Proposed Addition to Public School 96X
BRONX COUNTY
NEW YORK

SITE MANAGEMENT PLAN

NYSDEC Site Number: 203068

Prepared for:
New York City School Construction Authority
30-30 Thomson Avenue
Long Island City, NY 11101-3045

Prepared by:
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Revisions to Final Approved Site Management Plan:

Revision No.	Date Submitted	Explanation of Revision	NYSDEC Approval Date

SEPTEMBER 2015

CERTIFICATION STATEMENT

I DAVID S. GLASS certify that I am currently a New York State (NYS) registered professional engineer as 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).

BY: _____

DATE: 9.4.2015

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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
SVE	Soil Vapor Extraction
SVI	Soil Vapor Intrusion
SVMS	Soil Vapor Mitigation System
TAL	Target Analyte List
TCL	Target Compound List
TCLP	Toxicity Characteristic Leaching 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:	**No. 203068 - 650 Waring Avenue, Bronx, New York**
Institutional Controls:	1. The property may be used for restricted residential use;
	2. All ECs must be operated and maintained as specified in this SMP;
	3. All ECs 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 this SMP;
	6. Data and information pertinent to Site management must be reported at the frequency and in a manner as defined in this SMP;
	7. All future activities that will disturb remaining contaminated material must be conducted in accordance with this SMP;
	8. Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in this SMP;
	9. Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical component of the remedy shall be performed as defined in this 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 the Environmental Easement;
	11. The potential for vapor intrusion must be evaluated for any buildings developed in the area within the IC boundaries noted on Environmental Easement survey included in Appendix A, and any potential impacts that are identified must be monitored or mitigated; and
	12. Vegetable gardens and farming on the Site are prohibited.

Engineering Controls:	1. Gas Vapor Barrier beneath addition to school building 2. Sub-Slab Depressurization System (SSDS) beneath addition to school building

Inspections:	**Frequency:**
SSDS	Continuously Monitored by Building Management System and Alarm Indication Station
Site-wide inspection	Annually
Monitoring:	
Collection of groundwater samples from monitoring wells PS96X-TRC-MW-04 through PS96X-TRC-MW-19	Annually
Collection of sub-slab soil vapor, indoor air, and ambient air samples in the original portion of the Site building	Annually during the heating season
Maintenance:	
1. Vapor Barrier	As needed
2. SSDS	Semi-Annually
Reporting:	
3. Inspection Report	Annually
4. Periodic Review Report	Annually

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 Proposed Addition to Public School 96X (PS 96X) located in Bronx, New York (hereinafter referred to as the "Site"). See Figure 1 for the Site Location Map. The Site is currently in the New York State (NYS) Inactive Hazardous Waste Disposal Site Remedial Program, Site No. 203068, which is administered by New York State Department of Environmental Conservation (NYSDEC).

The New York City School Construction Authority (NYCSCA) entered into an Order on Consent (Order on Consent Index # R2-0801-13-01) on June 12, 2013 with the NYSDEC to remediate the Site. A figure showing the Site location and boundaries of this Site is 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 A.

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 Bronx 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 Order on Consent (Index #R2-0801-13-01; Site #203068) 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 B of this SMP.

This SMP was prepared by TRC Engineers, Inc. (TRC), on behalf of the NYCSCA, in accordance with the requirements of the NYSDEC's DER-10 ("Technical Guidance for Site Investigation and Remediation"), dated May 2010, and the guidelines provided by the NYSDEC. This SMP addresses the means for implementing the ICs and/or 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 Order on Consent, 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 Order on Consent, 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 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 B.

Table 1 - Notifications*

Name	Contact Information
Nigel N. Crawford, P.E. Environmental Engineer 2, Department of Environmental Remediation, NYSDEC Region 2	(718) 482-7778 nigel.crawford@dec.ny.gov
Jane O'Connell Chief, Superfund and Brownfield Cleanup Section, Division of Environmental Remediation, NYSDEC	(718) 482-4599 jane.oconnell@dec.ny.gov

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

2.0 SUMMARY OF PREVIOUS INVESTIGATIONS AND REMEDIAL ACTIONS

2.1 Site Location and Description

The Site is located at 650 Waring Avenue, Bronx County, New York and is identified as Block 4341 and Lot 13 on the New York City Tax Map (see Figure 2). The Site is an approximately 1.82-acre area and is bounded by Waring Avenue to the north, a six-story residential building to the south, Olinville Avenue to the east, and Backer Avenue to the west (see Figure 2 – Site Layout Map). The boundaries of the Site are more fully described in Appendix A – Environmental Easement. The owner of the Site parcel at the time of issuance of this SMP is the NYCSCA.

2.2 Physical Setting

2.2.1 Land Use

The Site is an approximately 79,250-square foot lot improved with a four-story public school building with an unoccupied basement and an asphalt-paved playground. Prior to construction of the current school building in 1929, the Site was occupied by a two-story residential dwelling and two one-story structures. The Site was undeveloped land prior to 1919. In approximately 2001, 11 temporary classroom units (TCUs) were constructed on Site. In 2012, the TCUs were removed and construction began on the new school addition. The addition to the PS 96X school building has been constructed south and east of the original portion of the school building. The new school addition is scheduled for completion and opening in September 2015. The Site is zoned residential and occupied as a public school facility.

The properties adjoining the Site and in the neighborhood surrounding the Site primarily include commercial and residential buildings. The adjoining properties to the north, south, east and west consist of residential buildings.

2.2.2 Geology

According to the State of New York Department of Conservation, Water Power and Control Commission Groundwater study of 1953, Bronx County is underlain by three separate formations of consolidated pre-Cambrian rocks; the Fordham gneiss, the Inwood Limestone and the Manhattan schist. The three principal formations are tightly folded, and both the folding and subsequent erosion have produced a belted outcrop pattern and also a series of northeast trending ridges and valleys. The eastern two-thirds of Bronx County is underlain by the Manhattan schist; the western third by Fordham gneiss and narrow bands of infolded Inwood limestone, with the limestone typically underlying low areas, forming long, narrow valleys.

Based on Geotechnical Engineering Study for PS 96X, 650 Waring Avenue, Bronx, New York (Geotechnical Report) prepared by Langan Engineering & Environmental Services, Inc., PC (Langan) in October 2012, bedrock at the Site consists of fresh to weathered, very closely to closely fractured, gray-white banded quartz-mica-garnet schist. The Langan report did not identify the orientation of the fractures. The depth to top of sound rock varies from about 4 to 19 feet below ground surface (bgs), but typically varies between 4 and 6 feet bgs. No information regarding bedrock strike and dip was included in the Geotechnical Report.

Previous investigations performed at the Site indicate historic fill material was observed throughout the Site between grade surface and depths of approximately 2 feet bgs in the north portion of the Site and depths of approximately 9 feet bgs in the south portion of the Site. The historic fill generally consisted of brown sand and silt with fragments of brick. Native soil below the historic fill generally consisted of silt and clay with sand and gravel. Weathered bedrock was observed below the historic fill and/or native soil. Geologic cross sections are presented in Figures 3A and 3B and boring logs are presented in Appendix C.

2.2.3 Hydrogeology

The Site is located approximately 0.5 miles east of the Bronx River, approximately 3.5 miles east of the Harlem River, and approximately 3 miles west of the Eastchester Bay. Based on the calculated groundwater elevations measured during field activities, groundwater in the northern portion of the Site appears to flow in a southerly direction, while groundwater in the southern portion of the Site flows in a southwesterly direction. Groundwater was encountered in the bedrock aquifer at depths ranging from approximately 5.1 to 17.8 feet bgs. A groundwater contour map exhibiting groundwater elevation data is presented in Figure 4. Groundwater monitoring well construction logs are provided in Appendix C. Groundwater surface elevation data is provided in the following table:

Table 2 – Groundwater Surface Elevation Measurements – November 15, 2013

Monitoring Well ID	Elevation (feet)
PS96X-TRC-MW-04	86.31
PS96X-TRC-MW-05	95.11
PS96X-TRC-MW-07	97.43
PS96X-TRC-MW-08	88.64
PS96X-TRC-MW-09	85.53
PS96X-TRC-MW-10	82.54
PS96X-TRC-MW-11	75.49
PS96X-TRC-MW-12	83.60
PS96X-TRC-MW-13	93.48
PS96X-TRC-MW-15	86.24
PS96X-TRC-MW-16	84.01

Datum: NAVD1988

Groundwater in Bronx County primarily flows through bedrock. An analysis of hydraulic conductivity was not performed at the Site, however, regional hydraulic

conductivity is generally low as groundwater traverses low permeability to impermeable bedrock formations.

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.

Prior to beginning construction of the new addition to PS 96X, several due diligence investigations were performed at the property. TetraTech EC, Inc. (TetraTech) performed a Phase II Environmental Site Investigation (ESI) in July 2009, a Sub-Slab Vapor and Indoor Air Quality Investigation in October 2009 and an Indoor Air Quality (IAQ) Survey in March 2010 which consisted of:

- Geophysical surveys
- The advancement of 4 soil borings and the collection of 4 soil samples for laboratory analyses
- The installation of 3 temporary monitoring wells and 3 permanent monitoring wells and the collection of 6 groundwater samples for laboratory analyses
- The collection of 4 soil vapor samples for laboratory analysis
- The collection of 6 indoor air samples for laboratory analysis
- The collection of 3 sub-slab soil vapor samples for laboratory analysis and
- The collection of 3 ambient air samples for laboratory analysis.

The following is a summary of the findings of the investigations:

- Lead was detected in one soil sample slightly above Unrestricted Use Soil Cleanup Objectives (SCOs)

- Tetrachloroethene (PCE) was detected in soil vapor at a concentration exceeding the NYSDOH Air Guideline Value[1]
- Solvent-related volatile organic compounds (VOCs) (including PCE and trichloroethene [TCE]) were detected in groundwater at concentrations above the NYSDEC Class GA Standards
- There were no VOCs detected in indoor air at concentrations above background and
- TCE was detected in two sub-slab vapor samples above the NYSDOH AGV.

Following the initial due diligence work, TRC performed a Supplemental Site Investigation (SSI) at the Site based on the prior due diligence activities to further characterize the nature and extent of contamination at the Site. The SSI consisted of the advancement of soil borings, installation of groundwater monitoring wells, and collection and laboratory analysis of soil and groundwater samples. As noted above, soil vapor sampling was completed during the initial Site Investigation and subsequent Sub-Slab Vapor and IAQ Investigation. The results of the investigations are described in detail in the SSI Report dated November 13, 2012. Below is a summary of the findings of the SSI.

Soil

Ten of the 49 VOCs analyzed for were detected in soil; no VOCs detected in soil exceeded Unrestricted Use Soil Cleanup Objectives.

[1] There is no NYSDOH comparison criteria for soil vapor concentrations; therefore, soil vapor results were compared to indoor air background levels and Air Guideline Values.

Site-Related Groundwater

Solvent-related VOCs (1,1,1-trichloroethane, 1,1-dichloroethane, 1,1-dichloroethene, cis-1,2-dichloroethene, PCE and/or TCE) were detected in groundwater at concentrations exceeding Class GA Values in samples collected from four monitoring wells (three wells installed during the SSI and one remaining from the Phase II ESI) located on the Site. Based on the survey and gauging of 11 monitoring wells installed as part of the SSI and three remaining monitoring wells from the prior Phase II ESI, groundwater in the northern section of the Site flows in the southerly direction and groundwater in the southern portion of the Site flows in a southwesterly direction. The groundwater sample collected from the downgradient monitoring well location contained concentrations of chlorinated solvent-related VOCs exceeding the Class GA Values. Concentrations of PCE and TCE were detected below the corresponding Class GA Values in samples collected from two off-Site wells located up-gradient and cross-gradient to the Site. Although the concentrations of chlorinated solvent-related compounds in groundwater at monitoring well locations up- and cross-gradient of the Site were less than the corresponding Class GA Values and downgradient monitoring well locations exhibited chlorinated solvent-related compounds at concentrations exceeding Class GA Values, the source of the elevated levels of chlorinated solvents in groundwater is unknown since the soil investigation revealed no concentrations of chlorinated solvent-related compounds that exceeded Unrestricted Use SCOs and there is no history of commercial or industrial activity at the Site.

2.4 Remedial Action Objectives

The Remedial Action Objectives (RAOs) for the Site are 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 groundwater aquifer to pre-disposal/pre-release conditions, to the extent practicable.

2.4.2 Soil Vapor

RAOs for Public Health Protection:

- Mitigate impacts to public health resulting from the potential for soil vapor intrusion into the Site building.

2.5 Remaining Contamination

2.5.1 Groundwater

Because chlorinated VOCs remain in groundwater at concentrations exceeding NYSDEC standards, an IRM Work Plan – Phase II was submitted to NYSDEC for approval. Although it is anticipated that the IRM Work Plan – Phase II will achieve remedial objectives, groundwater beneath the Site may contain residual contamination after completion of the proposed remedial actions. As a result, a number of engineering controls and institutional controls are required to protect human health and the environment, as anticipated in the IRM Work Plans – Phase I and Phase II. These ECs/ICs are described in Section 3.0. Long-term management of ECs/ICs and of residual

contamination will be performed under this SMP. Figure 5 summarizes the results of all samples of groundwater that exceed the Standards, Criteria and Guidelines (SCGs) after completion of the Phase I IRM remedial action.

2.5.2 Soil Vapor

The IRM Work Plan – Phase II was submitted to NYSDEC for approval. Although it is anticipated that the IRM Work Plan – Phase II will achieve remedial objectives, soil vapor beneath the Site may contain residual contamination after completion of the remedial actions. As a result, a number of engineering controls and institutional controls are required to protect human health and the environment, as anticipated in the IRM Work Plans – Phase I and Phase II. These ECs/ICs are described in Section 3.0. Long-term management of ECs/ICs and of residual contamination will be performed under this SMP.

3.0 INSTITUTIONAL AND ENGINEERING CONTROL PLAN

3.1 General

Since remaining contamination exists at the Site, ICs/ECs are required to protect human health and the environment. This IC/EC Plan describes the procedures for the implementation and management of all ICs/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 ICs/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 and
- Any other provisions necessary to identify or establish methods for implementing the ICs/ECs required by the Site remedy, as determined by the NYSDEC.

3.2 Institutional Controls

A series of ICs are required to: (1) implement, maintain and monitor Engineering Control systems; (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. The 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 6. The ICs are:

- 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
- Groundwater and other environmental or public health monitoring must be performed as defined in this SMP
- 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
- Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in 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 must be evaluated for any buildings developed in the area within the IC boundaries noted on the Environmental Easement survey, 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 Gas Vapor Barrier

The school building addition is constructed with a gas vapor barrier below the concrete floor slabs, below grade walls and bottom slabs and walls of pits and sumps with continuous waterstops within required construction joints. The vapor barrier consists of a 60-mil Liquid Boot membrane.

Procedures for operating and maintaining the gas vapor barrier are documented in the Operations and Maintenance Plan (Section 5.0 of this SMP). As built drawings are included in Appendix D – Operations and Maintenance Manual. The Environmental Easement survey shows the location of the ECs for the Site and is provided in Appendix A.

3.3.2 Building Sub-Slab Depressurization System (SSDS)

The school building addition is constructed with an active SSDS, which is designed and installed to minimize the potential for vapor intrusion. The principal components of the SSDS include:

- Five suction pits beneath the floor slab and vapor barrier,

- Pipe running horizontally beneath the slab from each suction pit to two common headers,

- Vertical risers, 6 inches in diameter, from each of the common headers penetrating the building roof,
- Exterior suction fans,
- Monitoring points at selected locations throughout the building, installed through the lowest level floor slab and,
- A warning device (alarm) which activates if vacuum drops below a set point.

The operation, maintenance, and monitoring (OM&M) requirements for the SSDS consist of initial start-up testing, routine maintenance and monitoring activities, and non-routine maintenance activities.

Operation of the active SSDS and maintenance of the vapor barrier will not be discontinued without written approval by NYSDEC and NYSDOH. A proposal to discontinue the active SSDS may be submitted by the property owner (NYCSCA) based on confirmatory data that justify such a request.

Procedures for operating and maintaining the SSDS are documented in the Operations and Maintenance Plan (Section 5.0 of this SMP). As built drawings are included in Appendix D – Operations and Maintenance Manual. The EC boundaries are shown on Figure 6.

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 - Gas Vapor Barrier

Maintenance of the gas vapor barrier will not be discontinued unless prior written approval is granted by the NYSDEC and NYSDOH. In the event that monitoring data indicates that vapor intrusion mitigation is no longer required, a proposal to discontinue the maintenance of the gas vapor barrier will be submitted by the property owner to the NYSDEC and NYSDOH.

3.3.3.2 - Sub-Slab Depressurization System

The active SSDS will not be discontinued unless prior written approval is granted by the NYSDEC and the NYSDOH. In the event that monitoring data indicate that the SSDS may no longer be required, a proposal to discontinue the operation, maintenance, and monitoring of the SSDS will be submitted by the remedial party to the NYSDEC and NYSDOH.

3.3.3.3 - Monitoring Wells associated with Monitored Natural Attenuation

Groundwater monitoring activities to assess natural attenuation will continue, as determined by the NYSDEC, with consultation with the NYSDOH, until residual groundwater concentrations are found to be consistently below ambient water-quality standards, the Site SCGs, or have become asymptotic at an acceptable level over an extended period. In the event that monitoring data indicates that monitoring for natural attenuation may no longer be required, a proposal to discontinue the monitoring will be submitted by the remedial party. Monitoring will continue until permission to discontinue is granted in writing by the NYSDEC. If groundwater contaminant levels become asymptotic at a level that is not acceptable to the NYSDEC, the performance of additional source removal, treatment and/or control measures will be evaluated.

4.0 MONITORING AND SAMPLING PLAN

4.1 General

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 are included in the QAPP provided in Appendix E. The Site-Specific Health and Safety Plan is provided in Appendix F.

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

- Sampling and analysis of all appropriate media (e.g., groundwater, indoor air, soil vapor)
- Assessing compliance with applicable NYSDEC/NYSDOH SCGs, particularly groundwater standards, 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 provides information on:

- Sampling locations, protocol and frequency
- Information on all designed monitoring systems
- Analytical sampling program requirements
- Inspection and maintenance requirements for monitoring wells

- Monitoring well decommissioning procedures and
- Annual inspection and periodic certification.

Reporting requirements are provided in Section 7.0 of this SMP.

4.2 Site-Wide Inspection

A comprehensive Site-wide inspection will be conducted annually. 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 G – Site Management Periodic Review Report Certification Form. 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 ECs
- General Site conditions at the time of the inspection
- That the Site management activities are 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 (PRR). 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.

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 ICs/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

The SSDS monitoring is performed on a continuous basis, as identified below in Table 3, by the Building Management System (BMS) and Alarm Indication Station (AIS), which monitors the pressure switches in the SSDS riser piping. Since the SSDS is continually monitored, specific monitoring events subsequent to the initial start-up testing is not proposed.

The system components to be inspected are listed in the Inspection Checklist, provided in Appendix I - Site Management Forms. If there is no pressure differential, any equipment is observed to be malfunctioning, or the system is not performing within

specifications; maintenance and repair, as per the Operations and Maintenance Plan, is required immediately.

Table 3 – Inspection, Monitoring and Sampling Schedule

Remedial System Component	Monitoring Parameter	Operating Range	Monitoring Schedule
SSDS	Fan Suction	0 to 8.0 in. of water	Continuously

4.3.2 Remedial System Sampling

Indoor air sampling is not proposed in the addition since the school addition has an operating SSDS; however, if the SSDS is not operational for longer than 10 consecutive days, indoor air sampling will be performed within the lowest level of the addition to the school building. Remedial system sampling requirements are provided in Table 4, below.

Table 4 – Remedial System Sampling Requirements

Sampling Location	Analytical Parameters	Schedule
	VOC (Method TO-15)	
Lowest level of school building addition	X	As needed when system is shut off for 10 consecutive days

Detailed sample collection methods and analytical procedures and protocols are provided in the QAPP (Appendix E).

4.4 Post-Remediation Media Monitoring and Sampling

Samples shall be collected from the groundwater monitoring wells, sub-slab vapor points, and indoor and ambient air sampling locations on an annual basis. Sampling locations, required analytical parameters and schedule are provided in Table 5 – Post-Remediation Media Monitoring, below. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

Table 5 – Post-Remediation Media Monitoring

Sampling Location	Matrix	Analytical Parameters		Schedule
		VOCs	MNAs[(1)]	
PS96X-TRC-MW-04	Groundwater	X	X	Annual
PS96X-TRC-MW-05	Groundwater	X	X	Annual
PS96X-TRC-MW-06	Groundwater	X	X	Annual
PS96X-TRC-MW-07	Groundwater	X	X	Annual
PS96X-TRC-MW-08	Groundwater	X	X	Annual
PS96X-TRC-MW-09	Groundwater	X	X	Annual
PS96X-TRC-MW-10	Groundwater	X	X	Annual
PS96X-TRC-MW-11	Groundwater	X	X	Annual
PS96X-TRC-MW-12	Groundwater	X	X	Annual
PS96X-TRC-MW-13	Groundwater	X	X	Annual
PS96X-TRC-MW-14	Groundwater	X	X	Annual
PS96X-TRC-MW-15	Groundwater	X	X	Annual
PS96X-TRC-MW-16	Groundwater	X	X	Annual
PS96X-TRC-MW-17[(2)]	Groundwater	X	X	Annual
PS96X-TRC-MW-18[(2)]	Groundwater	X	X	Annual
PS96X-TRC-MW-19[(2)]	Groundwater	X	X	Annual
PS96X-TRC-SV/IA-01	Sub-Slab Vapor / Indoor Air	X		Annual (during heating season)
PS96X-TRC-SV/IA-02	Sub-Slab Vapor / Indoor Air	X		Annual (during heating season)
PS96X-TRC-SV/IA-03	Sub-Slab Vapor / Indoor Air	X		Annual (during heating season)
PS96X-TRC-AMB	Ambient Air	X		Annual (during heating season)

[(1)]Monitored Natural Attenuation (MNA) constituents: sulfate, chloride, total organic carbon, volatile fatty acids, and soluble iron.
[(2)]Proposed monitoring well location and identification number.

