEPTH DRILLED: 38 feet TYPE OF WELL: Monitoring DRILLING METHOD: Hollow stem auger BIT TYPE: Auger bit									
DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS		
0							2.8' stickup above ground surface		
2									
4									
6									
8									
10									
12									
14									
16									
18									
20									
22									
24									
26									
28									
30									
CASING TYPE/DIAMETER (IN.) INNER: <u>PVC/2</u> OUTER: <u>Steel/4</u>						STATIC WATER LEVEL: <u>6.39 (4/30/2010)</u> feet below surface DEPTH WATER ENCOUNTERED: <u>6.39</u> feet below surface			
SCREENED OR OPEN INTERVAL: <u>28.30 - 38.0</u> (FEET BELOW SURFACE)						MEASURING POINT ELEVATION: _____ ft., msl GROUND SURFACE ELEVATION: _____ ft., msl			



MW-4i

INDEX

Environmental Corporation 57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006					WELL LOG		WELL NUMBER MW-4s WELL PERMIT NUMBER	
PROJECT NAME: CPB LOCATION: 3229 Far Rockaway Boulevard, Edgemere, Queens, NY							START DATE: 04/27/10 FINISH DATE: 04/29/10 DRILLER: R.Logel LOGGED BY: A.Safter-Myers	
PROJECT NO.: 174788.0000.0000 Phase 000002 CONTRACTOR: Summit, Inc.								
SAMPLER TYPE/DIA.: TYPE OF WELL: Monitoring DEPTH TO BEDROCK: N/A DRILLING METHOD: Hollow Stem Auger TOTAL DEPTH DRILLED: 17.74 feet BIT TYPE: Auger bit								
DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS	
0							3.41' stickup above ground surface	
2								
4								
6								
8								
10								
12								
14								
16								
18								
20								
22								
24								
26								
28								
30								
CASING TYPE/DIAMETER (IN.) INNER: stainless steel/2 OUTER: NA						STATIC WATER LEVEL: 5.79(4/30/2010) feet below surface DEPTH WATER ENCOUNTERED: 5.79 feet below surface		
SCREENED OR OPEN INTERVAL: 2.74-17.74 (FEET BELOW SURFACE)						MEASURING POINT ELEVATION: _____ ft., msl GROUND SURFACE ELEVATION: _____ ft., msl		

Environmental Corporation 57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006					WELL LOG		WELL NUMBER MW-6i		
PROJECT NAME: CPB LOCATION: 3229 Far Rockaway Boulevard, Edgemere, Queens, NY							WELL PERMIT NUMBER		
PROJECT NO.: 174788.0000.0000 Phase 000002 CONTRACTOR: Summit, Inc.							START DATE: 04/26/10 FINISH DATE: 04/30/10 DRILLER: R.Logel LOGGED BY: A.Safter-Myers		
SAMPLER TYPE/DIA.: split spoon/2" TYPE OF WELL: Monitoring DEPTH TO BEDROCK: N/A DRILLING METHOD: Hollow stem auger/ mud rotary TOTAL DEPTH DRILLED: 38 feet BIT TYPE: Auger bit/rotary bit									
DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS		
0							2.17' stickup above ground surface		
2							0 to 8': Fine Sand,		
4									
6									
8	1,1,1,3	20	ND						
10	1,1,1,2	6	ND				8 to 12': Brown to Lt. brown Fine to Medium SAND with little medium gravel, wet		
12	1,1,1,1	24	ND				12 to 18': Grey Brown Fine to Medium SAND		
14	1,1/12,3	18	ND						
16	1,1,1,2	22	ND						
18	1/18,1	11	ND				18 to 20': Grey Brown Fine to Medium SAND, grey clay at 20'		
20	1/24	16	ND				20 to 22': Dark Grey clay with organics		
22									
24									
26									
28									
30									
CASING TYPE/DIAMETER (IN.) INNER: PVC/2 OUTER: Steel/4						STATIC WATER LEVEL: 8.48 (4/30/2010) feet below surface DEPTH WATER ENCOUNTERED: 8.48 feet below surface			
SCREENED OR OPEN INTERVAL: 28.58 - 38.0 (FEET BELOW SURFACE)						MEASURING POINT ELEVATION: _____ ft., msl GROUND SURFACE ELEVATION: _____ ft., msl			

 Environmental Corporation 57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006					WELL LOG		WELL NUMBER MW-6i	
DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS	
32							End of boring at 38.58 feet	
34								
36								
38								
							<u>Well construction details</u> 0 to 22': 4" outer casing steel, cement grouted then rotary mud drilled for 2" inner solid PVC casing 22 to 25': cement grout, 2" solid PVC casing 25 to 26': bentonite seal, 2" solid PVC casing 26 to 28.58': No. 1 sand, 2" solid PVC casing 28.30 to 38.0': No. 1 sand, 2" PVC screen	

Environmental Corporation 57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006						WELL LOG		WELL NUMBER MW-6s	
PROJECT NAME: CPB LOCATION: 3229 Far Rockaway Boulevard, Edgemere, Queens, NY								WELL PERMIT NUMBER	
PROJECT NO.: 174788.0000.0000 Phase 000002 CONTRACTOR: Summit, Inc.								START DATE: 04/27/10 FINISH DATE: 04/30/10 DRILLER: R.Logel LOGGED BY: A.Safter-Myers	
SAMPLER TYPE/DIA.: DEPTH TO BEDROCK: N/A TOTAL DEPTH DRILLED: 12 feet				TYPE OF WELL: Monitoring DRILLING METHOD: Hollow Stem Auger BIT TYPE: Auger bit					
DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS		
0							2.42' stickup above ground surface		
2							<u>End of Boring 12 feet</u> <u>Well construction details</u> 0 to 1' : Cement grout, 2" PVCcasing 1 to 2'; Bentonite seal, 2" PVC casing 2 to 12': No. 1 sand, 2" PVC screen casing		
4									
6									
8									
10									
12									
14									
16									
18									
20									
22									
24									
26									
28									
30									
CASING TYPE/DIAMETER (IN.) INNER: PVC/2 OUTER: NA						STATIC WATER LEVEL: <u>8.29 (4/30/2010)</u> feet below surface DEPTH WATER ENCOUNTERED: <u>8.29</u> feet below surface			
SCREENED OR OPEN INTERVAL: <u>2-12</u> (FEET BELOW SURFACE)						MEASURING POINT ELEVATION: _____ ft., msl GROUND SURFACE ELEVATION: _____ ft., msl			

Environmental Corporation 57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006					WELL LOG		WELL NUMBER MW-8i		
PROJECT NAME: CPB LOCATION: 3229 Far Rockaway Boulevard, Edgemere, Queens, NY							WELL PERMIT NUMBER		
PROJECT NO.: 174788.0000.0000 Phase 000002 CONTRACTOR: Summit, Inc.							START DATE: 04/26/10 FINISH DATE: 04/30/10 DRILLER: R.Logel LOGGED BY: A.Safter-Myers		
SAMPLER TYPE/DIA.: split spoon/2" TYPE OF WELL: Monitoring DEPTH TO BEDROCK: N/A DRILLING METHOD: Hollow stem auger/ mud rotary TOTAL DEPTH DRILLED: 38 feet BIT TYPE: Auger bit/rotary bit									
DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS		
0							2.6' stickup above ground surface		
2							0 to 8': Fine Sand,		
4									
6									
8	1/12,1/12	10	ND						
10	1,1,1,2	6	ND				8 to 9': Fill 9 to 13': Grey Brown Fine to Medium SAND		
12	1,1,1,1	24	ND				13 to 14' : Dark Grey Clay		
14	1,1/12,3	18	ND				14 to 16': Grey Fine to Medium SAND		
16	1,1,1,2	22	ND				16 to 18': Grey fine SAND		
18	1/18,1	11	ND						
20	1/24	16	ND						
22									
24									
26									
28									
30									
CASING TYPE/DIAMETER (IN.) INNER: <u>PVC/2</u> OUTER: <u>Steel/4</u>						STATIC WATER LEVEL: <u>5.2(4/30/2010)</u> feet below surface DEPTH WATER ENCOUNTERED: <u>5.20</u> feet below surface			
SCREENED OR OPEN INTERVAL: <u>25.7 - 38</u> (FEET BELOW SURFACE)						MEASURING POINT ELEVATION: _____ ft., msl GROUND SURFACE ELEVATION: _____ ft., msl			



WELL LOG

MW-8i

TRC Raviv Job No. 01C2XXX
/CPB Well 4_26-30_10.xls/Well Log MW-8i

Environmental Corporation 57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006						WELL LOG		WELL NUMBER MW-8s	
PROJECT NAME: CPB LOCATION: 3229 Far Rockaway Boulevard, Edgemere, Queens, NY								WELL PERMIT NUMBER	
PROJECT NO.: 174788.0000.0000 Phase 000002 CONTRACTOR: Summit, Inc.								START DATE: 04/27/10 FINISH DATE: 04/29/10 DRILLER: R.Logel LOGGED BY: A.Safter-Myers	
SAMPLER TYPE/DIA.: DEPTH TO BEDROCK: N/A TOTAL DEPTH DRILLED: 12.07 feet				TYPE OF WELL: Monitoring DRILLING METHOD: Hollow Stem Auger BIT TYPE: Auger bit					
DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS		
0							2.98' stickup above ground surface		
2							<u>End of Boring 12.07 feet</u> <u>Well construction details</u> 0 to 1' : Cement grout, 2" PVCcasing 1 to 2'; Bentonite seal, 2" PVC casing 2 to 12.07': No. 1 sand, 2" PVC screen casing		
4									
6									
8									
10									
12									
14									
16									
18									
20									
22									
24									
26									
28									
30									
CASING TYPE/DIAMETER (IN.) INNER: PVC/2 OUTER: NA						STATIC WATER LEVEL: <u>4.54 (4/30/2010)</u> feet below surface DEPTH WATER ENCOUNTERED: <u>4.54</u> feet below surface			
SCREENED OR OPEN INTERVAL: <u>2-12.07</u> (FEET BELOW SURFACE)						MEASURING POINT ELEVATION: _____ ft., msl GROUND SURFACE ELEVATION: _____ ft., msl			

Environmental Corporation 57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006						WELL LOG		WELL NUMBER MW-9i	
PROJECT NAME: CPB LOCATION: 3229 Far Rockaway Boulevard, Edgemere, Queens, NY								WELL PERMIT NUMBER	
PROJECT NO.: 174788.0000.0000 Phase 000002 CONTRACTOR: Summit, Inc.								START DATE: 04/26/10 FINISH DATE: 04/29/10 DRILLER: R.Logel LOGGED BY: A.Safter-Myers	
SAMPLER TYPE/DIA.: split spoon/2" TYPE OF WELL: Monitoring DEPTH TO BEDROCK: N/A DRILLING METHOD: Hollow stem auger/ mud rotary TOTAL DEPTH DRILLED: 38 feet BIT TYPE: Auger bit/rotary bit									
DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS		
0							2.37' stickup above ground surface		
2							0 to 8": Fine Sand,		
4									
6									
8	WOR	12	0.9						
10	1,1,1,2	6	10.5				8.5 to 16": Grey Brown Fine to Medium SAND, wet, sheen and odor		
12	1,1,1,1	24	ND				1" clay lense at 11'		
14	1,1/12,3	18	ND				3" clay lense at 13.5'		
16	1,1,1,2	22	ND				14 to 18": Dark Grey Soft CLAY with trace of organics		
18	1/18,1	11	ND						
20	1/24	16	ND						
22									
24									
26									
28									
30									
CASING TYPE/DIAMETER (IN.) INNER: <u>PVC/2</u> OUTER: <u>Steel/4</u>						STATIC WATER LEVEL: <u>7.67(4/30/2010)</u> feet below surface DEPTH WATER ENCOUNTERED: <u>7.67</u> feet below surface			
SCREENED OR OPEN INTERVAL: <u>27.13 - 38</u> (FEET BELOW SURFACE)						MEASURING POINT ELEVATION: _____ ft., msl GROUND SURFACE ELEVATION: _____ ft., msl			

WELL LOG

WELL NUMBER

MW-9i[illegible]



57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006

WELL LOG

MW-9s

WELL PERMIT NUMBER

LOCATION: 3229 Far Rockaway Boulevard, Edgemere, Queens, NY

CONTRACTOR: Summit, Inc.

BIT TYPE: Auger bit

LOGGED BY: A.Safer-Myers

DEPTH
FROM
SURFACE
(FEET)

**BLOW
COUNT
PER 6 IN.**

RECOVERY
(INCHES)

PID
(ppm)

**SAMPLE
DESIGNATION**

WELL
DIAGRAM

UNIFIED

LITHOLOGIC CLASSIFICATION AND COMMENTS

0

2

4

6

8

10

12

14

16

18

20

22

24

26

20

30

ASING TYPE/DIAMETER (IN.)

INNER: PVC/2 OUTER: NA

STATIC WATER LEVEL: 6.43 (4/30/2010) feet below surface

DEPTH WATER ENCOUNTERED: 6.43 feet below surface

SCREENED OR OPEN INTERVAL: 2.98-13
(FEET BELOW SURFACE)

MEASURING POINT ELEVATION: ft., msl

GROUND SURFACE ELEVATION: ft., msl

Environmental Corporation 57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006					WELL LOG		WELL NUMBER MW-10s	
PROJECT NAME: CPB LOCATION: 3229 Far Rockaway Boulevard, Edgemere, Queens, NY							WELL PERMIT NUMBER	
PROJECT NO.: 174788.0000.0000 Phase 000002 CONTRACTOR: Summit, Inc.							START DATE: 04/27/10 FINISH DATE: 04/29/10 DRILLER: R.Logel LOGGED BY: A.Safter-Myers	
SAMPLER TYPE/DIA.: TYPE OF WELL: Monitoring DEPTH TO BEDROCK: N/A DRILLING METHOD: Hollow Stem Auger TOTAL DEPTH DRILLED: 16.35 feet BIT TYPE: Auger bit								
DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS	
0							3.41' stickup above ground surface	
2							<u>End of Boring 16.35 feet</u> <u>Well construction details</u> 0 to 1' : Cement grout, 2" stainless steel casing 1 to 2'; Bentonite seal, 2" stainless steel casing 2 to 3': No. 1 sand, 2" solid stainless steel casing 3 to 16.35': No. 1 sand, 2" stainless steel screen	
4								
6								
8								
10								
12								
14								
16								
18								
20								
22								
24								
26								
28								
30								
CASING TYPE/DIAMETER (IN.) INNER: stainless steel/2 OUTER: NA						STATIC WATER LEVEL: 5.36(4/30/2010) feet below surface DEPTH WATER ENCOUNTERED: 5.36 feet below surface		
SCREENED OR OPEN INTERVAL: 2-16.35 (FEET BELOW SURFACE)						MEASURING POINT ELEVATION: _____ ft., msl GROUND SURFACE ELEVATION: _____ ft., msl		

Environmental Corporation 57 E. Willow Street, Millburn, NJ 07041 (973) 564-6006						WELL LOG		WELL NUMBER PZ-3	
PROJECT NAME: CPB LOCATION: 3229 Far Rockaway Boulevard, Edgemere, Queens, NY								WELL PERMIT NUMBER	
PROJECT NO.: 174788.0000.0000 Phase 000002 CONTRACTOR: Summit, Inc.								START DATE: 04/27/10 FINISH DATE: 04/30/10 DRILLER: R.Logel LOGGED BY: A.Safter-Myers	
SAMPLER TYPE/DIA.: split spoon/2" TYPE OF WELL: Monitoring DEPTH TO BEDROCK: N/A DRILLING METHOD: Hollow stem auger TOTAL DEPTH DRILLED: 38 feet BIT TYPE: Auger bit									
DEPTH FROM SURFACE (FEET)	BLOW COUNT PER 6 IN.	RECOVERY (INCHES)	PID (ppm)	SAMPLE DESIGNATION	WELL DIAGRAM	UNIFIED	LITHOLOGIC CLASSIFICATION AND COMMENTS		
0							2.85' stickup above ground surface		
2									
4									
6									
8									
10									
12									
14									
16									
18									
20									
22									
24									
26									
28									
30									
CASING TYPE/DIAMETER (IN.) INNER: <u>PVC/2</u> OUTER: <u>Steel/4</u>						STATIC WATER LEVEL: <u>6.86(4/30/2010)</u> feet below surface DEPTH WATER ENCOUNTERED: <u>6.86</u> feet below surface			
SCREENED OR OPEN INTERVAL: <u>28.30 - 38.0</u> (FEET BELOW SURFACE)						MEASURING POINT ELEVATION: _____ ft., msl GROUND SURFACE ELEVATION: _____ ft., msl			



PZ-3

UNIFIED

APPENDIX 5 – FIELD SAMPLING PLAN

This section is not applicable to this SMP.

APPENDIX 6 – QUALITY ASSURANCE PROJECT PLAN

The QAPP will be developed and included in this Appendix only if a SSDS is installed as part of future development activities.

APPENDIX 7 – HEALTH AND SAFETY PLAN

Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) are attached below.



HEALTH AND SAFETY PLAN

**Remedial Action
CPB - Far Rockaway Project
Far Rockaway, New York**

TRC Job No.
174788.0000.0000

Prepared by:

TRC Environmental Corporation
41 Spring Street, Suite 102
New Providence, New Jersey 07974

April 2016

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Appendices

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Appendix C	Glove Selection Guideline
Appendix D	Heat & Cold Stress
Appendix E	Job Safety Analyses (JSAs)
Appendix F	Tailgate Meeting/Checklist
Appendix G	WorkCare Program Information
Appendix H	Incident Reporting
Appendix I	Acknowledgement

1. Client/Personnel Contact, Emergency Contacts and Utility Clearance Information

1.1 Client/Personnel Contact Information

Table 1 - Site Name/Location, Project Number, Client and Contractor Contact Information		
Site Name:	CPB Site – Queens, NY	TRC Project Number: 174788
Site Address:	Block 15950, Lot 29 Far Rockaway By the Corner of Far Rockaway Freeway and Beach Channel Drive	
Client Contact/Title	Office Phone Number	Cellular Phone Number
Grant Cooper, PhD, PE	(801) 240-4074	(801) 718-0427
Contractor ¹ Contact/Title	Office Phone Number	Cellular Phone Number
To Be Determined		

Notes:

¹ Contractors are required to develop and implement their own Health and Safety Plan.

Table 2 - TRC Personnel and Project Role		
Name / Project Role	Office Phone Number	Cellular Phone Number
Gail Bradbury / TRC Field Lead	908-988-1651	(856) 285-6018
Gail Bradbury / TRC OHSO*	908-988-1651	(856) 285-6018
Anthony Brown / TRC Field Staff	908-988-1618	(609) 226-2169
Phil Bosco / TRC Field Staff	908-988-1708	(551) 486-6452
Heath Potter / TRC Project Manager	(908)-988-1655	(908) 548-3655
Stacey Felts-Bock / Office Safety Coordinator (OSC)	908-988-1719	(973) 289-8213
David Sullivan / RMD Safety Manager	(978) 656-3565	(978) 758-2809
Mike Glenn / TRC Health & Safety Director	(949) 727-7347	(949) 697-7418
Notes: *OHOS – On-Site Health & Safety Officer. The OHOS is 40-hour OSHA certified, is current on refresher training, and has OSHA 8-hour supervisor training. The OHOS can be Field Lead or a member of the Field Staff as suits the work at hand and/or the availability of qualified personnel.		

1.2 Emergency Medical Assistance

Table 3 - Emergency Telephone Numbers		
Service	Emergency Telephone Numbers	Direct Telephone Numbers
Police: Far Rockaway Police Department (NYPD)	Emergency: 911	(718)-318-1294

Table 3 - Emergency Telephone Numbers		
Service	Emergency Telephone Numbers	Direct Telephone Numbers
Fire: NYFD	Emergency: 911	
Ambulance: St. John's Episcopal Hospital		(718) 868-7000
Poison Control: (use applicable local number)	800 222-1222	
CHEMTREC:		800-424-9300
WorkCare (Early Incident Intervention)	888 449-7787	

1.3 Medical Facility Identification and Directions

Hospitals or clinics identified for emergency medical care should be contacted, to verify that emergency care is provided at that location. Verify the exact location of the medical facility during this call.

Drive the emergency route as defined below before the fieldwork begins to verify that the planned route is feasible.

Nearest Hospital: St. John's Episcopal Hospital

Hospital Address: 327 Beach 19th St, Far Rockaway, NY 11691

Hospital Telephone Number: (718) 868-7000

Directions to Hospital (see attached Map):

Exit site, turn left and proceed west down Far Rockaway Boulevard. And make left hand turn from Far Rockaway Blvd onto Sea Girt Boulevard. Continue approximately $\frac{3}{4}$ of a mile and make left hand turn onto Beach 19th Street. Continue straight on Beach 19th Street. Hospital is one block up on left.

Map to Hospital:

A map to St. John's Episcopal Hospital from the site is provided as an insert to this HASP on the following page.

1.4 Utility Clearance Information

The utility clearance will be conducted prior to the commencement of subsurface drilling. Both one-call clearance and a private utility mark-out will be conducted. The clearance number will be provided by the subcontracted driller prior to work. The responding utility companies will be checked against the list below to ensure sufficient clearance.

Table 4 – Utility Clearance Information		
Clearance Organization, Number and Utilities Covered	Clearance Numbers (or Other Documentation) and Date Obtained	Expiration Dates/Other Notes
Consolidated Edison (Gas)	TO BE PROVIDED AS THE WORK DATE APPROACHES	
NYC DEP (Potable water and sewer)		
Verizon (Phone and fiber optics)		
LIPA or Consolidated Edison (Electric)		
Notes: Use Drilling/Borehole/Excavation Checklist in Appendix A before conducting intrusive or overhead work with the potential to encounter utilities.		

2. Site Information

This Health and Safety Plan covers the activities associated with TRC's conduct of environmental monitoring at CPB Site, located at Block 15950, Lot 29 (Far Rockaway Blvd.) in Edgemere, New York. CPB is a vacant lot with brush and shrubby growth. A detailed summary of previous site investigations and remedial actions, including implementation of the ISTT groundwater remedy, is contained in the ISTT Remedial Action Report (RAR) submitted to NYSDEC, dated August, 2012. As described in the RAR, a thermal treatment program was implemented at the Site from November 1, 2010 to August 25, 2011. The ISTT remedy successfully achieved and surpassed all required site-specific NYSDEC remedial goals.

Site History

Excavations to remove petroleum impacted soils were enacted following UST removal and the observation of free product on the site. During these excavations, impacts to soil and groundwater from chlorinated solvents was discovered. Soil and ground water investigations at the site have revealed the presence of soil and ground water impacts above NYDEC's soil cleanup criteria and Ground Water Quality Standards for PCE, cis 1,1 DCE and VC. Additional investigations also detected the presence of residual petroleum impacts at the site. An ISTT work plan was developed by TRC and approved by the New York state department of Environmental conservation (NYSDEC). The ISTT system operated on site from November 15, 2010 and operated for 283 days. The ISTT program was successful at removing contaminant mass, with a maximum post treatment PCE concentration of 23 ug/L observed at MW-4i.

Table 5 – Contaminant Concentrations	
Compound	Highest Concentration (December 2011) - µg/L
Tetrachloroethene (PCE)	23.1
Trichloroethene (TCE)	267
Cis-1,2 Dichloroethene	1,850
Vinyl Chloride	311
Xylenes	404
Toluene	189

3. Work Scope Summary

The work to be conducted at and around the site will consist of Remedial Action activities. Soil borings, temporary well point and soil gas sampling points will be installed both on-site, and along the sidewalks and streets around the site. Additional surface soil samples will be collected on site, to a depth of 2 feet below grade. Drilling locations will be pre-cleared with a private utility markout, in addition to the Dig Safe One Call. See the Remedial Action Work Plan for additional details regarding the Scope of Work.

Remedial Action activities will consist of the installation of 2 asphalt caps over areas of impacted soil. See the Remedial Action Work Plan and the Construction Quality Assurance Project Plan (CQAPP) for additional details regarding the Remedial Action Scope of Work.

4. Roles/Responsibilities

Per the TRC RMD HASP Template Development Memorandum (2013), Roles and responsibilities descriptions are required in all cases where a specific safety-related plan or permit is required such as permit-required confined space entry and Lock Out/Tag Out. The OSC or Project Manager may also require role and responsibility at their discretion. As noted below, per TRC policy all employees are empowered to stop work if they feel it is unsafe to continue. Safety issues must be brought to the attention of the Project Manager.

4.1 Stop Work Authority

All TRC employees and subcontractor employees have the authority and obligation to stop any project if they observe a condition that could put people or equipment at risk. TRC's Stop Work Authority policy is summarized below.

What is Stop Work Authority?: Stop Work Authority is the ability to stop work if there is a potential safety issue. Employees will not be reprimanded for issuing a stop work and all project employees will adhere to the stop work condition and no work will continue until the issues have been resolved. The Stop Work Process includes appropriate training, stopping the work, notifying Project Manager of the stop work condition, correcting the condition and resuming operation once the condition has been corrected.

Policy Understanding and Management Responsibility: Employees are required to read and understand the Stop Work Authority policy in order to recognize conditions that could warrant a stop work injunction. Project Managers will encourage employees to initiate stop work authority when necessary and notify other employees and the client of the stop work condition. The Project manager will conduct an investigation into the conditions that led to the stop work order and verify that the unsafe condition has been corrected before work can recommence. Work can only continue when it is safe to do so.

Stop Work Related Reporting: A written report will be prepared by the Project Manager that documents the reason for the stop work, the corrective measures taken and the lessons learned from the incident. These reports will be reviewed by the TRC Safety Department and Senior Management and also shared with the client. Once work has resumed after the stop work condition has been closed the Project Manager or designee will conduct a follow-up inspection to verify that the safety concerns have been addressed and corrective measures implemented.

4.2 Project Manager

The TRC Project Manager is responsible for controlling the technical work in an environmentally safe manner, assuring that operational hazards are minimized and that appropriate precautionary actions are implemented this during project work. Specific responsibilities include but are not limited to:

- Implementing and confirming that all subcontractors to TRC are prequalified to conduct the work included in their Contract, including health and safety pre-qualifications.
- Verifying that all TRC personnel involved with this project have the required training and medical clearance for the work and environment they will be assigned.
- Verifying that all personnel involved with this project have read and understand this HASP and have signed the HASP.
- Assuring that all personnel involved with this project have attended a briefing or a tailgate safety meeting regarding the contents of the HASP and site-specific hazards prior to performing work.
- Determining that sufficient personal protective equipment (PPE), air monitoring equipment and other equipment, as required by this HASP, are available and that the personnel are training in the proper use of PPE as well as other administrative and/or engineered controls.
- Assuring that all subcontractor personnel submit documentation of employee participation in a medical, training and drug & alcohol programs (when applicable).
- Promoting and maintaining a high level of health and safety consciousness among the field personnel.

4.3 On-Site Health & Safety Officer

The On-Site Health & Site Safety Officer (OHSO) is responsible for ensuring the Health & Safety guidelines are followed, in addition to monitoring for airborne contaminants when necessary and evaluating new hazards and operation changes. The OHSO has the authority to correct all noncompliance situations immediately and to stop work in cases of immediate danger. Specific responsibilities include but are not limited to:

- Performing daily safety meetings prior to commencement of work, commencement of a new task and whenever new personnel arrive.
- Obtaining the air monitoring instrumentation required and conducting or directing the necessary air monitoring.
- Verifying that all PPE and other health and safety equipment are in proper working condition.
- Advising the Project Manager and field personnel on matters relating to health and safety.
- Recommending appropriate PPE and air monitoring instrumentation to protect personnel from site hazards and coordinating the upgrading and downgrading of PPE as specified in the HASP.
- Establishing and maintaining the work zones per the HASP.
- Conducting field observations to monitor the effectiveness of the HASP and to assure compliance with the HASP.
- Performing personal exposure monitoring where required and to determine the adequacy of protective measures and PPE specified by this HASP. Working with the Project Manager to ensure that sufficient PPE is available onsite.
- Conducting briefing meetings and apprising personnel of the contents of the HASP and site hazards.
- Supervising and monitoring the safety performance of all field personnel to ensure required safety and health procedures are followed and correct any deficiencies.
- Initiating emergency response procedures, as well as incident reporting and near miss reporting.
- Notifying the Project Manager and Office Safety Coordinator of all noncompliance and dangerous situations.
- Reporting all accidents/incidents/near misses to the Office Safety Coordinators and/or Project Manager.

4.4 Office Safety Coordinators and Line Managers

The OSCs and Line Managers are responsible for the following:

- Providing managerial and executive level support for all matters regarding project health and safety.
- Assisting the Project Manager in developing the HASP and identifying task-specific Job Safety Analyses (JSAs) to incorporate in the plan.
- Safety Observations.
- Near miss/incident investigations.
- Accident/incident investigations.

4.5 Field Lead

The TRC Field Lead is responsible for the field operations needed to complete the project. The Field Lead may also be the OHSO. Specific responsibilities include but are not limited to:

- Leading by example.
- Ensuring all equipment needed for the project is available and properly maintained.
- Ensuring field personnel have received the necessary training and Health & Safety briefings before work begins.
- Correcting any deficiencies regarding health, safety or operating procedures.
- Communicating newly identified hazards or noncompliance issues with the OHSO, OSC(s), and TRC Management
- Reporting any injuries and illnesses to the Project Manager, OSHO, and OSCs.

4.6 Field Personnel/Staff

All field personnel are responsible for following the health and safety procedures specified in this HASP and work practices specified in applicable operating procedures. Some specific responsibilities include but are not limited to:

- Maintaining an awareness of their training status and demonstrating that they have the required training and medical clearance for the work and environment they will be assigned.
- Reporting all accidents, incidents, injuries, illnesses, or near misses to the Field Lead.
- Complying with the requests of the OHSO and Field Lead.
- Immediately communicating newly identified hazards or noncompliance issues to the OHSO and Field Lead.

5. Hazard Assessment

This HASP assumes that an ongoing hazard assessment process with Project Management and TRC Office Safety Coordinators (OSCs) will take place regularly (via meetings/teleconferences), supplemented by ad hoc communication on project safety needs, to ensure the project work is conducted at a high level of technical excellence both safely and efficiently. Where the on-going hazard assessment indicates the presence of hazards, tasks, or other activities that are not adequately covered by the HASP and supporting documentation and/or staff training levels, supplemental planning will be conducted and documented in a revised or higher level HASP document and appropriately trained personnel assigned.

5.1 Chemical Hazards

Based on previous experience at the site from prior RI and RA activities, TRC anticipates the presence of the following contaminants at the site:

- Petroleum hydrocarbons (e.g., benzene, mineral oil dielectric fluid)
- Chlorinated VOCs (Trichloroethene and breakdown products: cis-1,2 dichloroethene, vinyl chloride)

TRC also anticipates the presence of the following chemicals in laboratory bottles used as sample preservatives: nitric acid, sulfuric acid, and hydrochloric acid. Material Safety Data Sheets (MSDS) for preservatives and decontamination products are provided in Appendix B. Sample bottles containing hazardous preservatives will be handled with care. Sample bottles will be checked for leaks and lids tightened. Cut resistant and chemical resistant gloves and safety glasses will be worn at all times when handling sample bottles.

Isobutylene will be used during a short time period at the beginning of each work day to calibrate the PID. 100 ppm isobutylene will be primarily contained in a tedlar bag. Any gas that is released to the air will quickly disperse and will not pose a threat to on-site workers. No further monitoring is required for isobutylene.

The following is a list of the accepted exposure limits in parts per million (ppm) of the contaminants of concern.

Contaminant of Concern	PEL-TWA	PEL-STEL	TLV-TWA	TLV-STEL	A1	A2	Skin	Ceiling Concentration
Trichloroethene	100	NA	50	25	No	Yes	Yes	200
Tetrachloroethene	100	NA	10	25	No	Yes	Yes	200
Cis-1,2-Dichloroethene	200	NA	200	NA	No	No	No	NA
Vinyl Chloride	1	NA	1	NA	No	No	Yes	5
Petroleum Hydrocarbons (Naptha)	500	NA	350	NA	No	No	Yes	1800

PEL-TWA, OSHA = Permissible Exposure Limit-Time Weighted Average

PEL-STEL, OSHA = Permissible Exposure Limit-Short Term Exposure Limit

TLV-TWA, ACGIH = Threshold Limit Value-Time Weighted Average

TLV-STEL, ACGIH = Threshold Limit Value-Short Term Exposure Limit

A1, ACGIH = Known Human Carcinogen

A2 = Suspected Human Carcinogen

Skin = Potential overall exposure through skin absorption, including mucous membranes and eye, either airborne or through direct contact with the substance

Ceiling, ACGIH = Concentration that should not be exceeded during any part of the working exposure

Note: Concentrations are in ppmv

5.2 Key Physical Hazards

Key physical hazards are outlined below. If a Job Safety Analysis (JSA; see Section 10 and supporting appendix) has been included, this is signified below in first column.

Table 6 - Key Physical Hazards Matrix			
JSA	APPL.	KEY PHYSICAL HAZARDS	GENERAL CONTROL MEASURE
☐	☒	Edges/material handling	Cut resistant gloves are required to be worn at all times while performing all tasks. A glove selection guideline is presented in Appendix C.
☐	☒	Weather	Heat and cold stress are a potential concern for on-site workers. Please refer to Appendix D for the signs, symptoms and precautions for cold and heat stress, and required breaks. Work will also occur during a time of year when thunderstorms are possible/likely. If thunder or lightning is noted by onsite personnel, work will cease until the storm passes (thunder and/or lightning ceases and is not observed over at least a 15-minute period). Personnel will seek shelter in buildings or vehicles
☐	☒	Energized Sources (electrical equipment or hookups, lines, etc.)	Personnel engaged in electrical activities, and any facility equipment with moving parts must follow proper lock-out/tag-out procedures, and only properly trained employees will perform the work. Heed any caution signs or labels.
☐	☒	Slips, Trips, Falls	Be aware of uneven ground, and buried debris (metal, plastic, etc.), to avoid potential slip/trip/fall hazards, and use caution near open excavations. Maintain good housekeeping practices to eliminate physical hazards. Use proper lifting techniques to avoid injury and obtain help when lifting greater than 50 lbs. Be aware of uneven ground to avoid potential slip/trip/fall hazards and also of buried debris (metal, plastic, etc.). Sites with unprotected edges >6' require barricades and/or fall protection equipment. A fall protection plan will be required if there is leading edge work including excavations >6' deep.
☒	☒	Heavy Equipment	Use caution around construction equipment and emergency response vehicles. Ensure the operator of the construction/emergency equipment is aware of the location of onsite personnel at all times to avoid potential injury to onsite workers (e.g., maintain eye contact with the equipment operator). If full visibility is not possible during movement of equipment a spotter should be used to direct the movement of heavy equipment. A swing zone should be established with cones behind any excavators to prevent injury during movement of equipment. Exercise caution and wear protective equipment as noted herein (e.g., safety toe boots, hard hat, Class 3 reflective safety vest, ear plugs, etc.) around the heavy equipment to prevent crushing and pinching hazards.
☐	☒	Underground or Overhead Utilities	Existing underground utilities are present at the project site. Prior to conducting active excavation, the Site will be visually observed for potential overhead hazards (e.g., tree branches and wires), and drilling/excavation locations will be selected that are located at safe distances from the hazard. Use caution when heavy equipment may come in contact with utilities. Maintain a minimum distance of 10 feet from overhead utilities at all times. Proceed cautiously and with due diligence to minimize the possibility of contacting underground or overhead utilities. Use TRC utility clearance checklist prior to starting any subsurface work.

Table 6 - Key Physical Hazards Matrix

JSA	APPL.	KEY PHYSICAL HAZARDS	GENERAL CONTROL MEASURE
☐	☒	Driving/Traffic Hazards	Driving to and from the Site each day is considered a physical hazard. Directions and travel time to the Site should be determined in advance (a.k.a. Journey Management Planning) and adequate time should be allocated to drive safely. The use of cellular phones is prohibited, and distracted driving should be avoided. Seatbelts must be worn at all times while the vehicle is moving. Use caution around traffic flow. Ensure proper traffic control (e.g., signs, traffic cones, jersey barriers, etc., or where jurisdictionally required, police details) are in place prior to and throughout the work day where work takes place in or near traffic. Work personnel must wear ANSI-rated class 3 reflective traffic vests at all times. A site-specific traffic management plan describing procedures to be employed, including barriers, signage, and police detail, will be used for tasks taking place in areas of vehicular traffic.
Notes: APPL. – Abbreviation for “Applicable.” JSA – Job Safety Analysis			

5.3 Other Common Physical Hazards Potentially Present

Other common physical hazards that might be encountered during the course of the work are outlined below. If a JSA (see Section 10 and supporting appendix) has been included, this is signified below in the first column.

Table 7 - Other Common Physical Hazards Matrix			
JSA	APPL.	PHYSICAL HAZARD	GENERAL CONTROL MEASURE
☐	☐	Aboveground Storage Tanks (AST)	Be aware of any above ground storage tanks and the type of material being stored in them. Be aware of the potential of spills, sources of ignition, fires, explosions, etc., while working near the tanks. Stay clear of tanks whenever possible, and be aware of any equipment operators near the tank(s).
☐	☐	Arcing, welding, open flame work	TRC personnel will clear the area when work of this kind is undertaken by the client/subcontractor unless properly trained and equipped with PPE.
☐	☐	Blasting/Explosives	TRC personnel shall not handle any explosive devices or materials. TRC personnel should understand the blasting procedures being used by the subcontractor, and all of the associated health and safety precautions. The subcontractor shall handle, store, and use the explosives in accordance with 29 CFR 1926.900, Subpart H and U.
☐	☐	Business Traffic	Be aware of traffic patterns associated with local businesses near the work site. Allow traffic to enter and exit the businesses in such a manner to avoid creating traffic hazards, back-ups, delays, or potential accident situations. Review directions before all business travel.
☐	☐	Cement Dust	Stay clear of mixing operations and avoid contact with, or breathing of the dust.
☐	☐	Chain Saws/Power Saws	Stay clear of any chain saw/power saw operations. Subcontractor is responsible for the safe use of chain saws/power saws on site.
☐	☒	Cleaning Agents	Use caution of applying cleaning agent to equipment. Use gloves, safety glasses, splash shields, and protective clothing as needed.
☐	☒	Client Activities	Be aware of client activities at or adjacent to the site. Work activities should be coordinated with other site activities to avoid conflicts.
☐	☒	Compressed Air/Gas, Pressurized Liquids Hoses, Lines & Fittings	Compressed air or gas, or pressurized liquid lines or hoses should be inspected at least daily, or in the event a leak develops, or if a line or hose is run over or crimped.
☐	☐	Concrete/Masonry/ Foundations	No construction loads shall be placed on a concrete structure or portion of a concrete structure unless a person who is qualified in structural design has determined that the structure or portion of the structure is capable of supporting the loads. All protruding reinforcing steel, onto and into which employees could fall, shall be guarded to eliminate the hazard of impalement. No employee shall be permitted to work under concrete buckets while buckets are being elevated or lowered into position. To the extent practical, elevated concrete buckets shall be routed so that no employee, or the fewest number of employees, are exposed to the hazards associated with falling concrete buckets. A limited access zone shall be established whenever a masonry wall is being constructed. All masonry walls over eight feet in height shall be adequately braced to prevent overturning and to prevent collapse unless the wall is adequately supported so that it will not overturn or collapse. The bracing shall remain in place until permanent supporting elements of the structure are in place.

Table 7 - Other Common Physical Hazards Matrix			
JSA	APPL.	PHYSICAL HAZARD	GENERAL CONTROL MEASURE
☐	☐	Confined Spaces (tanks, vaults, vessels, trenches, manholes, some excavations, etc.)	The scope of this project does not entail entry into confined spaces. Confined spaces will not be entered unless a confined space entry permit or other planning has been completed, signed, and approved, and all participating personnel are trained in confined space entry procedures, including safety, and rescue procedures. Real and potential hazards of confined space are not addressed by this hazard assessment, and health and safety plan.
☐	☒	Cutting Tools	Stay clear of contractors' cutting tools, especially saws and torches. Be aware that cutting operations could create other hazards, such as falling objects, or shifting materials, etc. All cutting tools must be inspected and saw blade type reviewed prior to starting work. Appropriate hand protection and safety glasses should be worn while using cutting tools. Spark-proof tools should be used when working in areas of potential explosive or flammable conditions.
☐	☐	Demolition Activities/Debris	Stay clear of walls, ceilings, roofs, etc., as they are being demolished. Demolition material should only be handled by appropriate equipment because of sharp points, edges, etc. Demolition material may also pose a trip hazard, fall, or puncture hazard, so avoid walking or climbing on debris piles, etc.
☐	☐	Dim Lighting	If electrical power has been disrupted causing dim/low lighting conditions and or work is required to be performed through the evening hours. Use a suitable flashlight and/or portable lighting in low lighting areas.
☐	☒	Drilling Operations	Drilling operations involve boring, augering or directionally pushing into soil or other surfaces. Various types of mechanical equipment may be used to provide the force of drilling. Drilling may be on a small scale, such as during the installation of monitoring wells, or a large scale project such as oil or gas well drilling. Drilling operations present physical and mechanical hazards as well. The equipment used in drilling can cause injury if not operated properly. Combustion engines are often used as a power source, and these also present hazards in terms of flammability, and as sources of vapors. Typical injuries that could result include eye injuries, burns, scrapes, and cuts from mechanical equipment. Chemical hazards could also be present in the water or soil resulting from drill cuttings.
☐	☐	Downed electrical wires	Downed wires can energize other objects, including fences, water pipes, bushes and trees, buildings, telephone/CATV/fiber optic cables and other electric utilities. Even manhole castings and reinforcement bars (re/bar) in pavement can become energized by downed wires. During storms, wind-blown objects such as canopies, aluminum roofs, siding, sheds, etc., can also be energized by downed wires.
☐	☒	Drums	If drums are used on-site, they should be clearly labeled with the name of the contents. Drums should only be handled with the appropriate equipment. Drums discovered during excavations, etc., shall not be opened or moved until appropriate identification can be performed. <i>At a minimum, Level B protection is required for sampling any unlabeled drums discovered during remediation procedures. This HASP does not contemplate and upgrade to Level B. Coordinate in advance with your OSC, RMD Safety Manager, or TRC Health and Safety direct before conducting Level B work of any kind.</i>

Table 7 - Other Common Physical Hazards Matrix			
JSA	APPL.	PHYSICAL HAZARD	GENERAL CONTROL MEASURE
☐	☒	Dust/Particulates	For general dust, work should be performed up-wind if possible. If conditions warrant it, monitoring should be done with PM-10 monitor as described herein. For hazardous dusts, a detailed air monitoring plan and a respiratory protection plan should be developed in consultation with a Certified Industrial Hygienist (CIH) for the site activities before proceeding.
☐	☒	Ground Fault Circuit Interrupters (GFCI) and Electrical Cords	GFCIs will be used on all 120 volt, single phase, 15 and 20-ampere receptacle outlets when electrical equipment is used on-site. Electrical cords will be inspected for cracks, tears, or general wear to the outer protective casing. If the wiring of the cord is exposed, the cord will be repaired, if possible, or discarded. All extension cords will contain a grounding prong. If the grounding prong is missing, or if the cord was designed to contain only two prongs, the cord will not be allowed for use. These cords are dangerous and cannot be grounded through the use of a GFCI.
☐	☐	Elevated Work	For any construction work activities elevated 6 feet or more, or other non-construction activities elevated 4 feet or more, fall protection must be provided. Caution should be taken on catwalks and ladders because of potential slippery conditions, or the potential for footwear to catch on the surfaces.
☐	☒	Equipment Exhaust	Equipment exhaust should be ventilated away from the work area while drilling inside structures. Industrial fans can be used to move exhaust out of the area.
☐	☒	Ergonomic Issues	Ergonomic hazards will be addressed on a site-specific basis once mobilization to the field has occurred.
☐	☒	Evening Work	If work is performed during the evening hours, work shall be limited by the availability and the quality of artificial lighting. Care should also be taken to avoid slip, trip, and fall hazards that are not as easy to identify during low light conditions.
☐	☐	Excavations	Stay clear of excavation walls. TRC personnel will not enter an excavation, in accordance with 1926 Sub Part P. Subcontractor must provide a competent person on site, if one is required by the planned activities. Side cuts should conform to 1926 Subpart P requirements, or shoring should be used. All open excavations should be secured using traffic cones, barrier tape, or barricade signs stating "Do Not Enter Excavations", especially if left open overnight
☐	☐	Explosives	Be aware of potential explosive materials and how to identify them. No smoking is allowed on-site or near where potential explosive materials may be present.
☐	☐	Facility Conveyors (product or waste lines)	Stay clear of facility conveyors, product process lines, and waste disposal lines. Be aware of any client specific health and safety requirements to work in these areas.
☐	☒	Facility Equipment/Machinery	Be aware of active and moving client equipment on site.
☐	☐	Facility Piping (Above Ground)	Stay clear of above ground pipes. Unless other arrangements have been made, the Client and/or Facility owner is responsible to identify all applicable aboveground facility pipes prior to any work activities in the area on their facility. Pipes can be overhead hazards, or trip hazards. Pipes can be hazardous because of the material flowing through them, such as steam, natural gas, toxic chemicals, etc. Some pipes are also coated with hazardous material such as asbestos.

Table 7 - Other Common Physical Hazards Matrix			
JSA	APPL.	PHYSICAL HAZARD	GENERAL CONTROL MEASURE
☐	☐	Facility Piping (Below Ground)	Unless other arrangements have been made, the Client and/or Facility owner is responsible to identify all applicable underground facility pipe locations prior to any subsurface activities.
☐	☐	Fall Hazard	Proper tie-off, harnesses, railings, etc. should be used when performing work on ladders, scaffolding, man-lifts, or on the roof of buildings, etc. Stay clear of the edges of pits, trenches, quarries, etc.
☐	☒	Falling Objects	Be aware of any potential falling objects or materials on site. Stay clear of any areas identified as potential falling object areas.
☐	☒	Fences	Be aware of fences in disrepair that may be trip hazards, or may have materials that could cause punctures or cuts. Use caution when crossing over or under fences.
☐	☒	Field Equipment	If field equipment is heavy or awkward to carry, get assistance or use carts to help move around the site.
☐	☒	Field Vehicle	TRC personnel shall follow all applicable state and federal traffic laws while traveling to and from the site, and while working on the site. In particular the following laws should be followed: speed limits, parking restrictions, use of wipers and lights during precipitation events, etc. The use of cellular phones is prohibited, and distracted driving should be avoided. It is the responsibility of the driver to verify that all safety equipment on the vehicle is working properly before they drive the vehicle. In particular the following items should be checked: tire pressure, tire tread, windshield wipers, windshield washer, headlights, tail lights, brake lights, spare tire, fire extinguisher, first aid kit, etc.
☐	☐	Fire Extinguisher Chemicals	To the extent practicable, minimize exposure to potentially toxic fire extinguishing chemicals.
☐	☒	Fire Hazards	Eliminate sources of ignition in work areas that have ignitable materials. Provide an ABC fire extinguisher in close proximity to the support zone.
☐	☐	Flooded Areas	Do not drive through flooded areas or standing water. Do not wade into moving water, or water deeper than 2 feet without adequate assistance.
☐	☒	Flying Debris/ Eye Injuries	Be aware of any flying debris on site and wear protective eyewear when necessary.
☐	☐	Fork Lifts	Be aware of forklift patterns, and stay clear of those routes.
☐	☐	Gas Cylinders	See above.
☐	☒	Hand Tools	Use only the appropriate tool for the task at hand. Use the tool(s) as designed, described, and intended by the manufacturer. Hand tools will meet the manufacturer's safety standards. Hand tools will not be altered in any way. Makeshift tools will not be used. At a minimum, hand and eye protection will be used when working with hand tools (see glove selection guide provided herein). Wrenches, including adjustable, pipe, end and socket wrenches, will not be used when jaws are sprung to the point that slippage occurs. Impact tools such as drift pins, wedges and chisels, will be kept free of mushroom heads. Wooden handles will be free of splinters or cracks and secured tightly to the tool. At all times use appropriate hand protection when utilizing hand tools.

Table 7 - Other Common Physical Hazards Matrix			
JSA	APPL.	PHYSICAL HAZARD	GENERAL CONTROL MEASURE
☐	☒	Heavy Equipment.	Contractor is responsible for safe operation of equipment. All mobile heavy equipment must have a functioning backup alarm, and operators must comply with equipment manufacturer's instructions. Maintain proper distance and remain in line of sight of operator and out of reach of equipment. Recognize and take precaution not to enter equipment tail swing areas. Isolate equipment swings, if possible. Make eye contact with the equipment operator before approaching the equipment. Understand and review hand signals, and wear reflective safety vest.
☐	☒	Heavy Lifting	Use proper lifting procedures and equipment when handling heavy objects such as drums, manhole covers, tank covers, etc. If a load is greater than 50 lbs, at least two people must be used.
☐	☐	High Pressure Gas Lines, etc.	Be aware of high pressure gas lines, and follow approved safety precautions when working with or around the lines.
☐	☒	Highway Traffic	Traffic control within the right-of-way will be in accordance with local highway department protocols. Work may be restricted within specific lanes during peak traffic times. Verify peak traffic times, and review planned activities with local highway department, so that appropriate lane closures can be coordinated.
☐	☒	Housekeeping	All field vehicles, job trailers, and field offices will be properly cleaned and organized to prevent cluttered work and storage areas.
☐	☐	Hunters/Firing Range, etc.	Be aware of surrounding activities that may involve hunting, firearms, etc. that may not be in your immediate area, but could be create an unsafe work environment.
☐	☐	Ice (thin)	When project activities include either crossing ice or working directly on the ice, a detailed plan should be developed that will be used to continually evaluate the ice conditions, and to determine when work should be terminated due to unsafe conditions. All staff working on the ice will wear an appropriate and approved personal floatation device. Other emergency equipment such as ropes, a throwable floatation device, a means to warm a wet and cold worker, etc. must be available. A buddy system should also be used for this type of work, such that one person is always on shore or at least on previously determined safe ice.
☐	☐	Ladders	Ladders should only be used if they are in good condition, conform to OSHA requirements, and if they will be used in an appropriate manner. Be especially cautious of slipping on ladders when the ladder or footwear is wet or dirty.
☐	☐	Landfill Gas (Methane, CO ₂ , Hydrogen Sulfide)	Avoid breathing gas, especially in low oxygen areas (simple asphyxiant). Potentially flammable and explosive, so keep ignition sources away from gas. Explosive conditions of LEL >5% in a work area should be ventilated as soon as possible, or the area should be evacuated.
☐	☐	Leachate (Municipal Solid Waste - MSW)	MSW leachate may contain hazardous biological substances, so avoid physical contact with leachate and, if possible, stay up-wind. If contact is made with leachate, wash affected areas thoroughly with soap and water. If boots contact leachate they should be thoroughly washed with soap and water also.
☐	☐	Lead	Wear gloves when in contact with lead contaminated soil, etc. Thoroughly wash hands and arms when daily work is completed.

Table 7 - Other Common Physical Hazards Matrix			
JSA	APPL.	PHYSICAL HAZARD	GENERAL CONTROL MEASURE
☐	☐	Lighting	Lighting will be provided so that a sufficient amount of light will illuminate the work area. All electrical lighting will be protected with a Ground Fault Circuit Interrupter (GFCI). In areas where flammable or combustible vapors or dust are encountered, all lighting will be approved for use in Class 1, Division 1 hazardous locations.
☐	☒	Long Hours/Fatigue	Long work hours can lead to fatigue, and fatigue can lead to the physical inability to perform the work in a safe manner, or travel to, or from, a work site in a safe manner. If long work hours are scheduled, or if the scheduled work takes longer than planned, field staff should determine if fatigue is, or will be, an issue. Field staff should evaluate whether they are able to complete the work in a safe manner, or whether they are able to travel in a safe manner. If fatigue is an issue, appropriate breaks should be planned or taken, including overnight stays when necessary.
☐	☒	Material Handling	Move containers and heavy material only with the proper equipment, and secure them to prevent dropping, falling, or loss of control during transport. Stay clear of material handling operations, especially near slopes. Do not stand down the slope from equipment, supplies or materials being moved above on the slope, or being deployed onto the slope.
☐	☐	Material Storage	Stored material may be a falling hazard, or a crush hazard. Do not stand adjacent to materials stacked up, such as pipes, geosynthetic rolls, etc., or in the area of deployment.
☐	☐	Methane Gas (Landfill Gas)	Explosive conditions (5% LEL) will be ventilated, if encountered, prior to working in an area. Methane is a simple asphyxiant.
☐	☐	Mine or Quarry	No work shall be performed within 15 feet (or other designated client setback, whichever is greatest) of the mine or quarry walls. Be aware of the potential for falling rocks or slope failures.
☐	☐	Municipal Solid Waste (MSW)	MSW may contain hazardous biological substances, so avoid physical contact, and if possible stay up-wind. Wear appropriate PPE, such as gloves, safety shoes, and safety glasses. Wash hands, arms, and face after working near MSW. Reusable PPE and equipment should be thoroughly decontaminated after exposure to MSW. MSW may also contain sharp objects with the potential to puncture PPE.
☐	☐	Natural Gas	Natural gas is flammable and explosive. Keep ignition sources away from gas sources. Use spark proof tools when working with gas lines, etc.
☐	☒	Noise	Hearing protection must be worn when noise levels exceed 85 dBA in the work area. If you need to raise your voice to be heard at the work site, then hearing protection should be worn. Hearing protection will be worn near drill rigs.
☐	☒	Overhead Hazards	Pay attention to overhead equipment, piping, and structures. A hard hat must be worn at all times when overhead hazards are present on site.
☐	☒	Overhead Wires	If contact is possible (i.e., equipment, drill rig, excavator, etc.) one or more of the following will be done: ✧ Power sources will be disconnected by the utility. ✧ Power sources will be shielded by the utility. ✧ Object will get no closer than 10 feet to prevent arcing, unless site specific conditions or weather conditions warrant greater separation per best professional judgment, or as directed by utility representatives. ✧ Evaluate the need for shielding and coordinate with local utility representatives.

Table 7 - Other Common Physical Hazards Matrix			
JSA	APPL.	PHYSICAL HAZARD	GENERAL CONTROL MEASURE
☐	☒	Pedestrian Traffic (public, client, workers)	Be aware of pedestrian traffic patterns and, route traffic around the exclusion zone(s), as necessary, to avoid distractions and the potential for exposures or accidents. Use appropriate barricades and caution tape to mark work areas.
☐	☐	Portable Heaters	Be aware of portable heater locations and stay a safe distance from them.
☐	☒	Power Tools	All power tools will be inspected regularly (at least on a daily basis) and used in accordance with the manufacturer's instructions and its capabilities. Electrical tools will not be used in flammable areas, unless they are approved for that purpose. Portable electric tools will be used only with a GFCI. Proper hand, eye and hearing protection will be used when working with power tools and all appropriate safety guards must be in place. Personnel will be trained in the proper use of the specific tool. Any defective power tools will be immediately tagged and removed from service. Tools will be stored properly after use.
☐	☒	Power Washing Equipment	Stay clear of the power washing nozzles and equipment.
☐	☐	Propane Tanks	Be aware of propane tank locations, and any gas lines leading to or from the tanks.
☐	☐	Rock Blasting	Contractor is responsible for following safe blasting protocol. Heed all contractor warnings at time of blasting and stay well clear until safe to return to area, as indicated by the contractor.
☐	☒	Sample Preservative Chemicals	Wear safety glasses, cut resistant, and nitrile gloves or equivalent when adding preservative chemicals to sample bottles or vials. Have clean wash water nearby.
☐	☐	Scaffolding	Stay clear of scaffolding. Be aware of the OSHA safety requirements for using constructing and scaffolding.
☐	☒	Severe Weather	Work may be suspended if dangerous weather conditions (lightening, tornadoes, high winds, heavy rain, freezing rain, etc.) occur. Be aware of changing weather conditions, and be prepared to take shelter as necessary. Potential shelters should be identified prior to beginning work.
☐	☒	Sharp Objects	Wear appropriate cut resistant gloves when handling sharp objects, and use appropriate equipment to move objects. See Appendix C for the Glove Selection Guideline.
☐	☒	Slippery Ground/Surfaces	Exercise caution, especially on slopes, field trailer floors and stairs, after a precipitation event. Use slip resistant boots, or implement surface preparations to eliminate the slippery nature of the surface prior to accessing the area. Spill control measures and general housekeeping should be utilized to help prevent slipping on wet floors, wet pavement, and general work areas.
☐	☒	Slips, Trips, and Falls:	Maintain clear walkways for work areas.
☐	☒	Steam Cleaning Equipment	Stay clear of the steam cleaning nozzles and equipment. All personnel performing this task must wear a face shield.
☐	☐	Steel Erection	All materials, equipment, and tools, which are not in use while aloft, shall be secured against accidental displacement. The controlling contractor shall bar other construction processes below steel erection unless overhead protection for the employees below is provided. Employees engaged in steel erection activities on a walking/working surfaces with an unprotected side or edge more than 15 feet above a lower level shall be protected from fall hazards by guardrail systems, safety net systems, personal fall arrest systems, positioning device systems or fall restraint systems.

Table 7 - Other Common Physical Hazards Matrix			
JSA	APPL.	PHYSICAL HAZARD	GENERAL CONTROL MEASURE
☐	☐	Steep Slopes or Banks	Pay attention to footing and walking. Stay a safe distance from unstable or extremely steep slopes. Wear appropriate footwear. Be aware of potential slope or bank failures. Heavy equipment should not be operated on or near unstable slopes or banks.
☐	☐	Strong Nuisance Odors	Strong odors should be ventilated before entering a work area, or a respirator shall be worn as needed.
☐	☒	Sunburn	For extended periods of time outdoors on sunny days, sunglasses, long-sleeved shirts and long pants should be worn to help prevent sunburn and eye problems. Wear sunscreen as appropriate for the project.
☐	☐	Surface Water	Working next to or on, bodies of water shall be done using the buddy system. Staff shall wear USCG-approved personal floatation devices when on or adjacent to bodies of water.
☐	☒	Terrain	Uneven or steep terrain can cause hazardous conditions for walking and transporting equipment around the site. Site personnel should use caution when working on uneven surfaces, and they should avoid working down-slope from heavy equipment, or materials being moved or stored.
☐	☒	Traffic (client, contractors, public, semi-trucks, forklifts, etc.)	Obey all posted speed limits. Park in designated areas only. Be aware of traffic patterns on site, and during access to the site. Use orange traffic cones and barrier warning tape, as needed, or if within 25 feet of the right-of-way. TRC personnel must wear safety vests when working in or near traffic areas. For work in public roadways/highways, coordination with local officials and prepare a traffic safety plan.
☐	☐	Trains/Railroad Tracks	Be aware of any train activities on the site, entering or leaving the site, or immediately adjacent to the site. Do not walk between the rails or on the railroad ties. All work must be at least 25 feet away from the tracks unless you have a railroad representative acting as a flagman. When driving, stop at all railroad crossings, even if they are unmarked, and look in both directions before proceeding across the tracks. Coordinate with TRC Project Manager as special permitting may be required for this work, even if not conducted on railroad property or right of way.
☐	☐	Transporting Hazardous Materials	TRC personnel who transport hazardous materials shall have the required DOT and/or IATA training prior to transporting materials, and will comply with all applicable DOT regulations and requirements and IATA guidance for labeling, packaging, etc. See also the Required Personnel Training section of this HASP to review/specify if DOT/IATA training is required for this project.
☐	☐	Tree Cutting	Stay clear of tree cutting activities.
☐	☐	Trenching	TRC personnel will not enter trenches not in accordance with 1926 Sub Part P. Be aware that some trenching conditions may result in a confined space condition.
☐	☒	Trip Hazards (wires, cords, hoses, debris, corn stubble, uneven surfaces, etc.)	Temporary wires, cords, hoses, etc., should be properly located, marked, and protected to help prevent tripping and disruption to work activities. Trip hazards are particularly a problem early in the morning, late in the day, or under other poor lighting conditions.
☐	☐	Under Ground Storage Tanks (USTs) (Septic Tanks)	If any unknown UST's are encountered, drilling or excavations will be terminated in that location until a new scope of work, Risk Assessment and Health & Safety Plan can be developed.
☐	☒	Uneven Surfaces	Be aware of uneven walking or driving surfaces and exercise caution when moving around the site.

Table 7 - Other Common Physical Hazards Matrix			
JSA	APPL.	PHYSICAL HAZARD	GENERAL CONTROL MEASURE
☐	☒	Utilities – Overhead	Electrical, telephone, cable TV, etc. – In advance of the field work, a subcontractor, the client, or TRC will locate and identify all overhead utilities. The owner or client will be responsible for identifying all applicable overhead utilities, product lines, pipes, and aboveground tanks. A minimum clearance of 10 feet must be maintained between equipment and overhead utility lines. Notification timeframes vary regionally. Coordinate with the TRC Project Manager as to specific timeframes and responsibilities.
☐	☒	Utilities – Underground	Electric, gas, telephone, water, storm sewer, sanitary sewer, cable TV, etc. - In advance of the field work, A subcontractor, the client, or TRC will call Digger’s Hotline to locate all underground utilities. The owner or client will be responsible for marking all applicable on-site underground utilities, product lines, pipes, and tanks. Coordinate with the TRC Project Manager as to specific timeframes and responsibilities.
☐	☐	Waterways	Exercise caution near, around, or in waterways. Harnesses should be worn when working in, or within 4 feet of, the waterway, especially when attempting to sample from shore or a boat or barge. All applicable laws and regulations will be followed when navigating a boat or barge to and from a work site.
☐	☐	Welding Tools	Stay clear of welding operations, and do not look directly at the welding process without appropriate eyewear and shield.
Notes: APPL. – Abbreviation for “Applicable.” N/A – Not applicable JSA – Job Safety Analysis			

5.4 Biological Hazards

Table 8- Common Biological Hazards Matrix			
JSA	APPL.	BIOLOGICAL HAZARD	GENERAL CONTROL MEASURE
☐	☒	Animals (dogs, etc.)	Be aware of any animals on site or adjacent to the site. Appropriate care should be taken if any feral (wild) animals are encountered. Dogs often are not leashed and may be unfriendly. Bites from dogs and wild animals can cause infections or transmit disease. In general, it is best to not approach dogs even if they appear to be friendly, and wild animals should never be approached. If bitten, the area should be washed with soap and water. If the bite resulted in puncturing or tearing of the skin, the wound should be covered with a sterile dressing and medical attention should be sought immediately. A description of the dog should be noted and if possible, the dog’s owner.
☐	☒	Blood-Borne Pathogens	Injuries received in the field may require assistance from a field team member to perform first aid. Contact with blood and certain body fluids can contain pathogens that may be transmitted by contact with an open wound by the caregiver. The following precautions should be used when giving first aid: ✧ Use nitrile gloves to avoid contact with blood/fluids. Spent bandages and gloves used to perform first aid should be placed in a plastic bag and properly disposed. ✧ Blood/fluid should be cleaned from surfaces that may be contacted by

Table 8- Common Biological Hazards Matrix			
JSA	APPL.	BIOLOGICAL HAZARD	GENERAL CONTROL MEASURE
			other individuals. ✧ Use an appropriate barrier if required to perform rescue breathing.
☐	☐	Briars or Thistles	Be aware of any briars or thistles on site. Wear appropriate clothing and gloves. Avoid contact with briars or thistles whenever possible.
☐	☒	Cold Stress	Work schedules may be modified when temperatures are below 20° F as measured by the wind chill factor. Take frequent breaks to warm up. Drink plenty of fluids. Wear appropriate clothing, and monitor for cold stress symptoms (frostbite, hypothermia, etc.). See Appendix D for additional information.
☐	☒	Heat Stress	The work schedule may be modified if the ambient temperature is more than 80° F. Take breaks as necessary, and drink plenty of fluids. If necessary, wear sunscreen and sunglasses on bright days. Monitor site personnel for signs of heat stress symptoms (heat rash, heat cramps, heat exhaustion, or heat stroke). See Appendix D for more information.
☐	☒	Insects (ticks, bees, spiders, etc.)	Site workers with known allergies to insect bites should carry their own medication. In case of emergencies, inform fellow workers of any severe allergies. Use insect repellent as necessary, and as specifically allowed on site. If possible, wear long-sleeved shirts and pants. If appropriate, check for ticks at the end of each day. Have other appropriate first aid supplies handy for bites. Ticks - Avoid wooded and bushy areas with high grass and lots of leaf litter. If you do go into areas like this, try to stay in the center of a cleared trail to avoid contact with overgrown grass, brush, and leaf litter. Use effective tick repellants and apply according to the label instructions. For more information on repellants see the EPA Insect Repellants: Use and Effectiveness site. Wear long sleeves, long pants, and long socks to keep ticks on the outside of clothing. Light clothing will help spot ticks. Tuck shirts into pants and pants into shoes or socks to keep ticks on the outside of clothing. If outside for an extended period of time then tape pant legs where pants and socks meet so that ticks cannot crawl under clothes. Perform daily tick checks after being outdoors in areas where ticks are present, even in one's own yard. Remove ticks from clothing, gear, and pets before going inside. Inspect all parts of the body carefully, especially the armpits, scalp, and groin. Shower or bathe as soon as possible to wash off any ticks that still remain on you. Tumble clothes in a dryer on high heat for an hour to kill remaining ticks. Attached ticks should be immediately removed with fine-tipped tweezers. To remove an attached tick, grasp it with narrow-bladed tweezers or forceps as close as possible to attachment (skin) site, and pull upward and out with a firm and steady tension. If tweezers are not available, use fingers shielded with tissue paper or rubber gloves. Do not handle with bare hands. Be careful not to squeeze, crush or puncture the body of the tick which may contain infectious fluids. After tick removal, thoroughly disinfect the bite site and wash hands. Seek medical attention if there is a concern about incomplete tick removal. It is important that a tick be properly removed as soon as it is discovered. Seek medical attention if you develop a rash or fever within several weeks of removing a tick. Mosquitos - Reduce the risk of being bitten by mosquitoes. Minimize time spent outdoors around dusk and dawn when mosquitoes are most active. Wear shoes, socks, long pants, and a long-sleeved shirt when outdoors for long periods of time, or when mosquitoes are most active. Clothing should be light colored and made of tightly woven materials that keep mosquitoes away from the skin. Consider the use of an EPA-registered insect repellent. Follow the directions on the package. Be sure to use insect repellent and wear long sleeves and pants at these times or consider staying indoors during these hours. Spiders - Spiders typically seek cover in dark protected areas. Common areas

Table 8- Common Biological Hazards Matrix			
JSA	APPL.	BIOLOGICAL HAZARD	GENERAL CONTROL MEASURE
			where spiders may be encountered are heavy vegetation and trees or infrequently used buildings and structures. Spiders also are found in basements and enclosed spaces where sampling may be performed. Spider bites may cause swelling, pain and respiratory problems. Avoid dense vegetation, and use caution when sampling in dark or poorly illuminated locations. If bitten, wash the area and use ice on the bite area to reduce swelling. If respiratory stress, significant pain or swelling is noted, or discoloration around the bite area occurs, seek immediate medical attention. Stinging Insects - Like spiders, wasps and yellow jackets often nest in dense vegetation and in the ground, in long-standing protective casings on monitoring wells and shielded gate locks, or in infrequently used buildings and structures. An insect sting can cause pain, swelling, and respiratory problems that may be life-threatening to certain individuals. If stung, remove stinger if present using tweezers or similar, and wash the area and use ice on the sting area to reduce swelling. If respiratory stress, significant pain or swelling is noted, or discoloration around the sting area occurs, seek immediate medical attention.
☐	☒	Long Hours/Fatigue	Long work hours can lead to fatigue, and fatigue can lead to the physical inability to perform the work in a safe manner, or travel to, or from, a work site in a safe manner. If long work hours are scheduled, or if the scheduled work takes longer than planned, field staff should determine if fatigue is, or will be, an issue. Field staff should evaluate whether they are able to complete the work in a safe manner, or whether they are able to travel in a safe manner. If fatigue is an issue, appropriate breaks should be planned or taken, including overnight stays when necessary.
☐	☒	Poisonous Plants	Be able to identify any local poisonous plants and avoid them if possible, or wear protective clothing as necessary. When removing potentially exposed clothing or PPE, the clothing or PPE should be carefully and thoroughly washed or decontaminated.
☐	☐	Snakes	Be aware of the potential for snakes in the area and wear snake boots, snake chaps, gaiters, or leggings as needed.
Notes: APPL. – Abbreviation for “Applicable.” JSA – Job Safety Analysis			

5.5 Radiological Hazards

No radiological hazards are expected onsite. If any new condition is encountered during this activity, the HASP will be adjusted accordingly.

Table 9 - Radiological Hazards Matrix			
JSA	APPL.	PHYSICAL HAZARD	GENERAL CONTROL MEASURE
☐	☐	Radiation (ionizing)	Exposure to ionizing radiation can be controlled by one of three methods. Time, distance, or shielding. Limit your time near the radioactive source. Keep your distance from the radioactive source. Shield yourself from the radioactive source with appropriate shielding material. If the radioactive source(s) are from TRC equipment, the TRC employee using the equipment needs required training to use the equipment, and must be monitored using a dosimeter badge. Update contact information for TRC subject matter expertise and regulatory authorities.

Table 9 - Radiological Hazards Matrix			
JSA	APPL.	PHYSICAL HAZARD	GENERAL CONTROL MEASURE
☐	☐	X-Ray Fluorescence Instruments (a.k.a., XRF Guns)	XRF units for field metals analysis are only to be used by trained employees with radiation safety training. Licensing requirements can vary by state. Coordinate with a TRC CIH before utilizing in the field to set up dosimetry protocols and instrument specific safety procedures.
Notes: APPL. – Abbreviation for “Applicable.” XRF – X-ray fluorescence JSA – Job Safety Analysis			

6. WORK ZONE AND COMMUNITY AIR MONITORING AND ACTION LEVELS

An air-monitoring program will be implemented to identify areas of elevated airborne contaminant concentrations and to determine the level of the concentrations relative to background. Air monitoring will be performed in the exclusion zone and downwind of where the field activities are conducted for the safety of the field personnel and the surrounding population. Upon exceeding the action levels (listed below) within the exclusion zone, the field operations should cease or be continued with upgraded PPE levels or with dust/vapor control measures. In addition, monitoring should extend out to the support zone and/or out to the perimeter if high levels persist in the exclusion zone.

Additional controls may be employed if the action levels are exceeded at the downwind work parameter. If the control measures are not effective in reducing air concentrations at the exclusion zone perimeter, work will be stopped and air monitoring will continue until the air concentrations are abated. If concentrations remain above the action levels for longer than 30 minutes at the downwind boundary, up-wind monitoring will be conducted to assess if factors beyond the scope of work are impacting the local air quality. If no other sources of air impacts are identified, the work will be stopped and the work area will be abandoned until alternate control methods can be identified.

<u>Monitoring Equipment/Model</u>	<u>Frequency of Surveillance</u>
<u>X</u> PID	<u>Continuous in the breathing zone during drilling and surface soil sampling.</u>
<u>X</u> Combustible Gas Meter	<u>Every 15 minutes above the borehole during drilling.</u>
<u>X</u> Miniram	<u>Dust monitoring while drilling soil borings or transporting equipment.</u>

Dust quality should be monitored with a Miniram or similar instrument. If readings are above the action level, dust control measures will be implemented (i.e., water spraying), or work will be suspended until dust levels drop below action levels. Dust levels will be assessed in the exclusion zone, and if exceedances are observed, monitoring downwind will be conducted. If dust levels remain elevated, an assessment of upwind quality will also be made to determine if an unrelated source could be contributing to the elevated readings.

ACTION LEVELS

Direct Reading Instruments

A complex variety of toxic air pollutants (including organic and inorganic vapors, gases or particulates) can be produced at contaminated sites. Direct-reading field instruments will not detect or measure all of these substances. Thus negative readings should not be interpreted as the complete absence of airborne toxic substances. Verification of negative results can only be done by collecting air samples and analyzing them in a laboratory or in an off-site location using portable analyzers and should be considered and determined on a case-by-case basis.

Table 10 – Air Monitoring Action Levels		
Instrument	Action Level	Action Required
Organic Vapor Monitoring		
PID with 10.6eV Lamp	<i>Above 5 ppm sustained 15 min average reading in the downward perimeter of the work area or exclusion zone</i>	Stop operation until level remain < 5 ppm
PID with 10.6eV Lamp	Between 5 to 25 ppm in the downward perimeter of the work area or exclusion zone.	<i>Work must be halted, identify the source of vapors, take corrective actions to abate emissions. Then resume work activities if PID reading 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</i>
PID with 10.6eV Lamp	Above 25 ppm at the perimeter of the work area	Stop operations. Level B necessary
LEL Action		
MultiRAE	Above 10% LEL	Stop operations until levels remain <10%
Dust Monitoring		
Miniram	15 min. period downward PM-10 particulate level > 100 µg/m ³ or if airborne dust is observed leaving the work area	Dust suppression techniques must be employed. Then work may continue if downwind PM-10 particulate levels do not exceed 150 µg/m ³ above the upwind level and provided that no visible dust is migrating from the work area.
Miniram	Above 150 µg/m ³ after implementation of dust suppression techniques	Stop operations, re-evaluate suppression activities. Work can resume if dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to < 150 µg/m ³ of the upwind level and in preventing visible dust migration.

- (1) See the OSC for action levels using a 10.6eV lamp.
- (2) Conduct air monitoring periodically to determine when and if work may be continued. For work to continue above 25 ppm, cease work immediately and upgrade to Level B.
- (3) If dust is present above the action level, implement dust control measures such as water spraying

Dust Monitoring

The action level for the dust monitoring of $150 \mu\text{g}/\text{m}^3$ at the Site is based upon the EPA's Air Quality Standards of PM-10 (particulate matter of 10 microns) and New York State Department of Environmental Conservation's DER-10, Technical guidance for site investigation and remediation.

Inorganic Gases and Vapors

The ability to detect and quantify nonspecific inorganic vapors and gases is extremely limited. If specific inorganics are known or suspected to be present, measurements should be made with appropriate measuring device.

Organic Gases and Vapors

Multi-gas PID will be used to monitor air quality while performing the excavation/s. The air will be monitored for the levels of total organic vapors and the lower explosive limits (LEL). As discussed above, operation/s will temporarily cease or be upgraded to the next level of PPE upon exceeding action levels, until safe levels return.

Table 11 - Preservatives and Decontamination Products		
Chemical of Concern	On-Site Usage and Potential Exposures	Control Method/Other Notes
Hydrochloric Acid (HCl)	Less than 20 ml quantities used for sample preservation. Air phase exposure is expected to be minimal and incidental to sample containerization.	5 ppm (OSHA PEL)
Nitric Acid (HNO ₃)	Less than 20 ml quantities used for sample preservation. Air phase exposure is expected to be minimal and incidental to sample containerization.	5 mg/m ³ (OSHA PEL)
Isobutylene	100 ppm gas for use during calibration of PID instruments	No specific exposure limits for isobutylene (simple asphyxiant). Maintain oxygen levels above 19.5%. Before attaching regulator to cylinder, verify that the regulator is off. Before opening regulator, make sure that tubing connecting regulator to monitoring device/tedlar bag is secure. To use a tedlar bag, put bag control valve in an open position and close after filling. Before disconnecting gas from the instrument and/or tedlar bag, verify the regulator is closed. Empty bag of contents after calibration in a downwind position and/or to avoid inadvertent inhalation.
Notes: ppm – parts per million ml – milliliters ug/m ³ – micrograms per cubic meter OSHA – Occupational Safety and Health Administration PEL – Permissible Exposure Limit		

7. Personal Protective Equipment (Non-Respiratory)

TRC personnel will use Level D PPE as noted/modified below:

Table 12 - Level D Personal Protective Equipment	
Item	Rationale/Notes
Hardhat	Appropriately rated hard hats will be worn by personnel for protection against overhead hazards, including electrical.
Hearing protection	Hearing protection will be worn by all personnel exposed to at least 85 dB of sound during the workday.
Safety boots (steel toe/steel shank)	Steel-toe safety boots will be worn by all personnel during project work described in this HASP and at all times on site.
Eye protection (safety glasses)	Eye protection will be worn when personnel are exposed to flying debris, chemical vapors or particulates. Chemical splash goggles will be worn for protection against chemical gases, vapors or particulates. Safety glasses will be worn for protection against flying objects.
Safety vest	Utilize in areas in or near vehicular traffic of any kind on or off property.
Chemical Protective Clothing (CPC) and Gloves	CPC and gloves will be inspected according to TRC's Personal Protective Equipment Program. CPC will be chosen with assistance from the OSC according to the chemical hazards present. Gloves to be changed between samples to avoid cross-contamination.
Cut resistant work gloves	As indicated herein, use Cut and Abrasion Resistance gloves when necessary for hand protection during field tasks. See Appendix C for a Glove Selection Guide. Leather work gloves are expressly prohibited.

A basic first aid kit will be readily available on-site in the event of an emergency.

Fire extinguisher should be present with the rig. All personnel working on or around the drill rig should know the location of and how to operate the fire extinguisher.

8. Personal Protective Equipment (Respiratory)

8.1 Evaluating the Need for a Respiratory Protection Upgrade

TRC's health and safety goal is to avoid using respiratory protection unless it is absolutely necessary or required. Administrative controls or engineering controls should always be considered as a means to reduce potential exposures before PPE is required or considered consistent with the hierarchy of control philosophy (elimination/substitution > engineering controls > administrative controls > personal protective equipment).

For TRC operations that require the use of a respirator, the TRC Project Manager (and Contractor equivalent) must verify that Field Personnel are medically approved to use respiratory equipment, fit tested, and trained in the proper use of respirators. Only respirators that are NIOSH/MSHA¹ approved are to be used.

Respiratory protection is mandatory if workers are required to complete tasks within a hazardous atmosphere. Per that Occupational Health and Safety Administration (OSHA), a hazardous atmosphere is defined as:

- Flammable gas, vapor, or mist in excess of 10-percent of the Lower Explosive Limit (LEL).
- Atmospheric oxygen is below 19.5-percent or above 23.5-percent.
- When concentration of a known contaminant is greater than the permissible exposure limit (PEL).
- Airborne combustible dust exceeds its LEL (approximated when dust obscures vision at a distance of 5 feet or less).

Other conditions may warrant a respiratory protection upgrade per the discretion of the TRC Project Manager, OSC, RMD Safety Manager, or Health & Safety Director as well as the client.

Air monitoring may be required to verify the presence or absence of a hazardous atmosphere. Conduct air monitoring whenever a situation or condition arises that could reasonably result in a hazardous atmosphere.

Any worker wearing a respiratory protective device in a potentially or known hazardous atmosphere must demonstrate a proper fit test with that device. Fit test records are maintained on file by TRC. The proper fitting of respiratory protective devices requires the use of a fit test. The fit test is needed to determine a proper match between the face piece of the respirator and the face of the user. Fit testing will be conducted after medical approval has been obtained. Qualitative fit-tests involve the use of a test atmosphere that employees can sense. If they are not responsive to the test material then other test methods must be deployed. Quantitative fit-tests provide a respirator specific protection factor. TRC usually does qualitative fit-tests.

Please see Chapter 12 (Respiratory Protection) of the 10/5/2010 TRC Health and Safety Manual for detailed guidance.

8.2 Air-Purifying Particulate Respirators

Field work involving construction and earthmoving operations that result in nuisance dust and particulates may use air-purifying respirators. Particulate respirators can be used in situations where nuisance dust and particulates are the only contaminants posing an inhalation hazard. Particulate respirators are not to be used in oxygen deficient atmosphere or if hazardous levels of gas/vapor contaminants are also present.

¹ NIOSH – National Institute for Occupational Safety and Health; MSHA – Mine Safety and Health Administration

High efficiency particulate air (HEPA) P100 respirators should be used in place of commercially available “dust masks.” Select cartridges that are based on the amount of oil and liquid vapors present. Magenta is the color code for HEPA cartridges.