Detailed sample collection and analytical procedures and protocols are provided in Appendix E – QAPP.

4.4.1 Groundwater Sampling

Groundwater monitoring will be performed on an annual basis to assess the performance of the remedy. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

The network of monitoring wells has been installed to monitor upgradient, on-Site and downgradient groundwater conditions. In addition to existing monitoring wells, as part of the IRM Phase II Work Plan, three additional monitoring wells (PS96X-TRC-MW-17, PS96X-TRC-MW-18, and PS96X-TRC-MW-19) will be installed.

Table 6 summarizes each well identification number, as well as the purpose, location, depths, diameter and screened intervals of the wells. As part of the groundwater monitoring, 6 upgradient wells, 7 on-Site wells and 4 downgradient well are sampled to evaluate the effectiveness of the remedial action.

Table 6 – Monitoring Well Construction Details

Monitoring Well ID	Well Location	Well Diameter (inches)	Elevation (feet)			
			Casing	Surface	Screen Top	Screen Bottom
PS96X-TRC-MW-04	Central, on-Site	2	93.64	93.93	90.64	75.64
PS96X-TRC-MW-05	Upgradient, on-Site	4	106.06	106.32	98.06	86.06
PS96X-TRC-MW-06	Up/cross-gradient, east adjoining sidewalk	4	102.49	103.45	95.49	80.49
PS96X-TRC-MW-07	Up/cross-gradient, off-Site across Waring Ave.	2	107.15	107.82	104.15	89.15

Monitoring Well ID	Well Location	Well Diameter (inches)	Elevation (feet)			
			Casing	Surface	Screen Top	Screen Bottom
PS96X-TRC-MW-08	Up/cross-gradient, east adjoining sidewalk across Olinville Ave.	2	102.17	102.93	99.17	84.17
PS96X-TRC-MW-09	Up/cross-gradient, east adjoining sidewalk across Olinville Ave.	2	97.98	98.30	92.98	82.98
PS96X-TRC-MW-10	Downgradient, on-Site	2	93.32	93.72	90.32	75.32
PS96X-TRC-MW-11	Cross-gradient, west adjoining sidewalk	2	94.91	95.79	86.91	71.91
PS96X-TRC-MW-12	Cross-gradient, west adjoining sidewalk	2	98.70	99.49	93.70	78.70
PS96X-TRC-MW-13	Upgradient, north adjoining sidewalk	2	104.76	105.15	101.76	86.76
PS96X-TRC-MW-14[(1)]	Upgradient, north adjoining sidewalk	2	NA	NA	NA	NA
PS96X-TRC-MW-15	Central, on-Site	2	93.29	93.84	89.84	74.84
PS96X-TRC-MW-16	Central, on-Site	2	93.32	93.67	89.67	74.67
PS96X-TRC-MW-17[(2)]	Downgradient, on-Site	NA	NA	NA	NA	NA
PS96X-TRC-MW-18[(2)]	Downgradient, on-Site	NA	NA	NA	NA	NA
PS96X-TRC-MW-19[(2)]	Downgradient, south adjoining property	NA	NA	NA	NA	NA

[(1)]Wells installed by TetraTech EC, Inc. Complete well details not provided in available reports.
[(2)]PS96X-TRC-MW-14 not surveyed.
[(3)]PS96X-TRC-MW-16, PS96X-TRC-MW-17, and PS96X-TRC-MW-18 have not yet been installed.
Datum: NAVD1988

The monitoring well construction logs are included in Appendix C of this document.

Groundwater samples will be collected in accordance with USEPA Low-Stress (low flow) sampling procedures and in accordance with the procedures outlined in the QAPP provided in Appendix E. Groundwater from each well will be purged via bladder pump until groundwater quality parameters have sufficiently stabilized. Samples will be collected in a lab-supplied glassware, placed on ice in coolers and transported to the laboratory under standard chain-of-custody procedures.

If biofouling or silt accumulation occurs in any of the monitoring wells, the wells will be physically agitated/surged and redeveloped. Additionally, monitoring wells will be properly decommissioned and replaced, if an event renders the wells unusable.

Repairs and/or replacement of wells in the monitoring well network will be performed based on assessments of structural integrity and overall performance. The NYSDEC will be notified prior to any repair or decommissioning of any monitoring well for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent PRR. Well decommissioning without replacement will be done only with the prior approval of the NYSDEC. Well abandonment will be performed in accordance with NYSDEC's guidance entitled "CP-43: Groundwater Monitoring Well Decommissioning Procedures." Monitoring wells that are decommissioned because they have been rendered unusable will be replaced in kind in the nearest available location, unless otherwise approved by the NYSDEC.

The sampling frequency may only be modified with the approval of the NYSDEC. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC.

Deliverables for the groundwater monitoring program are specified in Section 7.0 – Reporting Requirements.

4.4.2 Soil Vapor Intrusion Sampling

The vapor intrusion monitoring program will be performed on an annual basis during the heating season to assess the performance of the remedy. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

Three permanent sub-slab vapor probes are present in the basement slab of the original portion of the school building. Sub-slab vapor samples from the permanent sub-slab vapor probes and co-located indoor air samples will be collected and analyzed on an annual basis during the heating season. The sub-slab vapor, indoor air and ambient air sampling locations are presented on Figure 2.

Sub-slab vapor points were installed by coring through the slab with a 1-inch drill bit and placing a vapor probe attached to polyethylene tubing approximately 2 inches beneath the bottom of the basement slab. The tubing implant was sealed to the floor with a non-VOC emitting surface sealing material (i.e., cement grout). A tracer gas (i.e., helium) was used at the time of installation to ensure that the seal of the vapor point was adequate. Following installation and sampling, monitoring points were sealed with Plumber's Putty. Additionally, tracer gas will be used during all subsequent sampling events to confirm the integrity of the existing seal.

Sub-slab vapor, indoor air, and ambient air samples will be collected in individually certified 6-liter SUMMA canisters fitted with an 8-hour flow-controller and submitted to the laboratory for analysis of VOCs by Method TO-15 and will achieve detection limits of 1.0 microgram per cubic meter ($\mu g/m^3$) for all analytes with the exception of vinyl chloride and trichloroethylene (TCE), which will be 0.25 $\mu g/m^3$. These detection limits will allow for comparison with the lowest action levels for these compounds in the NYSDOH Guidance.

The sampling frequency may only be modified with the approval of the NYSDEC. This SMP will be modified to reflect changes in sampling plans approved by the NYSDEC.

Deliverables for the soil vapor sampling program are specified in Section 7.0 – Reporting Requirements.

4.4.3 Monitoring and Sampling Protocol

All sampling activities will be recorded in a field book and associated sampling log as provided in Appendix H – Groundwater Monitoring Well Sampling Log Form and Vapor Intrusion Sampling Log Form. Other observations (e.g., groundwater monitoring well integrity, etc.) will be noted on the sampling log. The sampling log will serve as the inspection form for the monitoring network. Additional detail regarding monitoring and sampling protocols are provided in the QAPP included as Appendix E to this SMP.

5.0 OPERATIONS AND MAINTENANCE PLAN

5.1 General

This Operations and Maintenance Plan provides a brief description of the measures necessary to operate, monitor and maintain the mechanical components of the remedy selected for the Site. This Operations and Maintenance Plan:

- Includes the procedures necessary to allow individuals unfamiliar with the Site to operate and maintain the SSDS and monitor and maintain the gas vapor barrier beneath the slab of the addition
- Includes an operations and maintenance contingency plan and
- Will be updated periodically to reflect changes in Site conditions or the manner in which the SSDS is operated and maintained or the gas vapor barrier is monitored and maintained.

Further detail regarding the Operations and Maintenance of the SSDS and gas vapor barrier is provided in Appendix D – Operations and Maintenance Manual. A copy of this Operations and Maintenance Manual, along with the complete SMP, is maintained at the Site. This Operations and Maintenance Plan is not to be used as a stand-alone document, but as a component document of this SMP.

5.2 Gas Vapor Barrier Performance Criteria

The gas vapor barrier beneath the addition is comprised of a 60-mil Liquid Boot membrane system as manufactured by CETCO and was be applied beneath the slabs, below grade walls and bottom slabs and walls of pits and sumps. Note that the fluid applied gas vapor barrier was installed to work in tandem with the SSDS to prevent sub-slab vapors

from entering the building. The gas vapor barrier was installed and will be inspected in accordance with NYCSCA specifications and manufacturer requirements.

5.2.1 Operations and Maintenance of Gas Vapor Barrier

The gas vapor barrier beneath the addition will not be accessible under normal conditions. The gas vapor barrier will be accessible if intrusive construction activities occur at the Site. In the event that intrusive construction activities damage the gas vapor barrier, repair shall be made in accordance with the details included in the O&M Plan and must be performed by a licensed installer and supervised by the New York City Department of Education's (DOE) Professional Engineer.

5.3 SSDS Performance Criteria

The SSDS shall depressurize the entire gas permeable aggregate-filled space beneath the addition floor slabs, creating a differential pressure: lower pressure in the gas permeable aggregate layer below the floor slabs than in the building interior. The SSDS shall be connected to and monitored by the Building Management System (BMS) and to an SSDS Monitoring Panel installed in the building mechanical room.

5.4 Operations and Maintenance of SSDS

The following sections provide a description of the operations and maintenance of the SSDS beneath the addition. Cut-sheets and as-built drawings for the SSDS are provided in Appendix D - Operations and Maintenance Manual.

5.4.1 System Start-Up and Testing

This subsection outlines the procedures for confirming the effectiveness and proper installation of the SSDS prior to building occupancy, and complies with the post mitigation/confirmation testing requirements of NYSDOH's Guidance for Evaluating Soil

Vapor Intrusion in the State of New York dated October 2006. The following actions will be performed shortly after start-up of the SSDS:

1. Vacuum of the sub-slab area relative to indoor air will be measured at each monitoring point utilizing an appropriate hand-held instrument. A negative differential pressure will be confirmed between the indoor and the sub-slab vapor spaces
2. The operation of the warning device for low or no vacuum will be confirmed.

The school's BMS and AISo monitor the SSDS pressure switches in the SSDS riser pipe on a continuous basis. In the event of alarm activation at the BMS, the school custodian will be notified via email. If unacknowledged for more than 10 minutes, an email will be sent to the Regional Facilities Manager (Deputy Director of Facilities) and the Borough Maintenance Planner simultaneously. Since the SSDS is continually monitored, specific monitoring events subsequent to the initial start-up testing are not proposed in the addition to the school building. Annual indoor air, sub-slab vapor, and ambient air sampling will be conducted in the original portion of the school building as described in Section 4.4.

The system testing described above will be conducted if, in the course of the SSDS system lifetime, there is a system failure or significant changes are made to the system and the system must be restarted.

5.4.2 Routine System Operations and Maintenance

Routine maintenance and inspection will be conducted to ensure that the SSDS is operating properly and will continue until NYSDEC and NYSDOH have determined there is no need for such a system. The operation of the SSDS will not be discontinued without written approval from the NYSDEC.

The following tasks will be performed by the Custodial Engineer (unless noted otherwise) on the first week of each month and after any severe condition (e.g., major erosion, flooding, power outage, etc.).

- Inspect the roof top piping, suction fans and accessories for evidence of damage on the roof. In the event of a change from previous conditions, log the information in the logbook and monthly inspection form and immediately request an inspection from New York City Department of Education Environmental Health and Safety Division (DOE EHS). The DOE EHS's report will include a drawing with the locations and type of damage.

- In the event that a fan component fails, the component will be replaced by DOE EHS. DOE EHS will make appropriate arrangements in advance with suppliers to provide SSDS replacement parts within a 12-hour notice. In the event that a fan unit fails, the fan unit will be replaced by DOE EHS. A spare fan will be available on-Site for immediate replacement in case of fan failure.

- Identify any maintenance or repair activity that could affect the lowest level slabs, subgrade walls, SSDS piping, or rooftop components.

- Log the information in the logbook and monthly inspection form.

- The annual inspection performed by the DOE EHS's independent Professional Engineer will consist of, at a minimum, an inspection of the school grounds, lowest level floor slabs, monitoring points, exhaust fans (including spare fan), and fan exhaust stack(s).

Appendix I contains a routine SSDS inspection and maintenance checklist. Table 7 below provides a summary and schedule of routine maintenance.

Table 7 – Routine Maintenance Summary/Schedule

Component	Location	Frequency of Inspection
Piping	Roof	Monthly
Suction Fan	Roof	Monthly
Accessories	Roof	Monthly
Spare Fan	Site Building	Annually

5.4.3 Non-Routine Operations and Maintenance

Non-routine maintenance would typically occur when the BMS and AIS indicate the system is not working properly, or the system becomes damaged. The scope of non-routine maintenance will vary depending upon the situation. If an emergency, such as a natural disaster or an unforeseen failure of the ECs occurs, an inspection of the Site will be conducted by an independent Professional Engineer to verify the effectiveness of the ECs within 4 days of system failure.

5.4.4 System Monitoring Devices and Alarms

The SSDS is monitored by the BMS and AIS to indicate if the system is not operating properly. In the event of an alarm, applicable maintenance and repairs will be conducted, as specified in the Operations and Maintenance Plan, and the SSDS restarted. Operational problems will be noted in the subsequent PRR.

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 fluctuation, resulting from global climactic change and instability, have the potential to significantly impact the performance, effectiveness and protectiveness of Site conditions and engineering controls. Vulnerability assessments assist with preparing for the impacts associated with increasing frequency and intensity of severe storms/weather events and resulting flooding.

Based on the elevation and development of the Site and surrounding area, a vulnerability assessment was deemed to be unnecessary as it is unlikely that flooding, erosion, high winds, or related environmental factors would impact the engineering controls at the Site.

6.2 Green Remediation Evaluation

NYSDEC's DER-31 Green Remediation recommends considering green remediation concepts and techniques in all stages of the remedial program including Site management, with the goal of improving the sustainability of the cleanup and tracking the net environmental benefit of any implemented green technology. This section of the SMP provides a summary of green remediation evaluations to be completed as part of Site management, and reported in the 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 such evaluations and modifications are deemed

appropriate by the Remedial Engineer (e.g., during significant maintenance events or in conjunction with storm recovery activities).

Modifications resulting from green remediation evaluations will be scheduled during planned/routine operations and maintenance activities. Modifications will be reported in the PRR.

6.2.2 Remedial Systems

If a remedial system is installed in the future, remedial systems will be operated properly considering the current Site conditions and the objective to conserve materials and resources to the greatest extent possible. Consideration will be given to operating rates and use of consumables. Spent materials will be sent for recycling, as appropriate.

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.

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.

6.3 Remedial System Optimization

If a remedial system is installed in the future, an RSO 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

The results of any Site management inspection, maintenance and monitoring events will be recorded on the appropriate Site management forms provided in Appendix I. 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 8 and summarized in the PRR.

Table 8: Schedule of Interim Monitoring/Inspection Reports

Task/Report	Reporting Frequency*
Periodic Review Report	Annually

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

7.2 Periodic Review Report

A PRR will be submitted to the Department beginning 15 months after the Certificate of Completion is issued. After submittal of the initial PRR, the next PRR shall be submitted annually to the Department, or at another frequency as 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 A - 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 ROD

    - 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

- 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 and

- The overall performance and effectiveness of the remedy.

7.2.1 Certification of Institutional and Engineering Controls

Following the last inspection of the reporting period, a qualified environmental professional or 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*

- *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 control 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."

The signed certification will be included in the PRR.

The PRR 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. 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. The 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

- 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).

- 6NYCRR Part 375, Environmental Remediation Programs. December 14, 2006.

- NYSDOH Guidance for Evaluating Soil Vapor Intrusion in the State of New York. October 2006.

- Bureau of Toxic Substances Assessment NYSDOH, Tetrachloroethene (Perc) In Indoor and Outdoor Air Fact Sheet, September 2013.

- NYSDEC DER-10 – "Technical Guidance for Site Investigation and Remediation". May 2010.

- U.S. EPA Low Stress (low flow) Purging and Sampling Procedures for the Collection of Groundwater Samples from Monitoring Wells. July 30, 1996, Revised January 19, 2010.

- March 31, 2009, Phase I Environmental Site Assessment of Proposed Expansion of PS 96X, TetraTech EC, Inc.

- July 30, 2009, Phase II Environmental Site Investigation of Proposed Addition of PS 96X, TetraTech EC, Inc.

- October 16, 2009, Sub-Slab Vapor and Indoor Air Quality Investigation of Public School 96X, TetraTech EC, Inc.

- March 24, 2010, Indoor Air Quality Investigation Report of Public School 96X, TetraTech EC, Inc.

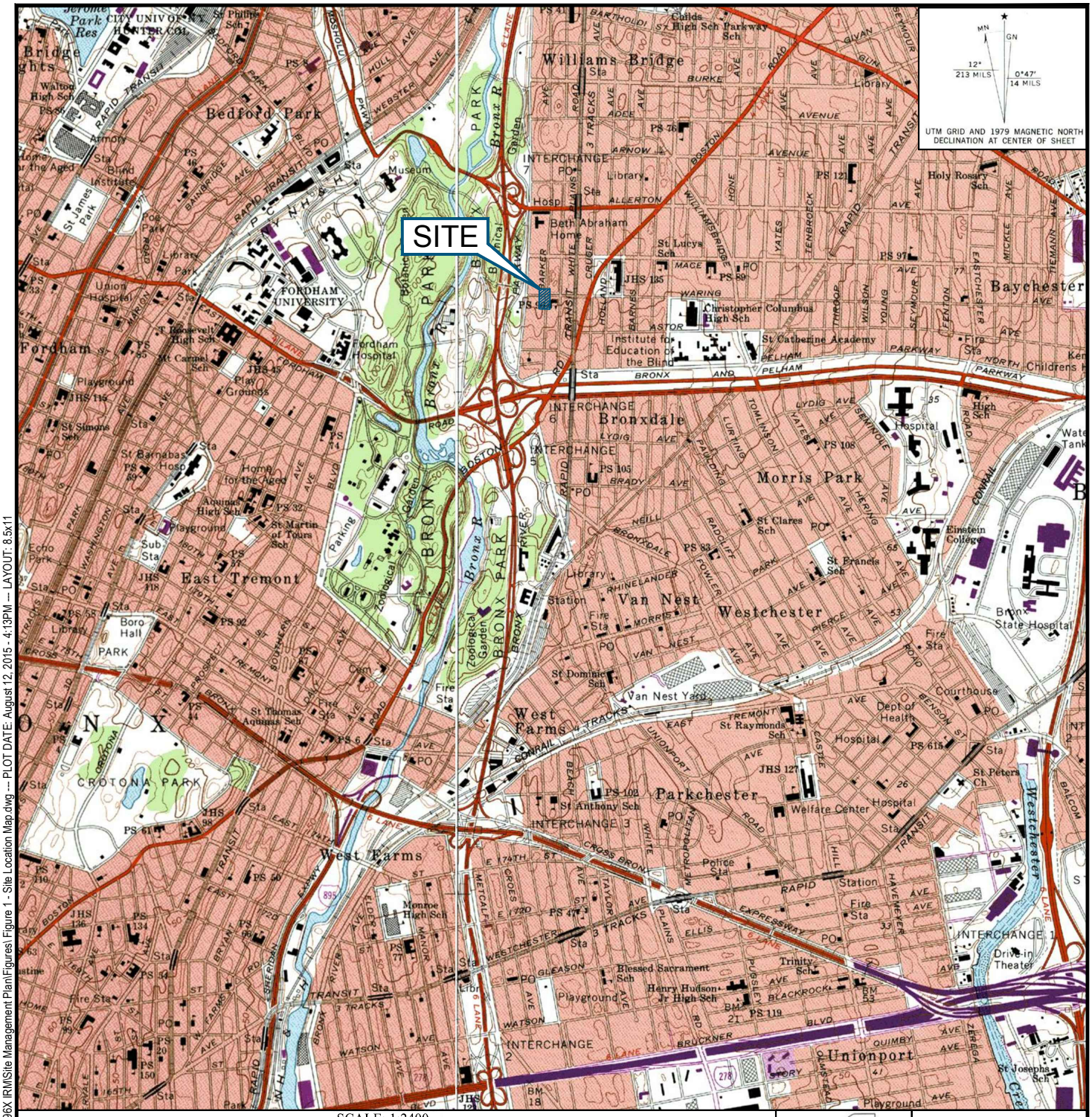
- November 13, 2012, Supplemental Site Investigation Report, Proposed Addition to Public School 96X, TRC Engineers, Inc.

- July 9, 2013, Confirmatory Groundwater Sampling Letter Report, Proposed Addition to Public School 96X, TRC Engineers, Inc.

- January 2014, Proposed Addition to Public School 96X Interim Remedial Measure Work Plan – Phase II, TRC Engineers, Inc.

- May 29, 2015, Proposed Addition to Public School 96X Interim Remedial Measures – Phase I Construction Completion Report, TRC Engineers, Inc.

FIGURES



SCALE: 1:2400

1 MILE
7000 FEET
1 KILOMETER

CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
DEPTH CURVES AND SOUNDINGS IN FEET—DATUM IS MEAN LOW WATER

NEW YORK
QUADRANGLE LOCATION

FLUSHING, N. Y.
SE/4 HARLEM 15' QUADRANGLE
40073-G7-TF-024
1966
PHOTOREVISED 1979
DMA 6265 IV SE—SERIES V821

MAP OBTAINED THROUGH USE OF MAPTECH TERRAIN NAVIGATOR PRO SOFTWARE.

TRC
1430 Broadway
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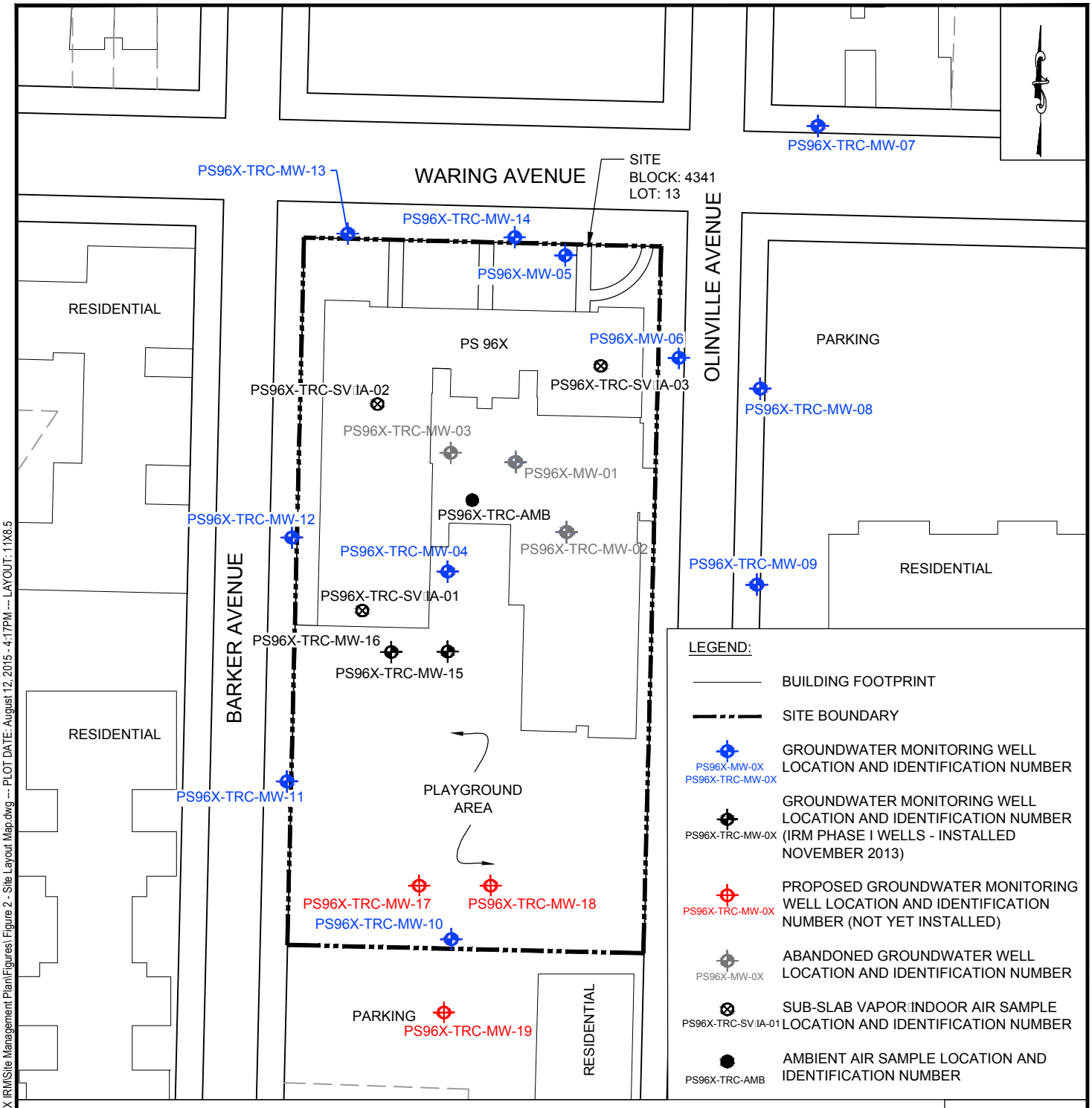
PROJECT:
NEW YORK CITY SCHOOL CONSTRUCTION AUTHORITY
SITE MANAGEMENT PLAN - P.S. 96X - 650 WARING AVENUE
BRONX, NEW YORK 10467

TITLE:
SITE LOCATION MAP

DRAWN BY:	HD
CHECKED BY:	JR
APPROVED BY:	DSG
DATE:	AUGUST 2015
PROJ. NO.:	211646.0000.0000
FILE:	F□□r□1 - S□□L□□□□□□M□□.d□□

FIGURE 1

DRAWING NAME: I:\Projects\NYCSCA Contract C000012279\211646 - 96X IRM\Site Management Plan\Figures\ Figure 1 - Site Location Map.dwg — PLOT DATE: August 12, 2015 - 4:13PM — LAYOUT: 8.5x11



NOTES:

1. MONITORING WELLS SURVEYED ON AUGUST 31, 2012 AND NOVEMBER 15, 2013 BY PERFECT POINT.
2. MONITORING WELLS PS96X-TRC-MW-01, PS96X-TRC-MW-02 AND PS96X-TRC-MW-03 WERE ABANDONED IN NOVEMBER 2013 DURING IMPLEMENTATION OF IRM PHASE I.

0 80' 160'

APPROXIMATE SCALE: 1"=80'-0"

GROUNDWATER FLOW

TRC
1430 Broadway
10th Floor
New York, NY 10018
Phone: 212.221.7822

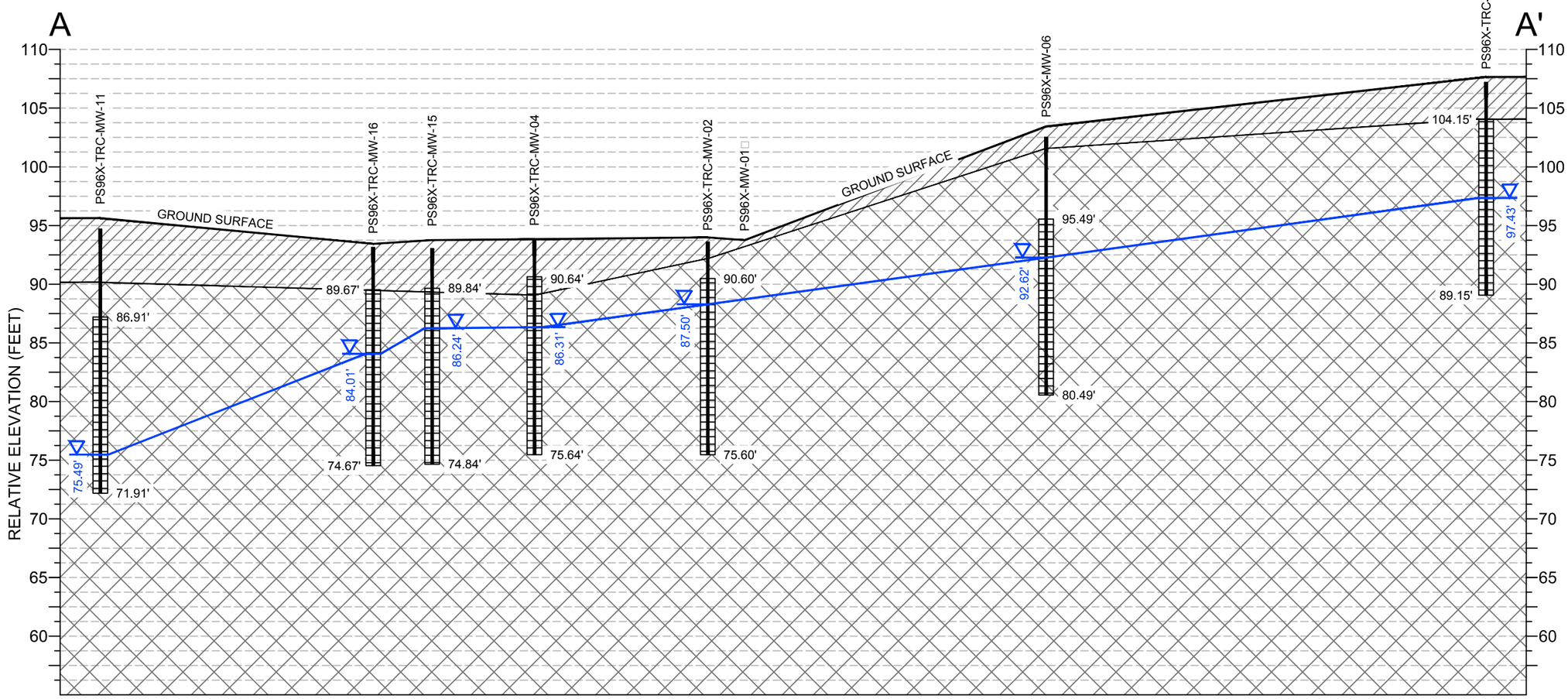
PROJECT:
NEW YORK CITY SCHOOL CONSTRUCTION AUTHORITY
SITE MANAGEMENT PLAN - P.S. 96X - 650 WARING AVENUE
BRONX, NEW YORK 10467

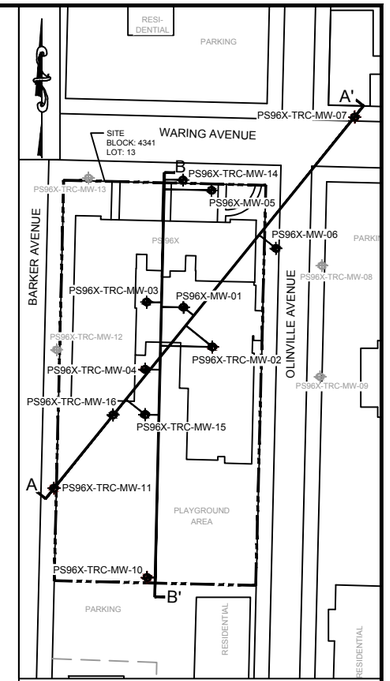
TITLE:
SITE LAYOUT MAP
GROUNDWATER MONITORING WELL, SUB-SLAB VAPOR, INDOOR AIR, AND AMBIENT AIR SAMPLING LOCATIONS

DRAWN BY:	HD
CHECKED BY:	JR
APPROVED BY:	DSG
DATE:	AUGUST 2015
PROJ. NO.:	211646.0000.0000
FILE:	F□□r□2 - S□□L□□□□M□□.d□□

FIGURE 2

DRAWING NAME: I:\Projects\NYCSCA Contract C000012279\211646 - 96X IRM\Site Management Plan\Figures\ Figure 2 - Site Layout Map.dwg --- PLOT DATE: August 12, 2015 - 4:17PM --- LAYOUT: 11X8.5





CROSS-SECTION A-A' LOCATION MAP
SCALE: 1"=150'

CROSS-SECTION A-A'

LEGEND:

- XX.XX' — WATER TABLE AND ELEVATION
- XX.XX' — MONITORING WELL SCREEN AND ELEVATION
- FILL
- BEDROCK

0 40' 80'
HORIZONTAL SCALE: 1"=40'-0"

0 10' 20'
VERTICAL SCALE: 1"=10'-0"

NOTES:

1. LOCATIONS AND GROUND SURFACE ELEVATIONS OF TRC POINTS OF INVESTIGATION SURVEYED BY PERFECT POINT LAND SURVEYING ON NOVEMBER 15, 2013.
2. □= WELL CONSTRUCTION LOG FOR PS96X-MW-01 WAS NOT AVAILABLE.

PROJECT:
NEW YORK CITY SCHOOL CONSTRUCTION AUTHORITY
SITE MANAGEMENT PLAN - PS 96X - 650 WARING AVENUE
BRONX, NEW YORK 10467

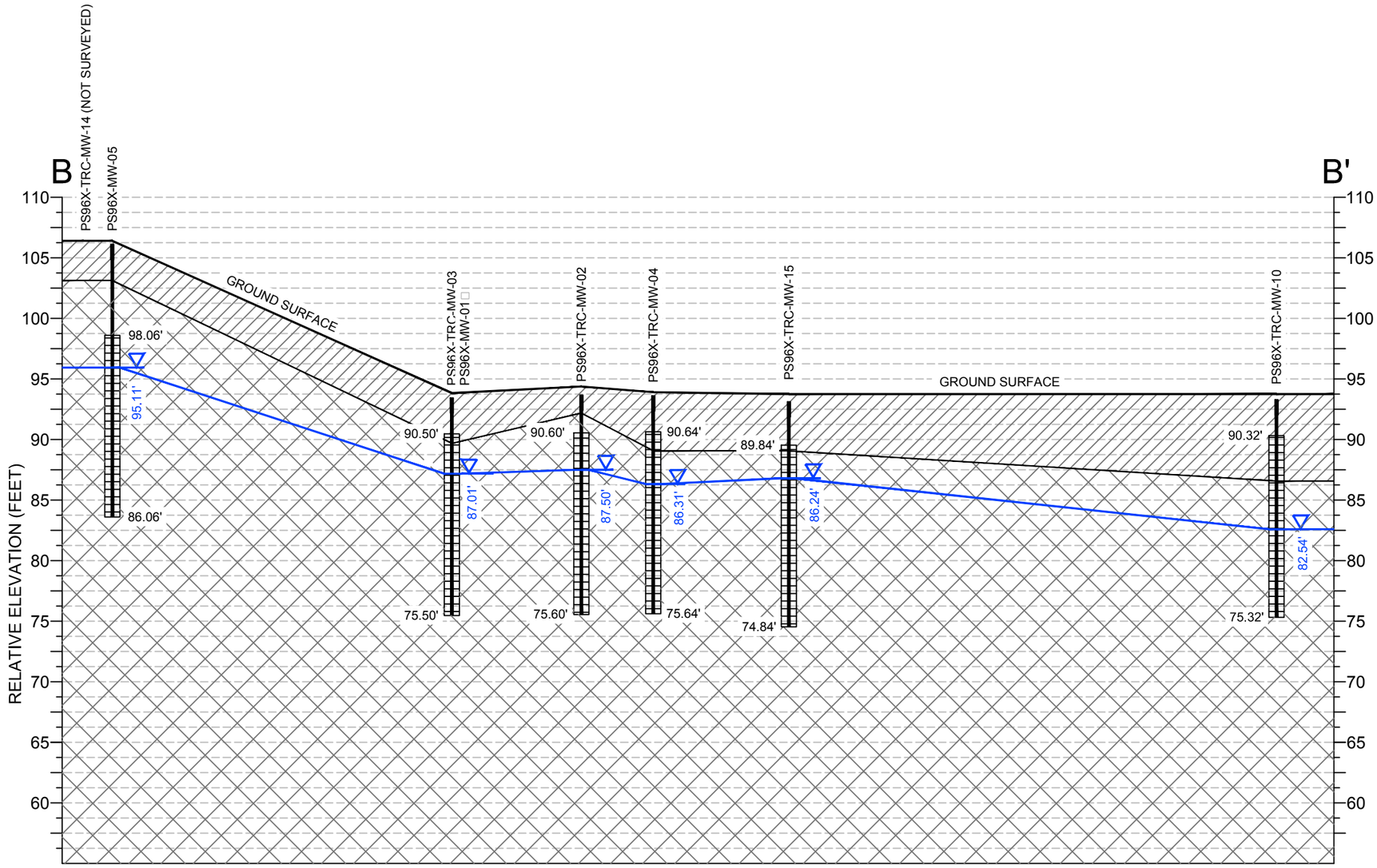
TITLE:
GEOLOGIC CROSS-SECTION A-A'

DRAWN BY:	HD	PROJ NO.:	211646.0000.0000
CHECKED BY:	PN		**FIGURE 3A**
APPROVED BY:	DSG		
DATE:	AUGUST 2015		

TRC
1430 Broadway
10th Floor
New York, NY 10018
Phone: 212.221.7822

FILE NO.: F□□r□3A-3B - G□□□□□□Cr□□□-S□□□□□□A-A' □ B-B'.d□□

DRAWING NAME: I:\Projects\NYCSCA Contract C000012279\211646 - 96X IRM\Site Management Plan\Figures\ Figure 3A-3B - Geologic Cross-Sections A-A' & B-B'.dwg -- PLOT DATE: August 12, 2015 - 1:04PM -- LAYOUT: 11X17L - A-A'



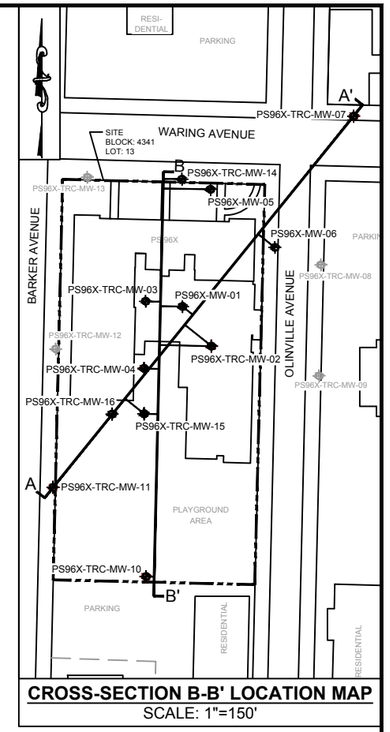
CROSS-SECTION B-B'

0 40' 80'

HORIZONTAL SCALE: 1"=40'-0"

0 10' 20'

VERTICAL SCALE: 1"=10'-0"



CROSS-SECTION B-B' LOCATION MAP
SCALE: 1"=150'

LEGEND:

XX.XX' — WATER TABLE AND ELEVATION

XX.XX' — MONITORING WELL SCREEN AND ELEVATION

FILL

BEDROCK

NOTES:

1. LOCATIONS AND GROUND SURFACE ELEVATIONS OF TRC POINTS OF INVESTIGATION SURVEYED BY PERFECT POINT LAND SURVEYING ON NOVEMBER 15, 2013.
2. □= WELL CONSTRUCTION LOG FOR PS96X-MW-01 WAS NOT AVAILABLE .

PROJECT:
NEW YORK CITY SCHOOL CONSTRUCTION AUTHORITY
SITE MANAGEMENT PLAN - PS 96X - 650 WARING AVENUE
BRONX, NEW YORK 10467

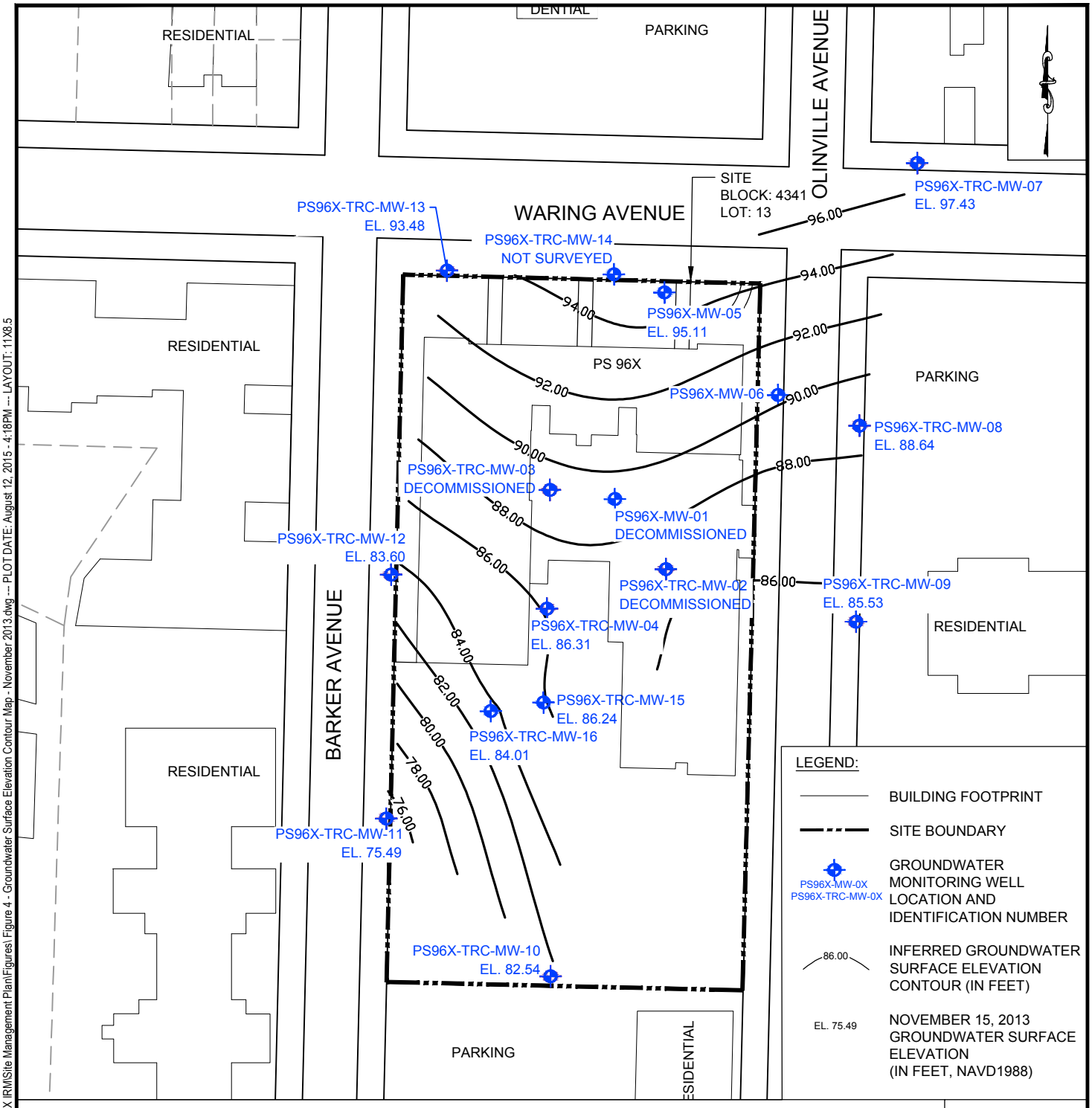
TITLE:
GEOLOGIC CROSS-SECTION B-B'

DRAWN BY:	HD	PROJ NO.:	211646.0000.0000
CHECKED BY:	PN		**FIGURE 3B**
APPROVED BY:	DSG		
DATE:	AUGUST 2015		

TRC
1430 Broadway
10th Floor
New York, NY 10018
Phone: 212.221.7822

FILE NO.: F□□r□3A-3B - G□□□□□Cr□□-S□□□□□A-A' □ B-B'.d□□

DRAWING NAME: I:\Projects\NYCSCA Contract C000012279\211646 - 96X IRM\Site Management Plan\Figures\ Figure 3A-3B - Geologic Cross-Sections A-A' & B-B'.dwg -- PLOT DATE: August 12, 2015 - 1:04PM -- LAYOUT: 11X17L - B-B'



NOTES:

1. MONITORING WELLS SURVEYED ON AUGUST 31, 2012 AND NOVEMBER 15, 2013 BY PERFECT POINT.
2. PS96X-MW-06 WAS DRY DURING SITE-WIDE GAUGING PERFORMED ON NOVEMBER 15, 2013.