8.3 Air-Purifying Gas/Vapor Respirators

TRC employees and Contractors are required to wear half-face, air-purifying respirators with the appropriate chemical cartridge under the following circumstances:

- When concentration of a known contaminant continuously exceeds permissible exposure limit (PEL) time-weighted average or the threshold limit value (TLV) time-weighted average.
- When volatile organic compound (VOC) vapors in the work area continuously exceed the threshold limit value-time-weighted average (TLV-TWA).
- When, at any time, VOC vapors in the work area exceed the threshold limit value - short-term exposure limit (TLV-STEL).

See Table 10 for site-specific or additional information on regulatory exposure limits for chemicals/exposures of concern at this site.

Air purifying respirators (APRs) with chemical cartridges can be used under the following conditions:

- If the oxygen concentration is between 19.5-percent and 23.5-percent.
- If chemical contaminants have been identified, the toxic concentrations are known and the respirator cartridges are effective in removing the contaminants.
- The respirator and cartridges are NIOSH/MSHA approved.
- The contaminants have noticeable warning qualities such as odor and visibility characteristics including color.

In the event workers are required to wear APRs with chemical cartridges, the following requirements must be met:

- The TRC Project Manager or Contractor’s SSO must verify that workers are:
 - ✧ Medically approved (within one year) to use respiratory protection,
 - ✧ Fit-tested for the specific respirator to be used, and
 - ✧ Trained in the proper care, use and limitations of the respirator to be used.
- Contractors must provide proof of the above to the TRC Project Manager, upon request.
- If an employee or contractor has not cleared by the Project Manager to use a respirator, they will not be assigned tasks that may potentially expose them to contaminants.
- Personnel with interfering facial hair are not permitted to wear respirators and shall not be permitted in areas where respiratory protection is required.
- Respirators must be sized to the employee
- Qualitative fit tests conducted by trained employees

Note that the protection factor (PF) on a ½ face APR is 10. If air concentrations/ levels are more than 10-times the TLV, the upgrade would require a full face APR (which has a PF of 50). All APR selections for a project are subject to TRC CIH review.

8.4 Supplied Air Respirators

Supplied-air respirators, such as a Self-Contained Breathing Apparatus (SCBA) or airline-equipped full-face respiratory protection, are not anticipated to be required at the site. This level of respiratory protection is utilized

in oxygen deficient atmospheres or atmospheres considered to be at or above immediately dangerous to life and health (IDLH) levels. These conditions will only occur in rare, if any, circumstances such as confined space entry or emergency situations. The use of air-supplied respiratory protection is not permitted without approval and guidance from the OSC and TRC CIH.

9. Site Control/Work Zones (Optional)

Access to the work area, specifically the immediate area surrounding the remediation activities, will be limited to authorized personnel only to the extent TRC has authorization.

Table 13 - Site Control/Work Zones Matrix		
APPL.	CONTROL ELEMENT	SPECIFY/DESCRIBE ¹
☐	Site Specific Controls	N/A
☐	Facility Alarms or Signals	N/A
☐	Work Permitting	N/A
☐	Work Area Traffic	N/A
☐	Parking Issues/Restrictions	N/A
☐	Railway Traffic/Activity	N/A
☐	Other	N/A
☒	Support Facilities/Zones	Noted below.
☒	Field vehicle	TRC Fleet Vehicle Number _____, Registration Number _____
☐	On-site office trailer	
☐	Other	
☒	Contaminant Reduction Zone	Noted below.
☐	Field vehicle	
☐	Facility restroom/utility room	
☒	Other	Ingress and egress area from the exclusion zone.
☒	Exclusion Zone(s)	Noted below.
☒	Immediate vicinity of work area	Delineate per OHSO.
☐	Other	
☒	Site Entry Procedures	Noted below.

Table 13 - Site Control/Work Zones Matrix		
APPL.	CONTROL ELEMENT	SPECIFY/DESCRIBE ¹
☒	Notify Site OSHO	Contact information in Section 1.
☒	Read/sign HASP	Note tailgate briefing below.
☐	Check in with facility contact	
☐	Check in with security guard	
☒	Wear PPE called for in HASP	See Sections 7 and 8.
☒	On-Site Orientation	Noted below.
☐	Attend facility orientation / tail gate safety meeting	
☒	Daily tailgate safety briefing	Document briefing per HASP/checklist (see Section 14).
☐	Other (specify)	
☐	Other (specify)	
Notes: 1- Were applicable, summarize or reference relevant plan, procedure, etc. APPL. – Abbreviation for “Applicable.” HASP – health and safety plan N/A – Not applicable OSHO – TRC’s On-Site Health and Safety Officer PPE – Personal Protective Equipment		

10. Job Safety Analyses

A Job Safety Analysis (JSA) is a safety management tool in which the risks or hazards of a specific job in the workplace are identified, and then measures to eliminate or control those hazards are determined and implemented. More specifically, a job safety analysis is a process of systematically evaluating certain jobs, tasks, processes or procedures and eliminating or reducing the risks or hazards to as low as reasonably practical (ALARP) in order to protect workers from injury or illness. The JSA process is documented and the JSA document is used in the workplace or at the job site to guide workers in safe job performance. The JSA document is also a living document that is adjusted as conditions warrant.

The JSA process begins with identification of the potential hazards or risks associated with a particular job. Once the hazards are understood, the consequences of those hazards are then identified, followed by control measures to eliminate or mitigate the hazards.

■

Please refer to Appendix E for the Job Safety Analyses prepared for the following:

- Air Monitoring for Subsurface Clearance
- Loading and Unloading of Equipment and Materials
- Oversight of Subcontractor Operations
- Site Inspection

11. Required Personnel Training

TRC field personnel will have the training outlined below before on-site work activities:

Table 14 - Project Training Requirements				
(* required for all sites; but minimum recommended)				
Check “A” if training required for everyone, and check “T” if training required for specific task or per notations.				
A	T	SUBJECT	REFERENCE	
			29 CFR 1910	29 CFR 1926 or Other
☒	☐	HAZWOPER 40 hour*	1910.120	1926.65
☐	☐	3-Day HAZWOPER Supervised On-site*	1910.120	1926.65
☒	☐	8-Hour HAZWOPER Refresher*	1910.120	1926.65
☐	☒	First Aid, CPR*, ¹	1910.151	1926.23,.50
☒	☐	Hazard Communication (HAZCOM)	1910.1200	1926.59
☐	☐	DOT / IATA Shipping Training	1910.1201	49 CFR 172.704
☐	☐	Respiratory Protection Training	1910.134	G-7-1989 ²
☒	☐	TRC Hand Protection Policy	1910.138	TRC Policy ⁴
☒	☐	Defensive Driving	N/A	White Paper ⁵ TRC Manual ⁶
Client-specific training: ☐ Not Applicable ☐ Specify				
Client-specific training: ☐ Not Applicable ☐ Specify				
Client-specific training: ☐ Not Applicable ☐ Specify				
Note: 1 Per the TRC Health and Safety Policy and Procedure Manual, each TRC project will have at least one certified CPR/first aid trained person on site at all times. All Project Managers and anyone acting as the on-site Health and Safety Officer must be current in First Aid/CPR. 2 Compressed Gas Association’s Commodity Specification for Air 4 TRC RMD Hand Protection Policy, August 2012 5 Guidelines for Employers to Reduce Motor Vehicle Crashes (joint white paper by NETS, NHTSA and OSHA) 6 TRC Driver and Vehicle Management Policy and Procedure Manual, Rev 1 (April 2012)				

Project training requirements beyond those provided in the above table will require a HASP revision/upgrade or concurrence of the TRC Safety Director or RMD Safety Manager.

12. Medical Monitoring

Medical monitoring will apply routinely to all employees who are or may be exposed to hazardous substances or health hazards at or above the established permissible exposure limit, above the published exposure levels for these substances, without regard to the use of respirators, for 30 days or more a year (40 CFR 1910.120[f][2][i]). Said TRC field personnel will have the medical surveillance outlined in the table below prior to commencing on-site work activities.

Table 15 - Medical Surveillance Required			
*Baseline is minimum recommended.			
	29 CFR 1910	29 CFR 1926 or Other	Notes
☒ HAZWOPER Physical - Baseline*	1910.120	1926.65	
☒ HAZWOPER Physical – Annual	1910.120	1926.65	
☒ HAZWOPER Physical - Biennial*	1910.120	1926.65	
☐ Medical clearance for respirator use	1910.134	N/A	Unrestricted clearance.
Client-specific drug testing ¹	☒ Not Applicable ☐ Specify		
Client-specific medical monitoring ¹	☒ Not Applicable ☐ Specify		
Site-specific medical monitoring:	☒ Not Applicable ☐ Specify		
Note: N/A – Not applicable. ¹ Client required drug testing or medical monitoring should be coordinated through the Project Manager.			

TRC has a Drug and Alcohol-Free Workplace Policy (TRC Academy Course #900013753). TRC may require employees or subcontractors to be tested upon reasonable suspicion, following accidents or incidents during work activities, or during travel to or from a project site. Client policies may be stricter in regard to procedures following an accident. Project Managers must be aware of these and inform employees and subcontractors of any additional requirements.

13. General Safety Requirements

The general safety rules listed below apply to all TRC personnel present at the site.

- A tailgate health and safety meeting will be held with all field team members and subcontractors each day prior to the start of work.
- Adhere to all requirements of this health and safety plan (HASP).
- Wear protective clothing appropriate for the designated level of protection and decontaminate before entering clean areas when applicable.
- Use safety equipment in accordance with OSHA guidance and labeling instructions.
- Maintain safety equipment in good condition and proper working order and make sure that the equipment is calibrated prior to use.
- Immediately report unsafe acts or conditions to the Project Manager and OSC.
- Eating, drinking, and smoking are prohibited on site, except in designated areas.
- Maintaining a position upwind from intrusive activities is encouraged.
- The emergency shutoff switch should be demonstrated to be working prior to initiating drilling.
- An adequately stocked first-aid kit will be maintained at the work site.

14. Tailgate Safety Meetings

A tailgate safety meeting will be conducted daily prior to commencement of the work day (see checklist provided in Appendix F) or if site conditions change.

Topics covered by the tailgate safety meeting will include, but not be limited to:

- Scope of work and who will conduct each task
- Potential hazards for the scope of work
- weather forecast
- PPE
- Emergency procedures and the route to the medical facility
- Site conditions and features
- Communication guidelines related to stakeholder engagement and visitors

Safety meetings will be held to address modifications to this HASP and any addenda prepared to supplement the HASP. Subcontractors and personnel present at the tailgate safety meeting shall be required to sign an acknowledgement form after each meeting.

15. Emergency/Contingency Plan

Before commencing any on-site operations, the TRC OHSO will advise all personnel of potential emergencies. Personnel will be advised on their roles in the event of an emergency, and the steps to take for a timely and controlled response.

Communication networks/chain of command - All on-site personnel will communicate any accident, injury or near miss to the TRC OHSO who will provide instruction on how to proceed further.

First Aid / Safety Equipment - First aid equipment should be readily available in the event of an emergency. First aid equipment should include a well-stocked first aid kit, fire extinguisher and emergency eye wash.

Evacuation Plans and Refuge Area - All personnel should safely remove themselves from danger in the event of an emergency and safely access the refuge area. The refuge area should be in an upwind location a safe distance from the work zone. The refuge area will be determined during the daily safety briefing.

Notifications of Fire, Police and Emergency Facilities - In the event of an emergency that cannot be controlled by on-site personnel, the appropriate emergency contact shall be notified. All personnel shall remove themselves from the area of danger and wait for the arrival of help in the predetermined refuge area. The following is a list of local emergency contacts:

15.1 Non-Emergency Medical Assistance

If an injury does occur and it is not life threatening, then the employee or employee's supervisor/project manager should contact WorkCare as soon as possible, but within the first hour after an injury. WorkCare information is provided in Appendix G. This information will help assist the injured employee by connecting them with instant access to a medically qualified professional in order to provide guidance on appropriate first aid measures and medications.

Table 16 - Non-Emergency Telephone Number		
Service	Telephone Numbers	Notes
TRC Work Care Service	888-449-787	See Appendix G

16. Observations

Note that the Project Manager and/or OSC will notify field staff if their site activities may be the subject of Safety Observation, an integral part of the continuous improvement safety culture promoted at TRC. If subject to an observation, please note the following:

- ✧ The Observation will tend to focus on the highest risk activity (as a general example, drilling in a public right-of-way).
- ✧ Follow-up observations may need to occur on previous observes, depending on prior data collected.
- ✧ The observer's preparation before visiting the site will be a review of the HASP, JSAs, client-specific requirements, etc., and a review of the work scope with the Project Manager to ensure the context of the work is well understood in advance.
- ✧ Review items may include PPE, body use and positioning, work environment, operating procedures, and tools and equipment.
- ✧ The observation should last between 30 and 60 minutes.

Both positive and negative observations are candidates for documentation and discussion. The overarching goals are to identify and correct questionable practices, and to identify and promote good, safe and efficient practices. This data gathering process allows TRC safety specialists to identify root causes for safety issues in both categories to better inform policy decisions.

17. Incident/Near Miss Reporting

In case of an accident, TRC personnel must report the incident or near miss immediately to their project manager/supervisor and/or OSC, and client's representative, and follow the TRC Incident Response and Reporting Process (see Appendix H). If neither is available, the incident shall be reported to the TRC Safety Director (Mike Glenn). Blue section of the TRC Incident Response and Reporting form must be completed within 24 hours following the incident. Accident/injury/exposure information must be recorded per TRC policy (see Appendix H) and will be the basis of any accident/incident investigations. A Near Miss Reporting "short form" is also included in Appendix L for use in expediting the reporting of near misses.

18. Acknowledgement

TRC personnel working under this HASP must read the HASP and sign the acknowledgment in Appendix I.

19. Subcontractors and Health and Safety Planning

TRC personnel must provide the complete HASP to all subcontractors for their reference in advance of the work. Subcontractors must prepare their own HASP and provide evidence of HASP preparation before the start of site work to ensure that the subcontractor has an understanding of the safety hazards associated with the work that they are performing. Subcontractor HASPs are not required to be included unless contractually/client required, or is so desired by the Project Manager or OSC.

20. Other Supporting Documentation

Supporting documentation and plans may be appended per the discretion of the Project Manager or OSC.

Figures



0 1,500 FT.
APPROXIMATE SCALE



TRC ENVIRONMENTAL CORP.
41 Spring Street
New Providence, New Jersey 07974

SITE LOCATION MAP

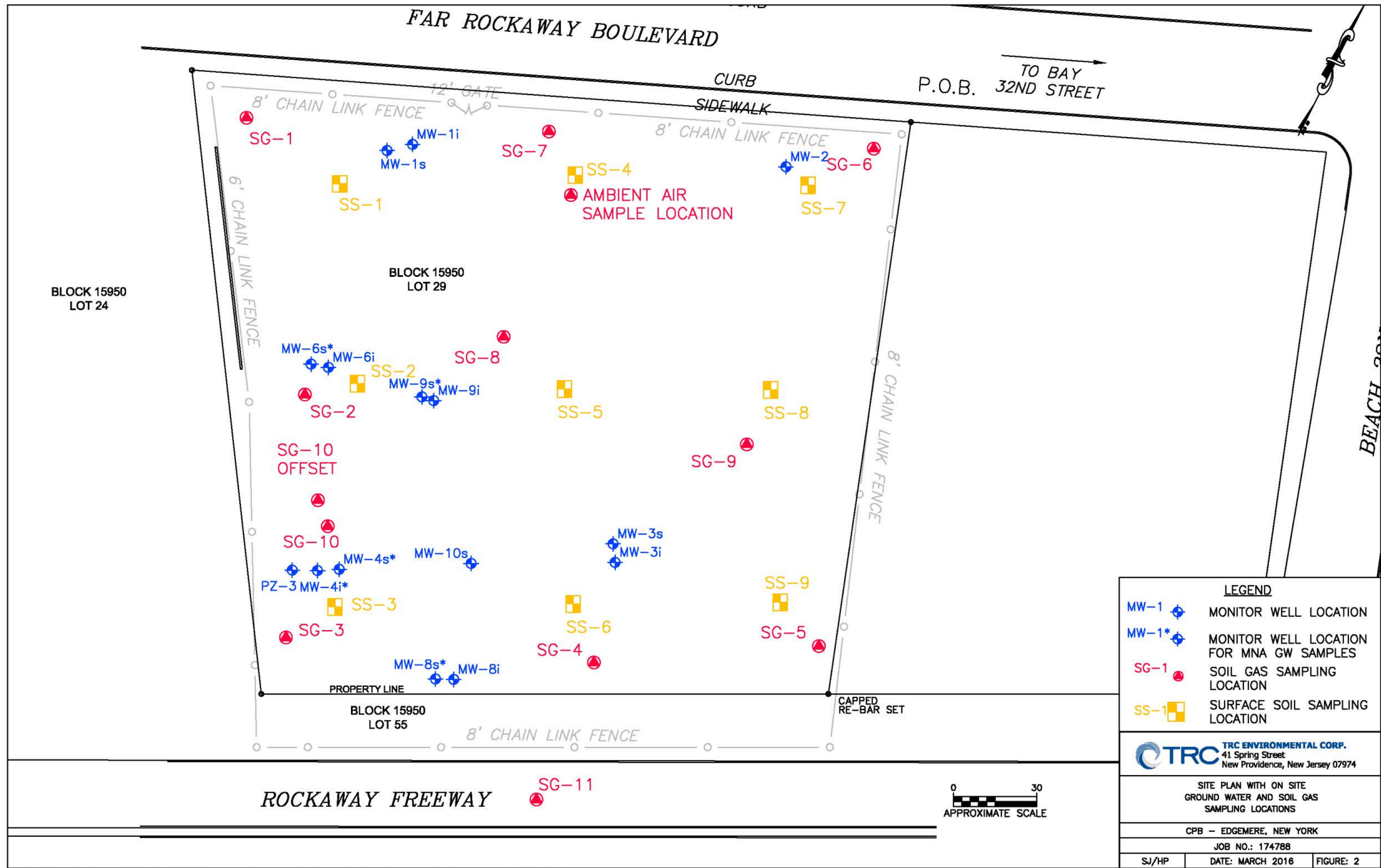
CPB - EDMERE, NEW YORK

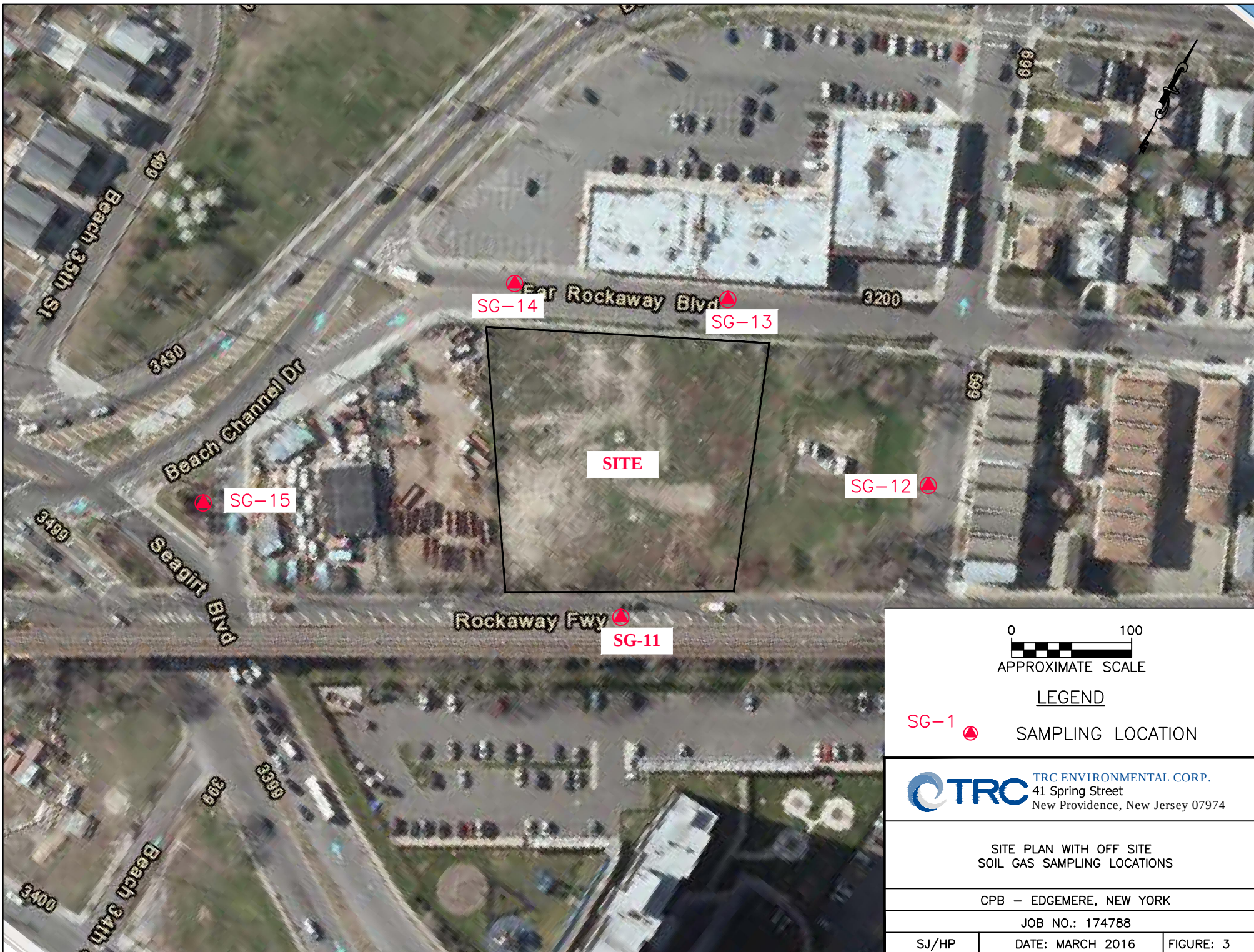
JOB NO.: 174788

HN

DATE: OCTOBER 15, 2008

FIGURE: 1





FAR ROCKAWAY BOULEVARD

TO BAY
P.O.B. 32ND STREET

BLOCK 15950
LOT 24

BLOCK 15950
LOT 29

CAP AREA 1:
5,400 sq. ft

CAP AREA 2:
9,900 sq. ft

BLOCK 15950
LOT 55

ROCKAWAY FREEWAY

8' CHAIN LINK FENCE

12' GATE

CURB

SIDEWALK

8' CHAIN LINK FENCE

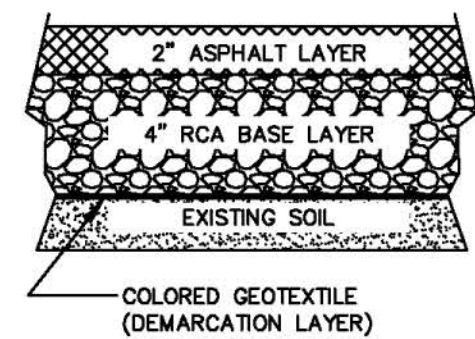
8' CHAIN LINK FENCE

8' CHAIN LINK FENCE

PROPERTY LINE

CAPPED
RE-BAR SET

ASPHALT CAP DETAIL



LEGEND

- MW-1 MONITOR WELL LOCATION
- SS-1 SURFACE SOIL SAMPLING LOCATION

TRC ENVIRONMENTAL CORP.
41 Spring Street
New Providence, New Jersey 07974

ENGINEERING CONTROL LOCATIONS
AND ASPHALT CAP DETAILS

CPB - FAR ROCKAWAY, NEW YORK

JOB NO.: 174788

SJ/HP DATE: MARCH 2016 FIGURE: 4



Appendix A

Drilling, Borehole, Excavation Checklist



DRILLING / BOREHOLE / EXCAVATION CHECKLIST

Site Location, Name: _____

Date: _____

Project Task: _____

Contractor: _____

Sub-contractor: _____

Supervisor: _____

ACTIVITY	Yes	No/ N/A	COMMENTS INCLUDING JUSTIFICATION IF A RESPONSE IS <u>NO</u> OR <u>NOT APPLICABLE</u>
Personnel briefed on potential site/work hazards and safety. Sub-surface Clearance protocols have been reviewed with all site personnel involved in subsurface disturbance activities.			
All applicable local and site-specific permits have been obtained.			
Site access/permission has been secured. Landowner/occupant has been contacted.			
Most recent as-built drawings and/or site plans, surveys, utility maps obtained.			
Reviewed site information to identify subsurface structures relevant to planned site activities (easements, right-of-ways, historical plot plans, previous site investigations, soil surveys, boring logs, etc.).			
Utility locates have been performed by public utility company(s) and One-Call companies within required timeframe. Locates are clear/visible.			
Subsurface structure locates performed by private locate company within required timeframe. Locates clear/visible.			
Location of all aboveground indicators of subsurface utilities/services that may be leading to or from buildings within planned work area are identified.			
Location of area lights/signs and associated subsurface lines identified.			
Location of all telecommunication and associated subsurface lines identified.			
Location of all drains and associated interconnecting lines identified.			
Location of all electrical junction boxes and associated interconnecting lines identified.			
Location of all natural gas meters or connections and all interconnecting lines identified.			
Orientation, arrangement, location, sizes, of tanks and extractor covers identified. Burial depth of tank determined if relevant.			
Location of paving/soil scars indicative of subsurface structures identified.			
Presence of underground pipelines associated with pumps and pump galleries, manifolds, tank fields, compressors, production wells, loading racks and equipment identified.			
Presence of underground lines for instrumentation, process analyzer, and motor-operated valves are inspected/identified.			
Presence and tracing of process/storm sewers identified/understood. If other cement, fiberglass, untraced PVC lines are potentially in the ground disturbance area, identify means of identification in comments section.			
Locations of other pertinent surface or sub-surface features that may be of relevance to work scope have been identified.			
Clearance methods reviewed with Project Manager.			
Ground disturbance locations reviewed by Project Manager.			

DRILLING / BOREHOLE / EXCAVATIONS CHECKLIST



ACTIVITY	Yes	No/ N/A	COMMENTS INCLUDING JUSTIFICATION IF A RESPONSE IS <u>NO</u> OR <u>NOT APPLICABLE</u>
Work area is secured. Emergency shut-off switch is located. Fire extinguishers/warning signs/barriers are present where needed. Signage in place for overhead power lines. Other safety equipment as needed.			
If subsurface structures exposed, extra precautions have been taken to ensure structural integrity.			

Comments / Findings	Actions to Close Out Items	Person Completing / Date

Completed by:

Name (print)

Company

Signature

Date

Appendix B

Material Safety Data Sheets for Preservatives and Decontamination Products



Section 1 - Chemical Product and Company Identification

54/58

Material Name: Trichloroethylene

CAS Number: 79-01-6

Chemical Formula: C_2HCl_3 Structural Chemical Formula: $ClCH=CCl_2$

EINECS Number: 201-167-4

ACX Number: X1000039-2

Synonyms: ACETYLENE TRICHLORIDE; ALGYLEN; ANAMENTH; BENZINOL; BLACOSOLV; BLANCOSOLV; CECOLENE; CHLORILEN; 1-CHLORO-2,2-DICHLOROETHYLENE; CHLORYLEA; CHLORYLEA, CHORYLEN, CIRCOSOLV, CRAWHASPOL, DOW-TRI, DUKERON, PER-A-CLOR, TRIAD, TRIAL, TRI-PLUS M, VITRAN; CHLORYLEN; CHORYLEN; CIRCOSOLV; CRAWHASPOL; DENSINFLUAT; 1,1-DICHLORO-2-CHLOROETHYLENE; DOW-TRI; DUKERON; EPA PESTICIDE CHEMICAL CODE 081202; ETHENE, TRICHLORO-; ETHINYL TRICHLORIDE; ETHYLENE TRICHLORIDE; ETHYLENE, TRICHLORO-; FLECK-FLIP; FLOCK FLIP; FLUATE; GEMALGENE; GERMALGENE; LANADIN; LETHURIN; NARCOGEN; NARKOGEN; NARKOSOID; NIALK; NSC 389; PERM-A-CHLOR; PERM-A-CLOR; PETZINOL; PHILEX; TCE; THRETHYLEN; THRETHYLENE; TRETHYLENE; TRI; TRIAD; TRIAL; TRIASOL; TRICHOORETHEEN; TRICHOORETHYLEEN, TRI; TRICHLORAETHEN; TRICHLORAETHYLEN, TRI; TRICHLORAN; TRICHLOREN; TRICHLORETHENE; TRICHLORETHYLENE; TRICHLORETHYLENE, TRI; TRICHLOROETHENE; 1,1,2-TRICHLOROETHYLENE; TRICHLOROETHYLENE; TRICHLOROETHYLENE; 1,2,2-TRICHLOROETHYLENE; TRI-CLENE; TRICLENE; TRICLORETENE; TRICLOROETILENE; TRIELENE; TRIELIN; TRIELINA; TRIELINE; TRIKLONE; TRILEN; TRILENE; TRILINE; TRIMAR; TRIOL; TRI-PLUS; TRI-PLUS M; VESTROL; VITRAN; WESTROSOL

General Use: Mainly used for vapor degreasing; solvent in textile and electronics industries; for adhesives, lubricants and consumer products (such as spot removers and rug cleaners).

Until recently, it was used to make hop extracts for beer, decaffeinated coffee and spice extracts.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
trichloroethylene	79-01-6	> 99

OSHA PEL

TWA: 100 ppm; Ceiling: 200 ppm;
300 ppm, 5-minute maximum
peak in any 2 hours.

NIOSH REL

IDLH Level
1000 ppm.

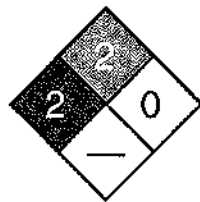
OSHA PEL Vacated 1989 Limits

TWA: 50 ppm; 270 mg/m³; STEL:
200 ppm; 1080 mg/m³.

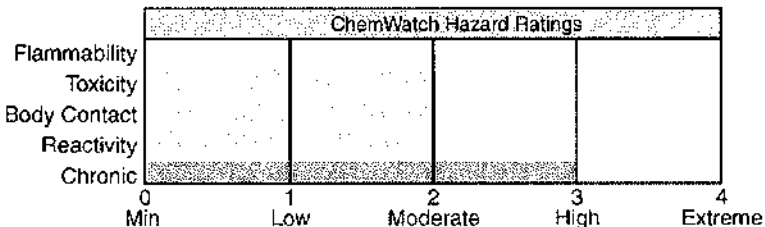
ACGIH TLV

TWA: 50 ppm; STEL: 100 ppm.

Section 3 - Hazards Identification



Fire Diamond



HMIS	
2	Health
2	Flammability
0	Reactivity

ANSI Signal Word

Warning!



Flammable

☆☆☆☆ Emergency Overview ☆☆☆☆

Clear, colorless liquid; sweet odor. Irritating to eyes/skin/respiratory tract. Inhalation: irregular heart beat, drunkenness. Chronic: heart, liver and kidney damage, dermatitis. Birth defects and cancer may occur based on animal studies. Flammable.

Potential Health Effects

Target Organs: respiratory system, central nervous system (CNS), peripheral nervous system, cardiovascular system, liver, kidneys, skin

Primary Entry Routes: inhalation, skin contact, eye contact, ingestion (rarely)

Acute Effects

Inhalation: The vapor is mildly discomforting to the upper respiratory tract.

Inhalation hazard is increased at higher temperatures.

Anesthetics and narcotic effects (with dulling of senses and odor fatigue) are a consequence of exposure to chlorinated solvents.

Individual response varies widely; odor may not be considered objectionable at levels which quickly induce central nervous system effects.

High vapor concentrations may give a feeling of euphoria. This may result in reduced responses, followed by rapid onset of unconsciousness, possible respiratory arrest and death.

Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.

If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.

Evidence of acute human toxicity comes mainly from the use of TCE as an anesthetic. Tachypnea and ventricular arrhythmias are experienced at inhaled concentrations exceeding 15000 ppm. Systemic toxicity is low following anesthesia. Occasional hepatotoxicity (liver dysfunction) has been reported; this is probably due to the breakdown of TCE to dichloroacetylene and phosgene by soda-lime present in some anesthetic devices. The effects of TCE appear to be enhanced in some individuals by simultaneous exposure to caffeine, ethanol and other drugs. "Degreasers Flush" describes a reddening of facial, neck, and back skin and is seen after intake of substantial quantities of ethanol by certain individuals after exposures to TCE.

Eye: The liquid is highly discomforting to the eyes and is capable of causing pain and severe conjunctivitis.

Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.

The vapor is discomforting to the eyes.

The material may produce moderate eye irritation leading to inflammation.

Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The liquid is discomforting to the skin and may cause drying of the skin, which may lead to dermatitis.

Toxic effects may result from skin absorption.

Bare unprotected skin should not be exposed to this material. The material may accentuate any pre-existing skin condition.

The material may produce severe skin irritation after prolonged or repeated exposure, and may produce a contact dermatitis (nonallergic).

This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis.

Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Repeated exposures may produce severe ulceration.

Localized application may produce pustular eruptions, pruritus and erythema. A permeability coefficient of 1.6×10^{-2} cm/hr has been calculated by the US EPA. Percutaneous absorption is unlikely to contribute significantly to total body burdens unless dermatitis is present.

Ingestion: The liquid is highly discomforting and toxic if swallowed.

Ingestion may result in nausea, abdominal irritation, pain and vomiting.

Considered an unlikely route of entry in commercial/industrial environments.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Listed as carcinogen; ACGIH - Class A5, Not suspected as a human carcinogen; EPA - Not listed; MAK - Class B, Justifiably suspected of having carcinogenic potential.

Chronic Effects: Sensitive humans may experience anesthetic effects from short exposures.

Chronic effects of exposure include fatigue, headache, irritability, vomiting, skin flush and intolerance to alcohol.

Liver, kidney, heart and neurological damage may also result from chronic overexposure.

Alcohol intake may increase the toxic effects of the material.

A variety of disturbances have been seen among workers exposed at concentrations ranging from 1 to 335 ppm. These disturbances increased with the length of exposure (to 5 years or more) and were more prominent when exposures exceeded 40 ppm. Increased complaints of alcohol intolerance, tremors, giddiness and anxiety were amongst symptoms recorded. Variation in effects in different occupational settings may be due to different physical workloads.

There appeared to be no increase in the expected rates of congenital defects in children born to women exposed to TCE over a 13 year period.

Epidemiological studies consistently fail to show a link between cancers and TCE exposure. This is significant because of the tens of thousands of exposed workers monitored.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If available, administer medical oxygen by trained personnel.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water.

Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).

Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

Avoid giving milk or oils.

Avoid giving alcohol.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Treat symptomatically.

Do not administer sympathomimetic drugs as they may cause ventricular arrhythmias.

Following acute or short-term continued exposures to trichloroethylene:

1. Trichloroethylene concentration in expired air correlates with exposure. 8 hours exposure to 100 ppm produces levels of 25 ppm immediately and 1 ppm 16 hours after exposures.

2. Most mild exposure respond to removal from the source and supportive care.

Serious toxicity most often results from hypoxemia or cardiac dysrhythmias so that oxygen, intubation, intravenous lines and cardiac monitoring should be started initially as the clinical situation dictates.

3. Ipecac syrup should be give to alert patients who ingest more than a minor amount and present within 2 hours.

4. The efficacy of activated charcoal and cathartics is unclear.

5. The metabolites, trichloroacetic acid, trichloroethanol and to a lesser degree, chloral hydrate, may be detected in the urine up to 16 days postexposure.

BIOLOGICAL EXPOSURE INDEX - BEI

These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

<u>Determinant</u>	<u>Index</u>	<u>Sampling Time</u>	<u>Comments</u>
Trichloroacetic acid in urine	10 mg/gm creatinine	End of work-week	NS
Trichloroacetic acid AND Trichloroethanol in urine	300 mg/mg creatinine	End of shift at end of work-week	NS
Free Trichloroethanol in blood	4 mg/L	End of shift at end of work-week	NS
Trichloroethylene in end-exhaled air			SQ
Trichloroethylene in blood			SQ

NS: Non-specific determinant; also seen after exposure to other materials

SQ: Semi-quantitative determinant - Interpretation may be ambiguous; should be used as a screening test or confirmatory test.

Section 5 - Fire-Fighting Measures

Flash Point: 32.222 °C Closed Cup

Autoignition Temperature: 420 °C

LEL: 8% v/v

UEL: 10.5% v/v

Extinguishing Media: Water spray or fog; foam, dry chemical powder, or BCF (where regulations permit).

Carbon dioxide.

General Fire Hazards/Hazardous Combustion Products: Vapor will burn when in contact with high temperature flame.

May form a flammable/explosive mixture in an oxygen enriched atmosphere. Heating may cause expansion/vaporization with violent rupture of containers. Decomposes on heating and produces corrosive fumes of hydrochloric acid, carbon monoxide and small amounts of toxic phosgene.

Fire Incompatibility: Avoid reaction with strong oxidizing agents (particularly oxygen in gas or liquid form and nitrogen dioxide), strong bases, sodium and sodium-potassium alloys. Powdered metals; magnesium, zinc and aluminum.

Contact with water may result in the slow formation of hydrochloric acid.

Attacks natural rubber.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.

Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.

Use water delivered as a fine spray to control fire and cool adjacent area.

Avoid spraying water onto liquid pools.

Do not approach containers suspected to be hot.

Cool fire-exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.



Fire Diamond

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.

Avoid breathing vapors and contact with skin and eyes.

Control personal contact by using protective equipment.

Contain and absorb spill with sand, earth, inert material or vermiculite.

Wipe up. Place in a suitable labeled container for waste disposal.

Large Spills: Clear area of personnel and move upwind.

Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.

Increase ventilation.

No smoking or bare lights within area.

Stop leak if safe to do so.

Contain and absorb spill with sand, earth, inert material or vermiculite.

Collect and seal in labeled drums for disposal.

If contamination of drains or waterways occurs, advise emergency services.

After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid all personal contact, including inhalation.

Wear protective clothing when risk of overexposure occurs.

Use in a well-ventilated area. Prevent concentration in hollows and sumps.

DO NOT enter confined spaces until atmosphere has been checked.

DO NOT allow material to contact humans, exposed food or food utensils.

Avoid smoking, bare lights or ignition sources. When handling, DO NOT eat, drink or smoke. Avoid contact with incompatible materials.

Keep containers securely sealed when not in used. Avoid physical damage to containers. Always wash hands with soap and water after handling. Working clothes should be laundered separately.

Launder contaminated clothing before reuse.

Observe manufacturer's storing/handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Recommended Storage Methods: Inhibited grades may be stored in metal drums.

DO NOT use aluminum or galvanized containers. Check that containers are clearly labeled and free from leaks.

Packaging as recommended by manufacturer.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Local exhaust ventilation usually required.

If risk of overexposure exists, wear NIOSH-approved respirator.

Correct fit is essential to obtain adequate protection. NIOSH-approved self contained breathing apparatus (SCBA) may be required in some situations.

Provide adequate ventilation in warehouse or closed storage area.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; chemical goggles. Full face shield.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: PVA gloves. Polyethylene gloves.

Viton gloves.

PVC boots.

Respiratory Protection:

Exposure Range >100 to <1000 ppm: Supplied Air, Constant Flow/Pressure Demand, Half Mask

Exposure Range 1000 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Note: odor threshold unknown

Other: Overallis. Eyewash unit. Barrier cream. Skin cleansing cream.

Glove Selection Index:

PE/LVAL/PE Best selection

PVA Best selection

TEFLON Best selection

VITON Satisfactory; may degrade after 4 hours continuous immersion

VITON/NEOPRENE Poor to dangerous choice for other than short-term immersion

VITON/NITRILE Poor to dangerous choice for other than short-term immersion

HYPALON Poor to dangerous choice for other than short-term immersion

NEOPRENE Poor to dangerous choice for other than short-term immersion

PVC Poor to dangerous choice for other than short-term immersion

NITRILE Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless liquid with a sweetish, chloroform-like odor, miscible with most organic solvents.

Physical State: Liquid

Vapor Pressure (kPa): 7.87 at 20 °C

Vapor Density (Air=1): 4.54

Formula Weight: 131.38

Specific Gravity (H₂O=1, at 4 °C): 1.47 at 15 °C

pH: Not applicable

pH (1 % Solution): Not applicable.

Boiling Point: 87 °C (189 °F)

Freezing/Melting Point: -73 °C (-99.4 °F)

Volatile Component (% Vol): 100

Water Solubility: < 1 mg/mL at 21 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Decomposes in the presence of moisture to produce corrosive acid.