0 80' 160'

APPROXIMATE SCALE: 1"=80'-0"

GROUNDWATER FLOW

TRC
1430 Broadway
10th Floor
New York, NY 10018
Phone: 212.221.7822

PROJECT:
NEW YORK CITY SCHOOL CONSTRUCTION AUTHORITY
SITE MANAGEMENT PLAN - P.S. 96X - 650 WARING AVENUE
BRONX, NEW YORK 10467

TITLE:
GROUNDWATER SURFACE ELEVATION CONTOUR MAP NOVEMBER 2013

DRAWN BY:	HD
CHECKED BY:	JR
APPROVED BY:	DSG
DATE:	AUGUST 2015
PROJ. NO.:	211646.0000.0000
FILE:	Figure 4 - Groundwater Surface Elevation Contour Map - November 2013.dwg

FIGURE 4

RESIDENTIAL

RESI-
DENTIAL

PARKING

WARING AVENUE

SITE
BLOCK: 4341
LOT: 13

PS96X-TRC-MW-13

PS96X-TRC-MW-14

PS96X-MW-05

PS96X-TRC-MW-07

PS96X-MW-06

PS96X-TRC-MW-08

PS96X-TRC-MW-03

PS96X-MW-01

PS96X-TRC-MW-12

PS96X-TRC-MW-02

PS96X-TRC-MW-04

PS96X-TRC-MW-09

PS96X-TRC-MW-16

PS96X-TRC-MW-15

PS96X-TRC-MW-11

PS96X-TRC-MW-10

PS 96X

PARKING

PLAYGROUND
AREA

BARKER AVENUE

OLINVILLE AVENUE

RESIDENTIAL

RESIDENTIAL

SAMPLE ID	COMPOUND	OCTOBER 2012 CONCENTRATION (µg/L)	MAY 2013 CONCENTRATION (µg/L)	CLASS GA VALUE (µg/L)
PS96X-TRC-MW-14	1,1,1-TRICHLOROETHANE	<CLASS GA	6.3	5
	METHYLENE CHLORIDE	<CLASS GA	6.1 J, B	5

SAMPLE ID	COMPOUND	JULY 2012 CONCENTRATION (µg/L)	MAY 2013 CONCENTRATION (µg/L)	CLASS GA VALUE (µg/L)
PS96X-MW-05	1,1,1-TRICHLOROETHANE	<CLASS GA	5.4	5

SAMPLE ID	COMPOUND	AUGUST 2012 CONCENTRATION (µg/L)	MAY 2013 CONCENTRATION (µg/L)	CLASS GA VALUE (µg/L)
PS96X-TRC-MW-07	CHLOROFORM	8.1	<CLASS GA	7

SAMPLE ID	COMPOUND	SEPTEMBER 2012 CONCENTRATION (µg/L)	MAY 2013 CONCENTRATION (µg/L)	CLASS GA VALUE (µg/L)
PS96X-TRC-MW-13	1,1,1-TRICHLOROETHANE	<CLASS GA	6.6	5

SAMPLE ID	COMPOUND	JULY 2012 CONCENTRATION (µg/L)	MAY 2013 CONCENTRATION (µg/L)	CLASS GA VALUE (µg/L)
PS96X-MW-01	1,1,1-TRICHLOROETHANE	130	<CLASS GA	5
	1,1-DICHLOROETHANE	23	5.8	5
	1,1-DICHLOROETHENE	9.6	<CLASS GA	5
	CIS-1,2-DICHLOROETHENE	170 D	36	5
	TETRACHLOROETHENE	200 D	<CLASS GA	5
	TRICHLRORETHENE	57	69	5

SAMPLE ID	COMPOUND	JULY 2012 CONCENTRATION (µg/L)	MAY 2013 CONCENTRATION (µg/L)	CLASS GA VALUE (µg/L)
PS96X-MW-06	1,1,1-TRICHLOROETHANE	NOT SAMPLED (DRY)	10	5

SAMPLE ID	COMPOUND	AUGUST 2012 CONCENTRATION (µg/L)	MAY 2013 CONCENTRATION (µg/L)	CLASS GA VALUE (µg/L)
PS96X-TRC-MW-03	TETRACHLOROETHENE	5.4	8.4	5

SAMPLE ID	COMPOUND	AUGUST 2012 CONCENTRATION (µg/L)	MAY 2013 CONCENTRATION (µg/L)	CLASS GA VALUE (µg/L)
PS96X-TRC-MW-02	CHLOROFORM	13	<CLASS GA	7

SAMPLE ID	COMPOUND	AUGUST 2012 CONCENTRATION (µg/L)	MAY 2013 CONCENTRATION (µg/L)	CLASS GA VALUE (µg/L)
PS96X-TRC-MW-04	1,1,1-TRICHLOROETHANE	290 D	4,500 D	5
	TETRACHLROETHENE	160 D	3,300 D	5
	1,1-DICHLROETHANE	<CLASS GA	34	5
	1,1-DICHLOROETHENE	<CLASS GA	46	5
	CIS-1,2-DICHLROETHENE	<CLASS GA	87	5
	METHYLENE CHLORIDE	<CLASS GA	5.3 J, B	5
	TRICHLROETHENE	<CLASS GA	230 J, D	5

SAMPLE ID	COMPOUND	NOVEMBER 2013 CONCENTRATION (µg/L)	JANUARY 2014 CONCENTRATION (µg/L)	CLASS GA VALUE (µg/L)
PS96X-TRC-MW-15	1,1,1-TRICHLOROETHANE	<CLASS GA	200 D	5
	CIS-1,2-DICHLOROETHYLENE	<CLASS GA	140	5
	TETRACHLOROETHYLENE	11	<CLASS GA	5
	TRICHLOROETHYLENE	7	<CLASS GA	5
	VINYL CHLORIDE	<CLASS GA	9.2 J	2
	IRON	320	<CLASS GA	300
	CHLORIDE	495,000 D	511,000 D,J	250,000
	SULFATE	338,000 D,E	<CLASS GA	250,000

SAMPLE ID	COMPOUND	NOVEMBER 2013 CONCENTRATION (µg/L)	JANUARY 2014 CONCENTRATION (µg/L)	CLASS GA VALUE (µg/L)
PS96X-TRC-MW-16	TETRACHLOROETHYLENE	8.5	<CLASS GA	5
	TOLUENE	6.1	<CLASS GA	5
	IRON	<CLASS GA	5,990	300
	CHLORIDE	470,000 D	<CLASS GA	250,000
DUP-1	TETRACHLOROETHYLENE	7	<CLASS GA	5
	TOLUENE	6	<CLASS GA	5

SAMPLE ID	COMPOUND	AUGUST 2012 CONCENTRATION (µg/L)	MAY 2013 CONCENTRATION (µg/L)	CLASS GA VALUE (µg/L)
PS96X-TRC-MW-11	METHYLENE CHLORIDE	<CLASS GA	6.4 J, B	5

SAMPLE ID	COMPOUND	AUGUST 2012 CONCENTRATION (µg/L)	MAY 2013 CONCENTRATION (µg/L)	CLASS GA VALUE (µg/L)
PS96X-TRC-MW-10	1,1,1-TRICHLOROETHANE	23 J, D	10	5
	1,1-DICHLOROETHANE	49 D	58	5
	1,1-DICHLOROETHENE	34 D	38	5
	CIS-1,2-DICHLOROETHENE	180 D	220 D	5
	TETRACHLOROETHENE	67 D	52	5
	TRICHLOROETHENE	530 D	740 D	5

LEGEND:

- BUILDING FOOTPRINT
- SITE BOUNDARY
- PS96X-MW-0X / PS96X-TRC-MW-0X — GROUNDWATER MONITORING WELL LOCATION AND IDENTIFICATION NUMBER
- J — ESTIMATED VALUE
- B — ANALYTE FOUND IN METHOD BLANK
- D — ANALYSIS RE□UIRED DILUTION

NOTES:

1. MONITORING POINTS SURVEYED ON AUGUST 31, 2012 BY PERFECT POINT.
2. MONITORING WELLS PS96X-TRC-MW-01, PS96X-TRC-MW-02 AND PS96X-TRC-MW-03 WERE ABANDONED IN NOVEMBER 2013 DURING IMPLEMENTATION OF IRM PHASE I.

0 60' 120'

APPROXIMATE SCALE: 1"=60'-0"

GROUNDWATER FLOW

PROJECT:
NEW YORK CITY SCHOOL CONSTRUCTION AUTHORITY
SITE MANAGEMENT PLAN - P.S. 96X - 650 WARING AVENUE
BRONX, NEW YORK 10467

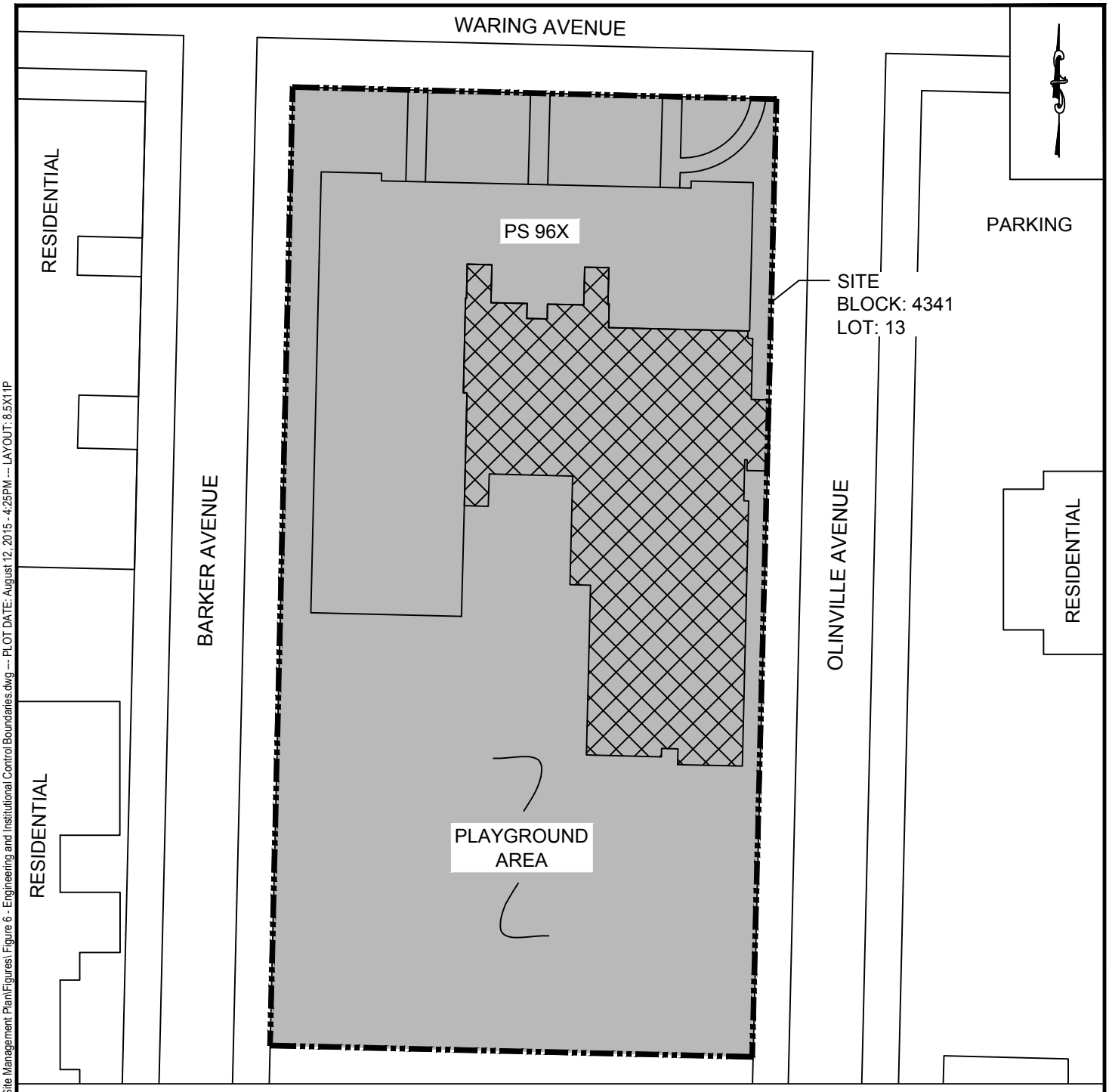
TITLE:
SUMMARY OF VOCs AND MNA CONSTITUENT CONCENTRATIONS IN GROUNDWATER DETECTED ABOVE CLASS GA VALUES

DRAWN BY:	HD	PROJ NO.:	211646.0000.0000
CHECKED BY:	JR		
APPROVED BY:	DSG		**FIGURE 5**
DATE:	AUGUST 2015		

TRC
1430 Broadway
10th Floor
New York, NY 10018
Phone: 212.221.7822

FILE NO.: F□□r□ 5 - S□□. □□VOC □ MNA □□ GW D□□A□□□□ C□□□□GA V□□□□□d□□

DRAWING NAME: I:\Projects\NYCSCA Contract C000012279\211646 - 96X IRM\Site Management Plan\Figures\ Figure 5 - Sum. of VOC & MNA in GW Det Above Class GA Values.dwg --- PLOT DATE: August 21, 2015 - 2:22PM --- LAYOUT: 11X17



LEGEND:

- SITE BOUNDARY
- BUILDING FOOTPRINT
- AREA ENCOMPASSING ENGINEERING CONTROLS
- AREA ENCOMPASSING INSTITUTIONAL CONTROLS

0 60' 120'

SCALE: 1"=60'-0"

TRC
1430 Broadway
10th Floor
New York, NY 10018
Phone: 212.221.7822

PROJECT:
NEW YORK CITY SCHOOL CONSTRUCTION AUTHORITY
SITE MANAGEMENT PLAN - P.S. 96X - 650 WARING AVENUE
BRONX, NEW YORK 10467

TITLE:
ENGINEERING AND INSTITUTIONAL CONTROL BOUNDARIES

DRAWN BY:	HD
CHECKED BY:	JR
APPROVED BY:	DSG
DATE:	AUGUST 2015
PROJ. NO.:	211646.0000.0000
FILE:	Figure 6 - Engineering and Institutional Control Boundaries.dwg

FIGURE 6

APPENDIX A – ENVIRONMENTAL EASEMENT

SCA
School Construction Authority

NYC
Department of Education

August 17, 2015

VIA OVERNIGHT DELIVERY

Lex Terrae, Ltd.
331 Madison Avenue
New York, New York 10017
Attn: Angela Tancredi

Re: Environmental Easement
PS 96(Bronx)
Block 4341, Lot 13

Dear Ms. Tancredi:

Enclosed herein please find an Environmental Easement and Transfer Tax forms for recording. Please record the documents, send me all recording receipts and bill the NYCSCA for your services.

Thanks for your assistance and, of course, please feel free to contact me if you have any questions.

Sincerely,

Michael McDermott
Principal Attorney

30-30 Thomson Avenue
Long Island City, NY 11101
718 472 8000 T
718 472 8840 F

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

THIS INDENTURE made this 12th day of August, 2015, between Owner(s) City of New York c/o New York City School Construction Authority, having an office at 30-30 Thomson Avenue, Long Island City, New York 11101, County of Queens, State of New York (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 650 Waring Avenue a/k/a 2385 Olinville Avenue in the City of New York, County of Bronx 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 4341 Lot 13, being the same as that property conveyed to Grantor as to part of Lot 13 by Letters Patent from the State of New York, dated June 4, 1928 and recorded in the Bronx County Clerk in Liber 701, Page 240, as to the balance of Lot 13 by Condemnation Title vested September 22, 1927. The property subject to this Environmental Easement (the "Controlled Property") comprises approximately 1.81 +/- acres, and is hereinafter more fully described in the Land Title Survey dated May 5, 2015 prepared by Richard Tom, PLS for Perfect Point Professional Land Surveying, 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 Order on Consent Index Number: R2-0801-13-01, 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)

(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 b 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.

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: 203068
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.

City of New York c/o New York City School Construction Authority:

By: _____

Print Name: Ross J. Holden

Executive Vice President & General Counsel

Title: _____ Date: August 4, 2015

Grantor's Acknowledgment

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

On the 4th day of August, in the year 20 15, before me, the undersigned, personally appeared ROSS J. HOLDEN, 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

JENSEN AMBACHEN
NOTARY PUBLIC, STATE OF NEW YORK
NO. 02AM6155485
QUALIFIED IN NASSAU COUNTY
COMMISSION EXPIRES 11/13/2018

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 12th day of August 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

PATRICK EUGENE FOSTER
NOTARY PUBLIC, STATE OF NEW YORK
QUALIFIED IN KINGS COUNTY
NO. 02FO6278032
COMMISSION EXPIRES 03/18/2017

SCHEDULE "A" PROPERTY DESCRIPTION

LEGAL DESCRIPTION OF PROPERTY SUBJECT TO EASEMENT

ADDRESS: 650 Waring Avenue, Bronx, New York
TAX MAP: Block 4341, Lot 13

ALL that certain plot, piece or parcel of land, with the buildings and improvements thereon erected, situate, lying and being in the County of Bronx, City and State of New York, bounded and described as follows:

BEGINNING at the corner formed by the intersection of the southerly side of Waring Avenue with the westerly side of Olinville Avenue;

RUNNING THENCE southerly along the westerly side of Olinville Avenue, 396.24 feet;

THENCE westerly at right angles to the westerly side of Olinville Avenue, 200 feet to the easterly side of Barker Avenue;

THENCE northerly along the easterly side of Barker Avenue, 396.24 feet to the southerly side of Waring Avenue; and

THENCE easterly along the southerly side of Waring Avenue, 200 feet to the point of place of BEGINNING.

Comprising of an area approximately 78,848 square feet or 1.8101 acres more or less.