Product is considered stable under normal handling conditions. Hazardous polymerization will not occur.

Storage Incompatibilities: Avoid storage with strong oxidizers (particularly oxygen in gas or liquid form and nitrogen dioxide), strong bases, acetone, sodium/sodium-potassium alloys, magnesium, zinc and aluminum.

Avoid contact with water as the slow formation of hydrochloric acid results.

Attacks natural rubber.

Haloalkenes are highly reactive. Some of the more lightly substituted lower members are highly flammable; many members of the group are peroxidizable and polymerizable.

Section 11 - Toxicological Information

Toxicity

Oral (human) LD₅₀: 7000 mg/kg
 Oral (man) TD₀₁: 2143 mg/kg
 Oral (rat) LD₅₀: 5650 mg/kg
 Inhalation (man) LC₀₁: 2900 ppm
 Inhalation (human) TD₀₁: 812 mg/kg
 Inhalation (human) TC₀₁: 6900 mg/m³/10 m
 Inhalation (man) TC₀₁: 2900 ppm
 Inhalation (man) TC₀₁: 110 ppm/8h
 Inhalation (man) TC₀₁: 160 ppm/83 m

Irritation

Skin (rabbit): 500 mg/24h - SEVERE
 Eye (rabbit): 20 mg/24h - SEVERE

See NIOSH, RTECS KX 4550000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.

Ecotoxicity: LC₅₀ Sheepshead minnow 20 mg/l/96 hr. /Conditions of bioassay not specified; LC₅₀ Mexican axolotl (3-4 wk after hatching) 48 mg/l/48 hr /Conditions of bioassay not specified; LC₅₀ Clawed toad (3-4 wk after hatching) 45 mg/l/48 hr /Conditions of bioassay not specified; LC₅₀ Pimephales promelas (fathead minnow) 40.7 mg/l/96 hr (95% confidence limits 31.4-71.8 mg/l) /Flow-through test; EC₁₀ Pimephales promelas (fathead minnow) 15.2 mg/l/24 hr; 16.9 mg/l/48 hr; 15.5 mg/l/72 hr; 13.7 mg/l/96 hr; Toxic effect for all concentrations specified: loss of equilibrium. /Flow-through bioassay; Toxicity Threshold (Cell Multiplication Inhibition Test) Scenedesmus quadricauda (green algae) >1000 mg/l /Time not specified, conditions of bioassay not specified; Toxicity Threshold (Cell Multiplication Inhibition Test) Pseudomonas putida (bacteria) 65 mg/l; LC₅₀ Grass shrimp 2 mg/l/96 hr. /Conditions of bioassay not specified

Henry's Law Constant: 1×10^{-2}

BCF: bluegill 17 to 39

Biochemical Oxygen Demand (BOD): 0%, 20 days

Octanol/Water Partition Coefficient: $\log K_{ow} = 2.29$

Soil Sorption Partition Coefficient: $K_{oc} = 2.0$

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options.

Follow applicable federal, state, and local regulations.

Reclaim solvent at an approved site.

Evaporate or incinerate residue at an approved site.

Recycle containers if possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name: TRICHLOROETHYLENE

Hazard Class: 6.1(b)

ID No.: 1710

Packing Group: III

Label: Harmful[6]

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Listed U228 Toxic Waste

CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4), per RCRA Section 3001, per CWA Section 307(a) 100 lb (45.35 kg)

SARA 40 CFR 372.65: Listed

SARA EHS 40 CFR 355: Not listed

TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.



Section 1 - Chemical Product and Company Identification

54/58

Material Name: Perchloroethylene**CAS Number:** 127-18-4**Chemical Formula:** C₂Cl₄**Structural Chemical Formula:** Cl₂C=CCl₂**EINECS Number:** 204-825-9**ACX Number:** X1000034-7

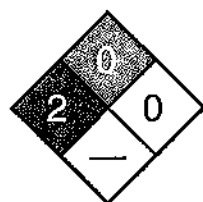
Synonyms: ANKILOSTIN; ANTISAL 1; ANTISOL 1; CARBON BICHLORIDE; CARBON DICHLORIDE; CZTEROCHLOROETYLEN; DIDAKENE; DILATIN PT; DOW-PER; ENT 1,860; EPA PESTICIDE CHEMICAL CODE 078501; ETHENE, TETRACHLORO-; ETHYLENE TETRACHLORIDE; ETHYLENE, TETRACHLORO-; FEDAL-UN; NEMA; PCE; PER; PERAWIN; PERC; PERCHLOORETHYLEEN, PER; PERCHLOR; PERCHLORAETHYLEN, PER; PERCHLORETHYLENE; PERCHLORETHYLENE, PER; PERCHLOROETHYLENE; PERCLENE; PERCLENE D; PERCHLOROETHYLENE; PERCOSOLV; PERCOSOLVE; PERK; PERKLONE; PERSEC; TETLEN; TETRACAP; TETRACHLOORETHEEN; TETRACHLORAFTHEN; TETRACHLORETHYLENE; TETRACHLOROETHENE; 1,1,2,2-TETRACHLOROETHYLENE; TETRACHLOROETHYLENE; TETRACHLOROETENE; TETRAGUER; TETRALENO; TETRALEX; TETRAVEC; TETROGUER; TETROPIL

General Use: Used as a drycleaning solvent, a vapor-degreasing solvent; a drying agent for metals and certain other solids. Used also as a heat transfer medium and in the manufacture of fluorocarbons.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
perchloroethylene	127-18-4	100
OSHA PEL TWA: 100 ppm; Ceiling 200 ppm; 300 ppm, 5-minute maximum peak in any 3 hours.	NIOSH REL Minimize workplace exposure concentrations. IDLH Level 150 ppm.	DFG (Germany) MAK Skin.
OSHA PEL Vacated 1989 Limits TWA: 25 ppm; 170 mg/m ³ .		
ACGIH TLV TWA: 25 ppm; STEL: 100 ppm.		

Section 3 - Hazards Identification



Fire Diamond

	ChemWatch Hazard Ratings				
Flammability					
Toxicity					
Body Contact					
Reactivity					
Chronic					
	0 Min	1 Low	2 Moderate	3 High	4 Extreme

HMIS	
2	Health
0	Flammability
0	Reactivity

ANSI Signal Word

Caution

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; ether-like odor. Irritating to eyes/skin/respiratory tract. Also causes: headache, dizziness, CNS depression, incoordination, slurred speech. Chronic: liver/kidney damage; possible cancer hazard based on animal studies.

Potential Health Effects

Target Organs: liver, kidneys, eyes, upper respiratory system, skin, central nervous system (CNS)

Primary Entry Routes: inhalation, skin contact, eye contact

Acute Effects

Inhalation: Acute intoxication by halogenated aliphatic hydrocarbons appears to take place over two stages. Signs of a reversible narcosis are evident in the first stage and in the second stage signs of injury to organs may become evident. A single organ alone is (almost) never involved.

The vapor is highly discomforting to the upper respiratory tract and lungs.

Inhalation hazard is increased at higher temperatures.

Anesthetic and narcotic effects (with dulling of senses and odor fatigue) are a consequence of exposure to chlorinated solvents.

Individual response varies widely; odor may not be considered objectionable at levels which quickly induce central nervous system effects.

High vapor concentrations may give a feeling of euphoria. This may result in reduced responses, followed by rapid onset of unconsciousness, possible respiratory arrest and death.

Accidental high level exposure has produced lightheadedness, unconsciousness and liver and kidney damage in workers. In at least two cases such exposures were fatal. Subjects exposed to 106 ppm in laboratory studies experienced slight eye irritation; dizziness and sleepiness were reported at 216 ppm; at exposures of 280 ppm or 600 ppm for 10 minutes there was a loss of motor coordination. In another study subjects exposed for 7 hours at 101 ppm complained of eye irritation and subjective symptoms such headache, drowsiness and sleepiness.

Eye: The liquid may produce eye discomfort and is capable of causing temporary impairment of vision and/or transient eye inflammation, ulceration. Eye contact may cause lachrymation (tears) and burning sensation.

The vapor is highly discomforting to the eyes.

The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The liquid is highly discomforting to the skin if exposure is prolonged and may cause drying of the skin, which may lead to dermatitis.

Toxic effects may result from skin absorption.

Absorption by skin may readily exceed vapor inhalation exposure.

Symptoms for skin absorption are the same as for inhalation.

Bare unprotected skin should not be exposed to this material.

The material may accentuate any pre-existing skin condition.

The material may produce severe skin irritation after prolonged or repeated exposure, and may produce a contact dermatitis (nonallergic).

This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis.

Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Prolonged contact is unlikely, given the severity of response, but repeated exposures may produce severe ulceration.

Industrial experience shows localized skin irritation. Prolonged dermal contact can cause chemical burns and blistering.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.

The liquid is highly discomforting and toxic if swallowed and may be fatal if swallowed in large quantity.

Ingestion may result in nausea, abdominal irritation, pain and vomiting.

When used in the treatment of hookworm (4.5 to 6.5 gm orally) the only adverse effect is inebriation. Transient hepatotoxicity in patients given single oral doses of up to 5 mL have been recorded.

Carcinogenicity: NTP - Class 2B, Reasonably anticipated to be a carcinogen, sufficient evidence of carcinogenicity from studies in experimental animals; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Listed as carcinogen; ACGIH - Class A3, Animal carcinogen; EPA - Not listed; MAK - Class B, Justifiably suspected of having carcinogenic potential.

Chronic Effects: Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following.

Workers inhaling 232 to 385 ppm for 8 hours/day, 5 days/week for 2 to 6 years have shown abnormal hepatic function, including cirrhosis, with lightheadedness, headache, malaise and dizziness.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water.

Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).

Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

Avoid giving milk or oils.

Avoid giving alcohol.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Treat symptomatically.

Do not administer sympathomimetic drugs as they may cause ventricular arrhythmias.

For acute or short-term repeated exposures to perchloroethylene:

Tetrachloroethylene/perchloroethylene is well absorbed through the lungs with peak levels more important than duration in determining blood concentration.

Lungs excrete most of the absorbed tetrachloroethylene in an unchanged state; about 3% is converted by the liver to form trichloroacetic acid and subsequently excreted by the kidney. Exhaled material has a biological half-life of 65 hours.

INHALATION:

The treatment of acute inhalation exposures is supportive with initial attention directed to evaluation/support of ventilation and circulation.

As with all hydrocarbons care must be taken to reduce the risk of aspiration by proper positioning and medical observation.

INGESTION:

1. The ingestion level at which emesis should be induced is difficult to predict in the absence of extensive human studies.

2. The role of charcoal and cathartics remains uncertain.

BIOLOGICAL EXPOSURE INDEX - BEI

These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

<u>Determinant</u>	<u>Index</u>	<u>Sampling Time</u>	<u>Comments</u>
Perchloroethylene in end-exhaled air	10 ppm	Prior to last shift of work-week	
Perchloroethylene in Blood	1 mg/L	Prior to last shift of work-week	
Trichloroacetic acid in urine	7 mg/L	End of work-week	NS,SQ

NS: Non-specific determinant; also seen after exposure to other materials

SQ: Semi-quantitative determinant - Interpretation may be ambiguous; should be used as a screening test or confirmatory test.

Section 5 - Fire-Fighting Measures

Flash Point: Nonflammable

Autoignition Temperature: 490 °C

LEL: 1.8% v/v

UEL: 11.5% v/v at 740 mm Hg 160 °C

Extinguishing Media: Use extinguishing media suitable for surrounding area.

General Fire Hazards/Hazardous Combustion Products: Nonflammable liquid. However vapor will burn when in contact with high temperature flame. Ignition ceases on removal of flame.

May form a flammable/explosive mixture in an oxygen enriched atmosphere. Heating may cause expansion/vaporization with violent rupture of containers. Decomposes on heating and produces corrosive fumes of hydrochloric acid, carbon monoxide and small amounts of toxic phosgene.

Fire Incompatibility: Avoid mixing with strong alkalis or powdered metals, particularly zinc as ignition may result.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.

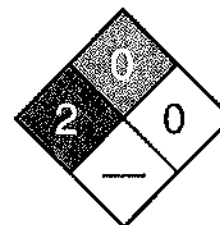
Wear breathing apparatus plus protective gloves for fire only. Prevent, by any means available, spillage from entering drains or waterways.

Use fire fighting procedures suitable for surrounding area.

Do not approach containers suspected to be hot.

Cool fire-exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.



Fire Diamond

Equipment should be thoroughly decontaminated after use.

Section 6 - Accidental Release Measures

Small Spills: Clean up all spills immediately.

Wear protective neoprene gloves and chemical goggles.

If risk of overexposure exists, wear NIOSH-approved respirator.

Wipe up and absorb small quantities with vermiculite or other absorbent material.

DO NOT discharge into sewer or waterways.

Place spilled material in clean, dry, sealable, labeled container.

Large Spills: Minor hazard. Clear area of personnel and move upwind.

Contact fire department and tell them location and nature of hazard.

Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.

No smoking, bare lights or ignition sources. Increase ventilation.

Stop leak if safe to do so. Contain spill with sand, earth or vermiculite.

Collect recoverable product into labeled containers for recycling.

Absorb remaining product with sand, earth or vermiculite.

Collect solid residues and seal in labeled drums for disposal.

Wash area and prevent runoff into drains.

If contamination of drains or waterways occurs, advise emergency services.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Avoid all personal contact, including inhalation.

Wear protective clothing when risk of exposure occurs.

Use in a well-ventilated area. Prevent concentration in hollows and sumps.

DO NOT enter confined spaces until atmosphere has been checked.

DO NOT allow material to contact humans, exposed food or food utensils.

Avoid contact with incompatible materials.

When handling, DO NOT eat, drink or smoke.

Keep containers securely sealed when not in use. Avoid physical damage to containers. Always wash hands with soap and water after handling. Work clothes should be laundered separately.

Launder contaminated clothing before reuse.

Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Recommended Storage Methods: Check that containers are clearly labeled. Glass container.

Heavy gauge metal packages/heavy gauge metal drums.

Avoid storage with zinc, galvanized or diecast metal (including bungs).

DO NOT use aluminum or galvanized containers.

Packaging as recommended by manufacturer.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: CARE: Use of a quantity of this material in confined space or poorly ventilated area, where rapid build-up of concentrated atmosphere may occur, could require increased ventilation and/or protective gear. Use in a well-ventilated area.

Local exhaust ventilation may be required for safe working, i. e. , to keep exposures below required standards; otherwise, PPE is required.

If inhalation risk exists, wear NIOSH-approved organic-vapor respirator or air supplied breathing apparatus.

Personal Protective Clothing/Equipment:

Eyes: Chemical goggles. Full face shield.

Hands/Feet: Neoprene gloves; Viton gloves.

PVA gloves.

PVC gloves.

Protective footwear.

Respiratory Protection:

Exposure Range >100 to <150 ppm: Supplied Air, Constant Flow/Pressure Demand, Half Mask

Exposure Range 150 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Note: poor warning properties

Other: Overallis. Eyewash unit. Ensure there is ready access to an emergency shower.

Glove Selection Index:

PE/EVAL/PE Best selection

VITON/CHLOROBUTYL	Best selection
VITON/NITRILE.....	Best selection
VITON	Best selection
PVA	Best selection
CPE	Best selection
NITRILE.....	Satisfactory; may degrade after 4 hours continuous immersion
TEFLON	Satisfactory; may degrade after 4 hours continuous immersion
NITRILE+PVC	Poor to dangerous choice for other than short-term immersion
SARANEX-23 2-PLY.....	Poor to dangerous choice for other than short-term immersion
SARANEX-23	Poor to dangerous choice for other than short-term immersion
PVC.....	Poor to dangerous choice for other than short-term immersion
BUTYL	Poor to dangerous choice for other than short-term immersion
NEOPRENE.....	Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless liquid, with a chloroform-like odor. Extremely stable, resists hydrolysis. Miscible with alcohol, ether and oils.

Physical State: Liquid

Vapor Pressure (kPa): 2.11 at 22 °C

Vapor Density (Air=1): 5.83

Formula Weight: 165.82

Specific Gravity (H₂O=1, at 4 °C): 1.63 at 15 °C

Evaporation Rate: 0.09 Ether=1

pH: Not applicable

pH (1% Solution): Not applicable.

Boiling Point: 121 °C (250 °F) at 760 mm Hg

Freezing/Melting Point: -19 °C (-2.2 °F)

Volatile Component (% Vol): 100

Water Solubility: 0.02% by weight

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable and hazardous polymerization will not occur.

Storage Incompatibilities: Avoid reaction with oxidizing agents. Segregate from strong alkalis.

Haloalkenes are highly reactive. Some of the more lightly substituted lower members are highly flammable; many members of the group are peroxidizable and polymerizable.

The presence of 0.5% trichloroethylene as an impurity caused generation of dichloroacetylene during unheated drying over solid sodium hydroxide.

Subsequent fractional distillation produced an explosion.

Section 11 - Toxicological Information

Toxicity

Oral (rat) LD₅₀: 2629 mg/kg

Inhalation (man) LD₅₀: 2857 mg/kg

Inhalation (human) TC₁₀₀: 96 ppm/7 hrs

Inhalation (man) TC₁₀₀: 280 ppm/2 hrs

Inhalation (man) TC₁₀₀: 600 ppm/10 min

Inhalation (rat) LC₅₀: 34200 mg/m³/8 hr

Irritation

Skin (rabbit): 810 mg/24h -SEVERE

Eye (rabbit): 162 mg -mild

See NIOSH, RTECS KX 3850000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If it is released to soil, it will be subject to evaporation into the atmosphere and to leaching to the groundwater. Biodegradation may be an important process in anaerobic soils based on laboratory tests with methanogenic columns. Slow biodegradation may occur in groundwater where acclimated populations of microorganisms exist. If released to water, it will be subject to rapid volatilization with estimated half-lives ranging from <1 day to several weeks. It will not be expected to significantly biodegrade, bioconcentrate in aquatic organisms or significantly adsorb to sediment. It will not be expected to significantly hydrolyze in soil or water under normal environmental conditions. If released to the atmosphere, it will exist mainly in the gas-phase and it will be subject to photooxidation with estimates of degradation time scales ranging from an approximate half-life of 2 months to complete degradation in an hour. Some in the atmosphere may be subject to washout in rain based on the solubility in water.

Ecotoxicity: LC₅₀ Tanytarsus dissimilis (midge) 30, 840 ug/l/48 hr, static bioassay; LC₅₀ Poecilia reticulata (guppy) 18 ppm/7 days /Conditions of bioassay not specified; LC₅₀ Daphnia magna (water flea) 18 mg/l/48 hr, static bioassay, at 22 °C; LC₅₀ Salmo gairdneri (rainbow trout) 5 mg/l/96 hr, static bioassay at 12 °C

Henry's Law Constant: 2.87×10^{-2}

BCF: fathead minnow 38.9

Biochemical Oxygen Demand (BOD): none

Octanol/Water Partition Coefficient: $\log K_{ow} = 3.40$

Soil Sorption Partition Coefficient: $K_{oc} = 209$

Section 13 - Disposal Considerations

Disposal: Reclaim solvent at an approved site.

Allow absorbed spillage to evaporate in an open top container, away from habitation.

Incinerate residue at an approved site.

Used containers should be left upside down with bungs out.

Return containers to drum reconditioner or recycler.

Section 14 - Transport Information

DOT Transportation Data (49 CFR 172.101):

Shipping Name:

TETRACHLOROETHYLENE

Additional Shipping Information: PERCHLOROETHYLENE

Hazard Class: 6.1(b)

ID No.: 1897

Packing Group: III

Label: Harmful[6]

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Listed U210 Toxic Waste

CERCLA 40 CFR 302.4: Listed per RCRA Section 3001, per CWA Section 307(a) 100 lb (45.35 kg)

SARA 40 CFR 372.65: Listed

SARA EHS 40 CFR 355: Not listed

TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Section 1 - Chemical Product and Company Identification

55/60

Material Name: cis-Acetylene Dichloride

CAS Number: 156-59-2

Chemical Formula: $C_2H_2Cl_2$

Structural Chemical Formula: $CHCl=CHCl$

EINECS Number: 205-859-7

ACX Number: X1007815-0

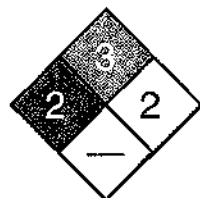
Synonyms: ACETALYNE DICHLORIDE; CIS-ACETYLENE DICHLORIDE; CIS-1,2-DICHLOROETHYLENE; CIS-1,2-DICHLOROETHENE; (Z)-1,2-DICHLOROETHYLENE; 1,2-CIS-DICHLOROETHYLENE; CIS-1,2-DICHLOROETHYLENE; CIS-DICHLOROETHYLENE; ETHENE,1,2-DICHLORO-(Z)-; ETHYLENE,1,2-DICHLORO-(Z)-

General Use: solvent for waxes, resins, fats, phenol, camphor, acetyl cellulose, organic materials and heat-sensitive substances such as caffeine; in rubber manufacture, as a refrigerant, as an additive to dye and lacquer solutions, in retarding fermentation, in organic synthesis, in medicines, in dye extraction, in chlorination reactions and in the manufacture of artificial pearls; a constituent of perfumes and thermoplastics

Section 2 - Composition / Information on Ingredients

Name	CAS	%
cis-acetylene dichloride	156-59-2	>98
OSHA PEL TWA: 200 ppm; 790 mg/m ³ .	NIOSH REL	DFG (Germany) MAK TWA: 200 ppm; PEAK: 400 ppm.
ACGIH TLV TWA: 200 ppm.		

Section 3 - Hazards Identification



Fire Diamond

Flammability
Toxicity
Body Contact
Reactivity
Chronic

ChemWatch Hazard Ratings				
0	1	2	3	4
Min	Low	Moderate	High	Extreme

HMIS	
2	Health
3	Flammability
2	Reactivity

ANSI Signal Word

Warning!



Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless liquid; sweetish odor. Irritating to eyes/skin/respiratory tract. Harmful. Other Acute Effects: narcotic effect. Flammable.

Potential Health Effects

Target Organs: eyes, skin, respiratory system, nervous system, liver, kidneys

Primary Entry Routes: inhalation of vapor, skin/eye contact

Acute Effects

Inhalation: There is a single report of an industrial poisoning, a fatality caused by the inhalation of a vapor in a small enclosure. Acute intoxication by halogenated aliphatic hydrocarbons appears to take place over two stages. Signs of a reversible narcosis are evident in the first stage and in the second stage signs of injury to organs may become evident, a single organ alone is (almost) never involved. Depression of the central nervous system is the most outstanding effect of most halogenated aliphatic hydrocarbons. Inebriation and excitation, passing into narcosis, is a typical reaction. In severe acute exposures there is always a danger of death from respiratory failure or cardiac arrest due to a tendency to make the heart more susceptible to catecholamines (adrenalin). The most important effects of exposure are narcosis and irritation of the central nervous system. Liver responses may occur after repeated narcotic doses and involves fatty liver degeneration. Vapor exposure may produce central nervous system depression or in milder exposures, nausea, vomiting, weakness, tremor and epigastric cramps. Recovery is usually rapid.

Eye: The vapor when concentrated has pronounced eye irritation effect; this gives some warning of high vapor concentrations. If eye irritation occurs seek to reduce exposure with available control measures, or evacuate area. Exposure to the trans isomer at 2200 ppm caused burning of the eyes, vertigo, nausea. Reversible corneal clouding has been described in exposures to acetylene dichloride.

Skin: The liquid may produce skin discomfort following prolonged contact. Defatting and/ or drying of the skin may lead to dermatitis.

Ingestion: The liquid is discomforting to the gastrointestinal tract and toxic if swallowed. Considered an unlikely route of entry in commercial/industrial environments.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Chronic Effects: The material may accumulate in the human body and progressively cause tissue damage.

Section 4 - First Aid Measures

Inhalation: • If fumes or combustion products are inhaled, remove to fresh air.

• Lay patient down. Keep warm and rested.

• If breathing is shallow or has stopped, ensure clear airway and apply resuscitation, preferably with a demand valve resuscitator, bag-valve mask device, or pocket mask as trained. Perform CPR if necessary.

• Transport to hospital or doctor.

Eye Contact: • Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water.

• Ensure complete irrigation of the eye by keeping eyelids apart and away from eye and moving the eyelids by occasionally lifting the upper and lower lids.

• Transport to hospital or doctor without delay.

• Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: • Immediately remove all contaminated clothing, including footwear (after rinsing with water).

• Wash affected areas thoroughly with water (and soap if available).

• Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center. Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Treatment should follow that practiced in carbon tetrachloride exposures:

• Acute exposures to carbon tetrachloride present, initially, with CNS depression followed by hepatic and renal dysfunction.

• Respiratory depression and cardiac dysrhythmias are an immediate threat to life.

• Since a major fraction of absorbed carbon tetrachloride is exhaled in first hour, good tidal volumes should be maintained in severely poisoned patients; hyperventilation may be an additional therapeutic modality.

• Ipecac syrup, lavage, activated charcoal or catharsis may all be used in the first 4 hours.

• Since reactive metabolites may cause hepatorenal toxicity, administration of N-acetyl-L-cysteine may reduce complications. Experience with this therapy is limited.



Section 5 - Fire-Fighting Measures

Flash Point: 2.2 to 3.9 °C Closed Cup

Autoignition Temperature: 460 °C

LEL: 9.7% v/v

UEL: 12.8% v/v

Extinguishing Media: Foam, Dry chemical powder, BCF (where regulations permit), Carbon dioxide, Water spray or fog - Large fires only.

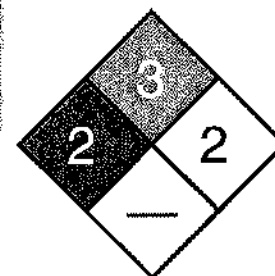
General Fire Hazards/Hazardous Combustion Products: • Liquid and vapor are highly flammable.

- Severe fire hazard when exposed to heat, flame and/or oxidizers.
- Vapor forms an explosive mixture with air.
- Severe explosion hazard, in the form of vapor, when exposed to flame or spark.
- Vapor may travel a considerable distance to source of ignition.
- Heating may cause expansion/decomposition with violent rupture of containers.
- On combustion, may emit toxic fumes of carbon monoxide (CO). Other combustion products include hydrogen chloride and phosgene.

Fire Incompatibility: Avoid contamination with oxidizing agents i.e., nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

Fire-Fighting Instructions: • Contact fire department and tell them location and nature of hazard.

- May be violently or explosively reactive.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or waterways.
- Consider evacuation (or protect in place).
- Fight fire from a safe distance, with adequate cover.
- If safe, switch off electrical equipment until vapor fire hazard removed.
- Use water delivered as a fine spray to control the fire and cool adjacent area.
- Avoid spraying water onto liquid pools.
- Do not approach containers suspected to be hot.
- Cool fire-exposed containers with water spray from a protected location.
- If safe to do so, remove containers from path of fire.



Fire Diamond

Section 6 - Accidental Release Measures

Small Spills: • Remove all ignition sources.

- Clean up all spills immediately.
- Avoid breathing vapors and contact with skin and eyes.
- Control personal contact by using protective equipment.
- Contain and absorb small quantities with vermiculite or other absorbent material.
- Wipe up.
- Collect residues in a flammable waste container.

Large Spills: • Clear area of personnel and move upwind.

- Contact fire department and tell them location and nature of hazard.
- May be violently or explosively reactive.
- Wear breathing apparatus plus protective gloves.
- Prevent, by any means available, spillage from entering drains or waterways.
- No smoking, bare lights or ignition sources.
- Increase ventilation.
- Stop leak if safe to do so.
- Water spray or fog may be used to disperse/absorb vapor.
- Contain spill with sand, earth or vermiculite.
- Use only spark-free shovels and explosion proof equipment.
- Collect recoverable product into labeled containers for recycling.
- Absorb remaining product with sand, earth or vermiculite.
- Collect solid residues and seal in labeled drums for disposal.
- Wash area and prevent runoff into drains.
- If contamination of drains or waterways occurs, advise emergency services.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).



Section 7 - Handling and Storage

Handling Precautions: • Avoid all personal contact, including inhalation.

- Wear protective clothing when risk of exposure occurs.
- Use in a well-ventilated area.
- Prevent concentration in hollows and sumps.

- DO NOT enter confined spaces until atmosphere has been checked.
- Avoid smoking, bare lights or ignition sources.
- Avoid contact with incompatible materials.
- When handling, DO NOT eat, drink or smoke.
- Keep containers securely sealed when not in use.
- Avoid physical damage to containers.
- Always wash hands with soap and water after handling.
- Work clothes should be laundered separately.
- Follow good occupational work practices.
- Observe manufacturer's storage and handling recommendations.
- Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

Recommended Storage Methods: Check that containers are clearly labeled. Packaging as recommended by manufacturer. DO NOT use aluminum or galvanized containers.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Local exhaust ventilation usually required. If risk of overexposure exists, wear NIOSH-approved respirator. Provide adequate ventilation in warehouse or closed storage area.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields or, as required, chemical goggles. Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Butyl rubber gloves. Neoprene gloves.

Respiratory Protection: Respirator protection may be required. Consult your supervisor.

Other: • Overalls.

• Barrier cream.

• Eyewash unit.

Glove Selection Index:

VITON Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless liquid with pleasant chloroform-like odor.

Physical State: colorless liquid

Vapor Pressure (kPa): 200 mm Hg at 25 °C

Vapor Density (Air=1): 3.34

Formula Weight: 96.94

Specific Gravity (H₂O=1, at 4 °C): 1.2837 at 20 °C/4 °C

Boiling Point: 60.3 °C (141 °F) at 760 mm Hg

Freezing/Melting Point: -80.5 °C (-112.9 °F)

Water Solubility: 1 to 5 mg/mL at 16 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.

Storage Incompatibilities: Avoid reaction with oxidizing agents. Acetylene dichloride in contact with solid caustic alkalis or their concentrated solutions will form chloroacetylene which ignites in air. Haloalkenes are highly reactive.

Section 11 - Toxicological Information

Toxicity

Inhalation (mouse) LC₅₀: 65000 mg/m³/2 hr

Rat liver cell mutagen in vitro

Irritation

Nil reported

See RTECS KV9420000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released on soil, it should evaporate and/or leach into the groundwater where very slow biodegradation should occur. If released into water, it will be lost mainly through volatilization (half life 3 hr in a model river). Biodegradation, adsorption to sediment, and bioconcentration in aquatic organisms should not be significant. In the atmosphere it will be lost by reaction with photochemically produced hydroxyl radicals (half life 8 days) and scavenged by rain. Because it is relatively long lived in the atmosphere, considerable dispersal from source areas should occur.

Ecotoxicity: LC₅₀ Lepomis macrochirus (bluegill) 135,000 ug/l/96 hr in a static unmeasured bioassay

Henry's Law Constant: estimated at 0.00337

BCF: calculated at 15

Octanol/Water Partition Coefficient: $\log K_{ow} = 1.86$

Soil Sorption Partition Coefficient: $K_{oc} = 49$

Section 13 - Disposal Considerations

Disposal: • Consult manufacturer for recycling options and recycle where possible.

• Follow applicable local, state, and federal regulations.

• Incinerate residue at an approved site.

• Recycle containers if possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: 1,2-Dichloroethylene

ID: UN1150

Hazard Class: 3 - Flammable and combustible liquid

Packing Group: II - Medium Danger

Symbols:

Label Codes: 3 - Flammable Liquid

Special Provisions: IB2, T7, TP2

Packaging: Exceptions: 150 Non-bulk: 202 Bulk: 242

Quantity Limitations: Passenger aircraft/rail: 5 L Cargo aircraft only: 60 L

Vessel Stowage: Location: B Other:



Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Not listed

CERCLA 40 CFR 302.4: Not listed

SARA 40 CFR 372.65: Not listed

SARA EHS 40 CFR 355: Not listed

TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Issue Date: 2005-05

Section 1 - Chemical Product and Company Identification

54/60

Material Name: Vinyl Chloride

CAS Number: 75-01-4

Chemical Formula: C₂H₃Cl

Structural Chemical Formula: CH₂=CHCl

EINECS Number: 200-831-0

ACX Number: X1003494-5

Synonyms: CHLORETHENE; CHLORETHYLENE; CHLOROETHENE; CHLOROETHYLENE; CHLORURE DE VINYLE; CLORURO DI VINILE; ETHENE,CHLORO-; ETHYLENE MONOCHLORIDE; ETHYLENE,CHLORO-; MONOCHLOROETHENE; MONOCHLOROETHYLENE; MONOCHOROETHENE; MONOVINYL CHLORIDE (MVC); TROVIDUR; VC; VCM; VINILE (CLORURO DI); VINYL C MONOMER; VINYL CHLORIDE; VINYL CHLORIDE MONOMER; VINYL CHLORIDE MONOMER (VCM); VINYL CHLORIDE,INHIBITED; VINYLCHLORID; VINYLE(CHLORURE DE); WINYLU CHLOREK

General Use: Used in the plastics industry; as a refrigerant; in organic syntheses

Section 2 - Composition / Information on Ingredients

Name	CAS	%
vinyl chloride	75-01-4	>98

OSHA PEL

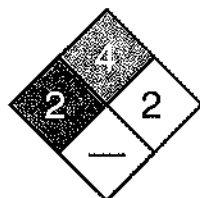
TWA: 1 ppm; Ceiling: 5 ppm, 15-minute; 1910.1017.

NIOSH REL

ACGIH TLV

TWA: 1 ppm.

Section 3 - Hazards Identification



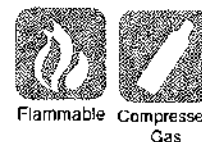
Fire Diamond

	ChemWatch Hazard Ratings				
Flammability					
Toxicity					
Body Contact					
Reactivity					
Chronic					
	0	1	2	3	4
	Min	Low	Moderate	High	Extreme

ANSI Signal Word

Danger!

HMIS	
3	Health
4	Flammability
2	Reactivity



☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless gas; pleasant ethereal odor. Compressed gas can cause frostbite. Toxic. Other Acute Effects: CNS depression. Chronic Effects: reproductive effects, skin/blood changes, arthralgias, bone effects (hand), vascular disorder (fingers/toes). Cancer hazard. Flammable

Potential Health Effects

Target Organs: liver, central nervous system (CNS), respiratory system, lymphatic system, bone, connective tissue of the skin

Primary Entry Routes: inhalation, skin contact, eye contact

Acute Effects

Inhalation: The gas is highly discomforting and may be fatal if inhaled.

Acute intoxication by halogenated aliphatic hydrocarbons appears to take place over two stages. Signs of a reversible narcosis are evident in the first stage and in the second stage signs of injury to organs may become evident. A single organ alone is (almost) never involved.

Depression of the central nervous system is the most outstanding effect of most halogenated aliphatic hydrocarbons. Inebriation and excitation, passing into narcosis, is a typical reaction. In severe acute exposures there is always a danger of death from respiratory failure or cardiac arrest due to a tendency to make the heart more susceptible to catecholamines (adrenalin).

A single 5 minute inhalation exposure of 8000-25000 ppm caused nausea, headache and dizziness among volunteers. After cessation of exposure only 3-5% of the parent compound was exhaled unchanged. Metabolism by microsomal cytochrome P-450 results in the production of chloroethylene oxide and 2-chloroacetaldehyde and subsequent urinary elimination as thiodiglycolic acid. Half-life is 4-5 hours.

Vinyl chloride and related vinyl monomers possess narcotic action and produce depending upon concentration, characteristic neurological effects, a state of euphoria, followed by a state of inebriation, similar to ethanol intoxication.

Exposure of mice, rats and guinea pigs at 100,000-300,000 ppm caused concentration-dependent mortality. Pulmonary edema, inflammation, hyperemia, congestion and engorgement were recorded - liver and kidney involvement was surprisingly low. Deaths were due to central arrest in narcosis.

Eye: The vapor is discomforting to the eyes and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration.

Skin: The vapor is mildly discomforting to the skin.

Toxic effects may result from skin absorption.

Vinyl chloride acts upon the skin and produces a sensation of heat.

Vaporizing liquid causes rapid cooling and contact may cause cold burns, frostbite.

Ingestion: Not normally a hazard due to physical form of product.

Carcinogenicity: NTP - Class 1, Known to be a carcinogen; IARC - Group 1, Carcinogenic to humans; OSHA - Listed as a carcinogen; NIOSH - Listed as carcinogen; ACGIH - Class A3, Animal carcinogen; EPA - Listed; MAK - Class A1, Capable of inducing malignant tumors as shown by experience with humans.

Chronic Effects: Repeated exposure of laboratory animals to vinyl chloride produced little liver or kidney damage. Repeated exposures produce neurological effects in man with somnolence prominent. Dyspeptic disturbances include epigastric pain, swelling, discomfort, heaviness in the right hypochondrium and anorexia. Congestive hepatomegaly may mimic toxic hepatitis without jaundice. Some cases become chronic. Allergic dermatitis and scleroderma and Raynaud's syndrome have been observed. Repeated exposure of workers has caused increased liver enzyme concentrations, restricted blood flow, bone degeneration in the fingers, liver and spleen enlargement, nervous system disturbance, CNS depression, decreased respiratory function and emphysema.

A dose-dependent relationship between exposure and the incidence of several tumor types has been established.

Exposures to high concentrations have little additional effect because the action of metabolites is responsible for the carcinogenicity rather than the action of the parent molecule. Formation rates of the metabolites are limited and dose-dependent and once the enzyme systems responsible for vinyl chloride activation are saturated, greater doses do not produce a corresponding increase in tumor incidence. Reports of hepatic angiosarcoma and respiratory cancers in vinyl chloride workers have appeared over many years. Cancers of the respiratory system (primarily angiosarcoma), brain as well as lymphomas occur more often than might be expected among men occupationally exposed to vinyl chloride for at least one year.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately flush body and clothes with large amounts of water, using safety shower if available.

Quickly remove all contaminated clothing, including footwear.

Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

In case of cold burns (frostbite): Bathe the affected area immediately in cold water for 10 to 15 minutes, immersing if possible and without rubbing.

Do not apply hot water or radiant heat. Apply a clean, dry dressing.

Transport to hospital or doctor.

Ingestion: Not normally a hazard due to physical form of product. DO NOT delay. Immediately transport to hospital or doctor.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Treat symptomatically. Do not give adrenalin (epinephrine) or related drugs.

See
DOT
ERG

Section 5 - Fire-Fighting Measures

Flash Point: -78 °C Open Cup

Autoignition Temperature: 472 °C

LEL: 3.6% v/v

UEL: 33% v/v

Extinguishing Media: Dry chemical powder. DANGER: Deliver media remotely.

For minor fires: Flooding quantities only.

For large fires: Do not attempt to extinguish.

General Fire Hazards/Hazardous Combustion Products: WARNING: Long standing in contact with air and light may result in the formation of potentially explosive peroxides.

Liquid and vapor are highly flammable.

Dangerous hazard when exposed to heat or flame.

Severe vapor explosion hazard, when exposed to flame or spark.

Heating may cause expansion or decomposition leading to violent rupture of containers.

Decomposition may produce toxic fumes of hydrogen chloride.

Fire Incompatibility: Avoid reaction with copper, aluminum, oxidizing agents and certain catalytic impurities.

Explosion hazard may follow contact with incompatible materials. Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.

Fight fire from a safe distance, with adequate cover.

May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Consider evacuation.

If safe to do so, switch off electrical equipment until vapor fire hazard is removed.

If safe to do so, stop flow of gas.

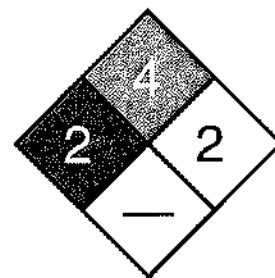
Do not approach cylinders suspected to be hot.

Cool fire-exposed containers with water spray from a protected location.

Use water delivered as a fine spray to control the fire and cool adjacent area.

Given its high vapor density spilled vinyl chloride is slow to disperse and will collect in low lying areas.

See
DOT
ERG



Fire Diamond

Section 6 - Accidental Release Measures

Small Spills: Erect warning notices and seal off area.

1. Avoid breathing vapor and any contact with liquid or gas. Protective equipment including respirator should be used.

2. Do NOT enter confined spaces where gas may have accumulated.

3. Shut off all sources of possible ignition and increase ventilation.

4. Clear area of personnel.

5. Stop leak only if safe to do so.

6. Remove leaking cylinders to safe place. Release pressure under safe controlled conditions by opening valve.

7. Keep area clear of personnel until gas has dispersed.

Large Spills: Supply maximum air ventilation (explosion proof equipment) to keep concentration well below lower flammability limit.

1. Clear area of all unprotected personnel and move upwind.

2. Contact fire department and advise them of the location and nature of hazard.

3. May be violently or explosively reactive.

4. Wear full body clothing with breathing apparatus.

5. Consider evacuation.

6. Shut off all possible sources of ignition and increase ventilation.

7. No smoking or bare lights within area.

8. Use extreme caution to prevent violent reaction.

9. Stop leak only if safe to do so.

10. Water spray or fog may be used to disperse vapor.

11. Do NOT enter confined space where gas may have collected.

12. Keep area clear until gas has dispersed.

When leaking containers have been removed or leak has been stopped, hose spill area down with copious quantities of water. Allow any liquid to evaporate prior to wash down.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

See
DOT
ERG

Section 7 - Handling and Storage

Handling Precautions: Used in closed pressurized systems, fitted with safety relief valve.

Vented gas is flammable, denser than air and will spread. Vent path must not contain ignition sources, pilot lights, bare flames.

Atmospheres must be tested and O.K. before work resumes after leakage.
 Obtain a work permit before attempting any repairs.
 Do not attempt repair work on lines, vessels under pressure.
 Handle and open container with care.
 Avoid all personal contact, including inhalation.
 Wear protective clothing when risk of exposure occurs.
 Use in a well-ventilated area. Prevent concentration in hollows and sumps.
 DO NOT enter confined spaces until atmosphere has been checked.
 Avoid smoking, bare lights, heat or ignition sources.
 When handling, DO NOT eat, drink or smoke.
 Vapor may ignite on pumping or pouring due to static electricity.
 DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.
 Avoid contact with incompatible materials.
 Keep containers securely sealed. Avoid physical damage to containers.
 Always wash hands with soap and water after handling.
 Work clothes should be laundered separately.
 Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.
 DO NOT transfer gas from one cylinder to another.

Recommended Storage Methods: Check that containers are clearly labeled.
 Cylinder fitted with valve protector cap.
 Ensure the use of equipment rated for cylinder pressure.
 Ensure the use of compatible materials of construction.
 Cylinder valve must be closed when not in use or when empty.
 Cylinder must be properly secured either in use or in storage.
WARNING: Suckback into cylinder may result in rupture.
 Use back-flow preventive device in piping.
 Aerosol pack.
 Vacuum insulated container.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Fans and electrical equipment must be explosion-proof to meet TLV requirements. Approved respirators must be available for non-routine and emergency situations.
 Areas where gas cylinders are stored/used require discrete, controlled exhaust ventilation.
 Local exhaust ventilation usually required.
 If risk of overexposure exists, wear NIOSH-approved respirator.
 Correct fit is essential to obtain adequate protection. NIOSH-approved self contained breathing apparatus (SCBA) may be required in some situations.
 Provide adequate ventilation in warehouse or closed storage area.

Personal Protective Clothing/Equipment:

Eyes: Close fitting gas tight goggles and DO NOT wear contact lenses.
 Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Neoprene rubber gloves.

Respiratory Protection:

Exposure Range >1 to 50 ppm: Supplied Air, Constant Flow/Pressure Demand, Half Mask
 Exposure Range >50 to 1000 ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face
 Exposure Range >1000 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face
 Note: poor warning properties

Other: Protective overalls, closely fitted at neck and wrist. Eye-wash unit.

IN CONFINED SPACES:

1. Non-sparking protective boots
2. Static-free clothing.

Glove Selection Index:

VITON Best selection
 NITRILE Satisfactory; may degrade after 4 hours continuous immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: A colorless poisonous gas at ambient temperature, with a mild sweet odor in high concentrations. It liquefies readily under increased pressure or at reduced temperatures. Soluble in alcohol, ether, carbon tetrachloride and benzene.

Physical State: Liquefied gas

Vapor Pressure (kPa): 343.5 at 20 °C

Vapor Density (Air=1): 2.2	pH (1% Solution): Not applicable.
Formula Weight: 62.5	Boiling Point: -13.37 °C (8 °F)
Specific Gravity (H₂O=1, at 4 °C): 0.912 at 20 °C	Freezing/Melting Point: -153.8 °C (-244.84 °F)
Evaporation Rate: Not applicable	Volatile Component (% Vol): 100
pH: Not applicable	Water Solubility: Slightly soluble

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Presence of heat source and direct sunlight (ultra-violet radiation).
 Presence of elevated temperatures.
 Presence of an ignition source.
 Storage in unsealed containers.
 Stable under normal storage conditions. Polymerization may occur at elevated temperatures and in the presence of ignition sources.

Storage Incompatibilities: Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

Avoid peroxides, copper and copper alloys and plastics.

Haloalkenes are highly reactive. Some of the more lightly substituted lower members are highly flammable; many members of the group are peroxidizable and polymerizable.

If peroxidation occurs, vinyl chloride tends to self-polymerize violently and this has resulted in several industrial accidents.

Accidental exposure of the recovered monomer to atmospheric oxygen for a long period resulted in the formation of an unstable polyperoxide which initiated explosion. A 20-30% aqueous solution has been used to destroy the peroxide.

An explosion in a valve in a liquid monomer line appears to have been caused by traces of nitrogen oxides remaining after passivation of the line by nitric acid.

Section 11 - Toxicological Information

Toxicity

Oral (rat) LD₅₀: 500mg/kg

Oral (rat) TD_{Lo}: 3463mg/kg/52w

Inhalation (rat) TC_{Lo}: 1ppm/4h/52w

Inhalation (man) TC_{Lo}: 200ppm/14y

Tumors of the sense organs, vascular system, respiratory system, gastrointestinal system, skin and liver, lymphoma, paternal effects, effects on fertility, fetotoxicity, specific developmental abnormalities involving the musculoskeletal system recorded.

Irritation

Nil reported

See RTECS YZ.3200000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released to soil, it will be subject to rapid volatilization with reported half-lives of 0.2 and 0.5 days for evaporation from soil at 1 and 10 cm incorporation, respectively. Any which does not evaporate will be expected to be highly to very highly mobile in soil and it may leach to the groundwater. It may be subject to biodegradation under anaerobic conditions such as exists in flooded soil and groundwater. If released to water, it will not be expected to hydrolyze, to bioconcentrate in aquatic organisms or to adsorb to sediments. It will be subject to rapid volatilization with an estimated half-life of 0.805 hr for evaporation from a river 1 m deep with a current of 3 m/sec and a wind velocity of 3 m/sec. In waters containing photosensitizers such as humic acid, photodegradation will occur fairly rapidly. Limited existing data indicate that it is resistant to biodegradation in aerobic systems and therefore, it may not be subject to biodegradation in aerobic soils and natural waters. It will not be expected to hydrolyze in soils or natural waters under normal environmental conditions. If released to the atmosphere, it can be expected to exist mainly in the vapor-phase in the ambient atmosphere and to degrade rapidly in air by gas-phase reaction with photochemically produced hydroxyl radicals with an estimated half-life of 1.5 days.

Ecotoxicity: No data found.

Henry's Law Constant: 0.0560

BCF: estimated at 7

Biochemical Oxygen Demand (BOD): none

Octanol/Water Partition Coefficient: log K_{ow} = calculated at 0.6

Soil Sorption Partition Coefficient: K_{oc} = estimated at 56

Section 13 - Disposal Considerations

Disposal: The gas should be burned in a high temperature furnace equipped with an afterburner and scrubber to remove HCl formed.

Follow applicable federal, state, and local regulations.

Return all damaged and empty cylinders and containers to the supplier.

Section 14 - Transport Information**DOT Hazardous Materials Table Data (49 CFR 172.101):**

Shipping Name and Description: Vinyl chloride, stabilized

ID: UN1086

Hazard Class: 2.1 - Flammable gas

Packing Group:

Symbols:

Label Codes: 2.1 - Flammable Gas

Special Provisions: 21, B44, T50

Packaging: Exceptions: 306 Non-bulk: 304 Bulk: 314, 315

Quantity Limitations: Passenger aircraft/rail: Forbidden

Cargo aircraft only: 150 kg

Vessel Stowage: Location: B Other: 40

**Section 15 - Regulatory Information****EPA Regulations:**

RCRA 40 CFR: Listed U043 Toxic Waste

CERCLA 40 CFR 302.4: Listed per RCRA Section 3001, per CWA Section 307(a), per CAA Section 112 1 lb (0.454 kg)

SARA 40 CFR 372.65: Listed

SARA EHS 40 CFR 355: Not listed

TSCA: Listed

Section 16 - Other Information

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Issue Date: 2004-12

Section 1 - Chemical Product and Company Identification

54/59

Material Name: Acetone

CAS Number: 67-64-1

Chemical Formula: C₃H₆O

Structural Chemical Formula: CH₃COCH₃

EINECS Number: 200-662-2

ACX Number: X1001253-6

Synonyms: ACETON; ACETONE; CHEVRON ACETONE; DIMETHYL KETONE;

DIMETHYLFORMALDEHYDE; DIMETHYLKETAL; EPA PESTICIDE CHEMICAL CODE 004101; KETONE PROPANE; KETONE, DIMETHYL; BETA-KETOPROPANE; METHYL KETONE; 2-PROPANONE; PROPANONE; PYROACETIC ACID; PYROACETIC ETHER

General Use: Solvent for fats, oils, waxes, resins, rubber, plastics, lacquers.

Used in manufacture of methyl isobutyl ketone, mesityl oxide, acetic acid, diacetone alcohol, isoprene. Used in solvent extraction processes.

Solvent in the manufacture of explosives and rayon. Component of adhesives, glues, cleaning solvents, lacquer thinners, nail polish, paint removers.

Storing acetylene gas (takes up about 24 times its volume of the gas).

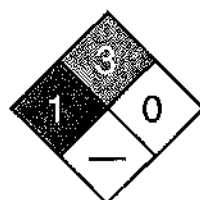
Purifying paraffin and biomedical hardening and dehydrating tissues.

Minor food additive, permitted in USA.

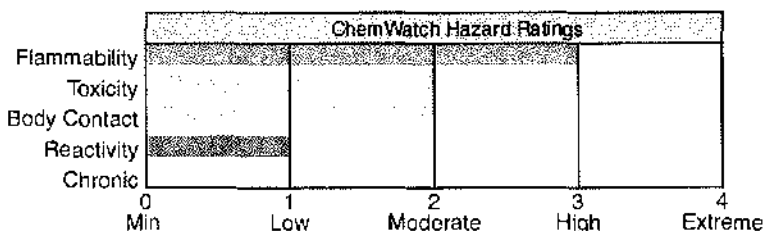
Section 2 - Composition / Information on Ingredients

Name	CAS	%
acetone	67-64-1	95-99.5
OSHA PEL TWA: 1000 ppm; 2400 mg/m ³ .	NIOSH REL TWA: 250 ppm, 590 mg/m ³ .	DFG (Germany) MAK TWA: 500 ppm; PEAK: 1000 ppm.
OSHA PEL Vacated 1989 Limits TWA: 750 ppm; 1800 mg/m ³ ; STEL: 1000 ppm; 2400 mg/m ³ .	IDLH Level 2500 ppm (10% LEL).	
ACGIH TLV TWA: 500 ppm; STEL: 750 ppm.		

Section 3 - Hazards Identification

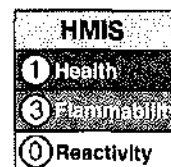


Fire Diamond



ANSI Signal Word

Danger!



Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless, highly volatile liquid; sweet odor. Irritating. Other Acute Effects: muscle weakness, mental confusion, coma (high concentrations). Ingestion: GI irritation, kidney/liver damage, metabolic changes, coma. Chronic Effects: dermatitis. Highly flammable.

Potential Health Effects

Target Organs: respiratory system, central nervous system (CNS), skin

Primary Entry Routes: inhalation, skin contact, eye contact, ingestion

Acute Effects

Inhalation: The vapor is discomforting to the upper respiratory tract.

Inhalation hazard is increased at higher temperatures.

Exposure to ketone vapors may produce nose, throat and mucous membrane irritation. High concentrations of vapor may produce central nervous system depression characterized by headache, vertigo, loss of coordination, narcosis and cardiorespiratory failure. Some ketones produce neurological disorders (polyneuropathy) characterized by bilateral symmetrical paresthesia and muscle weakness primarily in the legs and arms.

Symptoms of exposure may include restlessness, headache, vomiting, stupor, low blood pressure and rapid and irregular pulse, eye and throat irritation, weakness of the legs, dizziness and lightheadedness.

Inhalation of high concentrations produces dryness of the mouth and throat, dizziness, nausea, incoordinated movements, loss of coordinated speech, drowsiness, and in extreme cases, coma.

Inhalation of acetone vapors over long periods causes irritation of the respiratory tract, coughing, headache. Acetone concentrations of 52200 ppm for 1 hour produced narcosis in rats and fatalities at 126600 ppm.

Eye: The liquid may produce eye discomfort and is capable of causing temporary impairment of vision and/or transient eye inflammation, ulceration.

The vapor is discomforting to the eyes.

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The liquid is discomforting to the skin if exposure is prolonged and may cause drying of the skin, which may lead to dermatitis.

Toxic effects may result from skin absorption.

Open cuts, abraded or irritated skin should not be exposed to this material.

The material may accentuate any pre-existing skin condition.

The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.

The liquid is highly discomforting and mildly toxic if swallowed but may be harmful if swallowed in quantity.

Small amounts or low dose rates are regarded as practically non-harmful.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Class D, Not classifiable as to human carcinogenicity; MAK - Not listed.

Chronic Effects: Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following.

Workers exposed to 700 ppm acetone for 3 hours/day for 7-15 years showed inflammation of the respiratory tract, stomach and duodenum, attacks of giddiness and loss of strength. Exposure to acetone may enhance liver toxicity of chlorinated solvents.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If available, administer medical oxygen by trained personnel.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.

Eye Contact: Immediately hold the eyes open and flush with fresh running water.

Ensure irrigation under the eyelids by occasionally lifting upper and lower lids. If pain persists or recurs seek medical attention.

Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).

Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

Ingestion: Rinse mouth out with plenty of water.

Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to acetone:

1. Symptoms of acetone exposure approximate ethanol intoxication.

2. About 20% is expired by the lungs and the rest is metabolized.

Alveolar air half-life is about 4 hours following two hour inhalation at levels near the Exposure Standard; in overdose, saturable metabolism and limited clearance, prolong the elimination half-life to 25-30 hours.

3. There are no known antidotes and treatment should involve the usual methods of decontamination followed by supportive care.

Section 5 - Fire-Fighting Measures

Flash Point: -20 °C

Autoignition Temperature: 465 °C

LEL: 2.15% v/v

UEL: 13% v/v

Extinguishing Media: Water spray or fog; alcohol stable foam.

Dry chemical powder.

Bromochlorodifluoromethane (BCF) (where regulations permit).

Carbon dioxide.

General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable.

Severe fire hazard when exposed to heat, flame and/or oxidizers.

Vapor forms an explosive mixture with air.

Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition.

Heating may cause expansion/decomposition with violent rupture of containers.

On combustion, may emit toxic fumes of carbon monoxide (CO). Other combustion products include carbon dioxide (CO₂).

Fire Incompatibility: Avoid contamination with oxidizing agents i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc. as ignition may result.

PLEASE NOTE: 10% of acetone in water has a flash point below 20 deg. C.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.

Fight fire from a safe distance, with adequate cover.

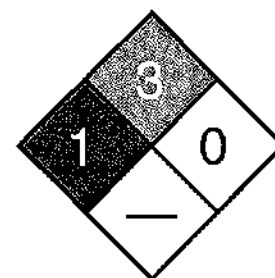
If safe, switch off electrical equipment until vapor fire hazard removed.

Use water delivered as a fine spray to control the fire and cool adjacent area. Avoid spraying water onto liquid pools.

Do not approach containers suspected to be hot.

Cool fire-exposed containers with water spray from a protective location.

If safe to do so, remove containers from path of fire.



Fire Diamond

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.

Avoid breathing vapors and contact with skin and eyes.

Control personal contact by using protective equipment.

Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.

Large Spills: Clear area of personnel and move upwind.

Contact fire department and tell them location and nature of hazard.

Avoid breathing vapors and contact with skin and eyes.

May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.

Shut off all possible sources of ignition and increase ventilation.

Water spray or fog may be used to disperse vapor.

Stop leak if safe to do so. Contain spill with sand, earth or vermiculite.

Collect residues and place in flammable waste container.

Any electric cleaning equipment must be explosion proof.

Wash spill area with large quantities of water.

If contamination of drains or waterways occurs, advise emergency services.

After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid all personal contact, including inhalation.

Wear protective clothing when risk of exposure occurs.

Use in a well-ventilated area. Prevent concentration in hollows and sumps.

DO NOT enter confined spaces until atmosphere has been checked.

Avoid smoking, bare lights, heat or ignition sources.

When handling, DO NOT eat, drink or smoke.

Vapor may ignite on pumping or pouring due to static electricity.

DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.

Avoid contact with incompatible materials.

Keep containers securely sealed. Avoid physical damage to containers.

Always wash hands with soap and water after handling.

Work clothes should be laundered separately.

Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

Recommended Storage Methods: Metal can; metal drum. Packing as recommended by manufacturer.

Check all containers are clearly labeled and free from leaks.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: CARE: Use of a quantity of this material in confined space or poorly ventilated area, where rapid build-up of concentrated atmosphere may occur, could require increased ventilation and/or protective gear. Use in a well-ventilated area. Local exhaust ventilation may be required for safe working, i. e. , to keep exposures below required standards; otherwise, PPE is required.

None required when handling small quantities. OTHERWISE: If inhalation risk of overexposure exists, wear NIOSH-approved organic-vapor respirator.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; or as required, chemical goggles.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Barrier cream with polyethylene gloves or Butyl rubber gloves or Neoprene rubber gloves.

Safety footwear.

Respiratory Protection:

Exposure Range >1000 to <2500 ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face

Exposure Range 2500 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Note: use ov (black) cartridge for nuisance(<1000)

Other: Overalls. Ensure that there is ready access to eye wash unit and Ensure there is ready access to an emergency shower.

Glove Selection Index:

BUTYL/NEOPRENE.....Best selection

PE/EVAL/PE.....Best selection

PVDC/PE/PVDC.....Best selection

BUTYL.....Best selection

SARANEX-23 2-PLY.....Satisfactory; may degrade after 4 hours continuous immersion

TEFLON.....Satisfactory; may degrade after 4 hours continuous immersion

SARANEX-23.....Poor to dangerous choice for other than short-term immersion

CPE.....Poor to dangerous choice for other than short-term immersion

HYPALON.....Poor to dangerous choice for other than short-term immersion

NITRILE+PVC.....Poor to dangerous choice for other than short-term immersion

PVA.....Poor to dangerous choice for other than short-term immersion

VITON/NEOPRENE.....Poor to dangerous choice for other than short-term immersion

NEOPRENE.....Poor to dangerous choice for other than short-term immersion

PVC.....Poor to dangerous choice for other than short-term immersion

NATURAL+NEOPRENE.....Poor to dangerous choice for other than short-term immersion

NATURAL RUBBER.....Poor to dangerous choice for other than short-term immersion

NITRILE.....Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear, colorless, highly volatile, highly flammable liquid with characteristic sweet odor.

Mixes in alcohol, ether, most hydrocarbons and oils.

Physical State: Liquid

Vapor Pressure (kPa): 24 at 20 °C

Vapor Density (Air=1): 2.0

Formula Weight: 58.08

Specific Gravity (H₂O=1, at 4 °C): 0.79 at 20 °C

Evaporation Rate: 11 (BuAc=1) VFast

pH: Not applicable

pH (1% Solution): Not applicable.

Boiling Point: 56.2 °C (133 °F) at 760 mm Hg

Freezing/Melting Point: -95.35 °C (-139.63 °F)

Volatile Component (% Vol): 100

Water Solubility: Miscible

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.

Storage Incompatibilities: Avoid storage with oxidizers, strong acids and strong alkalis.

Reacts violently with bromoform and chloroform in the presence of alkalis or in contact with alkaline surfaces.

Section 11 - Toxicological Information

Toxicity

Oral (man) TD_{10} : 2857 mg/kg

Oral (rat) LD_{50} : 5800 mg/kg

Inhalation (human) TC_{10} : 500 ppm

Inhalation (man) TC_{10} : 12000 ppm/4 hr

Inhalation (man) TC_{10} : 10 mg/m³/6 hr

Inhalation (rat) LC_{50} : 50100 mg/m³/8 hr

Dermal (rabbit) LD_{50} : 20000 mg/kg

Irritation

Eye (human): 500 ppm - irritant

Eye (rabbit): 3.95 mg - SEVERE

Eye (rabbit): 20 mg/24 hr - moderate

Skin (rabbit): 395 mg (open) - mild

Skin (rabbit): 500 mg/24 hr - mild

See RTECS AL 3150000, for additional data.

Section 12 - Ecological Information

Environmental Fate: If released on soil, it will both volatilize and leach into the ground and probably biodegrade. If released into water, it will probably biodegrade. It will also be lost due to volatilization (estimated half-life 20 hr from a model river). Bioconcentration in aquatic organisms and adsorption to sediment should not be significant. In the atmosphere, it will be lost by photolysis and reaction with photochemically produced hydroxyl radicals. Half-life estimates from these combined processes average 22 days and are shorter in summer and longer in winter. It will also be washed out by rain.

Ecotoxicity: LD_{100} Asellus aquaticus 3 ml/l (within 3 days of exposure) /Conditions of bioassay not specified; LC_{50} Mexican axolotl 20.0 mg/l/48 hr (3-4 weeks after hatching) /Conditions of bioassay not specified; TL_m Mosquito fish 13,000 mg/l/24, 48, 96 hr /Conditions of bioassay not specified; LD_{100} Gammarus fossarum 10 ml/l (within 48 hr) /Conditions of bioassay not specified; LC_{50} Poecilia reticulata (guppy) 7,032 ppm/14 days /Conditions of bioassay not specified; LC_{50} Ring-necked pheasant oral greater than 40,000 ppm, in diet, age 10 days, (no mortality to 40,000 ppm); LC_{50} Salmo gairdneri (Rainbow trout) 5,540 mg/l/96 hr at 12 °C (95% confidence limit 4,740-6,330 mg/l), wt 1.0 g /static bioassay; LC_{50} Clawed toad 24.0 mg/l/48 hr (3-4 weeks after hatching) /Conditions of bioassay not specified; TL_m Daphnia magna 10 mg/l/24, 48 hr /Conditions of bioassay not specified

Henry's Law Constant: 3.97×10^{-5}

BCF: negligible

Biochemical Oxygen Demand (BOD): theoretical 122%, 5 days

Octanol/Water Partition Coefficient: $\log K_{ow} = -0.24$

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.

Follow applicable federal, state, and local regulations.

Incinerate residue at an approved site.

Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Acetone

ID: UN1090

Hazard Class: 3 - Flammable and combustible liquid

Packing Group: II - Medium Danger

Symbols:

Label Codes: 3 - Flammable Liquid

Special Provisions: IB2, T4, TP1

Packaging: Exceptions: 150 Non-bulk: 202 Bulk: 242
Quantity Limitations: Passenger aircraft/rail: 5 L Cargo aircraft only: 60 L
Vessel Stowage: Location: B Other:

Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Listed U002 Ignitable Waste

CERCLA 40 CFR 302.4: Listed per RCRA Section 3001 5000 lb (2268 kg)

SARA 40 CFR 372.65: Not listed

SARA EHS 40 CFR 355: Not listed

TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Section 1 - Chemical Product and Company Identification

54/60

Material Name: n-Hexane

CAS Number: 110-54-3

Chemical Formula: C₆H₁₄

Structural Chemical Formula: H₃C(CH₂)₄CH₃

EINECS Number: 203-777-6

ACX Number: X1001498-5

Synonyms: DIPROPYL; ESANJ; GETTYSOLVE-B; HEKSAN; HEXANE; N-HEXANE; N-HEXANE; HEXANEN; HEXYL HYDRIDE; NORMAL HEXANE; NORMAL-HEXANE; SKELLYSOLVE-B; SKELLYSOLVE B

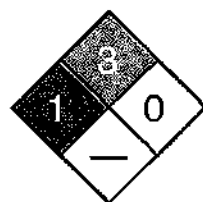
General Use: An incidental component of many aliphatic solvent mixes used as lacquer, paint and enamel thinners, also in ink reducers and cleaning solvents.

Also used for solvent extraction of oil seeds and in pesticide residue analysis and gas chromatography.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
n-hexane	110-54-3	> 95
OSHA PEL TWA: 500 ppm; 1800 mg/m ³ .	NIOSH REL TWA: 50 ppm; 180 mg/m ³ .	DFG (Germany) MAK TWA: 50 ppm; PEAK: 400 ppm.
OSHA PEL Vacated 1989 Limits TWA: 50 ppm; 180 mg/m ³ .	IDLH Level 1100 ppm (10% LEL).	
ACGIH TLV TWA: 50 ppm; skin.		

Section 3 - Hazards Identification



Fire Diamond

	ChemWatch Hazard Ratings				
Flammability					
Toxicity					
Body Contact					
Reactivity					
Chronic					
	0 Min	1 Low	2 Moderate	3 High	4 Extreme

ANSI Signal Word

Danger!

HMIS
2 Health
3 Flammability
0 Reactivity



Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless, volatile liquid; sweet/gasoline odor. Irritating to eyes/skin/respiratory tract. Other Acute Effects: dizziness, fatigue, muscle weakness, hallucinations. Chronic Effects: muscle weakness, motor loss, sensory disturbances. Flammable.

Potential Health Effects

Target Organs: eyes, skin, respiratory system, central nervous system (CNS), peripheral nervous system

Primary Entry Routes: inhalation, skin contact/absorption, eyes, ingestion

Acute Effects

Inhalation: The vapor is discomforting and harmful to the upper respiratory tract.

Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination.

If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.

Eye: The liquid is highly discomforting to the eyes and is capable of causing a mild, temporary redness of the conjunctiva (similar to wind-burn), temporary impairment of vision and/or other transient eye damage/ulceration.

The vapor is irritating to the eyes and may cause smarting, pain and redness.

The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The liquid is discomforting to the skin and is capable of causing skin reactions which may lead to dermatitis. Toxic effects may result from skin absorption.

Ingestion: The liquid is highly discomforting and harmful if swallowed.

Ingestion may result in nausea, pain, vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis.

Considered an unlikely route of entry in commercial/industrial environments.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: Chronic inhalation or skin exposure to n-hexane may cause peripheral neuropathy, which is damage to nerve ends in extremities, e.g. fingers, with loss of sensation and characteristic thickening. Nerve damage has been documented with chronic exposures of greater than 500 ppm.

Improvement in condition does not immediately follow removal from exposure and symptoms may progress for two or three months. Recovery may take a year or more depending on severity of exposure, and may not always be complete. Exposure to n-hexane with methyl ethyl ketone (MEK) will accelerate the appearance of damage, but MEK alone will not cause the nerve damage.

Other isomers of hexane do not cause nerve damage.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water).

Wash affected areas thoroughly with water (and soap if available).

Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Following acute or short-term repeated exposures to n-hexane:

1. Large quantities of n-hexane are expired by the lungs after vapor exposure (50-60%). Humans exposed to 100 ppm demonstrate an n-hexane biological half life of 2 hours.

2. Initial attention should be directed towards evaluation and support of respiration. Cardiac dysrhythmias are a potential complication.

INGESTION:

1. Ipecac syrup should be considered for ingestion of pure hexane exceeding 2-3 mL/kg. Extreme caution must be taken to avoid aspiration since small amounts of n-hexane intratracheally, produce a severe chemical pneumonitis

BIOLOGICAL EXPOSURE INDEX - BEI

These represent the determinants observed in specimens collected from a healthy worker exposed at the Exposure Standard (ES or TLV):

Determinant	Index	Sampling Time	Comments
2,5-hexanedione in urine	5 mg/gm creatinine	End of shift	NS
n-Hexane in end-exhaled air			SQ

NS: Non-specific determinant; Metabolite observed following exposure to other materials.

SQ: Semi-quantitative determinant; Interpretation may be ambiguous - should be used as a screening test or confirmatory test.



Section 5 - Fire-Fighting Measures

Flash Point: -22 °C

Autoignition Temperature: 225 °C

LEL: 1.1% v/v

UEL: 7.5% v/v

Extinguishing Media: Dry chemical powder. Foam.
Carbon dioxide.

General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable.

Severe fire hazard when exposed to heat, flame and/or oxidizers.

Vapor forms an explosive mixture with air.

Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition.

Heating may cause expansion/decomposition with violent rupture of containers.

On combustion, may emit toxic fumes of carbon monoxide (CO). May emit clouds of acrid smoke.

Fire Incompatibility: Avoid reaction with oxidizing agents.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.

Fight fire from a safe distance, with adequate cover.

If safe, switch off electrical equipment until vapor fire hazard removed.

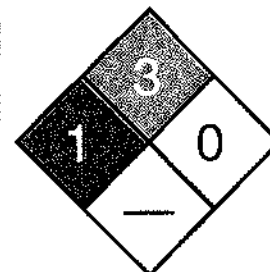
Use water delivered as a fine spray to control the fire and cool adjacent area. Avoid spraying water onto liquid pools.

Do not approach containers suspected to be hot.

Cool fire-exposed containers with water spray from a protective location.

If safe to do so, remove containers from path of fire.

See
DOT
ERG



Fire Diamond

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately.

Avoid breathing vapors and contact with skin and eyes.

Control personal contact by using protective equipment.

Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.

Large Spills: Pollutant - clear area of personnel and move upwind.

Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or waterways.

No smoking, bare lights or ignition sources. Increase ventilation.

Stop leak if safe to do so.

Water spray or fog may be used to disperse/absorb vapor.

Contain spill with sand, earth or vermiculite.

Use only spark-free shovels and explosion proof equipment.

Collect recoverable products into labeled containers for recycling.

Absorb remaining product with sand, earth or vermiculite.

Collect solid residues and seal in labeled drums for disposal.

Wash area and prevent runoff into drains.

If contamination of drains or waterways occurs, advise emergency services.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

See
DOT
ERG

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Avoid all personal contact, including inhalation.

Wear protective clothing when risk of exposure occurs.

Use in a well-ventilated area. Prevent concentration in hollows and sumps.

DO NOT enter confined spaces until atmosphere has been checked.

Avoid smoking, bare lights, heat or ignition sources.

When handling, DO NOT eat, drink or smoke.

Vapor may ignite on pumping or pouring due to static electricity.

DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling.

Avoid contact with incompatible materials.

Keep containers securely sealed. Avoid physical damage to containers.

Always wash hands with soap and water after handling.

Work clothes should be laundered separately.

Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

Avoid concurrent exposure to materials containing Methyl Ethyl Ketone MEK

Recommended Storage Methods: Metal can; metal drum. Packing as recommended by manufacturer.

Check all containers are clearly labeled and free from leaks.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area.

General exhaust is adequate under normal operating conditions.

Local exhaust ventilation may be required in specific circumstances.

If risk of overexposure exists, wear NIOSH-approved respirator.

Correct fit is essential to obtain adequate protection.

Provide adequate ventilation in warehouse or closed storage areas.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; or as required, chemical goggles.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Polyethylene gloves. Wear chemical protective gloves, eg. PVC.

Wear safety footwear.

Do NOT use this product to clean the skin.

Respiratory Protection:

Exposure Range >500 to <1100 ppm: Supplied Air, Constant Flow/Pressure Demand, Half Mask

Exposure Range 1100 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Note: poor warning properties

Other: Overalls. Eyewash unit. Barrier cream. Skin cleansing cream.

Glove Selection Index:

PE/LVAL/PE Best selection

PVA Best selection

SARANEX-23 2-PLY Best selection

VITON Best selection

VITON/CHLOROBUTYL Best selection

TEFLON Satisfactory; may degrade after 4 hours continuous immersion

NITRILE Satisfactory; may degrade after 4 hours continuous immersion

NEOPRENE Poor to dangerous choice for other than short-term immersion

NEOPRENE/NATURAL Poor to dangerous choice for other than short-term immersion

NITRILE+PVC Poor to dangerous choice for other than short-term immersion

PVC Poor to dangerous choice for other than short-term immersion

BUTYL Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear highly flammable liquid with typical paraffinic odor; floats on water. Mixes with most other organic solvents, chloroform, ether, alcohol. A very volatile liquid, it readily forms explosive vapor /air mixes.

Physical State: Liquid

Vapor Pressure (kPa): 13.33

Vapor Density (Air=1): 2.97

Formula Weight: 86.17

Specific Gravity (H₂O=1, at 4 °C): 0.6603 at 20 °C

pH: Not applicable

pH (1% Solution): Not applicable

Boiling Point: 68.89 °C (156 °F)

Freezing/Melting Point: -100 °C (-148 °F) to -95 °C (-139 °F)

Volatile Component (% Vol): 100

Water Solubility: 0.002% by weight

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Presence of heat source and ignition source. Hazardous polymerization will not occur.

Storage Incompatibilities: Avoid storage with oxidizers.

Section 11 - Toxicological Information

Toxicity

Oral (rat) LD₅₀: 28710 mg/kg
 Inhalation (human) TC₁₀₀: 190 ppm/8W
 Inhalation (rat) LD₅₀: 48000 ppm/4h

Irritation

Eye (rabbit): 10 mg - mild

See RTECS MN9275000, for additional data.

Section 12 - Ecological Information

Environmental Fate: Photolysis, hydrolysis or bioconcentration are not expected to be an important environmental fate processes. Biodegradation may occur in soil and water; however, volatilization and adsorption are expected to be far more important fate processes. A K_{oc} range of 1250 to 4100 indicates a low to slight mobility class in soil. In aquatic systems it may partition from the water column to organic matter contained in sediments and suspended materials. A Henry's Law constant of 1.81 atm-cu m/mole at 25 °C suggests rapid volatilization from environmental waters. The volatilization half-lives from a model river and a model pond, the latter considers the effect of adsorption, have been estimated to be 2.7 hr and 6.8 days, respectively. It is expected to exist entirely in the vapor-phase in ambient air. Reactions with photochemically produced hydroxyl radicals in the atmosphere have been shown to be important (average estimated half-life of 2.9 days). Data also suggests that nighttime reactions with nitrate radicals may contribute to atmospheric transformation, especially in urban environments.

Ecotoxicity: No data found.

Henry's Law Constant: calculated at 1.81

BCF: estimated at 2.24 to 2.89

Biochemical Oxygen Demand (BOD): theoretical 0%, 7 days

Octanol/Water Partition Coefficient: log K_{ow} = 4.11

Soil Sorption Partition Coefficient: K_{oc} = estimated at 1250 to 4100

Section 13 - Disposal Considerations

Disposal: Consult manufacturer for recycling options and recycle where possible.

Follow applicable federal, state, and local regulations.

Incinerate residue at an approved site.

Recycle containers where possible, or dispose of in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Hexanes

ID: UN1208

Hazard Class: 3 - Flammable and combustible liquid

Packing Group: II - Medium Danger

Symbols:

Label Codes: 3 - Flammable Liquid

Special Provisions: IB2, T4, TP1

Packaging: Exceptions: 150 Non-bulk: 202 Bulk: 242

Quantity Limitations: Passenger aircraft/rail: 5 L Cargo aircraft only: 60 L

Vessel Stowage: Location: E Other:



Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Not listed

CERCLA 40 CFR 302.4: Listed per RCRA Section 3001 5000 lb (2268 kg)

SARA 40 CFR 372.65: Listed

SARA EHS 40 CFR 355: Not listed

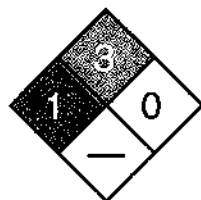
TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

**Section 1 - Chemical Product and Company Identification****54/58****Material Name:** Unleaded Petrol**CAS Number:** 8006-61-9**Chemical Formula:** Mixture of hydrocarbons**EINECS Number:** 232-349-1**ACX Number:** X1003056-5**Synonyms:** AUTOMOTIVE GASOLINE; LEAD-FREE; GASOLINE; MOTOR FUEL; MOTOR SPIRITS; NATURAL GASOLINE; PETROL; UNLEADED PETROL**General Use:** Lead free motor fuel for internal combustion engines, 2-stroke and 4-stroke.**Section 2 - Composition / Information on Ingredients**

Name	CAS	%
gasoline	8006-61-9	>90
benzene	71-43-2	5 max.

OSHA PEL**NIOSH REL****OSHA PEL Vacated 1989 Limits**TWA: 300 ppm; 900 mg/m³;STEL: 500 ppm; 1500 mg/m³.**ACGIH TLV**TWA: 300 ppm, 890 mg/m³;STEL: 500 ppm, 1480 mg/m³.**Section 3 - Hazards Identification**

Fire Diamond

ChemWatch Hazard Ratings				
Flammability				
Toxicity				
Body Contact				
Reactivity				
Chronic				
	0 Min	1 Low	2 Moderate	3 High
				4 Extreme

ANSI Signal Word**Danger!**

HMIS	
2	Health
3	Flammability
1	Reactivity



Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Clear liquid; distinctive odor. Irritating to eyes/skin/respiratory tract. Also causes: dizziness, drunkenness, unconsciousness. Absorbed through skin. Chronic: dermatitis. Possible cancer hazard. Flammable. Can form explosive mixtures in air.

Potential Health Effects**Target Organs:** skin, eye, respiratory system, central nervous system (CNS)**Primary Entry Routes:** inhalation, ingestion, skin contact

Acute Effects

Inhalation: The vapor is discomforting to the upper respiratory tract and may be harmful if exposure is prolonged. Inhalation hazard is increased at higher temperatures. Acute effects from inhalation of high concentrations of vapor are pulmonary irritation, including coughing, with nausea; central nervous system depression - characterized by headache and dizziness, increased reaction time, fatigue and loss of coordination. If exposure to highly concentrated solvent atmosphere is prolonged this may lead to narcosis, unconsciousness, even coma and possible death.

WARNING: Intentional misuse by concentrating/inhaling contents may be lethal. High inhaled concentrations of mixed hydrocarbons may produce narcosis characterized by nausea, vomiting and lightheadedness. Inhalation of aerosols may produce severe pulmonary edema, pneumonitis and pulmonary hemorrhage. Inhalation of petroleum hydrocarbons consisting substantially of low molecular weight species may produce irritation of mucous membranes, incoordination, giddiness, nausea, vertigo, confusion, headache, appetite loss, drowsiness, tremors and anesthetic stupor. Massive exposures may produce central nervous system depression with sudden collapse and deep coma; fatalities have been recorded. Irritation of the brain and/or apneic anoxia may produce convulsions. Although recovery following overexposure is generally complete, cerebral micro-hemorrhage of focal post-inflammatory scarring may produce epileptiform seizures some months after the exposure. Pulmonary episodes may include chemical pneumonitis with edema and hemorrhage. The lighter hydrocarbons may produce kidney and neurotoxic effects. Liquid paraffins may produce anesthesia and depressant actions leading to weakness, dizziness, slow and shallow respiration, unconsciousness, convulsions and death. C_{12} paraffins may also produce polyneuropathy. Aromatic hydrocarbons accumulate in lipid-rich tissues (typically the brain, spinal cord and peripheral nerves) and may produce functional impairment manifested by nonspecific symptoms such as nausea, weakness, fatigue, vertigo; severe exposures may produce inebriation or unconsciousness. Many of the petroleum hydrocarbons are cardiac sensitizers and may cause ventricular fibrillations.