NEW YORK CITY DEPARTMENT OF FINANCE

NYC-RPT Finance

REAL PROPERTY TRANSFER TAX RETURN

(Pursuant to Title 11, Chapter 21, NYC Administrative Code)

▲ DO NOT WRITE IN THIS SPACE ▲
FOR OFFICE USE ONLY

GRANTOR

● Name: NYC DEPARTMENT OF EDUCATION C/O

● Grantor is a(n): (check one) ☐ individual ☐ partnership ☐ corporation ☐ single member LLC ☐ multiple member LLC ☑ other

Telephone Number:

● Permanent mailing address after transfer (number and street): NYC SCHOOL CONSTRUCTION AUTHORITY 30-30 THOMSON AVENUE

● City and State: LONG ISLAND CITY, NY

Zip Code: 11101

● Single member's name if grantor is a single member LLC

SOCIAL SECURITY NUMBER

OR

EMPLOYER IDENTIFICATION NUMBER: 13-3535408

SINGLE MEMBER EIN OR SSN

GRANTEE

● Name: COMMISSIONER OF THE DEPARTMENT OF

● Grantee is a(n): (check one) ☐ individual ☐ partnership ☐ corporation ☐ single member LLC ☐ multiple member LLC ☑ other

Telephone Number:

● Permanent mailing address after transfer (number and street): ENVIRONMENTAL CONSERVATION 625 BROADWAY

● City and State: ALBANY, NY

Zip Code: 12233

● Single member's name if grantee is a single member LLC

SOCIAL SECURITY NUMBER

OR

EMPLOYER IDENTIFICATION NUMBER: 14-6013200

SINGLE MEMBER EIN OR SSN

PROPERTY LOCATION

LIST EACH LOT SEPARATELY. ATTACH A RIDER IF ADDITIONAL SPACE IS REQUIRED

● Address (number and street)	Apt. No.	Borough	Block	Lot	# of Floors	Square Feet	● Assessed Value of Property
2385 OLINVILLE AVENUE		BRONX	4341	13	4	164,449	6,725,139.00

● DATE OF TRANSFER TO GRANTEE: 6/30/2015

● PERCENTAGE OF INTEREST TRANSFERRED: 100 %

CONDITION OF TRANSFER. See Instructions

● Check (✓) all of the conditions that apply and fill out the appropriate schedules on pages 5-11 of this return. Additionally, Schedules1 and 2 must be completed for all transfers.

a. ☐ .....Arms length transfer
b. ☐ .....Transfer in exercise of option to purchase
c. ☐ .....Transfer from cooperative sponsor to cooperative corporation
d. ☐ .....Transfer by referee or receiver (complete Schedule A, page 5)
e. ☐ .....Transfer pursuant to marital settlement agreement or divorce decree (complete Schedule I, page 9)
f. ☐ .....Deed in lieu of foreclosure (complete Schedule C, page 6)
g. ☐ .....Transfer pursuant to liquidation of an entity (complete Schedule D, page 6)
h. ☐ .....Transfer from principal to agent, dummy, strawman or conduit or vice-versa (complete Schedule E, page 7)
i. ☐ .....Transfer pursuant to trust agreement or will (attach a copy of trust agreement or will)
j. ☐ .....Gift transfer not subject to indebtedness
k. ☐ .....Gift transfer subject to indebtedness
l. ☐ .....Transfer to a business entity in exchange for an interest in the business entity (complete Schedule F, page 7)
m. ☑ .....Transfer to a governmental body
n. ☐ .....Correction deed
o. ☐ .....Transfer by or to a tax exempt organization (complete Schedule G, page 8).
p. ☐ .....Transfer of property partly within and partly without NYC
q. ☐ .....Transfer of successful bid pursuant to foreclosure
r. ☐ .....Transfer by borrower solely as security for a debt or a transfer by lender solely to return such security
s. ☐ .....Transfer wholly or partly exempt as a mere change of identity or form of ownership. Complete Schedule M, page 9)
t. ☐ .....Transfer to a REIT or to a corporation or partnership controlled by a REIT. (Complete Schedule R, pages 10 and 11)
u. ☐ .....Other transfer in connection with financing (describe): _____
v. ☐ .....A grant or assignment of a leasehold interest in a tax-free NY area
w. ☐ .....Other (describe):

20150623004811O103

● TYPE OF PROPERTY (✓)	● TYPE OF INTEREST (✓)
a. ☐ ..... 1-3 family house b. ☐ ..... Individual residential condominium unit c. ☐ ..... Individual cooperative apartment d. ☐ ..... Commercial condominium unit e. ☐ ..... Commercial cooperative f. ☐ ..... Apartment building g. ☐ ..... Office building h. ☐ ..... Industrial building i. ☐ ..... Utility j. ☑ ..... OTHER. (describe): OTHER	Check box at LEFT if you intend to record a document related to this transfer. Check box at RIGHT if you do not intend to record a document related to this transfer. REC. NON REC. a. ☐ ..... Fee ..... ☐ b. ☐ ..... Leasehold Grant ..... ☐ c. ☐ ..... Leasehold Assignment or Surrender ..... ☐ d. ☑ ..... Easement ..... ☐ e. ☐ ..... Subterranean Rights ..... ☐ f. ☐ ..... Development Rights ..... ☐ g. ☐ ..... Stock ..... ☐ h. ☐ ..... Partnership Interest ..... ☐ i. ☐ ..... OTHER. (describe): ..... ☐

SCHEDULE 1 - DETAILS OF CONSIDERATION

COMPLETE THIS SCHEDULE FOR ALL TRANSFERS AFTER COMPLETING THE APPROPRIATE SCHEDULES ON PAGES 5 THROUGH 11. ENTER "ZERO" ON LINE 11 IF THE TRANSFER REPORTED WAS WITHOUT CONSIDERATION.

1. Cash ..... ●	1.	0 00
2. Purchase money mortgage ..... ●	2.	0 00
3. Unpaid principal of pre-existing mortgage(s) ..... ●	3.	0 00
4. Accrued interest on pre-existing mortgage(s) ..... ●	4.	0 00
5. Accrued real estate taxes ..... ●	5.	0 00
6. Amounts of other liens on property ..... ●	6.	0 00
7. Value of shares of stock or of partnership interest received ..... ●	7.	0 00
8. Value of real or personal property received in exchange ..... ●	8.	0 00
9. Amount of Real Property Transfer Tax and/or other taxes or expenses of the grantor which are paid by the grantee ..... ●	9.	0 00
10. Other (describe): _____ ●	10.	0 00
11. **TOTAL CONSIDERATION** (add lines 1 through 10 - must equal amount entered on line 1 of Schedule 2) (see instructions) ..... ●	11.	$ 0 00

See instructions for special rules relating to transfers of cooperative units, liquidations, marital settlements and transfers of property to a business entity in return for an interest in the entity.

SCHEDULE 2 - COMPUTATION OF TAX

A. **Payment**	Pay amount shown on line 12 - *See Instructions*	Payment Enclosed

1. Total Consideration (from line 11, above) ..... ●	1.	0 00
2. Excludable liens (see instructions) ..... ●	2.	0 00
3. Consideration (Line 1 less line 2) ..... ●	3.	0 00
4. Tax Rate (see instructions) ..... ●	4.	0 %
5. Percentage change in beneficial ownership (see instructions) ..... ●	5.	100 %
6. Taxable consideration (multiply line 3 by line 5) ..... ●	6.	0 00
7. Tax (multiply line 6 by line 4) ..... ●	7.	0 00
8. Credit (see instructions) ..... ●	8.	0 00
9. Tax due (line 7 less line 8) (if the result is negative, enter zero) ..... ●	9.	0 00
10. Interest (see instructions) ..... ●	10.	0 00
11. Penalty (see instructions) ..... ●	11.	0 00
12. **Total Tax Due** (add lines 9, 10 and 11) ..... ●	12.	$ 0 00

GRANTOR'S ATTORNEY ▼

Name of Attorney: MICHAEL MCDERMOTT, ESQ.			Telephone Number: (718) 472-8232
Address (number and street): NYC SCHOOL CONSTRUCTION AUTHORITY 30-30 THOMSON AVENUE		City and State: LONG ISLAND CITY, NY	Zip Code: 11101
EMPLOYER IDENTIFICATION NUMBER: 13-3535408	OR	SOCIAL SECURITY NUMBER:	

GRANTEE'S ATTORNEY ▼

Name of Attorney:			Telephone Number: ( )
Address (number and street):		City and State:	Zip Code:
EMPLOYER IDENTIFICATION NUMBER: 14-6013200	OR	SOCIAL SECURITY NUMBER:	

CERTIFICATION ▼

I swear or affirm that this return, including any accompanying schedules, affidavits and attachments, has been examined by me and is, to the best of my knowledge, a true and complete return made in good faith, pursuant to Title 11, Chapter 21 of the Administrative Code and the regulations issued thereunder.

GRANTOR

Sworn to and subscribed to before me on this 29 day of July, 2015.

Signature of Notary

13-3535408
EMPLOYER IDENTIFICATION NUMBER OR SOCIAL SECURITY NUMBER

NYC DEPARTMENT OF EDUCATION C/O
Name of Grantor

Signature of Grantor

Notary's stamp or seal

JENSEN AMBACHEN
NOTARY PUBLIC, STATE OF NEW YORK
NO. 02AM6155485
QUALIFIED IN NASSAU COUNTY
COMMISSION EXPIRES 11/13/2018

GRANTEE

Sworn to and subscribed to before me on this 12th day of August, 2015.

Signature of Notary

14-6013200
EMPLOYER IDENTIFICATION NUMBER OR SOCIAL SECURITY NUMBER

COMMISSIONER OF THE DEPARTMENT OF
Name of Grantee

Signature of Grantee

Notary's stamp or seal

Drew A. Wellette
Notary Public, State of New York
Qualified in Schenectady Co.
No. 01WE6089074
Commission Expires 03/17/2019

2015062300481101

FOR CITY USE ONLY

C1. County Code | | C2. Date Deed Recorded | / / | Month Day Year

C3. Book OR C5. CRFN | | C4. Page | |

REAL PROPERTY TRANSFER REPORT

STATE OF NEW YORK
STATE BOARD OF REAL PROPERTY SERVICES

RP - 5217NYC

PROPERTY INFORMATION

1. Property Location: 2385 (STREET NUMBER) | OLINVILLE AVENUE (STREET NAME) | BRONX (BOROUGH) | 10467 (ZIP CODE)

2. Buyer Name: COMMISSIONER OF THE DEPARTMENT OF (LAST NAME / COMPANY) | (FIRST NAME)

(LAST NAME / COMPANY) | (FIRST NAME)

3. Tax Billing Address: Indicate where future Tax Bills are to be sent if other than buyer address (at bottom of form) (LAST NAME / COMPANY) | (FIRST NAME)

(STREET NUMBER AND STREET NAME) | (CITY OR TOWN) | (STATE) | (ZIP CODE)

4. Indicate the number of Assessment Roll parcels transferred on the deed: 1 # of Parcels OR ☐ Part of a Parcel

4A. Planning Board Approval - N/A for NYC

4B. Agricultural District Notice - N/A for NYC

5. Deed Property Size: (FRONT FEET) X (DEPTH) OR (ACRES)

Check the boxes below as they apply:

6. Ownership Type is Condominium ☐

7. New Construction on Vacant Land ☐

8. Seller Name: NYC DEPARTMENT OF EDUCATION C/O (LAST NAME / COMPANY) | (FIRST NAME)

(LAST NAME / COMPANY) | (FIRST NAME)

9. Check the box below which most accurately describes the use of the property at the time of sale:

A ☐ One Family Residential
B ☐ 2 or 3 Family Residential
C ☐ Residential Vacant Land
D ☐ Non-Residential Vacant Land
E ☑ Commercial
F ☐ Apartment
G ☐ Entertainment / Amusement
H ☐ Community Service
I ☐ Industrial
J ☐ Public Service

SALE INFORMATION

10. Sale Contract Date: 6 / 30 / 2015 (Month Day Year)

11. Date of Sale / Transfer: 6 / 30 / 2015 (Month Day Year)

12. Full Sale Price $ 0

(Full Sale Price is the total amount paid for the property including personal property. This payment may be in the form of cash, other property or goods, or the assumption of mortgages or other obligations.) *Please round to the nearest whole dollar amount.*

13. Indicate the value of personal property included in the sale

14. Check one or more of these conditions as applicable to transfer:

A ☐ Sale Between Relatives or Former Relatives
B ☐ Sale Between Related Companies or Partners in Business
C ☐ One of the Buyers is also a Seller
D ☑ Buyer or Seller is Government Agency or Lending Institution
E ☐ Deed Type **not** Warranty or Bargain and Sale (Specify Below)
F ☐ Sale of Fractional or Less than Fee Interest (Specify Below)
G ☐ Significant Change in Property Between Taxable Status and Sale Dates
H ☐ Sale of Business is Included in Sale Price
I ☐ Other Unusual Factors Affecting Sale Price (Specify Below)
J ☐ None

ASSESSMENT INFORMATION - Data should reflect the latest Final Assessment Roll and Tax Bill

15. Building Class: W1

16. Total Assessed Value (of all parcels in transfer): 6,725,139

17. Borough, Block and Lot / Roll Identifier(s) (If more than three, attach sheet with additional identifier(s))

BRONX 4341 13

CERTIFICATION

I certify that all of the items of information entered on this form are true and correct (to the best of my knowledge and belief) and understand that the making of any willful false statement of material fact herein will subject me to the provisions of the penal law relative to the making and filing of false instruments.

BUYER		BUYER'S ATTORNEY	
Andrew Greguth	8-14-15		
BUYER SIGNATURE	DATE	LAST NAME	FIRST NAME
ENVIRONMENTAL CONSERVATION	625 BROADWAY		
STREET NUMBER	STREET NAME (AFTER SALE)	AREA CODE	TELEPHONE NUMBER
ALBANY	NY 12233	SELLER	
CITY OR TOWN	STATE ZIP CODE	SELLER SIGNATURE	DATE 7-29-15

2015062300481201

TP-584 (4/13)

New York State Department of Taxation and Finance

Combined Real Estate Transfer Tax Return, Credit Line Mortgage Certificate, and Certification of Exemption from the Payment of Estimated Personal Income Tax

Recording office time stamp

See Form TP-584-I, Instructions for Form TP-584, before completing this form. Print or type.

Schedule A — Information relating to conveyance

Grantor/Transferor

☐ Individual
☐ Corporation
☐ Partnership
☐ Estate/Trust
☐ Single member LLC
☑ Other

Name *(if individual, last, first, middle initial)* (☐ *check if more than one grantor*)
NYC DEPARTMENT OF EDUCATION C/O

Social security number

Mailing address NYC SCHOOL CONSTRUCTION AUTHORITY 30-30 THOMSON AVENUE

Social security number

City	State	ZIP code
LONG ISLAND CITY	NY	11101

Federal EIN: 13 3535408

Single member's name if grantor is a single member LLC *(see instructions)*

Single member EIN or SSN

Grantee/Transferee

☐ Individual
☐ Corporation
☐ Partnership
☐ Estate/Trust
☐ Single member LLC
☑ Other

Name *(if individual, last, first, middle initial)* (☐ *check if more than one grantee*)
COMMISSIONER OF THE DEPARTMENT OF

Social security number

Mailing address ENVIRONMENTAL CONSERVATION 625 BROADWAY

Social security number

City	State	ZIP code
ALBANY	NY	12233

Federal EIN: 14 6013200

Single member's name if grantee is a single member LLC *(see instructions)*

Single member EIN or SSN

Location and description of property conveyed

Tax map designation - Section, block & lot *(include dots and dashes)*	SWIS code (six digits)	Street address	City, town, or village	County
2 - 4341 - 13	650000	2385 OLINVILLE AVENUE	NEW YORK	BRONX

Type of property conveyed *(check applicable box)*

1 ☐ One- to three-family house
2 ☐ Residential cooperative
3 ☐ Residential condominium
4 ☐ Vacant land
5 ☐ Commercial/Industrial
6 ☐ Apartment building
7 ☐ Office building
8 ☑ Other OTHER

Date of conveyance: 6 (month) 30 (day) 2015 (year)

Percentage of real property conveyed which is residential real property 0.00 % *(see instructions)*

Condition of conveyance *(check all that apply)*

a. ☐ Conveyance of fee interest
b. ☐ Acquisition of a controlling interest (state percentage acquired _____ %)
c. ☐ Transfer of a controlling interest (state percentage transferred _____ %)
d. ☐ Conveyance to cooperative housing corporation
e. ☐ Conveyance pursuant to or in lieu of foreclosure or enforcement of security interest *(attach Form TP-584.1, Schedule E)*
f. ☐ Conveyance which consists of a mere change of identity or form of ownership or organization *(attach Form TP-584.1, Schedule F)*
g. ☐ Conveyance for which credit for tax previously paid will be claimed *(attach Form TP-584.1, Schedule G)*
h. ☐ Conveyance of cooperative apartment(s)
i. ☐ Syndication
j. ☐ Conveyance of air rights or development rights
k. ☐ Contract assignment
l. ☐ Option assignment or surrender
m. ☐ Leasehold assignment or surrender
n. ☐ Leasehold grant
o. ☑ Conveyance of an easement
p. ☑ Conveyance for which exemption from transfer tax claimed *(complete Schedule B, Part III)*
q. ☐ Conveyance of property partly within and partly outside the state
r. ☐ Conveyance pursuant to divorce or separation
s. ☐ Other *(describe)* _____

For recording officer's use	Amount received	Date received	Transaction number
	Schedule B., Part I $ Schedule B., Part II $		

20150623004813010 3

Schedule B — Real estate transfer tax return (Tax Law, Article 31)

Part I – Computation of tax due

1	Enter amount of consideration for the conveyance *(If you are claiming a total exemption from tax, check the exemption claimed box, enter consideration and proceed to Part III)* ☑ **Exemption claimed**	1.	0 00
2	Continuing lien deduction *(see instructions if property is taken subject to mortgage or lien)*	2.	0 00
3	Taxable consideration *(subtract line 2 from line 1)*	3.	0 00
4	Tax: $2 for each $500, or fractional part thereof, of consideration on line 3	4.	0 00
5	Amount of credit claimed for tax previously paid *(see instructions and attach Form TP-584.1,* Schedule G*)*	5.	0 00
6	Total tax due* *(subtract line 5 from line 4)*	6.	0 00

Part II – Computation of additional tax due on the conveyance of residential real property for $1 million or more

1	Enter amount of consideration for conveyance *(from* Part I*, line 1)*	1.	0 00
2	Taxable consideration *(multiply line 1 by the percentage of the premises which is residential real property, as shown in* Schedule A*)*	2.	0 00
3	Total additional transfer tax due* *(multiply line 2 by 1% (.01))*	3.	0 00

Part III – Explanation of exemption claimed on Part I, line 1 *(check any boxes that apply)*

The conveyance of real property is exempt from the real estate transfer tax for the following reason:

a. Conveyance is to the United Nations, the United States of America, the state of New York, or any of their instrumentalities, agencies, or political subdivisions (or any public corporation, including a public corporation created pursuant to agreement or compact with another state or Canada) ..... a ☑

b. Conveyance is to secure a debt or other obligation ..... b ☐

c. Conveyance is without additional consideration to confirm, correct, modify, or supplement a prior conveyance ..... c ☐

d. Conveyance of real property is without consideration and not in connection with a sale, including conveyances conveying realty as bona fide gifts ..... d ☐

e. Conveyance is given in connection with a tax sale ..... e ☐

f. Conveyance is a mere change of identity or form of ownership or organization where there is no change in beneficial ownership. (This exemption cannot be claimed for a conveyance to a cooperative housing corporation of real property comprising the cooperative dwelling or dwellings.) Attach Form TP-584.1, Schedule F ..... f ☐

g. Conveyance consists of deed of partition ..... g ☐

h. Conveyance is given pursuant to the federal Bankruptcy Act ..... h ☐

i. Conveyance consists of the execution of a contract to sell real property, without the use or occupancy of such property, or the granting of an option to purchase real property, without the use or occupancy of such property ..... i ☐

j. Conveyance of an option or contract to purchase real property with the use or occupancy of such property where the consideration is less than $200,000 and such property was used solely by the grantor as the grantor's personal residence and consists of a one-, two-, or three-family house, an individual residential condominium unit, or the sale of stock in a cooperative housing corporation in connection with the grant or transfer of a proprietary leasehold covering an individual residential cooperative apartment ..... j ☐

k. Conveyance is not a conveyance within the meaning of Tax Law, Article 31, section 1401(e) *(attach documents supporting such claim)* ..... k ☐

*The total tax (from Part I, line 6 and Part II, line 3 above) is due within 15 days from the date conveyance. Please make check(s) payable to the county clerk where the recording is to take place. If the recording is to take place in the New York City boroughs of Manhattan, Bronx, Brooklyn, or Queens, make check(s) payable to the ***NYC Department of Finance***. If a recording is not required, send this return and your check(s) made payable to the ***NYS Department of Taxation and Finance***, directly to the NYS Tax Department, RETT Return Processing, PO Box 5045, Albany NY 12205-5045.

Schedule C — Credit Line Mortgage Certificate (Tax Law, Article 11)

Complete the following only if the interest being transferred is a fee simple interest.
I (we) certify that: *(check the appropriate box)*

1. ☑ The real property being sold or transferred is not subject to an outstanding credit line mortgage.

2. ☐ The real property being sold or transferred is subject to an outstanding credit line mortgage. However, an exemption from the tax is claimed for the following reason:
   - ☐ The transfer of real property is a transfer of a fee simple interest to a person or persons who held a fee simple interest in the real property (whether as a joint tenant, a tenant in common or otherwise) immediately before the transfer.
   - ☐ The transfer of real property is (A) to a person or persons related by blood, marriage or adoption to the original obligor or to one or more of the original obligors or (B) to a person or entity where 50% or more of the beneficial interest in such real property after the transfer is held by the transferor or such related person or persons (as in the case of a transfer to a trustee for the benefit of a minor or the transfer to a trust for the benefit of the transferor).
   - ☐ The transfer of real property is a transfer to a trustee in bankruptcy, a receiver, assignee, or other officer of a court.
   - ☐ The maximum principal amount secured by the credit line mortgage is $3,000,000 or more, and the real property being sold or transferred is **not** principally improved nor will it be improved by a one- to six-family owner-occupied residence or dwelling.

     Please note: for purposes of determining whether the maximum principal amount secured is $3,000,000 or more as described above, the amounts secured by two or more credit line mortgages may be aggregated under certain circumstances. See TSB-M-96(6)-R for more information regarding these aggregation requirements.
   - ☐ Other *(attach detailed explanation)*.

3. ☐ The real property being transferred is presently subject to an outstanding credit line mortgage. However, no tax is due for the following reason:
   - ☐ A certificate of discharge of the credit line mortgage is being offered at the time of recording the deed.
   - ☐ A check has been drawn payable for transmission to the credit line mortgagee or his agent for the balance due, and a satisfaction of such mortgage will be recorded as soon as it is available.

4. ☐ The real property being transferred is subject to an outstanding credit line mortgage recorded in _____ (insert liber and page or reel or other identification of the mortgage). The maximum principal amount of debt or obligation secured by the mortgage is _____. No exemption from tax is claimed and the tax of _____ is being paid herewith. *(Make check payable to county clerk where deed will be recorded or, if the recording is to take place in New York City but not in Richmond County, make check payable to the **NYC Department of Finance**.)*

Signature (both the grantor(s) and grantee(s) must sign)

The undersigned certify that the above information contained in schedules A, B, and C, including any return, certification, schedule, or attachment, is to the best of his/her knowledge, true and complete, and authorize the person(s) submitting such form on their behalf to receive a copy for purposes of recording the deed or other instrument effecting the conveyance.

Grantor signature	Title	Grantee signature	Title
	7-29-15		Principal Attorney
Grantor signature	Title	Grantee signature	Title

Reminder: Did you complete all of the required information in Schedules A, B, and C? Are you required to complete Schedule D? If you checked e, f, or g in Schedule A, did you complete Form TP-584.1? Have you attached your check(s) made payable to the county clerk where recording will take place or, if the recording is in the New York City boroughs of Manhattan, Bronx, Brooklyn, or Queens, to the ***NYC Department of Finance***? If no recording is required, send your check(s), made payable to the ***Department of Taxation and Finance***, directly to the NYS Tax Department, RETT Return Processing, PO Box 5045, Albany NY 12205-5045.

Signature (both the grantor(s) and grantee(s) must sign)

The undersigned certify that the above information contained in schedules A, B, and C, including any return, certification, schedule, or attachment, is to the best of his/her knowledge, true and complete, and authorize the person(s) submitting such form on their behalf to receive a copy for purposes of recording the deed or other instrument effecting the conveyance.

Grantor signature	Title	Grantee signature	Title
	Principal Attorney		
Grantor signature	Title	Grantee signature	Title

Schedule D - Certification of exemption from the payment of estimated personal income tax (Tax Law, Article 22, section 663)

Complete the following only if a fee simple interest or a cooperative unit is being transferred by an individual or estate or trust.

If the property is being conveyed by a referee pursuant to a foreclosure proceeding, proceed to Part II, and check the second box under Exemptions for nonresident transferor(s)/seller(s) and sign at bottom.

Part I - New York State residents

If you are a New York State resident transferor(s)/seller(s) listed in Schedule A of Form TP-584 (or an attachment to Form TP-584), you must sign the certification below. If one or more transferors/sellers of the real property or cooperative unit is a resident of New York State, each resident transferor/seller must sign in the space provided. If more space is needed, please photocopy this Schedule D and submit as many schedules as necessary to accommodate all resident transferors/sellers.

Certification of resident transferor(s)/seller(s)

This is to certify that at the time of the sale or transfer of the real property or cooperative unit, the transferor(s)/seller(s) as signed below was a resident of New York State, and therefore is not required to pay estimated personal income tax under Tax Law, section 663(a) upon the sale or transfer of this real property or cooperative unit.

Signature	Print full name	Date
Signature	Print full name	Date
Signature	Print full name	Date
Signature	Print full name	Date

Note: A resident of New York State may still be required to pay estimated tax under Tax Law, section 685(c), but not as a condition of recording a deed.

Part II - Nonresidents of New York State

If you are a nonresident of New York State listed as a transferor/seller in Schedule A of Form TP-584 (or an attachment to Form TP-584) but are not required to pay estimated personal income tax because one of the exemptions below applies under Tax Law, section 663(c), check the box of the appropriate exemption below. If any one of the exemptions below applies to the transferor(s)/seller(s), that transferor(s)/seller(s) is not required to pay estimated personal income tax to New York State under Tax Law, section 663. Each nonresident transferor/seller who qualifies under one of the exemptions below must sign in the space provided. If more space is needed, please photocopy this Schedule D and submit as many schedules as necessary to accommodate all nonresident transferors/sellers.

If none of these exemption statements apply, you must complete Form IT-2663, *Nonresident Real Property Estimated Income Tax Payment Form*, or Form IT-2664, *Nonresident Cooperative Unit Estimated Income Tax Payment Form*. For more information, see *Payment of estimated personal income tax,* on page 1 of Form TP-584-I.

Exemption for nonresident transferor(s)/seller(s)

This is to certify that at the time of the sale or transfer of the real property or cooperative unit, the transferor(s)/seller(s) (grantor) of this real property or cooperative unit was a nonresident of New York State, but is not required to pay estimated personal income tax under Tax Law, section 663 due to one of the following exemptions:

☐ The real property or cooperative unit being sold or transferred qualifies in total as the transferor's/seller's principal residence (within the meaning of Internal Revenue Code, section 121) from _____ (Date) to _____ (Date) *(see instructions)*.

☐ The transferor/seller is a mortgagor conveying the mortgaged property to a mortgagee in foreclosure, or in lieu of foreclosure with no additional consideration.

☑ The transferor or transferee is an agency or authority of the United States of America, an agency or authority of the state of New York, the Federal National Mortgage Association, the Federal Home Loan Mortgage Corporation, the Government National Mortgage Association, or a private mortgage insurance company.

Signature	Print full name	Date
Signature 	Print full name Michael McDermott	Date 7-29-15
Signature	Print full name	Date
Signature	Print full name	Date
Signature	Print full name	Date

Certification of resident trans eror(s)/seller(s)

This is to certify that at the time of the sale or transfer of the real property or cooperative unit, the transferor(s)/seller(s) as signed below was a resident of New York State, and therefore is not required to pay estimated personal income tax under Tax Law, section 663(a) upon the sale or transfer of this real property or cooperative unit.

Signature	Print full name	Date
Signature	Print full name	Date
Signature	Print full name	Date
Signature	Print full name	Date

Exemption for nonresident transferor(s)/seller(s)

This is to certify that at the time of the sale or transfer of the real property or cooperative unit, the transferor(s)/seller(s) (grantor) of this real property or cooperative unit was a nonresident of New York State, but is not required to pay estimated personal income tax under Tax Law, section 663 due to one of the following exemptions:

☐ The real property or cooperative unit being sold or transferred qualifies in total as the transferor's/seller's principal residence (within the meaning of Internal Revenue Code, section 121) from _____ (Date) to _____ (Date) *(see instructions).*

☐ The transferor/seller is a mortgagor conveying the mortgaged property to a mortgagee in foreclosure, or in lieu of foreclosure with no additional consideration.

☑ The transferor or transferee is an agency or authority of the United States of America, an agency or authority of the state of New York, the Federal National Mortgage Association, the Federal Home Loan Mortgage Corporation, the Government National Mortgage Association, or a private mortgage insurance company.

Signature	Print full name	Date
[signature]	Michael McDermott	7-29-15
Signature	Print full name	Date
Signature	Print full name	Date
Signature	Print full name	Date

AFFIDAVIT OF COMPLIANCE WITH SMOKE DETECTOR REQUIREMENT FOR ONE- AND TWO-FAMILY DWELLINGS

State of New York)
) SS.:
County of Queens)

The undersigned, being duly sworn, depose and say under penalty of perjury that they are the grantor and grantee of the real property or of the cooperative shares in a cooperative corporation owning real property located at

2385 Olinville Avenue , ,
Street Address Unit/Apt.

Bronx New York, 4341 13 (the "Premises");
Borough Block Lot

That the Premises is a one or two family dwelling, or a cooperative apartment or condominium unit in a one- or two-family dwelling, and that installed in the Premises is an approved and operational smoke detecting device in compliance with the provisions of Article 6 of Subchapter 17 of Chapter 1 of Title 27 of the Administrative Code of the City of New York concerning smoke detecting devices;

That they make affidavit in compliance with New York City Administrative Code Section 11-2105 (g). (The signatures of at least one grantor and one grantee are required, and must be notarized).

New York City Department of Education
Name of Grantor (Type or Print)

Signature of Grantor

Sworn to before me
this 27 date of July 20 15

JENSEN AMBACHEN
NOTARY PUBLIC, STATE OF NEW YORK
NO. 02AM6155485
QUALIFIED IN NASSAU COUNTY
COMMISSION EXPIRES 11/13/2018

Andrew Gusfield
Name of Grantee (Type or Print)

Signature of Grantee

Sworn to before me
this 12th date of August 20 15

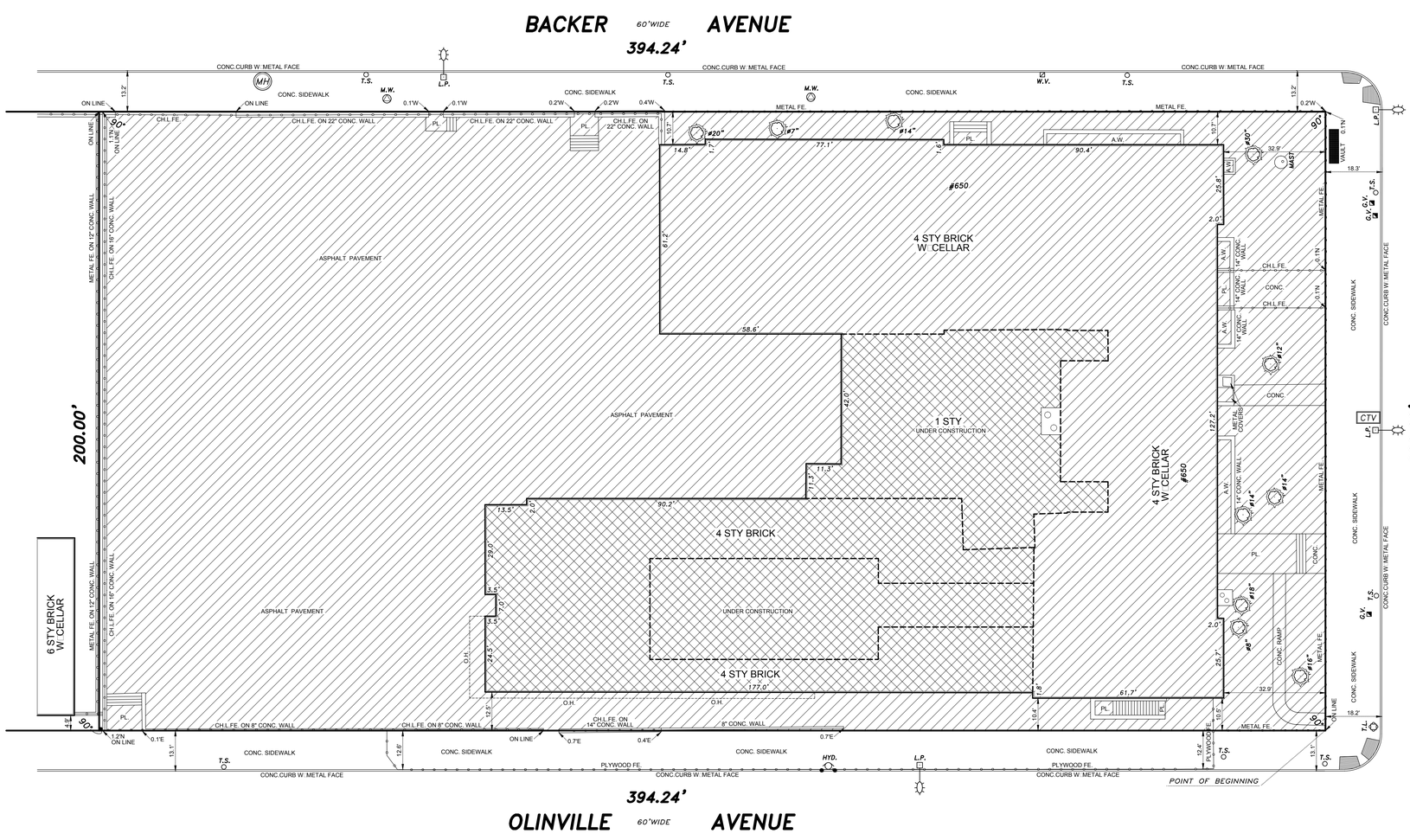
Drew A. Wellette
Notary Public, State of New York
Qualified in Schenectady Co.
No. 01WE6089074
Commission Expires 03/17/2019

These statements are made with the knowledge that a willfully false representation is unlawful and is punishable as a crime of perjury under Article 210 of the Penal Law.

NEW YORK CITY REAL PROPERTY TRANSFER TAX RETURNS FILED ON OR AFTER FEBRUARY 6th, 1990, WITH RESPECT TO THE CONVEYANCE OF A ONE- OR TWO-FAMILY DWELLING, OR A COOPERATIVE APARTMENT OR A CONDOMINIUM UNIT IN A ONE- OR TWO-FAMILY DWELLING, WILL NOT BE ACCEPTED FOR FILING UNLESS ACCOMPANIED BY THIS AFFIDAVIT.

JOB NO. BX 4341-13-EN
SURVEYED ON: MAY 7, 2015

SCALE 1"=20'



SYMBOLS AND ABBREVIATIONS

FENCE	CH.L.FE. / WOOD FE.
UTILITY POLE	U.P.
PARKING METER	P.M.
OIL FILL	O.F.
MONITORING WELL	M.W.
TRAFFIC LIGHT	T.L.
LIGHT	
STREET LIGHT	L.P.
FIRE HYDRANT	HYD.
SIAMESE CONNECTION	SPR.
SHUT OFF VALVE	G.V. / W.V.
HANDICAPPED PARKING	
EXISTING TREE	#12"
DRAINS	DR.
ROOF OVER	R.O.
EXISTING ELEVATIONS	×43.15 TOP OF CURB / ×42.93 BOTTOM OF CURB / ×43.78
CITY ESTABLISHED GRADES	L.G.7.52
CURB AND CURB CUT	CURB CUT
OVERHEAD SERVICE	OH.S.W.
CABLE TV MANHOLE	CTV
MANHOLES	MH, E, T, W, S — SIM. EL. INV.EL.
CATCH BASIN	C.B.
FIRE ESCAPE	F.E.
PLATFORM	PL. or PLTF.
BASEMENT ENTRANCE	B.E.
CELLAR ENTRANCE	C.E.
AIR WAY	A.W.
BAY WINDOW	B.W.
CONCRETE	CONC.
OVERHANG	O.H.
AIR CONDITION	AC
METAL	MET.
NORTH OF PROPERTY LINE	N
SOUTH OF PROPERTY LINE	S
EAST OF PROPERTY LINE	E
WEST OF PROPERTY LINE	W

GENERAL NOTES

SUBSURFACE UTILITIES ARE NOT GUARANTEED BY SURVEYOR. HIGH CAUTION RECOMMENDED AND VERIFICATION WITH PROPER CITY AGENCIES, IS MANDATORY BEFORE COMMENCING ALL NEW WORK.

ALL SUBSURFACE AND OVERHEAD UTILITIES (AS TO SIZE , TYPE AND DEPTH) SHOWN ON THIS SURVEY ARE TAKEN FROM RECORDS OF GOVERNMENTAL AGENCIES AND UTILITY COMPANIES, UNLESS OTHERWISE NOTED AND SHOWN.

COVER OR DEPTH OF UTILITIES WHICH DERIVED FROM FIELD MEASUREMENTS SHOWN ON THIS SURVEY SHOULD BE VERIFIED WITH PROPER AGENCY PRIOR TO CONSTRUCTION OF PROJECT. INVERT ELEVATIONS ARE DERIVED FROM CITY AGENCY RECORDS WHEN NOT AVAILABLE BY FIELD SURVEY AND NOTED AS "PER RECORD" ON THE SURVEY.

ALL SUBSURFACE UTILITY AS TO LOCATION AND DEPTH, SHOULD BE RECHECKED AND LEGAL GRADES SHOULD BE VERIFIED WITH THE TOPOGRAPHICAL BUREAU, PREFERABLY IN WRITING BEFORE COMMENCING CONSTRUCTION.

THIS IS TO CERTIFY THAT THERE ARE NO STREAMS OR NATURAL WATER COURSES ON THE SURVEYED PROPERTY EXCEPT AS SHOWN AND/OR DESCRIBED ON THIS SURVEY.

ALL OPERATIONS OF UNDERGROUND FACILITIES AND ALL EXCAVATORS ARE OBLIGATED TO COMPLY WITH ARTICLE 36 OF THE GENERAL BUSINESS LAW AND WITH PROVISIONS OF INDUSTRIAL CODE PART (RULE NO.35) BEFORE ANY EXCAVATION OR DEMOLITION IS COMMENCED. EVERY EXCAVATOR IS REQUIRED BY THESE LAWS TO GIVE ADVANCE NOTICE TO EVERY OPERATOR OF UNDERGROUND FACILITIES OF HIS INTENT TO PERFORM EXCAVATION OR DEMOLITION WORK IN THE SPECIFIED AREA

ALL ELEVATIONS SHOWN REFER TO THE **NAVD 1988** DATUM. TO OBTAIN:
- NGVD 1929 DATUM - ADD 1.098 FEET
- BRONX BOROUGH DATUM - SUBTRACT 1.508 FEET

EASEMENTS IF ANY ARE NOT SHOWN ON THIS SURVEY. NO INFORMATION PROVIDED TO SURVEYOR AT THIS TIME.

UNDERGROUND UTILITIES NOTE

UNDERGROUND, OVERHEAD AND GROUND LEVEL UTILITIES ARE NOT GUARANTEED AS TO ACCURACY, EXACT LOCATION, TYPE OR USE, ACTIVE OR INACTIVE. VERIFICATION IS MANDATORY WITH MUNICIPAL AGENCIES, PUBLIC AND PRIVATE UTILITY COMPANIES PRIOR TO TAKING TITLE AND OR DESIGN WORK. BOUNDARIES ARE NOT GUARANTEED UNLESS SO NOTED.

ENVIRONMENTAL EASEMENT NOTE

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 NEW YORK ENVIRONMENTAL CONSERVATION LAW. THE ENGINEERING AND INSTITUTIONAL CONTROLS FOR THIS EASEMENT ARE SET FORTH IN THE SITE MANAGEMENT PLAN (SMP). A COPY OF THE SMP MUST BE OBTAINED BY ANY PARTY WITH AN INTEREST IN THE PROPERTY. THE SMP CAN BE OBTAINED FROM NYS DEPARTMENT OF ENVIRONMENTAL CONSERVATION, DIVISION OF ENVIRONMENTAL REMEDIATION, SITE CONTROL SECTION, 625 BROADWAY, ALBANY, NY 12233 OR AT "d□r□□□□ d□□□□□□□."

UNAUTHORIZED ALTERATION OR ADDITION TO THIS SURVEY IS A VIOLATION OF SECTION 7209 OF **THE NEW YORK STATE EDUCATION LAW.** COPIES OF THIS SURVEY MAP NOT BEARING THE LAND SURVEYOR'S INKED SEAL OR EMBOSSED SEAL SHALL NOT BE CONSIDERED TO BE A VALID COPY. GUARANTEES OR CERTIFICATIONS INDICATED HEREON SHALL RUN ONLY TO THE PERSON FOR WHOM THE SURVEY IS PREPARED AND ON HIS BEHALF TO THE TITLE COMPANY, GOVERNMENTAL AGENCY AND LENDING INSTITUTION LISTED HEREON, AND TO THE ASSIGNEES OF THE LENDING INSTITUTION. GUARANTEES OR CERTIFICATIONS ARE NOT TRANSFERABLE TO ADDITIONAL INSTITUTIONS OR SUBSEQUENT OWNERS.

GUARANTEED TO: TRC E□□□□□r□, I□□.

COUNTY: BRONX CITY: BRONX

SECTION: BLOCK: 4341 LOT(S): 13

PROPERTY ADDRESS: 650 WARING AVENUE - P.S. 96X

LEGAL DESCRIPTION
BLOCK 4341, LOT 13
ENVIRONMENTAL EASEMENT AREA

ALL that certain plot, piece or parcel of land, with the buildings and improvements thereon erected, situate, lying and being in the County of Bronx, City and State of New York, bounded and described as follows:

BEGINNING at the corner formed by the intersection of the southerly side of Waring Avenue with the westerly side of Olinville Avenue;

RUNNING THENCE southerly along the westerly side of Olinvile Avenue, 396.24 feet;

THENCE westerly at right angles to the westerly side of Olinville Avenue, 200 feet to the easterly side of Barker Avenue;

THENCE northerly along the easterly side of Barker Avenue, 396.24 feet to the southerly side of Waring Avenue; and

THENCE easterly along the southerly side of Waring Avenue, 200 feet to the point or place of **BEGINNING**.

LOT AREA = 78848.00 □□.□□ = 1.8101 □□r□□

– *ENVIRONMENTAL EASEMENT AREA*

– *AREA ENCOMPASSING THE ENGINEERING CONTROLS – VAPOR BARRIER AND SUB–SLAB DEPRESSURIZATION SYSTEM*

GRAPHIC SCALE

ALL WRITTEN MEASUREMENTS AND OFFSETS NOTED ON THIS SURVEY SUPERSEDE MEASUREMENTS SCALED OF THIS PLOT.