Eye: The liquid may produce eye discomfort and is capable of causing temporary impairment of vision and/or transient eye inflammation, ulceration. The vapor is discomforting to the eyes. Petroleum hydrocarbons may produce pain after direct contact with the eyes. Slight, but transient, disturbances of the corneal epithelium may also result. The aromatic fraction may produce irritation and lachrymation. The material may produce moderate eye irritation leading to inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: The material is moderately discomforting to the skin if exposure is prolonged. The material contains a component that may be absorbed through the skin and may cause drying of the skin, which may lead to dermatitis from repeated exposures over long periods. Toxic effects may result from skin absorption. Open cuts, abraded or irritated skin should not be exposed to this material. The material may accentuate any pre-existing dermatitis condition.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments. The liquid may produce gastrointestinal discomfort and may be harmful if swallowed. Ingestion may result in nausea, pain and vomiting. Vomit entering the lungs by aspiration may cause potentially lethal chemical pneumonitis. Ingestion of petroleum hydrocarbons may produce irritation of the pharynx, esophagus, stomach and small intestine with edema and mucosal ulceration. Resulting symptoms include a burning sensation in the mouth and throat. Large amounts may produce narcosis with nausea and vomiting, weakness or dizziness, slow and shallow respiration, swelling of the abdomen, unconsciousness and convulsions. Myocardial injury may produce arrhythmias, ventricular fibrillation and electrocardiographic changes. Central nervous system depression may also occur. Light aromatic hydrocarbons produce a warm, sharp, tingling sensation on contact with taste buds and may anesthetize the tongue. Aspiration into the lungs may produce coughing, gagging, and a chemical pneumonitis with pulmonary edema and hemorrhage.

Carcinogenicity: NTP - Not listed; IARC - Group 2B, Possibly carcinogenic to humans; OSHA - Not listed; NIOSH - Listed as carcinogen; ACGIH - Class A3, Animal carcinogen; EPA - Not listed; MAK - Not listed.

Chronic Effects: Chronic solvent inhalation exposures may result in nervous system impairment and liver and blood changes. Prolonged or continuous skin contact with the liquid may cause defatting with drying, cracking, irritation and dermatitis following. Chronic poisoning may occur from vapor inhalation or skin absorption. The most significant toxic effect is insidious and irreversible injury to the blood-forming tissue by benzene. Leukemia may develop. Chronic exposure may cause headache, fatigue, loss of appetite and lassitude with incipient blood effects including anemia and blood changes. Gasoline "sniffing" has caused severe nerve damage. Repeated or prolonged exposure to mixed hydrocarbons may produce narcosis with dizziness, weakness, irritability, concentration and/or memory loss, tremor in the fingers and tongue, vertigo, olfactory disorders, constriction of visual field, paresthesias of the extremities, weight loss and anemia and degenerative changes in the liver and kidney. Chronic exposure by petroleum workers to the lighter hydrocarbons has been associated with visual disturbances, damage to the central nervous system, peripheral neuropathies (including numbness and paresthesias), psychological and neurophysiological deficits, bone marrow toxicities (including hypoplasia, possibly due to benzene) and hepatic and renal involvement. Chronic dermal exposure to petroleum hydrocarbons may result in defatting which produces localized dermatoses. Surface cracking and erosion may also increase susceptibility to infection by microorganisms.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air. Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital, or doctor.

Eye Contact: Immediately hold the eyes open and wash continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids. Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately remove all contaminated clothing, including footwear (after rinsing with water). Wash affected areas thoroughly with water (and soap if available). Seek medical attention in event of irritation.

Ingestion: Contact a Poison Control Center. If swallowed, do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short term repeated exposures to petroleum distillates or related hydrocarbons:

1. Primary threat to life from pure petroleum distillate ingestion and/or inhalation is respiratory failure.
 2. Patients should be quickly evaluated for signs of respiratory distress (e.g. cyanosis, tachypnea, intercostal retraction, obtundation) and given oxygen. Patients with inadequate tidal volumes or poor arterial blood gases ($pO_2 < 50$ mm Hg or $pCO_2 > 50$ mm Hg) should be intubated.
 3. Arrhythmias complicate some hydrocarbon ingestion and/or inhalation and electrocardiographic evidence of myocardial injury has been reported; intravenous lines and cardiac monitors should be established in obviously symptomatic patients. The lungs excrete inhaled solvents, so that hyperventilation improves clearance.
 4. A chest x-ray should be taken immediately after stabilization of breathing and circulation to document aspiration and detect the presence of pneumothorax.
 5. Epinephrine (adrenalin) is not recommended for treatment of bronchospasm because of potential myocardial sensitization to catecholamines.
- Inhaled cardioselective bronchodilators (e.g. Alupent, Salbutamol) are the preferred agents, with aminophylline a second choice.
6. Lavage is indicated in patients who require decontamination; ensure use of cuffed endotracheal tube in adult patients.

Section 5 - Fire-Fighting Measures

Flash Point: -43 °C

Autoignition Temperature: 280 °C

LEL: 1.4% v/v

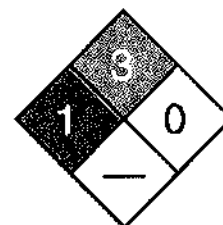
UEL: 7.6% v/v

Extinguishing Media: Foam. Dry chemical powder. Bromochlorodifluoromethane (BCF) (where regulations permit). Carbon dioxide.

General Fire Hazards/Hazardous Combustion Products: Liquid and vapor are highly flammable. Severe fire hazard when exposed to heat, flame and/or oxidizers. Vapor forms an explosive mixture with air. Severe explosion hazard, in the form of vapor, when exposed to flame or spark. Vapor may travel a considerable distance to source of ignition. Heating may cause expansion/decomposition with violent rupture of containers. On combustion, may emit toxic fumes of carbon monoxide (CO).

Fire Incompatibility: Avoid contamination with oxidizing agents, i.e. nitrates, oxidizing acids, chlorine bleaches, pool chlorine etc., as ignition may result.

Fire-Fighting Instructions: Alert fire department and tell them location and nature of hazard. May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or water ways. If safe, switch off electrical equipment until vapour fire hazard removed. Use water delivered as a fine spray to control fire and cool adjacent area. Avoid spraying water onto liquid pools. Do not approach containers suspected to be hot. Cool fire exposed containers with water spray from a protected location. If safe to do so, remove containers from path of fire.



Fire Diamond

Section 6 - Accidental Release Measures

Small Spills: Remove all ignition sources. Clean up all spills immediately. Avoid breathing vapors and contact with skin and eyes. Control personal contact by using protective equipment. Contain and absorb small quantities with vermiculite or other absorbent material. Wipe up. Collect residues in a flammable waste container.

Large Spills: Clear area of personnel and move upwind. Alert fire department and tell them location and nature of hazard. May be violently or explosively reactive. Wear breathing apparatus plus protective gloves. Prevent, by any means available, spillage from entering drains or water ways. No smoking, naked lights or ignition sources. Increase ventilation. Stop leak if safe to do so.

Water spray or fog may be used to disperse/absorb vapor. Contain spill with sand, earth or vermiculite. Use only spark-free shovels and explosion proof equipment. Collect recoverable product into labeled containers for recycling. Absorb remaining product with sand, earth or vermiculite. Collect solid residues and seal in labelled drums for disposal. Wash area and prevent runoff into drains.

If contamination of drains or waterways occurs, advise emergency services.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Avoid all personal contact, including inhalation. Wear protective clothing when risk of exposure occurs. Use in a well-ventilated area. Prevent concentration in hollows and sumps. DO NOT enter confined spaces until atmosphere has been checked. Avoid smoking, bare lights, heat or ignition sources. When handling, DO NOT eat, drink or smoke. Vapor may ignite on pumping or pouring due to static electricity. DO NOT use plastic buckets. Ground and secure metal containers when dispensing or pouring product. Use spark-free tools when handling. Avoid contact with incompatible materials. Keep containers securely sealed. Avoid physical damage to containers. Always wash hands with soap and water after handling. Work clothes should be laundered separately. Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions.

Recommended Storage Methods: Metal can, metal drum. Packing as recommended by manufacturer. Check all containers are clearly labeled and free from leaks.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: CARE: Use of a quantity of this material in confined space or poorly ventilated area, where rapid build-up of concentrated atmosphere may occur, could require increased ventilation and/or protective gear. Use in a well-ventilated area. If inhalation risk of overexposure exists, wear a NIOSH approved organic-vapor respirator. Correct respirator fit is essential to obtain adequate protection. In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus. Provide adequate ventilation in warehouse or closed storage areas.

Personal Protective Clothing/Equipment:

Eyes: Safety glasses with side shields; or as required, chemical goggles.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Barrier cream with polyethylene gloves or PVC gloves. Safety footwear. Do NOT use this product to clean the skin.

Respiratory Protection:

Exposure Range >300 to 1000 ppm: Air Purifying, Negative Pressure, Half Mask

Exposure Range >1000 to 15,000 ppm: Air Purifying, Negative Pressure, Full Face

Exposure Range >15,000 to 300,000 ppm: Supplied Air, Constant Flow/Pressure Demand, Full Face

Exposure Range >300,000 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Cartridge Color: black

Other: Overalls. Ensure that there is ready access to eye wash unit. Ensure there is ready access to an emergency shower.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Purple, highly flammable, volatile liquid with characteristic sharp odor. Floats on water. Consists of a complex mixture of hydrocarbons with small amounts of residual benzene from the refining operations.

Physical State: Liquid

Vapor Pressure (kPa): 53.33 at 20 °C

Vapor Density (Air=1): > 2

Formula Weight: Not applicable.

Specific Gravity (H₂O=1, at 4 °C): 0.72-0.735 at 15 °C

Evaporation Rate: Fast

pH: Not applicable

pH (1% Solution): Not applicable.

Boiling Point: 38.89 °C (102 °F)

Freezing/Melting Point: Not available

Volatile Component (% Vol): 100

Decomposition Temperature (°C): Not available.

Water Solubility: Insoluble

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Presence of incompatible materials. Product is considered stable. Hazardous polymerization will not occur.

Storage Incompatibilities: Avoid storage with oxidizers.

Section 11 - Toxicological Information**Toxicity**Oral (rat) LD₅₀: 18800 mg/kg**Irritation**

Skin (rabbit): 500 mg/24h mild

Section 12 - Ecological Information**Environmental Fate:** No data found.**Ecotoxicity:** No data found.**Biochemical Oxygen Demand (BOD):** 8%, 5 days**Section 13 - Disposal Considerations****Disposal:** Consult manufacturer for recycling options and recycle where possible. Follow all applicable federal, state, and local laws. Incinerate residue at an approved site. Recycle containers where possible, or dispose of in an authorized landfill.**BEWARE:** Empty solvent, paint, lacquer and flammable liquid drums present a severe explosion hazard if cut by flame torch or welded. Even when thoroughly cleaned or reconditioned, the drum seams may retain sufficient solvent to generate an explosive atmosphere in the drum.**Section 14 - Transport Information****DOT Transportation Data (49 CFR 172.101):****Shipping Name:** MOTOR SPIRIT OR
GASOLINE OR PETROL**Additional Shipping Information:** PETROL**Hazard Class:** 3.1**ID No.:** 1203**Packing Group:** II**Label:** Flammable Liquid[3]**Section 15 - Regulatory Information****EPA Regulations:****RCRA 40 CFR:** Not listed**CERCLA 40 CFR 302.4:** Not listed**SARA 40 CFR 372.65:** Not listed**SARA EHS 40 CFR 355:** Not listed**TSCA:** Listed**Section 16 - Other Information****Disclaimer:** Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.



Section 1 - Chemical Product and Company Identification

54/58

Material Name: Nitric Acid**CAS Number:** 7697-37-2**Chemical Formula:** HNO₃**Structural Chemical Formula:** HNO₃**EINECS Number:** 231-714-2**ACX Number:** X1002177-5

Synonyms: ACIDE NITRIQUE; ACIDO NITRICO; AQUA FORTIS; AZOTIC ACID; AZOTOWY KWAS; ENGRAVER'S ACID; ENGRAVERS ACID; HYDROGEN NITRATE; KYSELINA DUSICNE; NITAL; NITRIC ACID; NITRIC ACID OTHER THAN RED FUMING WITH >70% NITRIC ACID; NITRIC ACID OTHER THAN RED FUMING WITH NOT >70% NITRIC ACID; NITROUS FUMES; NITRYL HYDROXIDE; RED FUMING NITRIC ACID (RFNA); SALPETERSAURE; SALPETERZUUROPPLOSSINGEN; WHITE FUMING NITRIC ACID (WFNA)

General Use: Manufacture of organic and inorganic nitrates and nitro compounds for fertilizers, dye intermediates and many organic chemicals.

Used for etching and cleaning metals.

Operators should be trained in procedures for safe use of this material.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
nitric acid	7697-37-2	>95
OSHA PEL TWA: 2 ppm; 5 mg/m ³ .	NIOSH REL TWA: 2 ppm, 5 mg/m ³ ; STEL: 4 ppm, 10 mg/m ³ .	DFG (Germany) MAK TWA: 2 ppm; PEAK: 2 ppm.
OSHA PEL Vacated 1989 Limits TWA: 2 ppm; 5 mg/m ³ ; STEL: 4 ppm; 10 mg/m ³ .	IDLH Level 25 ppm.	
ACGIH TLV TWA: 2 ppm; STEL: 4 ppm.		

Section 3 - Hazards Identification



Fire Diamond

	ChemWatch Hazard Ratings				
Flammability					
Toxicity					
Body Contact					
Reactivity					
Chronic					
	0 Min	1 Low	2 Moderate	3 High	4 Extreme

HMIS	
3	Health
0	Flammability
0	Reactivity

ANSI Signal Word

Danger!



Corrosive

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Clear to yellow fuming liquid; acid, suffocating odor. Corrosive, causes severe burns to eyes/skin/respiratory tract. Also causes: heavy exposures: lung damage. Chronic: tooth erosion, bronchitis. Strong oxidizer capable of igniting combustibles.

Potential Health Effects

Target Organs: eyes, skin, respiratory system, teeth

Primary Entry Routes: inhalation, ingestion, skin contact, eye contact

Acute Effects

Inhalation: The vapor is extremely discomforting and corrosive to the upper respiratory tract and lungs and the material presents a hazard from a single acute exposure or from repeated exposures over long periods.

Inhalation hazard is increased at higher temperatures.

Reactions may occur following a single acute exposure or may only appear after repeated exposures.

Reactions may not occur on exposure but response may be delayed with symptoms only appearing many hours later.

The material may produce respiratory tract irritation which produces an inflammatory response involving the recruitment and activation of many cell types, mainly derived from the vascular system. Unlike most organs the lung can respond to a chemical insult or agent by first trying to remove or neutralize the irritant and then repairing the damage. The repair process, which initially developed to protect mammalian lungs from foreign matter and antigens, may however, cause further damage the lungs when activated by hazardous chemicals. The result is often the impairment of gas exchange, the primary function of the lungs.

Inhalation of nitric acid mist or fumes at 2 to 25 ppm over an 8 hour period may cause pulmonary irritation and symptoms of lung damage.

Only several minutes of exposure to concentrated atmosphere i.e. 200 ppm may cause severe pulmonary damage and even fatality. Death may be delayed for several days.

Exposure to nitric acid fumes (with concurrent inhalation of nitrogen dioxide and nitric oxide) may elicit prompt irritation of the upper respiratory tract leading to coughing, gagging, chest pain, dyspnea, cyanosis if concentrations are sufficiently high and duration of exposure sufficiently long, pulmonary edema.

Eye: The liquid is extremely corrosive to the eyes and contact may cause rapid tissue destruction and is capable of causing severe damage with loss of sight.

The vapor is extremely discomforting to the eyes and is capable of causing pain and severe conjunctivitis.

Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.

The material may produce moderate eye irritation leading to inflammation.

Repeated or prolonged exposure to irritants may produce conjunctivitis.

Eye contact with concentrated acid may give no pain, whilst diluted solution causes intense pain and both can cause permanent eye damage or blindness. Burns may result in shrinkage of the eyeball, symblepharon (adhesions between tarsal and bulbar conjunctivae), permanent corneal opacification, and visual impairment leading to blindness.

Skin: The liquid is extremely corrosive to the skin and contact may cause tissue destruction with severe burns.

Bare unprotected skin should not be exposed to this material.

The vapor is highly discomforting to the skin.

The material may cause skin irritation after prolonged or repeated exposure and may produce a contact dermatitis (nonallergic). This form of dermatitis is often characterized by skin redness (erythema) and swelling (edema) which may progress to vesiculation, scaling and thickening of the epidermis. Histologically there may be intercellular edema of the spongy layer (spongiosis) and intracellular edema of the epidermis.

Skin contact causes yellow discoloration of the skin, blisters and scars that may not heal. The skin may be stained bright-yellow or yellowish brown due to the formation of xanthoproteic acid. Dilute solutions may harden the epithelium without producing overt corrosion.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.

The material is extremely corrosive if swallowed and is capable of causing burns to mouth, throat, esophagus, with extreme discomfort, pain and may be fatal.

Even a small amount causes severe corrosion of the stomach, burning pain, vomiting and shock, possibly causing non-healing scarring of the gastrointestinal tract and stomach. Death may be delayed 12 hours to 14 days or to several months. Such late fatalities are attributed to a chemical lobular pneumonitis secondary to aspiration. Survivors show stricture of the gastric mucosa and subsequent pernicious anemia.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: Prolonged or repeated overexposure to low concentrations of vapor may cause chronic bronchitis, corrosion of teeth, even chemical pneumonitis.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If available, administer medical oxygen by trained personnel.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water.

Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Immediately transport to hospital or doctor. DO NOT delay.

Skin Contact: Immediately flush body and clothes with large amounts of water, using safety shower if available.

Quickly remove all contaminated clothing, including footwear.

Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor. DO NOT delay.

Ingestion: Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

Immediately transport to hospital or doctor. DO NOT delay.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to strong acids:

1. Airway problems may arise from laryngeal edema and inhalation exposure. Treat with 100% oxygen initially.
2. Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling.
3. Intravenous lines should be established immediately in all cases where there is evidence of circulatory compromise.
4. Strong acids produce a coagulation necrosis characterized by formation of a coagulum (eschar) as a result of the desiccating action of the acid on proteins in specific tissues.

INGESTION:

1. Immediate dilution (milk or water) within 30 minutes post-ingestion is recommended.
2. Do not attempt to neutralize the acid since exothermic reaction may extend the corrosive injury.
3. Be careful to avoid further vomiting since re-exposure of the mucosa to the acid is harmful. Limit fluids to one or two glasses in an adult.
4. Charcoal has no place in acid management.
5. Some authors suggest the use of lavage within 1 hour of ingestion.

SKIN:

1. Skin lesions require copious saline irrigation. Treat chemical burns as thermal burns with non-adherent gauze and wrapping.
2. Deep second-degree burns may benefit from topical silver sulfadiazine.

EYE:

1. Eye injuries require retraction of the eyelids to ensure thorough irrigation of the conjunctival cul-de-sacs. Irrigation should last at least 20-30 minutes. Do not use neutralizing agents or any other additives. Several liters of saline are required.
2. Cycloplegic drops (1% cyclopentolate for short-term use or 5% homatropine for longer term use), antibiotic drops, vasoconstrictive agents, or artificial tears may be indicated dependent on the severity of the injury.
3. Steroid eye drops should only be administered with the approval of a consulting ophthalmologist.

Section 5 - Fire-Fighting Measures

Flash Point: Nonflammable

Autoignition Temperature: Not applicable

LEL: Not applicable

UEL: Not applicable

Extinguishing Media: Water spray or fog; foam, dry chemical powder, or BCF (where regulations permit).

Carbon dioxide.

General Fire Hazards/Hazardous Combustion Products: Will not burn but increases intensity of fire.

Heating may cause expansion or decomposition leading to violent rupture of containers. Heat affected containers remain hazardous.

Contact with combustibles such as wood, paper, oil or finely divided metal may cause ignition, combustion or violent decomposition.

May emit irritating, poisonous or corrosive fumes.

Decomposes on heating and produces toxic fumes of nitrogen oxides (NO_x) and nitric acid.

Fire Incompatibility: Oxidizing agents as a class are not necessarily combustible themselves, but can increase the risk and intensity of fire in many other substances.

Reacts vigorously with water and alkali.

Avoid reaction with organic materials/compounds, powdered metals, reducing agents and hydrogen sulfide (H₂S) as ignition may result.

Reacts with metals producing flammable/explosive hydrogen gas.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.

Fight fire from a safe distance, with adequate cover.

Extinguishers should be used only by trained personnel.

Use water delivered as a fine spray to control fire and cool adjacent area.

Avoid spraying water onto liquid pools.

Do not approach containers suspected to be hot.

Cool fire-exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.

If fire gets out of control withdraw personnel and warn against entry.



Fire Diamond

Equipment should be thoroughly decontaminated after use.

Section 6 - Accidental Release Measures

Small Spills: Dangerous levels of nitrogen oxides may form during spills of nitric acid.

Wear fully protective PVC clothing and breathing apparatus.

Clean up all spills immediately. No smoking, bare lights, ignition sources.

Avoid all contact with any organic matter including fuel, solvents, sawdust, paper or cloth and other incompatible materials, as ignition may result.

Avoid breathing dust or vapors and all contact with skin and eyes.

Control personal contact by using protective equipment.

Contain and absorb spill with dry sand, earth, inert material or vermiculite. DO NOT use sawdust as fire may result.

Scoop up solid residues and seal in labeled drums for disposal.

Neutralize/decontaminate area.

Use soda ash or slaked lime to neutralize.

Large Spills: DO NOT touch the spill material. Restrict access to area.

Clear area of personnel and move upwind. Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.

No smoking, flames or ignition sources. Increase ventilation.

Contain spill with sand, earth or other clean, inert materials.

NEVER use organic absorbents such as sawdust, paper, cloth; as fire may result. Avoid any contamination by organic matter.

Use spark-free and explosion-proof equipment.

Collect any recoverable product into labeled containers for possible recycling. DO NOT mix fresh with recovered material.

Collect residues and seal in labeled drums for disposal.

Wash area and prevent runoff into drains. Decontaminate equipment and launder all protective clothing before storage and reuse.

If contamination of drains or waterways occurs advise emergency services.

DO NOT USE WATER OR NEUTRALIZING AGENTS INDISCRIMINATELY ON LARGE SPILLS.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Do not allow clothing wet with material to stay in contact with skin.

Avoid all personal contact, including inhalation.

Wear protective clothing when risk of exposure occurs.

Use in a well-ventilated area.

WARNING: To avoid violent reaction, ALWAYS add material to water and NEVER water to material.

Avoid smoking, bare lights or ignition sources.

Avoid contact with incompatible materials.

When handling, DO NOT eat, drink or smoke.

Keep containers securely sealed when not in use. Avoid physical damage to containers. Always wash hands with soap and water after handling. Work clothes should be laundered separately.

Launder contaminated clothing before reuse.

Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Recommended Storage Methods: Stainless steel drum. Check that containers are clearly labeled.

Packaging as recommended by manufacturer.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area.

Local exhaust ventilation may be required for safe working, i. e. , to keep exposures below required standards; otherwise, PPE is required.

If risk of overexposure exists, wear NIOSH-approved respirator.

Correct fit is essential to obtain adequate protection.

In confined spaces where there is inadequate ventilation, wear full-face air supplied breathing apparatus.

Personal Protective Clothing/Equipment:

Eyes: Chemical goggles. Full face shield.

DO NOT wear contact lenses. Contact lenses pose a special hazard; soft contact lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Bare unprotected skin should not be exposed to this material. Impervious, gauntlet length gloves i.e., butyl rubber gloves or Neoprene rubber gloves or wear chemical protective gloves, e.g. PVC.
Wear safety footwear or safety gumboots, e.g. Rubber.

Respiratory Protection:

Exposure Range >2 to <25 ppm: Supplied Air, Constant Flow/Pressure Demand, Half Mask

Exposure Range 25 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Other: Operators should be trained in procedures for safe use of this material.

Acid-resistant overalls or Rubber apron or PVC apron.

Ensure there is ready access to an emergency shower.

Ensure that there is ready access to eye wash unit.

Ensure that there is ready access to breathing apparatus.

Glove Selection Index:

BUTYL Best selection

HYPALON Best selection

NEOPRENE Best selection

NEOPRENE/NATURAL Best selection

PE/EVAL/PE Best selection

SARANEX-23 Best selection

NATURAL RUBBER Satisfactory; may degrade after 4 hours continuous immersion

NATURAL+NEOPRENE Satisfactory; may degrade after 4 hours continuous immersion

PVC Poor to dangerous choice for other than short-term immersion

NITRILE+PVC Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Clear, colorless to slightly yellow liquid. Sharp strong odor.

CAUTION: exothermic dilution hazard.

HIGHLY CORROSIVE. Corrosive to most metals. Powerful oxidizing agent.

Darkens to brownish color on aging and exposure to light.

Physical State: Liquid

Vapor Pressure (kPa): 8.26

Vapor Density (Air=1): 1.5

Formula Weight: 63.02

Specific Gravity (H₂O=1, at 4 °C): 1.3-1.42

pH: < 1

pH (1% Solution): 1

Boiling Point: 83 °C (181 °F) at 760 mm Hg

Freezing/Melting Point: -42 °C (-43.6 °F)

Volatile Component (% Vol): 100 (nominal)

Decomposition Temperature (°C): Not applicable

Water Solubility: Soluble in all proportions

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Presence of heat source and direct sunlight. Storage in unsealed containers. Hazardous polymerization will not occur.

Storage Incompatibilities: Segregate from reducing agents, finely divided combustible materials, combustible materials, sawdust, metals and powdered metals.

Avoid contamination of water, foodstuffs, feed or seed.

Segregate from alkalis, oxidizing agents and chemicals readily decomposed by acids, i.e. cyanides, sulfides, carbonates.

Section 11 - Toxicological Information

Toxicity

Oral (human) LD₅₀: 430 mg/kg

Inhalation (rat) LC₅₀: 2500 ppm/1 hr

Unreported (man) LD₅₀: 110 mg/kg

Irritation

Nil reported

See NIOSH, RTECS QU 5775000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.

Ecotoxicity: LC₅₀ Starfish 100-300 mg/l/48 hr /Aerated water conditions; LC₅₀ Shore crab 180 mg/l/48 hr /Static, aerated water conditions; LC₅₀ Cockle 330-1000 mg/l/48 hr /Aerated water conditions

BCF: no food chain concentration potential

Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Special hazards may exist - specialist advice may be required.
Consult manufacturer for recycling options.
Follow applicable federal, state, and local regulations.
Treat and neutralize at an approved treatment plant.
Decontaminate empty containers. Observe all label safeguards until containers are cleaned and destroyed.
Puncture containers to prevent reuse and bury at an authorized landfill.

Section 14 - Transport Information**DOT Transportation Data (49 CFR 172.101):**

Shipping Name: NITRIC ACID

Hazard Class: 8

ID No.: 2031

Packing Group: I

Label: Corrosive[8],Oxid.Agent

Section 15 - Regulatory Information**EPA Regulations:**

RCRA 40 CFR: Not listed

CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4) 1000 lb (453.5 kg)

SARA 40 CFR 372.65: Listed

SARA EHS 40 CFR 355: Listed

RQ: 1000 lb

TPQ: 1000 lb

TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Section 1 - Chemical Product and Company Identification

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Material Name: Hydrochloric Acid

CAS Number: 7647-01-0

Chemical Formula: ClH

Structural Chemical Formula: HCl

EINECS Number: 231-595-7

ACX Number: X1002202-3

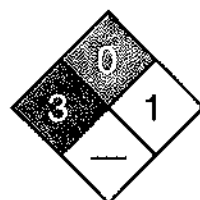
Synonyms: 4-D BOWL SANITIZER; ACIDE CHLORHYDRIQUE; ACIDO CLORHIDRICO; ACIDO CLORIDRICO; ANHYDROUS HYDROCHLORIC ACID; ANHYDROUS HYDROGEN CHLORIDE; AQUEOUS HYDROGEN CHLORIDE; BOWL CLEANER; CHLOORWATERSTOF; CHLOROHYDRIC ACID; CHLOROWODOR; CHLORURE D'HYDROGENE; CHLORURE D'HYDROGENE ANHYDRE; CHLORURO DE HIDROGENO; CHLORWASSERSTOFF; CLORURO DE HIDROGENO ANHIDRO; EMULSION BOWL CLEANER; EPA PESTICIDE CHEMICAL CODE 045901; HYDROCHLORIC ACID; HYDROCHLORIC ACID GAS; HYDROCHLORIDE; HYDROGEN CHLORIDE; HYDROGEN CHLORIDE (HCL); HYGEIA CREME; MAGIC BOWL CLEANER; MURIATIC ACID; MURIATIC ACID); NOW SOUTH SAFTI-SOL BRAND CONCENTRATED BOWL CLEANSE WITHMAGIC ACTIO; PERCLEEN BOWL AND URINAL CLEANER; SPIRITS OF SALT; VARLEY'S OCEAN BLUE SCENTED TOILET BOWL CLEANER; VARLEY POLY-PAK BOWL CREME; WHITE EMULSION BOWL CLEANER; WUEST BOWL CLEANER SUPER CONCENTRATED

General Use: Hydrogen chloride is used to produce pharmaceutical hydrochlorides; vinyl chloride from acetylene; alkyl chlorides from olefins and arsenious chloride from arsenious oxide; electronic grade for etching semiconductor crystals. Used in the chlorination of rubber; in organic reactions involving isomerization, polymerization and alkylation; as a catalyst and condensing agent; for making chlorine where economical; in the separation of cotton from wool and cotton de-linting; as flux in the babbitt type of metal alloy; etching semi-conductor crystals. Hydrochloric acid is used for pickling and heavy duty cleaning of metal parts; rust and scale removal. The production of chlorides; neutralizing bases; a laboratory reagent. For hydrolyzing starch and proteins in preparations for food. As a catalyst and solvent in organic synthesis. As "spirits of salts" for cleaning of lime and masonry from new brickwork. As flux or flux component for soldering; manufacture of "killed spirits".

Section 2 - Composition / Information on Ingredients

Name	CAS	%
hydrogen chloride	7647-01-0	> 99.0
OSHA PEL Ceiling: 5 ppm, 7 mg/m ³ .	NIOSH REL Ceiling: 5 ppm (7 mg/m ³).	DFG (Germany) MAK TWA: 5 ppm; PEAK: 5 ppm.
ACGIH TLV Ceiling: 2 ppm.	IDLH Level 50 ppm.	
EU OEL TWA: 5 ppm; STEL: 10 ppm.		

Section 3 - Hazards Identification



Fire Diamond

	ChemWatch Hazard Ratings				
Flammability					
Toxicity					
Body Contact					
Reactivity					
Chronic					
	0 Min	1 Low	2 Moderate	3 High	4 Extreme

HMIS	
2	Health
0	Flammability
0	Reactivity

ANSI Signal Word

Danger!



Corrosive Compressed Gas

☆☆☆☆ Emergency Overview ☆☆☆☆

Colorless gas; characteristic suffocating, pungent odor. Corrosive. Stored as compressed gas which may cause frostbite. Chronic Effects: erosion of teeth.

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Potential Health Effects

Target Organs: eyes, skin, respiratory system, liver (in animals)

Primary Entry Routes: inhalation, skin contact, eye contact

Acute Effects

Inhalation: The vapor is extremely discomforting to the upper respiratory tract, may cause severe mucous membrane damage and may be harmful if inhaled.

Inhalation of quantities of liquid mist may be extremely hazardous, even lethal due to spasm, extreme irritation of larynx and bronchi, chemical pneumonitis and pulmonary edema.

A single severe exposure may cause coughing and choking; bleeding of nose, inflammation and occasionally ulceration of the nose, throat and larynx. Fluid on the lungs followed by generalized lung damage may follow.

Breathing of vapor may aggravate asthma and inflammatory or fibrotic pulmonary disease.

High concentrations cause necrosis of the tracheal and bronchial epithelium, pulmonary edema, atelectasis and emphysema and damage to the pulmonary blood vessels and liver.

Inhalation hazard is increased at higher temperatures.

The vapor from heated material is extremely discomforting to the upper respiratory tract and lungs if inhaled.

Continued severe exposure can result in pulmonary edema and corrosion of tissues in the nose and throat.

Eye: Hydrogen Chloride: The vapor is extremely discomforting to the eyes and is capable of causing pain and severe conjunctivitis. Corneal injury may develop, with possible permanent impairment of vision, if not promptly and adequately treated.

The material may be irritating to the eye, with prolonged contact causing inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Hydrochloric Acid: Eye contact is extremely painful and may cause rapid corneal damage. The liquid is extremely corrosive to the eyes and is capable of causing severe damage with loss of sight.

The vapor is highly discomforting and may be corrosive to the eyes. The vapor from heated material is extremely discomforting to the eyes.

Skin: The material is corrosive to the skin and may cause chemical burns.

Toxic effects may result from skin absorption. Bare unprotected skin should not be exposed to this material. The material may accentuate any pre-existing skin condition.

The vapor is discomforting to the skin.

Ingestion: Considered an unlikely route of entry in commercial/industrial environments.

The liquid is extremely corrosive if swallowed and is capable of causing burns to mouth, throat, esophagus, with extreme discomfort, pain and may be fatal if swallowed in quantity. Ingestion may result in nausea, abdominal irritation, pain and vomiting.

Carcinogenicity: NTP - Not listed; IARC - Group 3, Not classifiable as to carcinogenicity to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Chronic Effects: Chronic exposure may cause discoloration or erosion of the teeth, bleeding of the nose and gums; and ulceration of the nasal mucous membranes.

Repeated exposures of animals to concentrations of about 34 ppm produced no immediate toxic effects.

Workers exposed to hydrochloric acid suffered from gastritis and a number of cases of chronic bronchitis have also been reported.

Repeated or prolonged exposure to dilute solutions may cause dermatitis. Repeated exposure to low vapor concentrations can cause skin tenderness, bleeding of the nose and gums, chronic bronchitis, gastritis.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor.

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately flush body and clothes with large amounts of water, using safety shower if available. Quickly remove all contaminated clothing, including footwear.

Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

Ingestion: Contact a Poison Control Center. Rinse mouth out with plenty of water. Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to strong acids:

1. Airway problems may arise from laryngeal edema and inhalation exposure.

Treat with 100% oxygen initially.

2. Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling.

See
DOT
ERG

3. Intravenous lines should be established immediately in all cases where there is evidence of circulatory compromise.
4. Strong acids produce a coagulation necrosis characterized by formation of a coagulum (eschar) as a result of the desiccating action of the acid on proteins in specific tissues.

INGESTION:

1. Immediate dilution (milk or water) within 30 minutes post-ingestion is recommended.
2. Do not attempt to neutralize the acid since exothermic reaction may extend the corrosive injury.
3. Be careful to avoid further vomiting since re-exposure of the mucosa to the acid is harmful. Limit fluids to one or two glasses in an adult.
4. Charcoal has no place in acid management.
5. Some authors suggest the use of lavage within 1 hour of ingestion.

SKIN:

1. Skin lesions require copious saline irrigation. Treat chemical burns as thermal burns with non-adherent gauze and wrapping.
2. Deep second-degree burns may benefit from topical silver sulfadiazine.

EYE:

1. Eye injuries require retraction of the eyelids to ensure thorough irrigation of the conjunctival cul-de-sacs. Irrigation should last at least 20-30 minutes. Do not use neutralizing agents or any other additives. Several liters of saline are required.
2. Cycloplegic drops (1% cyclopentolate for short-term use or 5% homatropine for longer term use), antibiotic drops, vasoconstrictive agents, or artificial tears may be indicated dependent on the severity of the injury.
3. Steroid eye drops should only be administered with the approval of a consulting ophthalmologist.

Section 5 - Fire-Fighting Measures

Flash Point: Nonflammable**Autoignition Temperature:** Not applicable**LEL:** Not applicable**UEL:** Not applicable**Extinguishing Media:** Water spray or fog; foam;

Bromochlorodifluoromethane (BCF) (where regulations permit); Dry agent; Carbon dioxide.

General Fire Hazards/Hazardous Combustion Products: Noncombustible liquid. Will not burn, but heat produces highly toxic fumes/vapors.

Heating may cause expansion or decomposition leading to violent rupture of containers.

Decomposes on heating and produces toxic fumes of hydrogen chloride. Decomposition may produce toxic fumes of chlorine.

Reacts with metals producing flammable/explosive hydrogen gas. Contact with moisture or water may generate heat causing ignition. Reacts vigorously with alkalis. Moderate fire hazard when in contact with reducing agents.

Fire Incompatibility: Reacts with metals producing flammable/explosive hydrogen gas.

Avoid reactions with metals, metal oxides, hydroxides, amines, carbonates, alkaline materials, acetic anhydride, cyanides, sulphides, sulphites, phosphides, acetylides, borides, carbides, silicides, vinyl acetate, formaldehyde and potassium permanganate, unsaturated organics, metal acetylides, sulphuric acid.

Note: Compatibility with plastics should be confirmed prior to use.

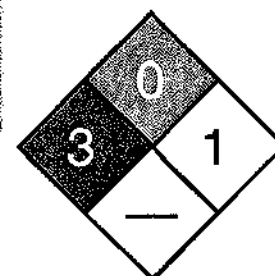
Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.

Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation. Cool fire-exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire. Equipment should be thoroughly decontaminated after use.

Water spray or fog may be used to disperse vapor. Do not approach cylinders suspected to be hot. If safe to do so, stop flow of gas.

See
DOT
ERG



Fire Diamond

Section 6 - Accidental Release Measures

Small Spills: DO NOT touch the spill material. Clean up all spills immediately. Wear fully protective PVC clothing and breathing apparatus. Contain and absorb spill with sand, earth, inert material or vermiculite. Use soda ash or slaked lime to neutralize. Collect residues and place in labeled plastic containers with vented lids. Clear area of personnel and move upwind. Avoid breathing vapors and contact with skin and eyes. Do not exert excessive pressure on valve; do not attempt to operate damaged valve. Water spray or fog may be used to disperse vapor.

See
DOT
ERG

Large Spills: Contact fire department and tell them location and nature of hazard. Clear area of personnel and move upwind. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation. Stop leak if safe to do so. Remove leaking cylinders to a safe place if possible. Release pressure under safe, controlled conditions by opening the valve. Do not exert excessive pressure on valve; do not attempt to operate damaged valve. Shut off all possible sources of ignition and increase ventilation. Water spray or fog may be used to disperse vapor. Use soda ash or slaked lime to neutralize. Collect and seal in labeled drums for disposal. Wash spill area with large quantities of water. If contamination of

drains or waterways occurs, advise emergency services. After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing. DO NOT touch the spill material. Contain and absorb spill with sand, earth, inert material or vermiculite.

DO NOT USE WATER OR NEUTRALIZING AGENTS INDISCRIMINATELY ON LARGE SPILLS.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist and vapor, breathing vapors and contact with skin and eyes.

Avoid physical damage to containers. Use in a well-ventilated area. Wear protective clothing and gloves when handling containers. Handle and open container with care.

WARNING: To avoid violent reaction, ALWAYS add material to water and NEVER water to material. When handling, DO NOT eat, drink or smoke. Always wash hands with soap and water after handling. Work clothes should be laundered separately. Use good occupational work practices. Observe manufacturer's storing and handling recommendations.

Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Local exhaust ventilation may be required for safe working, i.e. to keep exposures below required standards; otherwise, PPE is required.

Keep dry. Reacts violently with water.

Transport containers on a trolley. Avoid sources of heat. DO NOT transfer gas from one cylinder to another.

Recommended Storage Methods: Packaging as recommended by manufacturer. Check that containers are clearly labeled.

Cylinder. Ensure the use of equipment rated for cylinder pressure. Ensure the use of compatible materials of construction. Valve protection cap to be in place until cylinder is secured, connected. Cylinder must be properly secured either in use or in storage. Cylinder valve must be closed when not in use or when empty. Segregate full from empty cylinders. **WARNING:** Suckback into cylinder may result in rupture. Use back-flow preventive device in piping.

Hydrochloric acid; Packs of 2.5 litres or less require a child-resistant closure. Glass container or Plastic carboy or Polylined drum.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: If risk of overexposure exists, wear air supplied breathing apparatus. Provide adequate ventilation in warehouse or closed storage areas. Use in a well-ventilated area. Local exhaust ventilation may be required for safe working, i.e., to keep exposures below required standards; otherwise, PPE is required.

If risk of inhalation or overexposure exists, wear NIOSH-approved respirator or work in fume hood. Hydrogen chloride vapors will not be adequately absorbed by organic vapor respirators.

Personal Protective Clothing/Equipment:

Eyes: Chemical goggles. Full face shield.

DO NOT wear contact lenses. Contact lenses pose a special hazard; soft contact lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Neoprene gloves; rubber gloves. Nitrile gloves.

Safety footwear. Rubber boots.