SCALE 1:20

3.05 m 6.10 m 9.14 m 12.20 m 15.24 m 30.48 meters

5 f 15 f 25 f 35 f 45 f

0 10 f 20 f 30 f 40 f 50 f 100 feet

ENVIRONMENTAL EASEMENT SURVEY

PREPARED BY

PERFECT POINT
PROFESSIONAL LAND SURVEYING
79-14 ROCKAWAY BEACH BLVD
ROCKAWAY BEACH, NY 11693
brooklyn - queens - manhattan - bronx
staten island - nassau
phone: (718) 474-7700
fax: (718) 872-9699
info@ppsurveying.com
www.ppsurveying.com

STATE OF NEW YORK ★ RICHARD ★ LICENSED LAND SURVEYOR

N.Y.S. L.L.S. 049844

APPENDIX B – LIST OF SITE CONTACTS

Name	Phone/Email Address
New York City School Construction Authority – Srinivas Kanaparthi	(718) 472-8620 SKANAPARTHI@nycsca.org
TRC Engineers, Inc., Jenna Raup	(212) 221-7822, Cell: (518) 275-5005 jraup@trcsolutions.com
TRC Engineers, Inc., David Glass	(212) 221-7822, Cell: (516) 330-2671 dglass@trcsolutions.com
Nigel Crawford	(718) 482-7778 nigel.crawford@dec.ny.gov
Jane O'Connell	(718) 482-4599 jane.oconnell@dec.ny.gov

APPENDIX C
SOIL BORING LOGS AND GROUNDWATER MONITORING WELL CONSTRUCTION LOGS

TRC Engineers, Inc. 1430 Broadway, 10th Floor New York, New York 10018 Phone 212 221 7822	**BORING LOG**	**BORING PS96X-TRC-MW-02** **SHEET 1 OF 1**

JOB NAME/ CLIENT	**PROJECT NO.**	**AREA OF CONCERN**	
Public School 96X/NYCSCA	190209.0000.0001	Central grassy area.	
ADDRESS		**ELEVATION/DATUM**	
650 Waring Avenue Bronx, New York		94.28 feet/Fixed on-site datum was assigned a relative elevation of 100.00 feet	
DRILLING CONTRACTOR	**DRILLER**	**INSPECTOR**	
Aquifer Drilling & Testing, Inc.	C. Migliori	P. Narea	
DRILLING RIG	**TYPE/SIZE BIT**	**START DATE**	**END DATE**
Track-mounted drill rig	4 1/4" Hollow Stem Augers	8/27/2012	8/27/2012
SAMPLER TYPE	**HAMMER WEIGHT/DROP**	**TOTAL DEPTH**	**WATER LEVEL**
2' Split spoons	140 lb./30 in.	2 feet bgs	Not encountered

SAMPLES		**DEPTH (FEET)**	**WATER**	**DESCRIPTION OF SOILS**	**REMARKS**
NUMBER	**RECOVERY IN FEET**			**(SAA = Same As Above)** **f - fine m - medium c - coarse** **lt - light dk - dark tr - trace ltl - little**	**(PID, STAINING, ODORS, ETC.)** **FP = Free Product** **N/S = No Staining, N/O = No odors** **SO = Slight Odor, MO = Moderate Odor** **STO = Strong Odor**
1	-			0 - 2': Brown c-f sand, c-f gravel, tr ash, cinder, red bricks (fill) (dry)	PID = 0.0 ppm, N/S, N/O
		2		Hand cleared to 2 feet bgs. Refusal/bedrock encountered at 2 feet bgs.	Sample collected: PS96X-TRC-MW-02 (0-2')

TRC	TRC Engineers, Inc. 1430 Broadway, 10th Floor New York, New York 10018 Phone 212 221 7822	**BORING LOG**	**BORING PS96X-TRC-MW-03** **SHEET 1 OF 1**

JOB NAME/ CLIENT Public School 96X/NYCSCA	**PROJECT NO.** 190209.0000.0001	**AREA OF CONCERN** Northern Play Area	
ADDRESS 650 Waring Avenue Bronx, New York		**ELEVATION/DATUM** 93.86 feet/Fixed on-site datum was assigned a relative elevation of 100.00 feet	
DRILLING CONTRACTOR Aquifer Drilling & Testing, Inc.	**DRILLER** Joe Magill	**INSPECTOR** P. Castellano	
DRILLING RIG Track-mounted drill rig	**TYPE/SIZE BIT** 4 1/4" Hollow Stem Augers	**START DATE** 8/15/2012	**END DATE** 8/15/2012
SAMPLER TYPE 2' Split spoons	**HAMMER WEIGHT/DROP** 140 lb./30 in.	**TOTAL DEPTH** 4 feet bgs	**WATER LEVEL** Not encountered

SAMPLES NUMBER	SAMPLES RECOVERY IN FEET	DEPTH (FEET)	WATER	DESCRIPTION OF SOILS (SAA = Same As Above) f - fine m - medium c - coarse lt - light dk - dark tr - trace ltl - little	REMARKS (PID, STAINING, ODORS, ETC.) FP = Free Product N/S = No Staining, N/O = No odors SO = Slight Odor, MO = Moderate Odor STO = Strong Odor
1	-	1		0 - 1': Asphalt	PID = 0.0 ppm, N/S, N/O
2	-	3		1 - 3': Brown f-m sand, tr gravel, tr silt, tr red brick (dry) (fill)	PID = 3.2 ppm, N/S, N/O
3	-	5		3 - 5': Brown f-m sand, tr gravel, tr silt, tr red brick, ltl weathered bedrock (dry) (fill) Refusal/bedrock was encountered at 4 feet bgs. Boring was hand cleared to 4 feet bgs.	PID = 75.7 ppm, N/S, NO <u>Sample collected:</u> PS96X-TRC-MW-03 (3-4')

TRC Engineers, Inc.
1430 Broadway, 10th Floor
New York, New York 10018
Phone 212 221 7822

BORING LOG

BORING PS96X-TRC-MW-04

SHEET 1 OF 1

JOB NAME/ CLIENT	PROJECT NO.	AREA OF CONCERN	
Public School 96X/NYCSCA	190209.0000.0001	Central Play Area	
ADDRESS		**ELEVATION/DATUM**	
650 Waring Avenue Bronx, New York		93.93 feet/Fixed on-site datum was assigned a relative elevation of 100.00 feet	
DRILLING CONTRACTOR	**DRILLER**	**INSPECTOR**	
Aquifer Drilling & Testing, Inc.	Joe Magill	P. Castellano	
DRILLING RIG	**TYPE/SIZE BIT**	**START DATE**	**END DATE**
Track-mounted drill rig	4 1/4" Hollow Stem Augers	8/14/2012	8/14/2012
SAMPLER TYPE	**HAMMER WEIGHT/DROP**	**TOTAL DEPTH**	**WATER LEVEL**
2' Split spoons	140 lb./30 in.	5 feet bgs	Not encountered

SAMPLES NUMBER	SAMPLES RECOVERY IN FEET	DEPTH (FEET)	WATER	DESCRIPTION OF SOILS (SAA = Same As Above) f - fine m - medium c - coarse lt - light dk - dark tr - trace ltl - little	REMARKS (PID, STAINING, ODORS, ETC.) FP = Free Product N/S = No Staining, N/O = No odors SO = Slight Odor, MO = Moderate Odor STO = Strong Odor
1	-			0 - 0.5' Asphalt 0.5 - 1': Dk Brown f-m sand, tr gravel, tr silt (dry) (fill) 1 - 3': Brown f-m sand, tr gravel, tr silt, tr red brick (dry) (fill) Hand cleared to 3 feet bgs.	 PID = 806 ppm, N/S, N/O PID = 908 ppm, N/S, N/O <u>Sample collected:</u> PS96X-TRC-MW-04 (1-3')
		3			
2	1.5			0-1.5': Brown f-m sand, tr gravel, tr silt, tr red brick (dry) (fill) Refusal/bedrock encountered at 5 feet bgs.	PID = 371 ppm, N/S, NO <u>Sample collected:</u> PS96X-TRC-MW-04 (3-5')
		5			

TRC	TRC Engineers, Inc. 1430 Broadway, 10th Floor New York, New York 10018 Phone 212 221 7822	**BORING LOG**	**BORING PS96X-TRC-MW-07** **SHEET 1 OF 1**

JOB NAME/ CLIENT Public School 96X/NYCSCA	**PROJECT NO.** 190209.0000.0001	**AREA OF CONCERN** Sidewalk on north side of Waring Ave/near Olinville Ave.	
ADDRESS 650 Waring Avenue Bronx, New York		**ELEVATION/DATUM** 107.82 feet/Fixed on-site datum was assigned a relative elevation of 100.00 feet	
DRILLING CONTRACTOR Aquifer Drilling & Testing, Inc.	**DRILLER** C. Migliori	**INSPECTOR** P. Narea	
DRILLING RIG Track-mounted drill rig	**TYPE/SIZE BIT** 4 1/4" Hollow Stem Augers	**START DATE** 8/20/2012	**END DATE** 8/20/2012
SAMPLER TYPE 2' Split spoons	**HAMMER WEIGHT/DROP** 140 lb./30 in.	**TOTAL DEPTH** 3 feet bgs	**WATER LEVEL** Not encountered

SAMPLES		DEPTH (FEET)	WATER	DESCRIPTION OF SOILS (SAA = Same As Above) f - fine m - medium c - coarse lt - light dk - dark tr - trace ltl - little	REMARKS (PID, STAINING, ODORS, ETC.) FP = Free Product N/S = No Staining, N/O = No odors SO = Slight Odor, MO = Moderate Odor STO = Strong Odor
NUMBER	RECOVERY IN FEET				
1	-			0 - 1': Concrete 1 - 2': Brown m-f sand, tr gravel, red bricks (fill) (dry) 2 - 3': Tan silt, tr clay (dry)	PID = 538 ppm, N/S, N/O PID = 328 ppm, N/S, N/O Sample collected: PS96X-TRC-MW-07 (1-2') PS96X-TRC-MW-07 (2-3')
		3		Hand cleared to 3 feet bgs. Refusal/bedrock encountered at 3 feet bgs.	

TRC Engineers, Inc. 1430 Broadway, 10th Floor New York, New York 10018 Phone 212 221 7822	**BORING LOG**	**BORING PS96X-TRC-MW-07A** **SHEET 1 OF 1**

JOB NAME/ CLIENT	**PROJECT NO.**	**AREA OF CONCERN**	
Public School 96X/NYCSCA	190209.0000.0001	Sidewalk on north side of Waring Ave/near Olinville Ave.	
ADDRESS		**ELEVATION/DATUM**	
650 Waring Avenue Bronx, New York		Not surveyed	
DRILLING CONTRACTOR	**DRILLER**	**INSPECTOR**	
Aquifer Drilling & Testing, Inc.	C. Migliori	P. Narea	
DRILLING RIG	**TYPE/SIZE BIT**	**START DATE**	**END DATE**
Track-mounted drill rig	4 1/4" Hollow Stem Augers	8/21/2012	8/21/2012
SAMPLER TYPE	**HAMMER WEIGHT/DROP**	**TOTAL DEPTH**	**WATER LEVEL**
2' Split spoons	140 lb./30 in.	3.5 feet bgs	Not encountered

SAMPLES		**DEPTH (FEET)**	**WATER**	**DESCRIPTION OF SOILS** **(SAA = Same As Above)** **f - fine m - medium c - coarse** **lt - light dk - dark tr - trace ltl - little**	**REMARKS** **(PID, STAINING, ODORS, ETC.)** **FP = Free Product** **N/S = No Staining, N/O = No odors** **SO = Slight Odor, MO = Moderate Odor** **STO = Strong Odor**
NUMBER	**RECOVERY IN FEET**				
1	-			0 - 1': Concrete 1 - 3.5': Brown/gray c-f sand, tr gravel, coal fragments, red bricks (fill) (dry)	PID = 532 ppm, N/S, N/O
		3.5		Hand cleared to 3.5 feet bgs. Refusal/bedrock encountered at 3.5 feet bgs. Borehole was abandoned.	Sample collected: PS96X-TRC-MW-07A (1-3.5')

TRC Engineers, Inc. 1430 Broadway, 10th Floor New York, New York 10018 Phone 212 221 7822	**BORING LOG**	**BORING PS96X-TRC-MW-08** **SHEET 1 OF 1**

JOB NAME/ CLIENT	**PROJECT NO.**	**AREA OF CONCERN**	
Public School 96X/NYCSCA	190209.0000.0001	Sidewalk on Olinville Ave.	
ADDRESS		**ELEVATION/DATUM**	
650 Waring Avenue Bronx, New York		102.93 feet/Fixed on-site datum was assigned a relative elevation of 100.00 feet	
DRILLING CONTRACTOR	**DRILLER**	**INSPECTOR**	
Aquifer Drilling & Testing, Inc.	C. Migliori	P. Narea	
DRILLING RIG	**TYPE/SIZE BIT**	**START DATE**	**END DATE**
Track-mounted drill rig	4 1/4" Hollow Stem Augers	8/21/2012	8/21/2012
SAMPLER TYPE	**HAMMER WEIGHT/DROP**	**TOTAL DEPTH**	**WATER LEVEL**
2' Split spoons	140 lb./30 in.	3 feet bgs	Not encountered

SAMPLES		DEPTH (FEET)	WATER	DESCRIPTION OF SOILS (SAA = Same As Above) f - fine m - medium c - coarse lt - light dk - dark tr - trace ltl - little	REMARKS (PID, STAINING, ODORS, ETC.) FP = Free Product N/S = No Staining, N/O = No odors SO = Slight Odor, MO = Moderate Odor STO = Strong Odor
NUMBER	RECOVERY IN FEET				
1	-			0 - 1': Concrete 1 - 3': Tan m-f sand, some silt, tr gravel, weathered bedrock (dry)	PID = 0.0 ppm, N/S, N/O
		3		Hand cleared to 3 feet bgs. Refusal/bedrock encountered at 3 feet bgs.	Sample collected: PS96X-TRC-MW-08 (1-3')

TRC Engineers, Inc. 1430 Broadway, 10th Floor New York, New York 10018 Phone 212 221 7822	**BORING LOG**	**BORING PS96X-TRC-MW-09** **SHEET 1 OF 1**

JOB NAME/ CLIENT	**PROJECT NO.**	**AREA OF CONCERN**	
Public School 96X/NYCSCA	190209.0000.0001	Sidewalk on Olinville Ave.	
ADDRESS		**ELEVATION/DATUM**	
650 Waring Avenue Bronx, New York		98.30 feet/Fixed on-site datum was assigned a relative elevation of 100.00 feet	
DRILLING CONTRACTOR	**DRILLER**	**INSPECTOR**	
Aquifer Drilling & Testing, Inc.	C. Migliori	P. Narea	
DRILLING RIG	**TYPE/SIZE BIT**	**START DATE**	**END DATE**
Track-mounted drill rig	4 1/4" Hollow Stem Augers	8/22/2012	8/22/2012
SAMPLER TYPE	**HAMMER WEIGHT/DROP**	**TOTAL DEPTH**	**WATER LEVEL**
2' Split spoons	140 lb./30 in.	11 feet bgs	Not encountered

SAMPLES		DEPTH (FEET)	WATER	DESCRIPTION OF SOILS (SAA = Same As Above) f - fine m - medium c - coarse lt - light dk - dark tr - trace ltl - little	REMARKS (PID, STAINING, ODORS, ETC.) FP = Free Product N/S = No Staining, N/O = No odors SO = Slight Odor, MO = Moderate Odor STO = Strong Odor
NUMBER	RECOVERY IN FEET				
1	-	1		0 - 1': Concrete	PID = 0.0 ppm, N/S, N/O
2	-	3		1 - 5': Tan m-f sand, some silt, tr gravel (dry) Hand cleared to 5 feet bgs.	PID = 0.0 ppm, N/S, N/O
3	-	5 7		SAA (dry)	PID = 0.0 ppm, N/S, N/O
4	-	9		SAA (dry)	PID = 0.0 ppm, N/S, N/O
5	-	11		Brown silty sand, tr gravel, weathered bedrock (moist). Refusal/bedrock encountered at 11 feet bgs.	PID = 16.3 ppm, N/S, N/O Sample collected: PS96X-TRC-MW-09 (9-11')

TRC Engineers, Inc.
1430 Broadway, 10th Floor
New York, New York 10018
Phone 212 221 7822

BORING LOG

BORING PS96X-TRC-MW-10

SHEET 1 OF 1

JOB NAME/ CLIENT	PROJECT NO.	AREA OF CONCERN	
Public School 96X/NYCSCA	190209.0000.0001	Southern Playground Area	
ADDRESS		**ELEVATION/DATUM**	
650 Waring Avenue Bronx, New York		93.72 feet/Fixed on-site datum was assigned a relative elevation of 100.00 feet	
DRILLING CONTRACTOR	**DRILLER**	**INSPECTOR**	
Aquifer Drilling & Testing, Inc.	G. Rivera	M. Garrett	
DRILLING RIG	**TYPE/SIZE BIT**	**START DATE**	**END DATE**
Track-mounted drill rig	4 1/4" Hollow Stem Augers	8/8/2012	8/8/2012
SAMPLER TYPE	**HAMMER WEIGHT/DROP**	**TOTAL DEPTH**	**WATER LEVEL**
2' Split spoons	140 lb./30 in.	7 feet bgs	Not encountered

SAMPLES NUMBER	SAMPLES RECOVERY IN FEET	DEPTH (FEET)	WATER	DESCRIPTION OF SOILS (SAA = Same As Above) f - fine m - medium c - coarse lt - light dk - dark tr - trace ltl - little	REMARKS (PID, STAINING, ODORS, ETC.) FP = Free Product N/S = No Staining, N/O = No odors SO = Slight Odor, MO = Moderate Odor STO = Strong Odor
1	-	1		0 - 1': Asphalt	PID = 0.0 ppm, N/S, N/O
2	0.58	3		0 - 0.58': Lt Brown c-f sand, tr gravel (dry) (fill)	PID = 148 ppm, N/S, N/O
3	0.5	5		0-0.5': Brown c-f sand, tr gravel (dry) (fill) Hand cleared to 5 feet bgs.	PID = 690 ppm, N/S, NO Sample collected: PS96X-TRC-MW-10 (3-5')
4	1	7		0-1': Brown c-f sand, ltl silt, ltl clay (moist) Refusal/bedrock encountered at 7 feet bgs	PID = 98.3 ppm, N/S, NO Sample collected: PS96X-TRC-MW-10 (5-7')

TRC	TRC Engineers, Inc. 1430 Broadway, 10th Floor New York, New York 10018 Phone 212 221 7822	**BORING LOG**	**BORING PS96X-TRC-MW-11** **SHEET 1 OF 1**

JOB NAME/ CLIENT Public School 96X/NYCSCA	**PROJECT NO.** 190209.0000.0001	**AREA OF CONCERN** Sidewalk on Barker Ave.	
ADDRESS 650 Waring Avenue Bronx, New York		**ELEVATION/DATUM** 95.79 feet/Fixed on-site datum was assigned a relative elevation of 100.00 feet	
DRILLING CONTRACTOR Aquifer Drilling & Testing, Inc.	**DRILLER** G. Rivera	**INSPECTOR** M. Garrett	
DRILLING RIG Track-mounted drill rig	**TYPE/SIZE BIT** 4 1/4" Hollow Stem Augers	**START DATE** 8/8/2012	**END DATE** 8/8/2012
SAMPLER TYPE 2' Split spoons	**HAMMER WEIGHT/DROP** 140 lb./30 in.	**TOTAL DEPTH** 5.5 feet bgs	**WATER LEVEL** Not encountered

SAMPLES				DESCRIPTION OF SOILS	REMARKS
NUMBER	RECOVERY IN FEET	DEPTH (FEET)	WATER	(SAA = Same As Above) f - fine m - medium c - coarse lt - light dk - dark tr - trace ltl - little	(PID, STAINING, ODORS, ETC.) FP = Free Product N/S = No Staining, N/O = No odors SO = Slight Odor, MO = Moderate Odor STO = Strong Odor
1	-			0 - 1': Concrete 1 - 3': Lt Brown f-m sand, tr gravel, tr f boulder (dry) (fill)	PID = 1.4 ppm, N/S, N/O
		3		Hand cleared to 3 feet bgs.	
2	1.83			0-1.83': Lt Brown m-f sand, ltl clay, tr silt (dry)	PID = 475 ppm, N/S, NO Sample collected: PS96X-TRC-MW-11 (3-5')
		5			
3	0.5			0-0.5': Dk Brown m-f sand, ltl clay (dry)	PID = 398 ppm, N/S, NO Sample collected:
		7		Refusal/bedrock encountered at 5.5 feet bgs	PS96X-TRC-MW-11 (5-5.5')

TRC Engineers, Inc. 1430 Broadway, 10th Floor New York, New York 10018 Phone 212 221 7822	**BORING LOG**	**BORING PS96X-TRC-MW-12** **SHEET 1 OF 1**

JOB NAME/ CLIENT	**PROJECT NO.**	**AREA OF CONCERN**
Public School 96X/NYCSCA	190209.0000.0001	Sidewalk on Barker Ave.
ADDRESS		**ELEVATION/DATUM**
650 Waring Avenue Bronx, New York		99.49 feet/Fixed on-site datum was assigned a relative elevation of 100.00 feet
DRILLING CONTRACTOR	**DRILLER**	**INSPECTOR**
Aquifer Drilling & Testing, Inc.	C. Migliori	M. Garrett
DRILLING RIG	**TYPE/SIZE BIT**	**START DATE** / **END DATE**
Track-mounted drill rig	4 1/4" Hollow Stem Augers	8/7/2012 / 8/7/2012
SAMPLER TYPE	**HAMMER WEIGHT/DROP**	**TOTAL DEPTH** / **WATER LEVEL**
2' Split spoons	140 lb./30 in.	5 feet bgs / Not encountered

SAMPLES		DEPTH (FEET)	WATER	DESCRIPTION OF SOILS (SAA = Same As Above) f - fine m - medium c - coarse lt - light dk - dark tr - trace ltl - little	REMARKS (PID, STAINING, ODORS, ETC.) FP = Free Product N/S = No Staining, N/O = No odors SO = Slight Odor, MO = Moderate Odor STO = Strong Odor
NUMBER	RECOVERY IN FEET				
1	-			0 - 1': Concrete 1 - 3': Lt Brown f-m sand, tr gravel, tr red brick (dry) (fill)	PID = 20.6 ppm, N/S, N/O Sample collected:
		3		Hand cleared to 3 feet bgs.	PS96X-TRC-MW-12 (0-3')
2	0.833			0-0.833': Brown weathered bedrock (dry)	PID = 3.8 ppm, N/S, NO Sample collected:
		5		Refusal/bedrock encountered at 5 feet bgs.	PS96X-TRC-MW-12 (3-5')

TRC Engineers, Inc. 1430 Broadway, 10th Floor New York, New York 10018 Phone 212 221 7822	**BORING LOG**	**BORING PS96X-TRC-MW-13** **SHEET 1 OF 1**

JOB NAME/ CLIENT	**PROJECT NO.**	**AREA OF CONCERN**	
Public School 96X/NYCSCA	190209.0000.0001	Sidewalk on Waring Ave.	
ADDRESS		**ELEVATION/DATUM**	
650 Waring Avenue Bronx, New York		105.15 feet/Fixed on-site datum was assigned a relative elevation of 100.00 feet	
DRILLING CONTRACTOR	**DRILLER**	**INSPECTOR**	
Aquifer Drilling & Testing, Inc.	C. Migliori	M. Garrett	
DRILLING RIG	**TYPE/SIZE BIT**	**START DATE**	**END DATE**
Track-mounted drill rig	4 1/4" Hollow Stem Augers	8/16/2012	8/16/2012
SAMPLER TYPE	**HAMMER WEIGHT/DROP**	**TOTAL DEPTH**	**WATER LEVEL**
2' Split spoons	140 lb./30 in.	3 feet bgs	Not encountered