Hydrochloric acid: Barrier cream and Neoprene gloves or Elbow length PVC gloves. Nitrile gloves.

PVC boots or PVC safety gumboots.

Respiratory Protection:

Exposure Range >5 to <50 ppm: Air Purifying, Negative Pressure, Half Mask

Exposure Range 50 to unlimited ppm: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Cartridge Color: white

Other: Ensure there is ready access to a safety shower; Eyewash unit.

Acid-resistant overalls. Full protective suit. Operators should be trained in procedures for safe use of this material.

Glove Selection Index:

BUTYL Best selection

BUTYL/NEOPRENE Best selection

HYPALON Best selection

NEOPRENE Best selection

NEOPRENE/NATURAL Best selection

NITRILE+PVC Best selection

PE/EVAL/PE Best selection

SARANEX-23 Best selection

VITON/NEOPRENE Best selection

PVC Best selection

NITRILE.....	Best selection
NATURAL RUBBER.....	Satisfactory; may degrade after 4 hours continuous immersion
NATURAL+NEOPRENE.....	Satisfactory; may degrade after 4 hours continuous immersion
NAT+NEOPR+NITRILE	Poor to dangerous choice for other than short-term immersion

Section 9 - Physical and Chemical Properties

Appearance/General Info: Hydrogen chloride: Colorless, corrosive gas. Pungent suffocating odor. White fumes in moist air. Soluble in methanol, ethanol, ether and benzene.

Hydrochloric acid: Clear to light yellow (orange tint for inhibited grades) fuming corrosive liquid with sharp, suffocating odor.

Physical State: Hydrogen chloride: Compressed gas;

Hydrochloric acid: Liquid

Odor Threshold: 0.26 to 0.3 ppm

Vapor Pressure (kPa): < 24.8 at 25 °C

Vapor Density (Air=1): 1.268 at 20 °C

Formula Weight: 36.461

Specific Gravity (H₂O=1, at 4 °C): < 1.19 at 20 °C

Evaporation Rate: Slow

pH: Hydrochloric acid: < 1

Boiling Point: -85 °C (-121 °F)

Freezing/Melting Point: -114.44 °C (-173.992 °F)

Volatile Component (% Vol): 100

Decomposition Temperature (°C): Not applicable

Water Solubility: 56.1 g/100 cc hot water at 60 °C

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Decomposes in the presence of moisture to produce corrosive acid.

May generate sufficient heat to ignite combustible materials. Presence of heat source and direct sunlight (ultra-violet radiation). Product is considered stable under normal handling conditions. Hazardous polymerization will not occur.

Storage Incompatibilities: Hydrogen chloride: Segregate from most common metals and their alloys, alkalis, unsaturated organics, fluorine, metal carbides, metal acetylides, potassium permanganate and sulfuric acid.

Compatibility with plastics should be confirmed prior to use.

Hydrochloric acid: Segregate from alkalies, oxidizing agents and chemicals readily decomposed by acids, i.e. cyanides, sulfides, carbonates. Avoid storage with metals, metal oxides, hydroxides, amines, carbonates, alkaline materials, acetic anhydride, cyanides, sulphides, sulphites, phosphides, acetylides, borides, carbides, silicides, vinyl acetate, formaldehyde and potassium permanganate. Reacts with zinc, brass, galvanized iron, aluminum, copper and copper alloys.

Section 11 - Toxicological Information

Toxicity

Inhalation (human) LC₅₀: 1300 ppm/30 m

Inhalation (human) LC₅₀: 3000 ppm/5 m

Inhalation (rat) LC₅₀: 3124 ppm/60 m

Inhalation (rat) LC₅₀: 4701 ppm/30 m

Oral (rat) LD₅₀: 900 mg/kg

Irritation

Eye (rabbit): 5 mg/30 s - mild

See RTECS MW 4025000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.

Ecotoxicity: TL_m Gambusia affinis (mosquito fish) 282 ppm/96 hr (fresh water) /Conditions of bioassay not specified;

Lethal Lepomis macrochirus (bluegill sunfish) 3.6 mg/l/48 hr /Conditions of bioassay not specified; LC₅₀ Cockle 330

to 1,000 mg/l/48 hr /Conditions of bioassay not specified; LC₅₀ Carassius auratus (goldfish) 178 mg/l (1 to 2 hr

survival time) /Conditions of bioassay not specified; LC₅₀ Shore crab 240 mg/l/48 hr /Conditions of bioassay not

specified; LC₅₀ Shrimp 100 to 330 ppm/48 hr (salt water) /Conditions of bioassay not specified; LC₁₀₀ Trout 10 mg/l 24

hr /Conditions of bioassay not specified

Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible. Consult manufacturer for recycling options. Treat and neutralize at an effluent treatment plant. Bury residue in an authorized landfill. Decontaminate empty containers with a lime slurry. Return empty containers to supplier or bury empty containers at an authorized landfill.

Return empty cylinders to supplier.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Note: This material has multiple possible HMT entries. Choose the appropriate one based on state and condition of specific material when shipped.

Shipping Name and Description: Hydrogen chloride, anhydrous

ID: UN1050

Hazard Class: 2.3 - Poisonous gas

Packing Group:

Symbols:

Label Codes: 2.3 - Poison Gas, 8 - Corrosive

Special Provisions: 3

Packaging: Exceptions: None **Non-bulk:** 304 **Bulk:** None

Quantity Limitations: Passenger aircraft/rail: Forbidden **Cargo aircraft only:** Forbidden

Vessel Stowage: Location: D **Other:** 40



Shipping Name and Description: Hydrochloric acid

ID: UN1789

Hazard Class: 8 - Corrosive material

Packing Group: II - Medium Danger

Symbols:

Label Codes: 8 - Corrosive

Special Provisions: A3, A6, B3, B15, IB2, N41, T8, TP2, TP12

Packaging: Exceptions: 154 **Non-bulk:** 202 **Bulk:** 242

Quantity Limitations: Passenger aircraft/rail: 1 L **Cargo aircraft only:** 30 L

Vessel Stowage: Location: C **Other:**



Shipping Name and Description: Hydrochloric acid

ID: UN1789

Hazard Class: 8 - Corrosive material

Packing Group: III - Minor Danger

Symbols:

Label Codes: 8 - Corrosive

Special Provisions: IB3, T4, TP1, TP12

Packaging: Exceptions: 154 **Non-bulk:** 203 **Bulk:** 241

Quantity Limitations: Passenger aircraft/rail: 5 L **Cargo aircraft only:** 60 L

Vessel Stowage: Location: C **Other:**



Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Not listed

CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4) 5000 lb (2268 kg)

SARA 40 CFR 372.65: Listed

SARA EHS 40 CFR 355: Listed

RQ: 5000 lb

TPQ: 500 lb

TSCA: Listed

Section 16 - Other Information

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Section 1 - Chemical Product and Company Identification

54/60

Material Name: Sulfuric Acid

CAS Number: 7664-93-9

Chemical Formula: H₂O₄S

Structural Chemical Formula: H₂SO₄

EINECS Number: 231-639-5

ACX Number: X1002217-4

Synonyms: ACIDE SULFURIQUE; ACIDO SOLFORICO; ACIDO SULFURICO; BATTERY ACID; BOV; DIHYDROGEN SULFATE; DIPPING ACID; ELECTROLYTE ACID; EPA PESTICIDE CHEMICAL CODE 078001; HYDROGEN SULFATE; MATTING ACID; OIL OF VITRIOL; SCHWEFELSAEURELOESUNGEN; SULFURIC ACID; SULFURIC ACID (AQUEOUS); SULFURIC ACID, SPENT; SULPHURIC ACID; VITRIOL BROWN OIL; ZWAVELZUROPLOSSINGEN

General Use: The manufacture of superphosphate fertilizer, inorganic and petro-chemicals, explosives and pigments. Component of heavy duty metal cleaners, pickles. In manufacture of rayon, cellulose film. As battery electrolyte and also in electroplating processes.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
sulfuric acid	7664-93-9	>51
water	7732-18-5	remainder

OSHA PEL

TWA: 1 mg/m³.

NIOSH REL

TWA: 1 mg/m³.

DFG (Germany) MAK

TWA: 0.1 mg/m³; PEAK: 0.1 mg/m³; Ceiling: 0.2 mg/m³; measured as inhalable fraction of the aerosol.

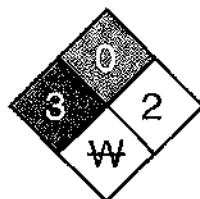
ACGIH TLV

TWA: 1 mg/m³; STEL: 3 mg/m³; A2 = as contained in strong inorganic acid mists.

IDLH Level

15 mg/m³.

Section 3 - Hazards Identification



Fire Diamond

	0	1	2	3	4
Flammability	Min	Low	Moderate	High	Extreme
Toxicity					
Body Contact					
Reactivity					
Chronic					

ANSI Signal Word

Danger!

HMIS
3 Health
0 Flammability
2 Reactivity



Corrosive

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Colorless to dark-brown, oily, odorless liquid. Corrosive. Other Acute Effects: blindness. Chronic Effects: tooth erosion, GI disturbances, dermatitis. Reaction with water produces excessive heat.

Potential Health Effects

Target Organs: respiratory system, eyes, skin, teeth

Primary Entry Routes: inhalation, skin contact, eye contact

Acute Effects

Inhalation: The vapor is extremely discomforting to the upper respiratory tract and is capable of causing severe mucous membrane irritation, upper respiratory tract inflammation.

Exposure to high concentrations causes bronchitis and is characterized by the onset of hemorrhagic pulmonary edema.

Mists are highly irritating to eyes, mucous membranes and respiratory tract and high mist concentrations may lead to pulmonary edema.

Eye: HIGHLY CORROSIVE The liquid is extremely corrosive to the eyes and any contact may cause rapid tissue destruction and is capable of causing severe damage with loss of sight.

The mist is highly corrosive and contact may cause rapid tissue destruction.

The vapor is extremely discomforting to the eyes.

The material may produce severe irritation to the eye causing pronounced inflammation. Repeated or prolonged exposure to irritants may produce conjunctivitis.

Skin: HIGHLY CORROSIVE. The liquid is extremely corrosive to the skin and any contact may cause rapid tissue destruction with severe burns.

The mist is highly discomforting to the skin and may cause deep ulceration to body tissue.

Topical application of a 10% solution to skin on the scapula or waist produces only negligible evidence of irritation.

Ingestion: HIGHLY CORROSIVE and Considered toxic by all exposure routes.

The liquid is extremely corrosive and may rapidly cause severe burns to the gastrointestinal tract and may be fatal if swallowed in quantity.

Considered an unlikely route of entry in commercial/industrial environments.

Carcinogenicity: NTP - Not listed; IARC - Group 1, Carcinogenic to humans; OSHA - Not listed; NIOSH - Not listed; ACGIH - Class A2, Suspected human carcinogen; EPA - Not listed; MAK - Not listed.

Chronic Effects: Repeated minor exposure to mists can cause erosion of teeth and inflammation of the upper respiratory tract leading to chronic bronchitis.

Repeated skin contact with dilute solutions may cause dermatitis.

Lungs of sulfuric acid plant workers appear to be less affected than the lungs of workers exposed to "dust".

There is evidence that the corrosion of tooth enamel occurs at 1 mg/m³ but that acclimatized workers could tolerate three to four times that level. Forming room workers in a battery factory exposed to 3 to 16 mg/m³ sulfuric acid mist concentrations exhibited the most serious signs of erosion whilst charging room workers exposed to 0.08 to 2.5 mg/m³ were affected to a lesser degree.

Workers chronically exposed to sulfuric acid mists may show various skin lesions, tracheobronchitis, stomatitis, conjunctivitis and gastritis.

Increased risk of laryngeal cancer is associated with chronic exposures.

Section 4 - First Aid Measures

Inhalation: Remove to fresh air.

Lay patient down. Keep warm and rested.

If available, administer medical oxygen by trained personnel.

If breathing is shallow or has stopped, ensure clear airway and apply resuscitation. Transport to hospital or doctor, without delay.

See
DOT
ERG

Eye Contact: Immediately hold the eyes open and flush continuously for at least 15 minutes with fresh running water. Ensure irrigation under eyelids by occasionally lifting the upper and lower lids.

Transport to hospital or doctor without delay. Removal of contact lenses after an eye injury should only be undertaken by skilled personnel.

Skin Contact: Immediately flush body and clothes with large amounts of water, using safety shower if available.

Quickly remove all contaminated clothing, including footwear.

Wash affected areas with water (and soap if available) for at least 15 minutes. Transport to hospital or doctor.

DO NOT attempt to neutralize burns with alkaline solutions.

Ingestion: Rinse mouth out with plenty of water.

Contact a Poison Control Center.

Do NOT induce vomiting. Give a glass of water.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: For acute or short-term repeated exposures to strong acids:

1. Airway problems may arise from laryngeal edema and inhalation exposure.

Treat with 100% oxygen initially.

2. Respiratory distress may require cricothyroidotomy if endotracheal intubation is contraindicated by excessive swelling.

3. Intravenous lines should be established immediately in all cases where there is evidence of circulatory compromise.

4. Strong acids produce a coagulation necrosis characterized by formation of a coagulum (eschar) as a result of the desiccating action of the acid on proteins in specific tissues.

INGESTION:

1. Immediate dilution (milk or water) within 30 minutes post-ingestion is recommended.

2. Do not attempt to neutralize the acid since exothermic reaction may extend the corrosive injury.

3. Be careful to avoid further vomiting since re-exposure of the mucosa to the acid is harmful. Limit fluids to one or two glasses in an adult.

4. Charcoal has no place in acid management.

5. Some authors suggest the use of lavage within 1 hour of ingestion.

SKIN:

- 1.Skin lesions require copious saline irrigation. Treat chemical burns as thermal burns with non-adherent gauze and wrapping.
- 2.Deep second-degree burns may benefit from topical silver sulfadiazine.

EYE:

- 1.Eye injuries require retraction of the eyelids to ensure thorough irrigation of the conjunctival cul-de-sacs. Irrigation should last at least 20-30 minutes. Do not use neutralizing agents or any other additives. Several liters of saline are required.
- 2.Cycloplegic drops (1% cyclopentolate for short-term use or 5% homatropine for longer term use), antibiotic drops, vasoconstrictive agents, or artificial tears may be indicated dependent on the severity of the injury.
- 3.Steroid eye drops should only be administered with the approval of a consulting ophthalmologist.

Section 5 - Fire-Fighting Measures**Flash Point:** Nonflammable**Autoignition Temperature:** Not applicable**LEL:** Not applicable**UEL:** Not applicable**Extinguishing Media:** Use extinguishing media suitable for surrounding area. Water spray or fog, from a safe distance only.**General Fire Hazards/Hazardous Combustion Products:** HIGHLY CORROSIVE.

Noncombustible liquid. Reacts vigorously with water.

Heating may cause expansion or decomposition leading to violent rupture of containers.

Contact with readily oxidizable organic material may cause ignition /fire.

Reacts with metals producing flammable/explosive hydrogen gas.

Decomposes on heating and produces acrid and toxic fumes of sulfur oxides (SO_x).**Fire Incompatibility:** Reacts with mild steel, galvanized steel/zinc producing hydrogen gas which may form an explosive mixture with air.

Contact with readily oxidizable organic material may cause ignition /fire.

Avoid any contamination of this material as it is very reactive and any contamination is potentially hazardous.

Fire-Fighting Instructions: Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.

Use water delivered as a fine spray to control fire and cool adjacent area.

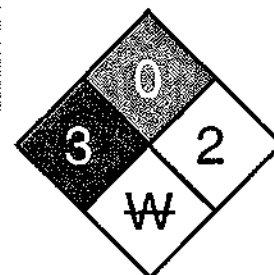
Avoid spraying water onto liquid pools.

Do not approach containers suspected to be hot.

Cool fire-exposed containers with water spray from a protected location.

If safe to do so, remove containers from path of fire.

Equipment should be thoroughly decontaminated after use.



Fire Diamond

Section 6 - Accidental Release Measures**Small Spills:** Clean up all spills immediately.

Avoid breathing vapors and contact with skin and eyes.

Control personal contact by using protective equipment.

Contain and absorb spill with sand, earth, inert material or vermiculite.

Wipe up. Place in a suitable labeled container for waste disposal.

Use soda ash or slaked lime to neutralize.

Large Spills: DO NOT touch the spill material. Clear area of personnel and move upwind.

Contact fire department and tell them location and nature of hazard.

May be violently or explosively reactive. Wear full body protective clothing with breathing apparatus. Prevent, by any means available, spillage from entering drains or waterways. Consider evacuation.

Stop leak if safe to do so.

Contain spill with sand, earth or vermiculite.

Collect recoverable product into labeled containers for recycling.

Neutralize/decontaminate residue.

Collect solid residues and seal in labeled drums for disposal.

Wash area and prevent runoff into drains.

After clean-up operations, decontaminate and launder all protective clothing and equipment before storing and reusing.

If contamination of drains or waterways occurs, advise emergency services.

DO NOT USE WATER OR NEUTRALIZING AGENTS INDISCRIMINATELY ON LARGE SPILLS.**Regulatory Requirements:** Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid generating and breathing mist. Avoid all personal contact, including inhalation.

Wear protective clothing when risk of exposure occurs.

Use in a well-ventilated area.

WARNING: To avoid violent reaction, ALWAYS add material to water and NEVER water to material.

Avoid smoking, bare lights or ignition sources.

Avoid contact with incompatible materials.

When handling, DO NOT eat, drink or smoke.

Keep containers securely sealed when not in use. Avoid physical damage to containers. Always wash hands with soap and water after handling. Work clothes should be laundered separately.

Launder contaminated clothing before reuse.

Use good occupational work practices. Observe manufacturer's storing and handling recommendations. Atmosphere should be regularly checked against established exposure standards to ensure safe working conditions are maintained.

Recommended Storage Methods: Glass carboy. Glass container is suitable for laboratory quantities.

Plastic carboy. Polylined drum.

Check that containers are clearly labeled.

Packaging as recommended by manufacturer.

DO NOT use mild steel or galvanized containers.

Regulatory Requirements: Follow applicable OSHA regulations.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: Use in a well-ventilated area.

General exhaust is adequate under normal operating conditions.

Local exhaust ventilation may be required in special circumstances.

If risk of overexposure exists, wear NIOSH-approved respirator. Correct fit is essential to ensure adequate protection.

Provide adequate ventilation in warehouses and enclosed storage areas.

Personal Protective Clothing/Equipment:

Eyes: Chemical goggles. Full face shield.

Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them.

Hands/Feet: Wear chemical protective gloves, eg. PVC.

Wear safety footwear or safety gumboots, eg. Rubber.

Respiratory Protection:

Exposure Range >1 to 10 mg/m³: Air Purifying, Negative Pressure, Half Mask

Exposure Range >10 to <15 mg/m³: Air Purifying, Negative Pressure, Full Face

Exposure Range 15 to unlimited mg/m³: Self-contained Breathing Apparatus, Pressure Demand, Full Face

Cartridge Color: white with dust/mist prefilter (use P100 or consult supervisor for appropriate dust/mist prefilter)

Other: Overalls, PVC apron, PVC protective suit may be required if exposure severe.

Eyewash unit. Ensure there is ready access to a safety shower.

Glove Selection Index:

NATURAL RUBBER..... Best selection

NATURAL+NEOPRENE..... Best selection

NEOPRENE..... Best selection

NEOPRENE/NATURAL..... Best selection

NITRILE..... Best selection

PE..... Best selection

PVC..... Best selection

SARANEX-23..... Best selection

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless, oily, dense, HIGHLY CORROSIVE liquid. Faint acid odor.

Material is a powerful oxidizing and dehydrating agent causing rapid human tissue destruction on contact.

Concentrated acid is very exothermic (generates heat) when mixed with water.

DANGER: Adding water to acid will cause violent steam explosion, scattering corrosive acid. Always add acid slowly to water.

Mixes with alcohol in all proportions. Available in technical, pure and analytical grades

Physical State: Liquid

Vapor Pressure (kPa): 0.133 at 146 °C

Vapor Density (Air=1): 3.40

Formula Weight: 98.07

Specific Gravity (H₂O=1, at 4 °C): 1.6-1.84 at 15 °C

Evaporation Rate: Non Vol. at 38 °C

pH: < 1

pH (1% Solution): 1

Boiling Point: About 290 °C (554 °F)

Freezing/Melting Point: 10.36 °C (50.648 °F)

Decomposition Temperature (°C): 340

Water Solubility: Soluble in water

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Product is considered stable. Hazardous polymerization will not occur.
Storage Incompatibilities: Segregate from alkalis, oxidizing agents and chemicals readily decomposed by acids, i.e. cyanides, sulfides, carbonates.
 Reacts vigorously with water and alkali.
 Contact with readily oxidizable organic material may cause ignition /fire.
 Avoid contamination of water, foodstuffs, feed or seed.

Section 11 - Toxicological Information

Toxicity

Oral (rat) LD₅₀: 2140 mg/kg
 Inhalation (rat) LC₅₀: 510 mg/m³/2h
 Inhalation (human) TC_{Lo}: 3 mg/m³/24w

Irritation

Eye (rabbit): 1.38 mg SEVERE
 Eye (rabbit): 5 mg/30sec SEVERE

See RTECS WS 5600000, for additional data.

Section 12 - Ecological Information

Environmental Fate: No data found.

Ecotoxicity: TL₁₅ Lepomis macrochirus (bluegill) 24.5 ppm/24 hr fresh water /Conditions of bioassay not specified;
 LC₅₀ Flounder 100 to 330 mg/l/48 hr aerated water /Conditions of bioassay not specified; LC₅₀ Shrimp 80 to 90 mg/l/48 hr aerated water /Conditions of bioassay not specified; LC₅₀ Prawn 42.5 ppm/48 hr salt water /Conditions of bioassay not specified

BCF: no food chain concentration potential

Biochemical Oxygen Demand (BOD): none

Section 13 - Disposal Considerations

Disposal: Recycle wherever possible or consult manufacturer for recycling options.

Follow applicable federal, state, and local regulations.

Treat and neutralize at an effluent treatment plant.

Use soda ash or slaked lime to neutralize.

Recycle containers, otherwise dispose of in an authorized landfill.

Bury residue in an authorized landfill.

Section 14 - Transport Information

DOT Hazardous Materials Table Data (49 CFR 172.101):

Shipping Name and Description: Sulfuric acid with more than 51 percent acid

ID: UN1830

Hazard Class: 8 - Corrosive material

Packing Group: II - Medium Danger

Symbols:

Label Codes: 8 - Corrosive

Special Provisions: A3, A7, B3, B83, B84, IB2, N34, T8, TP2, TP12

Packaging: Exceptions: 154 Non-bulk: 202 Bulk: 242

Quantity Limitations: Passenger aircraft/rail: 1 L Cargo aircraft only: 30 L

Vessel Stowage: Location: C Other: 14



Section 15 - Regulatory Information

EPA Regulations:

RCRA 40 CFR: Not listed

CERCLA 40 CFR 302.4: Listed per CWA Section 311(b)(4) 1000 lb (453.5 kg)

SARA 40 CFR 372.65: Listed

SARA EHS 40 CFR 355: Listed

RQ: 1000 lb

TPQ: 1000 lb

TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Section 1 - Chemical Product and Company Identification

51/58

Material Name: Methanol

CAS Number: 67-56-1

Chemical Formula: CH₃O

Structural Chemical Formula: CH₃OH

EINECS Number: 200-659-6

ACX Number: X1001287-2

Synonyms: ALCOHOL, METHYL; ALCOOL METHYLIQUE; ALCOOL METILICO; CARBINOL; X-CIDE 402 INDUSTRIAL BACTERICIDE; COAT-B1400; COLONIAL SPIRIT; COLONIAL SPIRITS; COLUMBIAN SPIRIT; COLUMBIAN SPIRITS; EPA PESTICIDE CHEMICAL CODE 053801; EUREKA PRODUCTS CRIOSINE DISINFECTANT; EUREKA PRODUCTS, CRIOSINE; FREERS ELM ARRESTER; IDEAL CONCENTRATED WOOD PRESERVATIVE; METANOL; METANOLO; METHANOL; METHYL ALCOHOL; METHYL HYDRATE; METHYL HYDROXIDE; METHYLALKOHOL; METHYLOL; METYLOWY ALKOHOL; MONOHYDROXYMETHANE; PMC REJEX-IT F-40ME; PYROLIGNEOUS SPIRIT; PYROXYLIC SPIRIT; PYROXYLIC SPIRITS; SURFLO-B17; WILBUR-ELLIS SMUT-GUARD; WOOD ALCOHOL; WOOD NAPHTHA; WOOD SPIRIT

Derivation: Prepared by wood pyrolysis; non-catalytic oxidation of hydrocarbons; as a by-product in the fisher-tropsch synthesis; or by reduction of carbon monoxide.

General Use: Used as an industrial solvent; starting material for organic synthesis; antifreeze for windshield washer fluid; in fuel antifreezes; gasoline octane booster; fuel for stoves; extractant for oils; denaturing ethanol; softening agent; food additive; in paint, varnish removers, and embalming fluids; in the manufacture of photographic film, celluloid, textile soap, wood stains, coated fabrics, shatterproof glass, paper coating, waterproofing formulations, artificial leather, dyes.

Section 2 - Composition / Information on Ingredients

Name	CAS	%
Methanol	67-56-1	ca 100% vol

Trace Impurities: (Grade A): Acetone and aldehydes < 30 ppm, acetic acid < 30 ppm

OSHA PEL

TWA: 200 ppm; 260 mg/m³.

NIOSH REL

TWA: 200 ppm, 260 mg/m³;
 STEL: 250 ppm, 325 mg/m³;
 skin.

DFG (Germany) MAK

TWA: 200 ppm; PEAK: 800 ppm;
 skin.

OSHA PEL Vacated 1989 Limits

TWA: 200 ppm; 260 mg/m³;
 STEL: 250 ppm; 325 mg/m³.

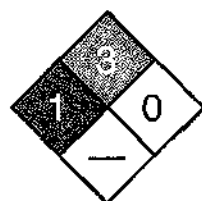
IDLH Level

6000 ppm.

ACGIH TLV

TWA: 200 ppm; STEL: 250 ppm;
 skin.

Section 3 - Hazards Identification



Fire Diamond

	ChemWatch Hazard Ratings				
Flammability	0	1	2	3	4
Toxicity	0	1	2	3	4
Body Contact	0	1	2	3	4
Reactivity	0	1	2	3	4
Chronic	0	1	2	3	4
	Min	Low	Moderate	High	Extreme

ANSI Signal Word

Warning!

HMIS	
2	Health
3	Flammability
0	Reactivity



Flammable

☆☆☆☆☆ Emergency Overview ☆☆☆☆☆

Methanol is a colorless liquid with a slight alcohol odor when pure, or disagreeably pungent odor when crude. It is irritating to the eyes, skin, and respiratory tract. Exposure may result in headache, visual disturbance, blindness, and respiratory failure. Reproductive effects have been reported in animal testing. This flammable liquid is a moderate explosion hazard. When heated to decomposition, methanol emits carbon oxides (CO_x), formaldehyde, acrid smoke, and irritating fumes.

Potential Health Effects

Target Organs: Eyes, skin, central nervous system (CNS), gastrointestinal (GI) tract, respiratory system

Primary Entry Routes: Inhalation, ingestion, skin and/or eye contact/absorption

Acute Effects

Inhalation: Irritation, breathing difficulty, headache, drowsiness, vertigo, light-headedness, nausea, vomiting, acidosis (decreased blood alkalinity), visual disturbance, and at high concentrations, CNS damage, convulsions, circulatory collapse, respiratory failure, coma and blindness can result from inhalation of methanol vapor. Concentration ≥ 200 ppm may cause headache; 50,000 ppm can cause death within 1-2 hrs.

Eye: Contact with liquid may result in irritation, inflamed lids, light sensitization, and superficial lesions.

Skin: Contact may cause irritation, dermatitis, swelling, scaling, and systemic effects listed under inhalation.

Ingestion: GI irritation and systemic effects (see Inhalation). Symptoms may be delayed 18-48 hours. Fatal dose - 2 to 8 ounces.

Carcinogenicity: NTP - Not listed; IARC - Not listed; OSHA - Not listed; NIOSH - Not listed; ACGIH - Not listed; EPA - Not listed; MAK - Not listed.

Medical Conditions Aggravated by Long-Term Exposure: None reported.

Chronic Effects: Exposure to methanol vapors has caused conjunctivitis, headache, giddiness, insomnia, GI disturbance, impaired vision. CNS damage is also likely. Methanol is slowly eliminated from the body; exposure is considered cumulative over the short term.

Section 4 - First Aid Measures

Inhalation: Remove exposed person to fresh air and support breathing as needed.

Eye Contact: *Do not* allow victim to rub or keep eyes tightly shut. Gently lift eyelids and flush immediately and continuously with flooding amounts of water for at least 15 minutes. Consult a physician or ophthalmologist if pain or irritation develops.

Skin Contact: *Quickly* remove contaminated clothing. Rinse with flooding amounts of water for at least 15 min. Wash exposed area with soap and water. For reddened or blistered skin, consult a physician.

Ingestion: Never give anything by mouth to an unconscious or convulsing person. Contact a poison control center. Unless the poison control center advises otherwise, have the *conscious and alert* person drink 1 to 2 glasses of water, then induce vomiting.

After first aid, get appropriate in-plant, paramedic, or community medical support.

Note to Physicians: Follow emesis with rehydration, correction of acidosis, and folate to enhance formate oxidation. Consider IV administration of ethanol (if blood methanol >20 mg/dL) to show metabolic oxidation of methanol. Assay formic acid in urine, blood pH and plasma bicarbonate.

Section 5 - Fire-Fighting Measures

Flash Point: 54 °F (12 °C), Closed Cup

Burning Rate: 1.7 mm/min

Autoignition Temperature: 867 °F (464 °C)

LEL: 6.0% v/v

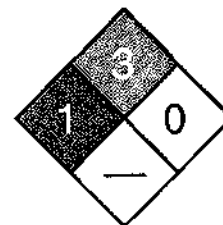
UEL: 36% v/v

Flammability Classification: OSHA Class IB Flammable Liquid.

Extinguishing Media: Use dry chemical, carbon dioxide, water spray, fog or alcohol-resistant foam. A water spray may be used to cool fire-exposed containers, and flush spills away from ignition sources.

General Fire Hazards/Hazardous Combustion Products: Heating methanol to decomposition can produce carbon oxides (CO_x), formaldehyde, acrid smoke, and irritating fumes. Can form explosive mixtures in the air. The heavier-than-air vapors of methanol may travel along low-lying surfaces to distant sources of ignition and flash back to the material source. Containers may explode in heat of fire.

Fire-Fighting Instructions: *Do not* scatter material with any more water than needed to extinguish fire. *Do not* release runoff from fire control methods to sewers or waterways. Because fire may produce toxic thermal decomposition products, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in pressure-demand or positive-pressure mode.



Fire Diamond

Section 6 - Accidental Release Measures

Spill/Leak Procedures: Isolate spill area for at least 330-660 feet (100-200 m) in all directions. Fully encapsulating, vapor protective clothing should be worn for spills and leaks with no fire. Eliminate all ignition sources (no smoking, flares, sparks or flames in immediate area). Ground all equipment used when handling this product. *Do not* touch or walk through spilled material. Stop leak if you can do it without risk. Prevent entry into waterways, sewers, basements or confined areas. A vapor suppressing foam may be used to reduce vapors.

Small Spills: Absorb with earth, sand or other non-combustible material and transfer to containers for later disposal. Use clean non-sparking tools to collect absorbed material.

Large Spills: Dike far ahead of liquid spill for later disposal. *Do not* release into sewers or waterways. Ground all equipment. Use non-sparking tools.

Regulatory Requirements: Follow applicable OSHA regulations (29 CFR 1910.120).

Section 7 - Handling and Storage

Handling Precautions: Avoid vapor inhalation, and skin and eye contact. Use only with ventilation sufficient to reduce airborne concentrations to non-hazardous levels (see Sec. 2). Wear protective gloves, goggles, and clothing (see Sec. 8). Keep away from heat and ignition sources. Ground and bond all containers during transfers to prevent static sparks. Use non-sparking tools to open and close containers.

Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Recommended Storage Methods: Store in tightly closed container in cool, well-ventilated area, away from heat, ignition sources and incompatibles (see Sec. 10). Equip drums with self-closing valves, pressure vacuum bungs, and flame arrestors.

Regulatory Requirements: Follow applicable OSHA regulations. Also 29 CFR 1910.106 for Class 1B Flammable Liquids.

Section 8 - Exposure Controls / Personal Protection

Engineering Controls: To prevent static sparks, electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations. Provide general or local exhaust ventilation systems to maintain airborne concentrations as low as possible. Local exhaust ventilation is preferred because it prevents contaminant dispersion into the work area by controlling it at its source.

Administrative Controls: Enclose operations and/or provide local explosion-proof exhaust ventilation at the site of chemical release. Where possible, transfer methanol from drums or other storage containers to process containers. Minimize sources of ignition in surrounding areas.

Personal Protective Clothing/Equipment: Wear chemically protective gloves, boots, aprons, and gauntlets of butyl rubber, Teflon, Viton, Saranex, 4H, Responder, Trellechem HPS, or Tychem 10000 (Breakthrough Time (BT) >8 hr) to prevent skin contact. Natural rubber, neoprene, nitrile rubber, polyethylene, polyvinyl alcohol and CPF 3 may degrade after contact and are not recommended. Wear splash-proof chemical safety goggles, and face shield, per OSHA eye- and face-protection regulations (29 CFR 1910.133). Contact lenses are not eye protective devices. Appropriate eye protection must be worn instead of, or in conjunction with contact lenses.

Respiratory Protection: Seek professional advice prior to respirator selection and use. Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a MSHA/NIOSH-approved respirator. For concentrations $\leq$ 2000 ppm, use a supplied air respirator; $\leq$ 5000 ppm, supplied air (SA) respirator in continuous flow mode; $\leq$ 6000 ppm, SA respirator with tight-fitting face mask operated in continuous flow mode, or SCBA with full facepiece, or SA respirator with full facepiece; $>$ IDLH/unknown/emergency, SCBA with full facepiece operated in pressure-demand or other positive-pressure mode, or SA respirator with full facepiece operated in pressure-demand or other positive-pressure mode in combination with auxiliary SCBA operated in pressure-demand or other positive-pressure mode. For escape, use an appropriate escape-type SCBA. *Warning! Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.* If respirators are used, OSHA requires a written respiratory protection program that includes at least: medical certification, training, fit-testing, periodic environmental monitoring, maintenance, inspection, cleaning, and convenient, sanitary storage areas.

Other: Separate contaminated work clothes from street clothes. Launder before reuse. Remove this material from your shoes and clean personal protective equipment. Make emergency eyewash stations, safety/quick-drench showers, and washing facilities available in work area.

Section 9 - Physical and Chemical Properties

Appearance/General Info: Colorless; slight alcohol odor when pure, disagreeably pungent odor when crude.

Physical State: Liquid

Vapor Pressure (kPa): 127 mm Hg at 77 °F (25 °C)

Vapor Density (Air=1): 1.11

Bulk Density: 6.59 lbs/gal at 68 F (20 °C)

Formula Weight: 32.04

Density: 0.796 g/mL at 59 °F (15 °C)

Specific Gravity (H₂O=1, at 4 °C): 0.81 at 0 °C/4 °C

Refractive Index: 1.3292 at 68 °F (20 °C)

pH: Slightly acidic

Boiling Point: 148 °F (64.7 °C) at 760 mm Hg

Freezing/Melting Point: -144.04 °F (-97.8 °C)
Viscosity: 0.614 mPa sec
Surface Tension: 22.61 dynes/cm
Ionization Potential (eV): 10.84 eV

Water Solubility: Miscible
Other Solubilities: Ethanol, acetone, benzene, chloroform, DMSO, ether, ketones, most organic solvents.

Section 10 - Stability and Reactivity

Stability/Polymerization/Conditions to Avoid: Methanol is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur. Vapor inhalation, oxidizers.
Storage Incompatibilities: Include beryllium dihydride, metals (potassium, magnesium), oxidants (barium perchlorate, bromine, chlorine, hydrogen peroxide, sodium hypochlorite, phosphorus trioxide), potassium tertbutoxide, carbon tetrachloride and metals, chloroform and heat, diethyl zinc, alkyl aluminum salts, acetyl bromide, chloroform and sodium hydroxide, cyanuric chloride, nitric acid, chromic anhydride, lead perchlorate.
Hazardous Decomposition Products: Thermal oxidative decomposition of methanol can produce carbon oxides (CO₂), formaldehyde, acrid smoke, and irritating fumes.

Section 11 - Toxicological Information

Acute Oral Effects:

Rat, oral, LD₅₀: 5628 mg/kg.
 Human, oral, LD₅₀: 428 mg/kg produced toxic effects: behavioral - headache; lungs, thorax, or respiration - other changes.
 Human, oral, LD₅₀: 143 mg/kg produced optic nerve neuropathy, dyspnea, nausea or vomiting.

Acute Inhalation Effects:

Rat, inhalation, LC₅₀: 64000 ppm/4 hr.
 Human, inhalation, TC₅₀: 300 ppm produced visual field changes, headache; lungs, thorax, or respiration - other changes.

Acute Skin Effects:

Rabbit, skin, LD₅₀: 15800 mg/kg.
 Monkey, skin, LD₅₀: 393 mg/kg.

Irritation Effects:

Rabbit, standard Draize test: 100 mg/24 hr resulted in moderate irritation.
 Rabbit, standard Draize test: 20 mg/24 hr resulted in moderate irritation.

Other Effects:

Rat, oral: 10 µmol/kg resulted in DNA damage.
 Rat, inhalation: 50 mg/m³/12 hr/13 weeks intermittently produced degenerative changes to brain and coverings; muscle contraction or spasticity.
 Rat, inhalation: 2610 ppm/6 hr/4 weeks intermittently produced toxic effects: endocrine - changes in spleen weight.
 Multiple Dose Toxicity Effects - Rat, oral: 12 g/kg/8 weeks intermittently produced toxic effects: behavioral - ataxia; behavioral - alteration of operant conditioning.
 Human, lymphocyte: 300 mmol/L resulted in DNA inhibition.
 Rat (female), oral: 7500 mg/kg, administered during gestational days 17-19 produced effects on newborn - behavioral.
 Rat (female), oral: 35295 mg/kg administered during gestational days 1-15 produced effects on the fertility index; pre implantation mortality; and post-implantation mortality.
 Rat (female), inhalation: 20000 ppm/7 hr, administered during gestational days 1-22 produced specific developmental abnormalities - musculoskeletal system; cardiovascular (circulatory) system; urogenital system.
 Rat (male), oral: 200 ppm/20 hr, 78 weeks prior to mating produced paternal effects - testes, epididymis, sperm duct.

See NIOSH, RTECS PC1400000, for additional data.

Section 12 - Ecological Information

Environmental Fate: Bioconcentration (BCF, estimated at 0.2) is not expected to be significant. Physical removal from air can occur via rainfall. Relatively rapid evaporation from dry surfaces is likely to occur. If released to the atmosphere, it degrades via reaction with photochemically produced hydroxyl radicals with an approximate half-life of 17.8 days. If released to water or soil, biodegradation is expected to occur. A low K_{oc} indicates little sorption and high mobility in the soil column.

Ecotoxicity: Trout, LC₅₀: 8,000 mg/L/48 hr; *Pimephales promelas* (fathead minnow) LC₅₀: 29.4 g/L/96 hr.

Henry's Law Constant: 4.55 x 10⁻⁶ atm-m³/mole at 77 °F (25 °C)

Octanol/Water Partition Coefficient: log K_{ow} = -0.77

Soil Sorption Partition Coefficient: K_{oc} = 0.44

Section 13 - Disposal Considerations

Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.

Section 14 - Transport Information**DOT Transportation Data (49 CFR 172.101):**

Shipping Name: Methanol

Hazard Class: 3

ID No.: UN1230

Packing Group: II

Label: FLAMMABLE LIQUID

Section 15 - Regulatory Information**EPA Regulations:**

RCRA 40 CFR: Listed U154 Ignitable Waste

CERCLA 40 CFR 302.4: Listed per RCRA Section 3001 5000 lb (2268 kg)

SARA 40 CFR 372.65: Listed

SARA EHS 40 CFR 355: Not listed

TSCA: Listed

Section 16 - Other Information

Disclaimer: Judgments as to the suitability of information herein for the purchaser's purposes are necessarily the purchaser's responsibility. Although reasonable care has been taken in the preparation of such information, Genium Group, Inc. extends no warranties, makes no representations, and assumes no responsibility as to the accuracy or suitability of such information for application to the purchaser's intended purpose or for consequences of its use.

Appendix C

Glove Selection Guideline

GLOVE SELECTION GUIDELINE			
HAZARD	EXAMPLE TASKS	ANSI CUT/ABRASION RATING*	REPRESENTATIVE GLOVE
Impact Hazards, Med/Heavy Duty Puncture Cut	Drilling/direct push activities. Construction. Heavy materials handling. Power tools. Air knifing. Excavation.	ANSI Cut and Abrasion Resistance Level 5 EN 388 4521	Hexarmor®Chrome Hexarmor® GGT5 Hexarmor® L5 Hexarmor® SteelLeather III Ironclad® Kong Glove
Med/Heavy Duty Puncture Cut Oil/Solvent Resistant	Tasks where materials are treated with oil or solvents.	ANSI Cut and Abrasion Resistance Level 3 - 4 EN 388 4522	Ansell Alpha-Tec ® Memphis® Ultra Tech Nitrile Cut & Splash Best® Neoprene 6780 Hexarmor™ TenX Threesixty
Medium Duty Cut/Puncture Gloves with Oily Surface Grip	Light materials handling, wet service	ANSI Cut and Abrasion Resistance Level 3 EN 388 44xx	Best®Zorb-It Ultimate HV 4567 Ansell® Cut Protective Glove 97-505 Ansell HyFlex® 11-511 Ansell HyFlex® 11-624
Med/Heavy Duty Cut/Puncture	Light Materials Handling. System O&M. Use of Hand Tools. Hand Augering. Heavy Equipment Operator.	ANSI Cut and Abrasion Resistance Level 2 EN 388 33xx	Perfect Fit® PF570 Hexarmor® Level Six 9010/9012 Ironclad® Cut Resistant Glove Ansell HyFlex® 11-511 Ansell HyFlex® 11-624 Ansell® Cut Protective Glove 97-505
Light Duty Cut/Puncture Abrasion Only	Handling soil and Groundwater Samples. Opening spoons. Well construction.	ANSI Cut and Abrasion Resistance Level 2 - 4 EN 388 21xx	Memphis® Ninja Max N9676GL Memphis® UltraTech Dyneema 9676 Memphis® Ninja Ice (Cold Weather) Ansell HyFlex® 11-511 Ansell® Cut Protective Glove 97-505 Ansell® Powerflex 80-813 Ironclad™ Workforce
Light Duty Glove Cut/Abrasion (used under nitrile gloves)	Groundwater Sampling.	ANSI Cut and Abrasion Resistance Level 2 EN 388 21xx	Ansell HyFlex® 11-500 Ansell HyFlex® 11-624 Ansell GoldKnit
* Reference to ANSI and EN 388 glove testing standards. Listed gloves meet the standards in the table, but are not the only gloves that meet the standard.			
This selection chart is not intended to address all chemical hazards. Gloves used for chemical protection shall provide cut/puncture resistance, or be used in tandem with cut/puncture protection. Nitrile gloves used for environmental sampling must be used in tandem with a cut/puncture resistant glove.			
Gloves available in high visibility colors have shown to be effective and are preferred.			

Appendix D

Heat & Cold Stress

COLD STRESS

Ambient air temperatures during site activities may create cold stress for on-site workers. Procedures for recognizing and avoiding cold stress must be followed. Cold stress can range from frostbite to hypothermia. The signs and symptoms of cold stress are listed below.

Frostbite is defined as the actual freezing of one or more layers of skin. In severe cases, organs and structures below the skin can become frozen. Usually, body areas exposed to the most cold, and least body warmth, are affected first. These areas include fingers, toes, ears, and the tip of your nose. Frostbite is characterized by pain and loss of dexterity in the affected limb. The tissue initially appears reddened, but may progress to white, blue, or black.

FIRST AID: Bring the affected employee indoors and call the local emergency clinic. Rewarming of frostbitten parts is best left to a medical doctor in a controlled setting.

Hypothermia is the condition that occurs when the body's natural warming mechanisms (muscle activity and shivering) cannot counteract the loss of body heat to the environment. The onset of hypothermia is greatly hastened by being wet. Hypothermia is marked by severe, uncontrollable shivering. The patient will show signs of excessive fatigue, drowsiness, irritability, or euphoria. As hypothermia progresses, the patient will begin to lose consciousness, blood pressure will drop, shivering will cease, and the patient may slip into a coma and possibly die.

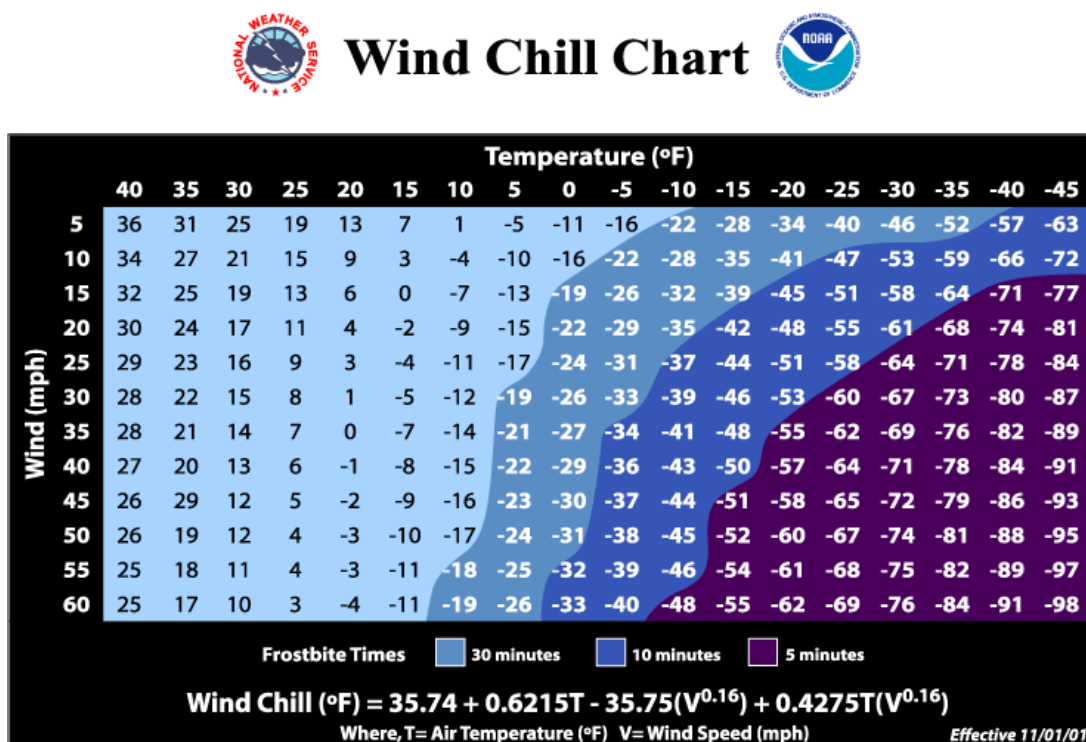
FIRST AID: If these symptoms occur, remove the patient to a warm, dry place. If clothing is wet, remove and replace with dry clothing. Keep the patient warm, but not overheated. The patient should be gradually rewarmed to prevent shock. If the patient is conscious and alert, warm liquids should be provided. Coffee and other caffeinated liquids should be avoided because of diuretic and circulatory effects. Notify the emergency clinic if conditions worsen, the patient loses consciousness, or the patient has an altered mental status. Have the patient transported to an emergency facility.

General Precautions. The reduction of adverse health effects from cold exposure can be achieved by adopting the following work practices.

- Provide adequate insulating clothing to maintain core temperature at 98.6° F if work is to be performed in air temperatures below 40° F. Wind chill cooling rates and the cooling power of air are critical factors. The higher the wind speed and the lower the air temperature in the work area, the greater the insulation value of the protective clothing should be.
- If the air temperature is 32° F or less, hands should be protected by mittens/gloves.
- If only light work is involved and if the clothing on the worker may become wet on the job site, the outer layer of clothing should be impermeable to water. With more severe work under such conditions, the outer layer should be water repellent, and the outer layer should be changed as it becomes wet. The outer garments should include provisions for easy ventilation in order to prevent wetting of the inner layer by sweat.
- If available clothing does not give adequate protection to prevent cold injury, work should be modified or suspended until adequate clothing is available, or until weather conditions improve.
- For prolonged work, heated shelters should be available. Workers should be encouraged to use these at regular intervals, with the frequency depending on the severity of the environmental exposure. When entering the shelter, the outer layer of clothing should be removed and the remainder of the clothing loosened to permit heat evaporation, or a change of work clothing should be provided.

- Warm, sweet drinks, such as hot cocoa or soup, should be available at the work site to provide caloric intake and fluid volume. The intake of coffee should be limited because of diuretic and circulatory effects.
- The weight and bulk of cold-weather gear should be included in estimating the required work performance and weights to be lifted in the field.

Workers should be instructed in safety and health procedures regarding cold work environments as part of the pre-work safety meeting. The training program should include instruction in preventing, recognizing, and treating cold stress conditions.



HEAT STRESS

There is a potential for heat stress from the use of protective clothing and climate conditions. One or more of the following procedures may be employed to alleviate potential heat stress problems in the event that site conditions warrant the use of personal protective equipment (PPE), or ambient temperatures exceed 85° F. Heat stress training must be emphasized during the daily safety meetings, and adequate supplies of potable water must be provided to workers each day.

General Precautions. Provide plenty of liquids. To replace body fluids (water and electrolytes) lost because of sweating, use a 0.1 percent saltwater solution, more heavily salted foods, or commercial drink mixes. The commercial mixes may be preferable for those employees on a low sodium diet. Employees on low sodium diets, or other special diets, are advised to contact their personal physician for recommendations regarding appropriate electrolyte replacement fluids/beverages.

In extremely hot weather, conduct operations in early morning or evening and rotate shifts of workers wearing impervious clothing. Install mobile showers and/or hose-down facilities to reduce body temperature and cool protective clothing.

Ensure that adequate shelter is available for breaks to protect personnel against heat, which can decrease physical efficiency and increase the probability of accidents.

Acclimatization for workers not accustomed to working in elevated temperature environments will be considered and implemented as appropriate in accordance with American Conference of Governmental and Industrial Hygienists (ACGIH) Guidelines.

Heat Stress Monitoring.

For monitoring the body's recuperative ability toward excess heat, one or more of the following techniques should be used as a screening mechanism. Monitoring of personnel wearing impervious clothing should commence when the ambient temperature is 70° F or above. Frequency of monitoring should increase as the ambient temperature increases or as slow recovery rates are indicated. When temperatures exceed 80° F, regardless of the use of Personal Protective Equipment (PPE), workers will be monitored for heat stress after every work period.

Good hygienic standards must be maintained by the employee to aid in the prevention of heat stress illnesses. At a minimum, frequent changes of clothing and daily showering should occur with clothing being allowed to dry during rest periods. Persons who notice skin problems should immediately inform their supervisor.

Heart rate (HR) should be measured by the radial pulse for 30 seconds as early as possible in the resting period. The HR at the beginning of the rest period should not exceed 110 beats/minute. If the HR is higher, the next work period should be shortened by 25 percent. The HR is then measured again, once each minute for 2 minutes (a total of three measurements), after the initial rest period measurement. The HR should decrease by ten beats per minute between each measurement (a total reduction of 20 beats). If the HR does not decrease, the work period should be reduced by an additional 25 percent.

Body temperature can be measured orally with a clinical thermometer as early as possible in the resting period. Oral temperature (OT) at the beginning of the rest period should not exceed 99°F. If it is greater than 99°F, the next work period should be shortened by 25 percent. The OT should be measured again at the end of the rest period to make sure that it has dropped below 99° F.

Effects of Heat Street

If the body's physiological processes fail to maintain a normal body temperature because of excessive heat loading, a number of physical reactions can occur. The severity of these reactions ranges from mild (such as fatigue, irritability, anxiety, and decreased concentration, dexterity, or movement) to severe (fatal).

Heat-related illnesses include:

Heat rash (also known as prickly heat rash) is caused by continuous exposure to heat and humid air and aggravated by chafing clothes. Heat rash decreases the ability to tolerate heat as well as being a nuisance. Signs are not limited to, but may include, a red prickly rash.

FIRST AID: Employees exhibiting signs of heat rash will be directed to shower and change into clean, dry clothing.

Heat cramps are caused by profuse perspiration with inadequate fluid intake and electrolyte replacement (especially salts). Signs are muscle spasms and pain in the extremities and abdomen, and may occur several hours after work has stopped.

FIRST AID: Employees showing signs of heat cramps will be directed to lie in a cool, shady area, and drink cool fluids. If symptoms persist or worsen, the employee will be transported to an emergency facility.

Heat exhaustion is caused by increased stress on various organs to meet increased demands to cool the body. Signs are shallow breathing; pale, cool, moist skin; profuse sweating; dizziness and lassitude.

FIRST AID: Employees with signs of heat exhaustion will be brought to a cool, shady location and given fluids. After recovering, the employee will be dismissed for the day. If employee is unconscious, or conditions persist, the employee will be transported to a hospital.

Heat stroke is the most severe form of heat stress. The body must be cooled immediately to prevent severe injury and/or death. Signs and symptoms are red, hot, dry skin; no perspiration; nausea; dizziness and confusion; strong, rapid pulse; and/or coma.

FIRST AID: HEAT STROKE IS A MEDICAL EMERGENCY. Employees will be brought to a cool area, aggressively treated by removing constricting clothes and applying wet towels or ice packs, and transported without delay to an emergency facility.

Appendix E

Job Safety Analysis (JSA)

Job Safety Analysis #1

Page 1 of 2

COMPANY/PROJECT NAME or ID/LOCATION (City, State)		DATE	NEW/REVISED
TRC Environmental Corp./ CPB - Far Rockaway Project Far Rockaway, New York		3/23/16	☒ NEW ☐ REVISED
WORK ACTIVITY (Description):			
Ambient air monitoring for the presence of VOCs using a photo-ionization detector (PID) during subsurface clearance by subcontractor. Readings are collected continuously while work proceeds.			
DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
Santhi Jagupilla	APM	Heath Potter	Senior Engineer
MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR ADDITIONAL STEP-SPECIFIC REQUIREMENTS)			
☒ Reflective Vest or Bands ☒ Hard Hat ☐ Lifeline/Harness ☒ Safety Glasses	☒ Goggles if wind > 25mph ☐ Face Shield ☒ Hearing Protection: Ear plugs or Ear Muffs ☒ Safety Shoes—Type: Steel-Toe	☒ Air purifying respirator (when action level reached) ☐ Supplied respirator ☒ PPE Clothing—Type: Long sleeves	☒ Gloves—Type: Cut-4 gloves ☐ Other—Specify:
REMINDER: Always perform a Safety Assessment: 1) prior to starting work; 2) when changing tasks; and 3) throughout the day. Focus on each new task, procedures, and skill sets to be used.			
¹ JOB STEPS	² POTENTIAL HAZARDS	³ CRITICAL ACTIONS TO MITIGATE HAZARDS	
1. Calibrate PID outside of vehicle	Dust or debris blown into eyes by wind.	Wear safety glasses with side shields , Upgrade to goggles if heavy wind (25mph) are present.	
	Miss calibration of PID leading to inhalation exposure	Wear Cut-4 gloves for improved dexterity while calibrating and operating PID	
2. Ambient air monitoring using a PID around workers.	Struck by tools or equipment used by workers	Stay out of workers line of fire	
		Stop work if you must move in closer to the work area get ambient air readings and let them restart if safe.	
		Do not approach heavy equipment unless visual contact with operator is made and "Show of Hands" is performed	
	Inhalation Hazard from vapors from work area	Wear hard hat	
		When PID readings exceed action level. (see next page) Stop work and have all personnel working in area move upwind and don respirators with organic cartridges.	
	Foot crush hazard from falling tools or material while air monitoring around work area	Identify potential foot stubs or possible foot crushing hazards	
		Wear steel-toe-boots	
Hearing loss from excessive noise from equipment	Make sure to always have hearing protection available		
	Wear ear plugs or ear muffs when noise is above 85db (regular in door speaking) and wear double hearing protection if noise above 95dbls		
Struck by Vehicle entering work area	Make sure to set up cones around the work area		
	Wear reflective safety vest to improve visibility		

SELECTION CRITERIA FOR PERSONAL PROTECTION		
Meter Reading	Action	Level of Personal Protection
0.5 ppm to 5 ppm on PID sustained	Use benzene detector tube (dt). (dt) < 0.5 ppm work proceeds (dt) > 0.5 ppm work proceeds	Modified Level D Level C
5 ppm to 25 ppm on PID	Work proceeds	Level C
25 ppm to 500 ppm on PID	Work stops and area is allowed to vent. If engineering controls cannot be implemented, Level B PPE will be used.	Level B
CGI Reading (Lower Explosive Limit)	<10% Work Proceeds >10% Stop Work, evacuate area, notify ExxonMobil supervisor	Modified Level D Evacuate Area

Job Safety Analysis #2

Page 1 of 1

COMPANY/PROJECT NAME or ID/LOCATION (City, State)		DATE	NEW/REVISED
TRC Environmental Corp./ CPB - Far Rockaway Project Far Rockaway, New York		3/23/16	☒ NEW ☐ REVISED
WORK ACTIVITY (Description):			
Loading and Unloading of equipment and material			
DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
Santhi Jagupilla	APM	Heath Potter	Senior Engineer
MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR ADDITIONAL STEP-SPECIFIC REQUIREMENTS)			
☒ Reflective Vest or Bands ☒ Hard Hat ☐ Lifeline/Harness ☒ Safety Glasses	☒ Goggles if wind > 25mph ☐ Face Shield ☒ Hearing Protection Based on Subcontractor Operations ☒ Safety Shoes—Type: Steel-Toe	☐ Air purifying respirator ☐ Supplied respirator ☒ PPE Clothing—Type: Long sleeves	☒ Gloves—Type: Cut-4 gloves ☐ Other—Specify:
REMINDER: Always perform a Safety Assessment: 1) prior to starting work; 2) when changing tasks; and 3) throughout the day. Focus on each new task, procedures, and skill sets to be used.			
¹ JOB STEPS	² POTENTIAL HAZARDS	³ CRITICAL ACTIONS TO MITIGATE HAZARDS	
1. Inspect unloading/loading area for obstructions	Dust or debris blown into eyes by wind.	Wear safety glasses with side shields , upgrade to goggles if heavy wind (25mph) are present.	
	Cut or abrasion from contact with obstruction if moving them from area	Avoid contact with obstructions when possible and mark out with cones Wear Cut-4 gloves to move small obstruction such as small of wire or scrap	
2. Unload /loading equipment/materials from vehicle	Struck by door or tailgate when opening/closing	Position body to stay out of line of fire Wear hard hat	
	Fingers or hands pinched in doors, tailgate or caught between equipment and materials	Identify pinch point contact areas and avoid Wear Cut-4 gloves to move small obstruction such as small of wire or scrap	
	Inhalation Hazard from vapors from work area	Stand upwind of possible vapor source	
	Foot crush hazard from falling tools or material while unloading and loading	Position body to stay out of line of fire Wear steel-toe-shoes	
	Unsecure and unstable footing	Visual inspect area for ground stability Choose safest route to destination based on how secure and stable the ground surface is	
	Back injury or strain from lifting and moving equipment/materials	For heavy or bulky equipment try to coordinate with subcontractor supervisor to have them drive it to well, sump, piezometers location	
		Do not lift equipment or materials over 50 lbs without assistance	
		Bend at the knees and not the back when lifting	
		Make multiple trips to avoid carrying too much equipment or materials that could increase the chance of injury	
Struck by Vehicle entering work area	Make sure to set up cones as per EM Practices		
	Wear reflective safety vest or bands to improve visibility		
3. Secure equipment and materials	Damage to equipment, materials, personnel or environmental release due to un-secured items	Secure items before they are moved with rope or bungee cords, etc.	

Job Safety Analysis #3

COMPANY/PROJECT NAME or ID/LOCATION (City, State)		DATE	NEW/REVISED
TRC Environmental Corp./ CPB - Far Rockaway Project Far Rockaway, New York		3/23/16	☒ NEW ☐ REVISED
WORK ACTIVITY (Description):			
Oversight of Subcontractor operations.			
DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
Santhi Jagupilla	APM	Heath Potter	Senior Engineer
MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR ADDITIONAL STEP-SPECIFIC REQUIREMENTS)			
☒ Reflective Vest or Bands ☒ Hard Hat ☐ Lifeline/Harness ☒ Safety Glasses	☒ Goggles if wind > 25mph or BENS alert issued ☐ Face Shield ☒ Hearing Protection Based on Subcontractor Operations ☒ Safety Shoes—Type: Steel-Toe	☐ Air purifying respirator ☐ ☐ Supplied respirator ☒ PPE Clothing—Type: Long Sleeves	☒ Gloves—Type: Cut-4 gloves ☐ Other—Specify:
REMINDER: Always perform a Safety Assessment: 1) prior to starting work; 2) when changing tasks; and 3) throughout the day. Focus on each new task, procedures, and skill sets to be used.			
¹ JOB STEPS	² POTENTIAL HAZARDS	³ CRITICAL ACTIONS TO MITIGATE HAZARDS	
1. Inspect subcontractors work area to make sure it complies with their JSA	Dust or debris blown into eyes by wind.	Wear safety glasses with side shields , Upgrade to goggles if heavy wind (25mph) are present.	
	Cut or abrasion from contact with subcontractor tools or equipment	Avoid contact with tools and equipment when checking condition Wear Cut-4 gloves	
2. Oversight of subcontractor operations.	Struck by tools or equipment used by workers	Stay out of workers line of fire Do not approach heavy equipment unless visual contact with operator is made and “Show of Hands” is performed Wear hard hat	
	Inhalation Hazard from vapors from work area	Stand upwind of possible vapor source	
	Foot crush hazard from falling tools or material while walking the area	Wear steel-toe-boots	
	Struck by Vehicle entering work area	Make sure to set up cones as per EM Practices	
		Wear reflective safety vest or bands with reflective stripes to improve visibility	
	Hearing loss to loud noise from equipment or refinery process	Move away from source of noise when possible Use ear plugs or ear muffs	

Job Safety Analysis #4

Page 1 of 1

COMPANY/PROJECT NAME or ID/LOCATION (City, State)		DATE	NEW/REVISED
TRC Environmental Corp. / CPB - Far Rockaway Project Far Rockaway, New York		4/6/16	☒ NEW ☐ REVISED
WORK ACTIVITY (Description):			
Site Inspection/Visit			
DEVELOPMENT TEAM	POSITION/TITLE	REVIEWED BY	POSITION/TITLE
Santhi Jagupilla	APM	Heath Potter	Senior Engineer
MINIMUM REQUIRED PERSONAL PROTECTIVE EQUIPMENT (SEE CRITICAL ACTIONS FOR ADDITIONAL STEP-SPECIFIC REQUIREMENTS)			
☒ High Viz Reflective Vest or Bands ☒ Hard Hat ☐ Lifeline/Harness ☒ Safety Glasses	☒ Goggles if wind > 25mph or BENS alert issued ☐ Face Shield ☒ Hearing Protection ☒ Safety Shoes—Type: Safety-Toe (*must meet ASTM 2413 Standards for I, C, PR, EH)	☐ Air purifying respirator ☐ Supplied respirator ☒ PPE Clothing—Type: Long Sleeves	☒ Gloves—Type: Cut-4 gloves ☐ Other—Specify: Personal H2S meter (alarms at 5ppm and 10ppm), two-way radio
REMINDER: Complete an SPSA at start of, and continuously throughout, job/task to identify additional and/or changing hazards to act on.			
"4 Foot Rule " must be followed as per COP SWP – If within 4ft of personnel in a higher level of PPE you must match level or leave area			
¹ JOB STEPS	² POTENTIAL HAZARDS	³ CRITICAL ACTIONS TO MITIGATE HAZARDS	
1. Inspect/Visit work site for possible hazards and pre planning	Flying debris, falling tools, equipment or icicles from above.	Wear hard hat and safety-toe-boots when outside of Vehicle	
	Eye injury due to wind blowing dust and debris.	Wear safety glasses with side shields . If winds are very high (>25mph)upgrade to goggles	
	Injuries to hand caused by Slips, Trips, and Falls,	Stay aware of footing and do not run.	
		Watch for uneven or wet ground.	
		Keep areas clean and clear of debris	
	Heat Stress Hazards and Sunburn	Wear Cut-4 gloves	
	Injury due to using improper PPE.	Review TRC HASP – Appendix D Stay in shade when possible and wear sunblock	
Struck by vehicle	Stop work, obtain proper PPE.		
		Stay out of the line of fire Wear reflective vest or bands or FRC with reflective stripes	

Site Inspection/Visit JSA – Updates – 2014

*Safety Toe boots must comply with ASTM Standards 2413 for

Impact (I), Compression (C), Electric Hazard (EH), Puncture Resistance (PR)

Appendix F

Tailgate Meeting/Checklist

TAILGATE SAFETY MEETING CHECKLIST

Date / Time of Tailgate Meeting: _____

- ☐ **Vehicle Inspection:** Driver will perform Driver's Daily Vehicle Inspection Checklist before leaving the yard or if changing drivers during the day.
- ☐ **Personnel training/qualifications:** Check cards for OSHA HAZWOPER 40-hour certification/8-hour-refresher training (or any other specialized training to perform the task if appropriate). TRC personnel have been trained on the Company's Drug and Alcohol Policy and will inform all site personnel.
- ☐ **Supplies:** Indicate location of first aid kit, fire extinguisher, clean water supply (drinking, eye wash), and Site Health and Safety Plan (HASP).
- ☐ **Emergency services:** Discuss location of nearest telephone and directions to hospital. Map, directions, phone numbers are provided in the HASP (Attachment C).

The TRC Emergency Twenty-four Hour Number is 1-800-274-9072.

▪ **First-Aid/CPR volunteers:** _____

- ☐ **Site background:** Discuss types, locations, and concentrations of chemicals found onsite, presence of free product, depth to groundwater, etc.
- ☐ **Offsite Permits/Access Permits:** Discuss any permitting requirements for the site.
- [] **Work activities:** Discuss scope of work for the day and activities to be performed.
- ☐ **Potential hazards: Review JSAs.** Discuss physical, chemical and biological hazards. Discuss the prohibiting of any eating, drinking, and/or smoking in the work zone.
- ☐ **Personal protective equipment (PPE):** Discuss required level of protection; review additional PPE requirements in JSAs, as needed.
 - ☐ Hard Hat ☐ Safety Shoes/Boots ☐ Safety Vest ☐ Eye Protection - ☐ glasses
 - ☐ goggles ☐ face shield
 - ☐ Hand Protection - ☐ Kevlar ☐ nitrile ☐ other _____ ☐ Hearing Protection
 - ☐ Respiratory Protection - ☐ APR Particulate ☐ APR Chemical cartridge ☐ other _____
 - ☐ Protective Clothing - ☐ Tyvex ☐ Nomex ☐ Coveralls ☐ other _____
- ☐ **Utilities:** Utilities have been cleared/marked by appropriate divisions.
- ☐ **Traffic control** (vehicular and pedestrian): Work area is properly delineated and cordoned off from traffic. Technician will put a traffic cone at all four corners of his parked vehicle. Upon completion of work, walk around vehicle to pick up cones and check all four sides and underneath vehicle for obstacles prior to moving truck.
- ☐ **Dispenser Emergency Shut-off Switch:** Location has been identified/communicated with field personnel.
- ☐ **Dealer Notification:** Notify dealer/owner of site work activities to be performed.

JSAs Reviewed: _____

HASP COMPLIANCE AGREEMENT

By signing below, I have completed the Tailgate Safety Meeting Checklist, reviewed this Site Health and Safety Plan and the Job Safety Analysis (JSA) and understand their contents. I hereby agree to comply with all safety requirements outlined herein:

TRC

Signature: _____, Site Safety Officer (SSO)

Print Name: _____ Date: _____

Signature: _____, Asst. Site Safety Officer (Asst. SSO)

Print Name: _____ Date: _____

Contractor:

Signature: _____, Site Safety Officer (SSO)

Print Name: _____ Date: _____

Signature: _____, Asst. Site Safety Officer (Asst. SSO)

Print Name: _____ Date: _____

Contractor:

Signature: _____, Site Safety Officer (SSO)

Print Name: _____ Date: _____

Signature: _____, Asst. Site Safety Officer (Asst. SSO)

Print Name: _____ Date: _____

TRC Employees / Contractor Personnel / Visitors
--

Signature: _____ Date: _____

Print Name: _____ Company: _____

Signature: _____ Date: _____

Print Name: _____ Company: _____

HASP COMPLIANCE AGREEMENT (cont.)

By signing below, I have completed the Tailgate Safety Meeting Checklist, reviewed this Site Health and Safety Plan and the Job Safety Analysis (JSA) and understand their contents. I hereby agree to comply with all safety requirements outlined herein:

TRC Employees / Contractor Personnel / Visitors (cont.)
--

Signature: _____ Date: _____

Print Name: _____ Company: _____

Signature: _____ Date: _____

Print Name: _____ Company: _____

Signature: _____ Date: _____

Print Name: _____ Company: _____

Signature: _____ Date: _____

Print Name: _____ Company: _____

Signature: _____ Date: _____

Print Name: _____ Company: _____

Signature: _____ Date: _____

Print Name: _____ Company: _____

Signature: _____ Date: _____

Print Name: _____ Company: _____

Signature: _____ Date: _____

Print Name: _____ Company: _____

Signature: _____ Date: _____

Print Name: _____ Company: _____

Appendix G

WorkCare Program Information

EARLY INCIDENT INTERVENTION®

Immediate Access to Medical Advice for Work Related Incidents

(888) 449-7787

INTRODUCTION

WorkCare, Inc. (WorkCare) and TRC have partnered together to promote Incident Intervention®, a resource designed to support company safety goals/targets—while reducing runaway-costs associated with workplace injuries and illnesses.

PURPOSE

Early Incident Intervention provides TRC employees with **IMMEDIATE** telephonic access to WorkCare clinicians at the time of a presumed, non-emergency workplace injury or illness. Clinicians provide expert guidance on the evaluation of symptoms, appropriate first aid, and the need for additional medical evaluation or treatment.

When utilizing this service within the first hour of an incident, known as the “Golden Hour,” licensed medical staff can guide the case so that medical evaluation and treatment are rendered appropriately.

*“...helps the worker
traverse the unpredictable
terrain of work-related
injuries and illness.”*

PRINCIPLES OF EARLY INCIDENT INTERVENTION

- Utilizes principles of the “Golden Hour.”
- Provides workers immediate clinician support at the time of an incident.
- Focuses on providing the right care, at the right time in the proper setting.

BENEFITS FOR EMPLOYEES

- Instant access to a medically qualified professional for evaluation of symptoms and possible outcomes.
- Professional guidance on appropriate first aid measures and medications.
- Professional advice regarding the need for additional medical evaluation or treatment.

BENEFITS FOR TRC

- Point of contact for emergency and non-emergency medical clinicians.
- Triage the incident to determine risk and urgency, delivering interventions that are consistent with medical guidelines for the specified injury and illness.
- Maintains communication with clinicians to ensure accurate and timely reporting.

Appendix H

Incident Reporting



TRC Incident Report Form

(To be completed immediately after an Injury, Illness, Incident, Accident or Significant Near Miss by Employee's Supervisor and Employee involved)

TO BE COMPLETED BY EMPLOYEE AND SUPERVISOR, AND SUBMITTED WITHIN 24 HOURS OF INCIDENT

Incident Category	
☐ Employee Injury/Illness ☐ Near Miss/Loss ☐ Property Damage ☐ Vehicle Accident ☐ Fire ☐ Other	
1	Incident Location:
2	Site Identification/Project No.:
3	Site Address:
4	Date Incident Occurred:
5	Time Incident Occurred:
6	Date Incident Reported:
7	Time Incident Reported:
8	Was WorkCare Contacted? ☐ Yes ☐ No
9	Client:

TRC Employee Information	
10	Name:
11	Office/Address:
12	Supervisor Name/Phone:
13	Employee Phone/Cell:
14	Title or Occupation:
15	Sector/Practice:

Type of Employee Injury or Illness (To be determined by Safety Director)	
16	☐ First Aid Only
17	☐ Medical Treatment Only
18	☐ Restricted Work-case
19	☐ Lost Workday
20	☐ Extended Time Away From Work (3 days or more)
21	☐ Fatality
22	☐ Other (specify):
23	Estimated Number of Days on Restricted Work:
24	Estimated Number of Days Away from Work:

Employee Injury or Illness Description	
25	Describe the Injury or Illness:
26	First Aid/Medical Treatment Administered:
27	Name of Doctor's Office, Clinic, or Hospital:
28	Address/Phone:



TRC Incident Report Form

(To be completed immediately after an Injury, Illness, Incident, Accident or Significant Near Miss by Employee's Supervisor and Employee involved)

TO BE COMPLETED BY EMPLOYEE AND SUPERVISOR, AND SUBMITTED WITHIN 24 HOURS OF INCIDENT

Incident Description	
29	Equipment Involved:
30	Site Description:
31	Task Being Performed at Time of Incident:
32	Describe Incident in Detail:
33	Conditions at Time of Incident (weather, lighting, etc.):
34	Motor Vehicle Accident:
35	TRC Vehicle ID:
36	Year/Make/Model:
☐ DOT Regulated Vehicle ☐ Towed From Scene ☐ Airbag Deployed ☐ Seatbelt in Use ☐ TRC Fleet ☐ Rental ☐ Personal Vehicle	
37	Other Vehicle License Plate:
38	Other Vehicle Year/Make/Model:
39	Other Vehicle Driver Name:
40	Other Vehicle Insurance:
41	Other Injured Parties: ☐ Yes ☐ No
42	Description of Other Injuries:

Subcontractor Involvement / Description of Incident	
43	Subcontractor Involved: ☐ Yes ☐ No
44	Name of Company:
45	Address:
46	Contact Name and Phone Number:
47	Subcontractor Description of Incident:



TRC Incident Report Form

(To be completed immediately after an Injury, Illness, Incident, Accident or Significant Near Miss by Employee's Supervisor and Employee involved)

TO BE COMPLETED BY EMPLOYEE AND SUPERVISOR, AND SUBMITTED WITHIN 24 HOURS OF INCIDENT

Witness Involvement / Description of Incident

48	Witnesses to Incident: ☐ Yes ☐ No
49	Name(s) and Address(es): ----- ----- -----
50	Phone Number(s):
51	Witness Description of Incident: ----- ----- -----

Personal Protective Equipment (PPE)

52	List PPE Required to Complete the Task (glasses, gloves, shoes, hard hat, respirator, hearing protection, etc.): ----- ----- -----
53	List the PPE Employee Used at the Time of Incident: ----- ----- -----

Immediate Corrective Actions

54	Describe the Immediate Corrective Actions Taken: ----- ----- ----- ----- -----
----	---

Immediate Supervisor: _____ Signature: _____ Date: _____

Employee: _____ Signature: _____ Date: _____



TRC Incident Report Form

(To be completed immediately after an Injury, Illness, Incident, Accident or Significant Near Miss by Employee's Supervisor and Employee involved)

TO BE COMPLETED BY SUPERVISOR WITH ASSISTANCE FROM
RMD SAFETY COORDINATOR AND TRC SAFETY DIRECTOR

Supervisor's Post-Incident Review and Recommendations

Safety Violation

☐ Yes☐ No

55 State the Company Safety Rule, OSHA Regulation, or Specific Training that was Violated:

56 Describe the Training the Employee Received to Prevent this Violation:

Root Cause Factors (RCF)

#1 Lack of skill or knowledge

#2 In the past, did not follow procedures or acceptable practices, and no incident occurred (injury, product quality incident, equipment damage, regulatory assessment or production delay)

#3 Doing the job according to procedures or acceptable practices takes more time/effort

#4 Short-cutting procedures or acceptable practices are positively reinforced or tolerated

#5 Lack of or inadequate operational procedures

#6 Inadequate communication of expectations regarding procedures or acceptable practices

#7 Inadequate tools or equipment (available, operable and safely maintained, proper task and workplace design)

#8 External factors

57 Root Cause(s)

Identified Root Cause(s):

#1	#2	#3	#4	#5	#6	#7	#8
☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐
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☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐
☐	☐	☐	☐	☐	☐	☐	☐



TRC Incident Report Form

(To be completed immediately after an Injury, Illness, Incident, Accident or Significant Near Miss by Employee's Supervisor and Employee involved)

TO BE COMPLETED BY SUPERVISOR WITH ASSISTANCE FROM RMD SAFETY COORDINATOR AND TRC SAFETY DIRECTOR	58	Conclusion: Why did the Incident Occur?						
	59	Item No.	RCF No.	Recommended Corrective Action(s) How to Prevent Incident from Reoccurring	Responsible Person	Due Date	Completed (date)	Verified/ Validated (date)
Supervisor: _____ Signature: _____ Date: _____								
TRC Safety Director: _____ Signature: _____ Date: _____								

Appendix I

Acknowledgement

PERSONAL ACKNOWLEDGEMENT

A component of the Health and Safety Plan (HASP), designed to provide personnel safety during this subsurface investigation requires that you receive training as described in the HASP prior to working at this site. Additionally, you are required to read and understand the HASP. When you have fulfilled these requirements, please sign and date this personal acknowledgement:

_____ Name (Printed)	_____ Signature	_____ Date
_____ Name (Printed)	_____ Signature	_____ Date
_____ Name (Printed)	_____ Signature	_____ Date
_____ Name (Printed)	_____ Signature	_____ Date
_____ Name (Printed)	_____ Signature	_____ Date
_____ Name (Printed)	_____ Signature	_____ Date
_____ Name (Printed)	_____ Signature	_____ Date
_____ Name (Printed)	_____ Signature	_____ Date
_____ Name (Printed)	_____ Signature	_____ Date
_____ Name (Printed)	_____ Signature	_____ Date

APPENDIX 8
SITE MANAGEMENT FORMS

A form for the inspection/monitoring of the SSDS will be provided if the system is designed and installed. The Site Inspection Checklist for the cap is attached below.

SITE INSPECTION CHECKLIST

CPB SITE, FAR ROCKAWAY, QUEENS NEW YORK

Inspector: _____

Date: _____

Review the previous inspection checklist for issues identified in the previous inspection. Verify that any previously identified issues have been satisfactorily addressed. Answer the following and **take photographs of any observed damage** to the items listed. Provide additional pages/sketches as needed.

General Site Inspection

- ☐ Walk along the perimeter of the chain link fence.
- ☐ Look for evidence of damage along entire length of perimeter fence due to vandalism, falling trees or other means. Watch for places where vandals may have cut through the fencing.
- ☐ No Damage ☐ The following damage was observed: _____
- ☐ Other Observations: _____
- ☐ Inspect the lock on the gate at the main entrance to the site for evidence of damage due to vandalism or other means.
- ☐ No Damage ☐ The following damage was observed: _____
- ☐ Other Observations: _____

Cap Inspection

- ☐ Inspect Cap Area 1 (south-west corner of site) for evidence of cracking in the asphalt, damage or pot-holes. Look for exposed base material or colored geotextile suggesting that the impacted shallow soils are exposed.
- ☐ No Damage ☐ The following damage was observed: _____
- ☐ Other Observations: _____
- ☐ Inspect Cap Area 2 (eastern side of site) for evidence of cracking in the asphalt, damage or pot-holes. Look for exposed base material or colored geotextile suggesting that the impacted shallow soils are exposed.
- ☐ No Damage ☐ The following damage was observed: _____
- ☐ Other Observations: _____

Provide a description of any items checked off above:

APPENDIX 9

O&M MANUAL FOR SSDS

An O&M Manual for the SSDS will be provided in this appendix when the system is designed and installed. The O&M Manual will include procedures for routine inspections and manufacturer's recommendations for preventative maintenance.

APPENDIX 10

REMEDIAL SYSTEM OPTIMIZATION

To be added if a SSDS is designed and installed.