SAMPLES		DEPTH (FEET)	WATER	DESCRIPTION OF SOILS (SAA = Same As Above) f - fine m - medium c - coarse lt - light dk - dark tr - trace ltl - little	REMARKS (PID, STAINING, ODORS, ETC.) FP = Free Product N/S = No Staining, N/O = No odors SO = Slight Odor, MO = Moderate Odor STO = Strong Odor
NUMBER	RECOVERY IN FEET				
1	-			0 - 1': Concrete 1 - 3': Lt Brown/gray weathered bedrock (dry)	PID = 0.0 ppm, N/S, N/O
		3		Hand cleared to 3 feet bgs. Refusal/bedrock encountered at 3 feet bgs.	Sample collected: PS96X-TRC-MW-13 (1-3')

TRC Engineers, Inc. 1430 Broadway, 10th Floor New York, New York 10018 Phone 212 221 7822	**BORING LOG**	**BORING PS96X-TRC-MW-14** **SHEET 1 OF 1**

JOB NAME/ CLIENT	**PROJECT NO.**	**AREA OF CONCERN**	
Public School 96X/NYCSCA	190209.0000.0001	Sidewalk on Waring Ave.	
ADDRESS		**ELEVATION/DATUM**	
650 Waring Avenue Bronx, New York		Not surveyed	
DRILLING CONTRACTOR	**DRILLER**	**INSPECTOR**	
Aquifer Drilling & Testing, Inc.	C. Migliorie	L. Metcalf	
DRILLING RIG	**TYPE/SIZE BIT**	**START DATE**	**END DATE**
Track-mounted drill rig	4 1/4" Hollow Stem Augers	10/6/2012	10/6/2012
SAMPLER TYPE	**HAMMER WEIGHT/DROP**	**TOTAL DEPTH**	**WATER LEVEL**
NA	NA	2 feet bgs	Not encountered

SAMPLES		**DEPTH (FEET)**	**WATER**	**DESCRIPTION OF SOILS** **(SAA = Same As Above)** **f - fine m - medium c - coarse** **lt - light dk - dark tr - trace ltl - little**	**REMARKS** **(PID, STAINING, ODORS, ETC.)** **FP = Free Product** **N/S = No Staining, N/O = No odors** **SO = Slight Odor, MO = Moderate Odor** **STO = Strong Odor**
NUMBER	**RECOVERY IN FEET**				
1	-	3		0 - 0.75': Concrete 0.75-2': Brown to black f-m SAND, tr Silt, Gravel, and Weathered Bedrock (dry) Hand cleared to 2 feet bgs. Refusal/bedrock encountered at 2 feet bgs.	PID = 0.0 ppm, N/S, N/O

OPEN HOLE BEDROCK MONITORING WELL CONSTRUCTION DIAGRAM (FLUSH MOUNT)

PROJECT: P596X

WELL NUMBER: P596X-MW05

PROJECT NO.: 106-3830.0002

DATE COMPLETED: 6/6/09

FIELD GEOLOGIST: C De Carlo

FIELD GEOLOGIST: C. De Carlo

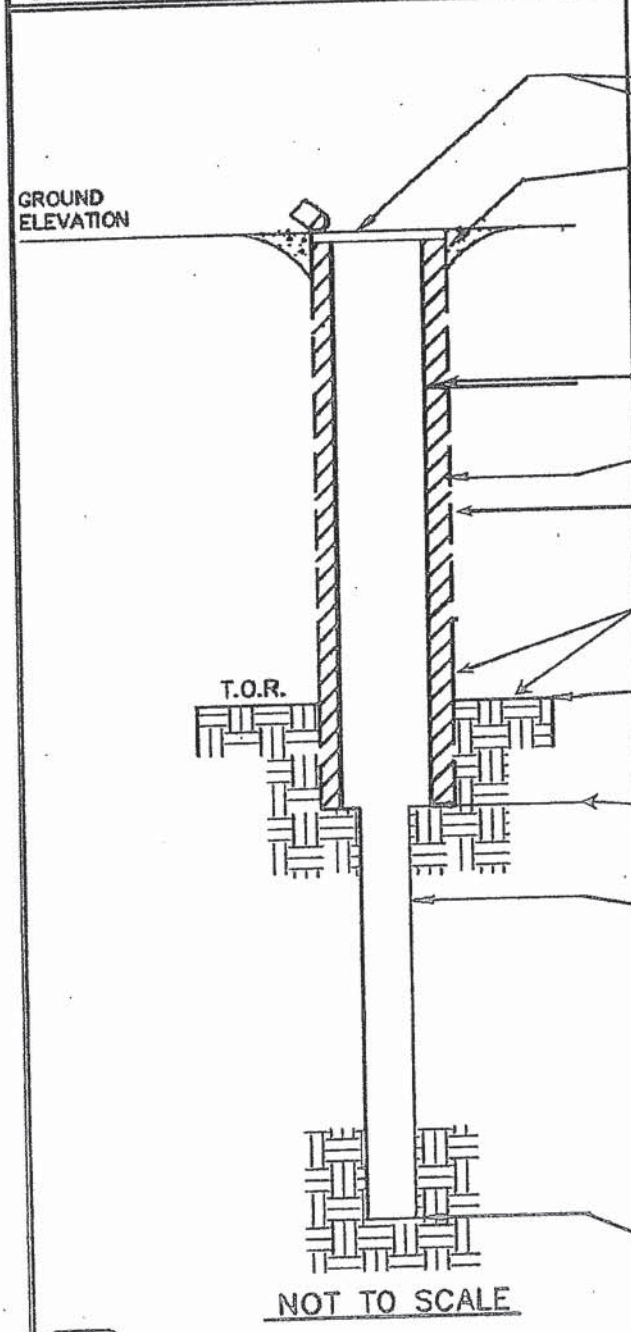
DRILLER: ADT

START DEPTH (FT): —

DRILLING METHOD: Air Rotary

SUMP INSTALLED?(Y/N): N SUMP LENGTH (FT): —

DEVELOPMENT METHOD: Whale Pump



Depth of Surface Plug (bgs in feet)	0.56
Diameter of Surface Plug (Ft)	0.75
Type of Surface Plug	Grout
I.D. of Surface Casing (Inches)	4-inch
Type of Surface Casing	Steel
Depth of Surface Casing (Ft)	
Borehole Diameter (Inches)	6-inch
Type of Backfill for Surface Casing	Grout
Backfill - Tremied (Y or N)	Y
Depth of Top of Seal (Ft)	0.75'
Type of Casing Seal:	Grout
Depth of Bottom of Seal (Ft)	3'
Seal - Tremied (Y or N)	Y
Depth of Top of Bedrock (Ft)	3'
Depth of Riser Inner Casing (Ft)	8'
O.D. of Hole in Bedrock (Inches)	4-inch
Well Bedrock Groundwater Capture Zone:	
Type of Bedrock:	Mica Schist
Depth of Hole	20'

Well Construction Remarks:

Water present @ 14' bgs

TETRA TECH

OPEN HOLE BEDROCK MONITORING WELL CONSTRUCTION DIAGRAM (FLUSH MOUNT)

PROJECT: PSTC X

WELL NUMBER: PSTC X - MW0C

PROJECT NO.: 106-3830 0002

DATE COMPLETED: 6/13/09

FIELD GEOLOGIST: C. De Carlo

FIELD GEOLOGIST: C. De Carlo

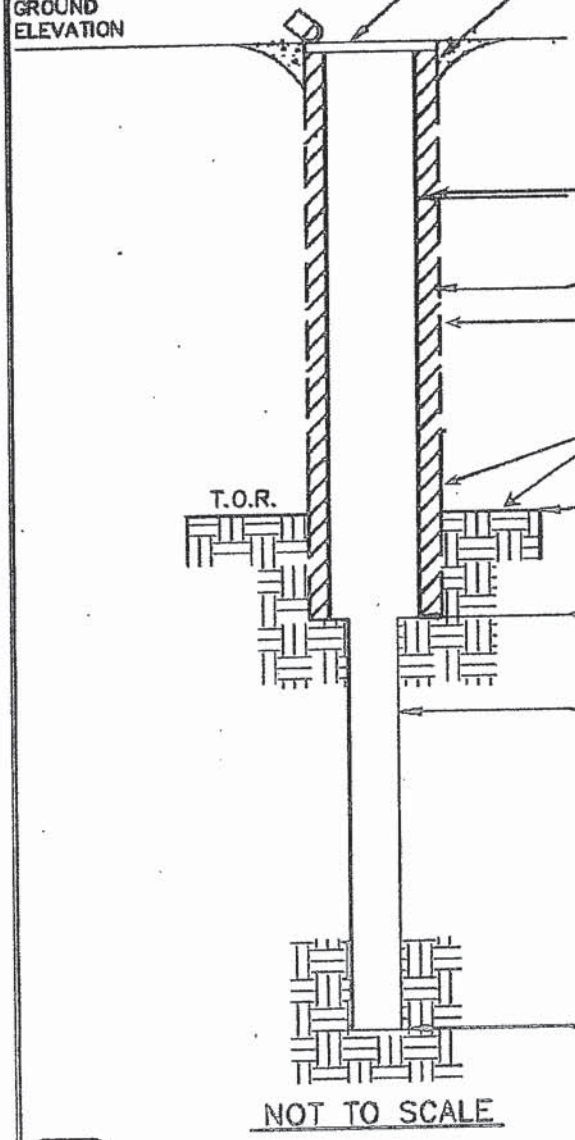
DRILLER: AOT

START DEPTH (FT):

DRILLING METHOD: Sonic

SUMP INSTALLED?(Y/N): N SUMP LENGTH (FT): —

DEVELOPMENT METHOD: Whale pumps

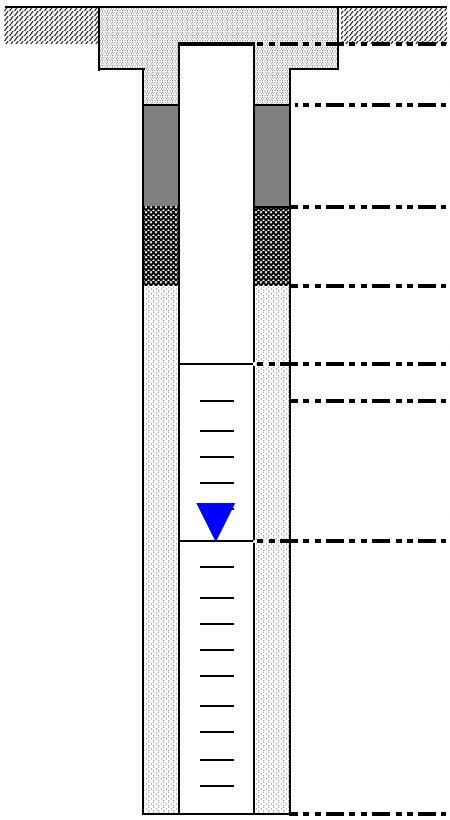


Depth of Surface Plug (bgs in feet)	0.94
Diameter of Surface Plug (Ft)	0.35
Type of Surface Plug	Grout
I.D. of Surface Casing (Inches)	4-inch
Type of Surface Casing	Steel
Depth of Surface Casing (Ft)	
Borehole Diameter (Inches)	6-inch
Type of Backfill for Surface Casing	Grout
Backfill - Tremied (Y or N)	Y
Depth of Top of Seal (Ft)	3-feet
Type of Casing Seal:	Grout
Depth of Bottom of Seal (Ft)	7'
Seal - Tremied (Y or N)	yes
Depth of Top of Bedrock (Ft)	2 ft
Depth of Riser Inner Casing (Ft)	7 ft
O.D. of Hole in Bedrock (Inches)	3-inch
Well Bedrock Groundwater Capture Zone:	
Type of Bedrock:	Mica sch. s+
Well Construction Remarks:	
Depth of Hole	22'

TETRA TECH

TRC Engineers, Inc. 1430 Broadway, 10th Floor New York, New York 10018 Phone 212 221 7822	**WELL INSTALLATION LOG**	**WELL: PS96X-TRC-MW-04** **SHEET 1 OF 1**

JOB NAME:	Public School 96X	DRILLING METHOD:	Air Rotary Rig
ADDRESS:	650 Waring Avenue	DRILLER:	Aquifer Drilling & Testing, Inc.
	Bronx, New York	INSTALLATION DATE:	8/15/2012
ELEVATION[1]:	93.93	DEVELOPMENT DATE:	8/15/2012
INSPECTOR:	Patrick Narea	DEPTH TO WATER[2]:	6.65
		PRODUCT THICKNESS:	None detected



Depth from Ground Surface (feet)	Elevation[1]	
0.00	93.93	Protective Manhole Cover, Ground Surface
0.29	93.64	Top of Casing (TOC) 2" PVC
1.00	92.93	Top of Grout
1.29	92.64	Bottom of Grout/Top of Bentonite Seal
2.29	91.64	Bottom of Bentonite Seal/Top of No. 1 Sand Pack
3.29	90.64	Top of Well Screen - Slot Size 0.01
5.00	88.93	Top of Bedrock
6.94	86.99	Water Table
18.29	75.64	Bottom of No. 1 Sand Pack/Bottom of Well Screen

Not to Scale

Notes:

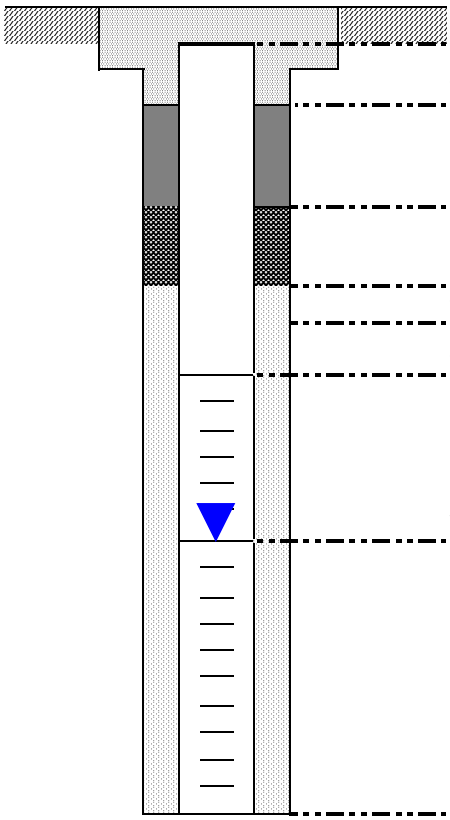
[1]Feet below arbitrary datum point which was given an elevation of 100 feet. Groundwater monitoring well was surveyed by Perfect Point Land Surveying on August 31, 2012.

[2]Feet below top of casing

TRC Engineers, Inc. 1430 Broadway, 10th Floor New York, New York 10018 Phone 212 221 7822	**WELL INSTALLATION LOG**	**WELL: PS96X-TRC-MW-07** **SHEET 1 OF 1**

JOB NAME:	Public School 96X	DRILLING METHOD:	Air Rotary Rig
ADDRESS:	650 Waring Avenue	DRILLER:	Aquifer Drilling & Testing, Inc.
	Bronx, New York	INSTALLATION DATE:	8/21/2012
ELEVATION[1]:	107.82	DEVELOPMENT DATE:	8/21/2012
INSPECTOR:	Patrick Narea	DEPTH TO WATER[2]:	11.68
		PRODUCT THICKNESS:	None detected

Depth from Ground Surface (feet)	Elevation[1]	
0.00	107.82	Protective Manhole Cover, Ground Surface
0.67	107.15	Top of Casing (TOC) 2" PVC
1.00	106.82	Top of Grout
1.67	106.15	Bottom of Grout/Top of Bentonite Seal
2.67	105.15	Bottom of Bentonite Seal/Top of No. 1 Sand Pack
3.00	104.82	Top of Bedrock
3.67	104.15	Top of Well Screen - Slot Size 0.01
12.35	95.47	Water Table
18.67	89.15	Bottom of No. 1 Sand Pack/Bottom of Well Screen



Not to Scale

Notes:

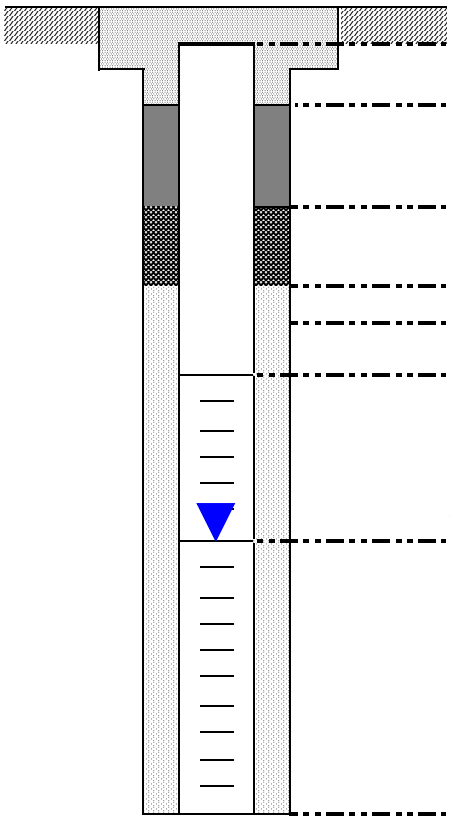
[1]Feet below arbitrary datum point which was given an elevation of 100 feet. Groundwater monitoring well was surveyed by Perfect Point Land Surveying on August 31, 2012.

[2]Feet below top of casing

TRC Engineers, Inc. 1430 Broadway, 10th Floor New York, New York 10018 Phone 212 221 7822	**WELL INSTALLATION LOG**	**WELL: PS96X-TRC-MW-08** **SHEET 1 OF 1**

JOB NAME:	Public School 96X	DRILLING METHOD:	Air Rotary Rig
ADDRESS:	650 Waring Avenue	DRILLER:	Aquifer Drilling & Testing, Inc.
	Bronx, New York	INSTALLATION DATE:	8/21/20122
ELEVATION[1]:	102.93	DEVELOPMENT DATE:	8/22/2012
INSPECTOR:	Patrick Narea	DEPTH TO WATER[2]:	13.53
		PRODUCT THICKNESS:	None detected

Depth from Ground Surface (feet)	Elevation[1]	
0.00	102.93	Protective Manhole Cover, Ground Surface
0.76	102.17	Top of Casing (TOC) 2" PVC
1.00	101.93	Top of Grout
1.76	101.17	Bottom of Grout/Top of Bentonite Seal
2.76	100.17	Bottom of Bentonite Seal/Top of No. 1 Sand Pack
3.00	99.93	Top of Bedrock
3.76	99.17	Top of Well Screen - Slot Size 0.01
14.29	88.64	Water Table
18.76	84.17	Bottom of No. 1 Sand Pack/Bottom of Well Screen



Not to Scale

Notes:

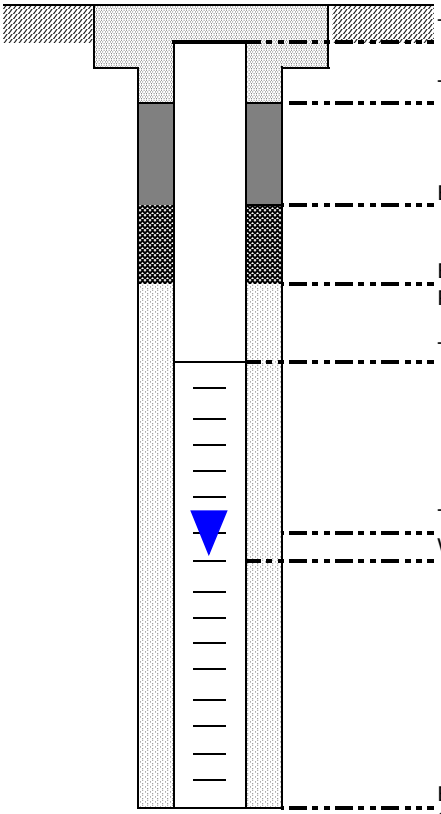
[1]Feet below arbitrary datum point which was given an elevation of 100 feet. Groundwater monitoring well was surveyed by Perfect Point Land Surveying on August 31, 2012.

[2]Feet below top of casing

TRC Engineers, Inc. 1430 Broadway, 10th Floor New York, New York 10018 Phone 212 221 7822	**WELL INSTALLATION LOG**	**WELL: PS96X-TRC-MW-09** **SHEET 1 OF 1**

JOB NAME:	Public School 96X	DRILLING METHOD:	Air Rotary Rig
ADDRESS:	650 Waring Avenue	DRILLER:	Aquifer Drilling & Testing, Inc.
	Bronx, New York	INSTALLATION DATE:	8/23/2012
ELEVATION[1]:	98.30	DEVELOPMENT DATE:	8/23/2012
INSPECTOR:	Patrick Narea	DEPTH TO WATER[2]:	11.21
		PRODUCT THICKNESS:	None detected

Depth from Ground Surface (feet)	Elevation[1]	
0.00	98.30	Protective Manhole Cover, Ground Surface
0.32	97.98	Top of Casing (TOC) 2" PVC
1.00	97.30	Top of Grout
1.50	96.80	Bottom of Grout/Top of Bentonite Seal
2.50	95.80	Bottom of Bentonite Seal/Top of No. 1 Sand Pack
5.32	92.98	Top of Well Screen - Slot Size 0.01
11.00	87.30	Top of Bedrock
11.53	86.77	Water Table
15.32	82.98	Bottom of No. 1 Sand Pack/Bottom of Well Screen



Not to Scale

Notes:

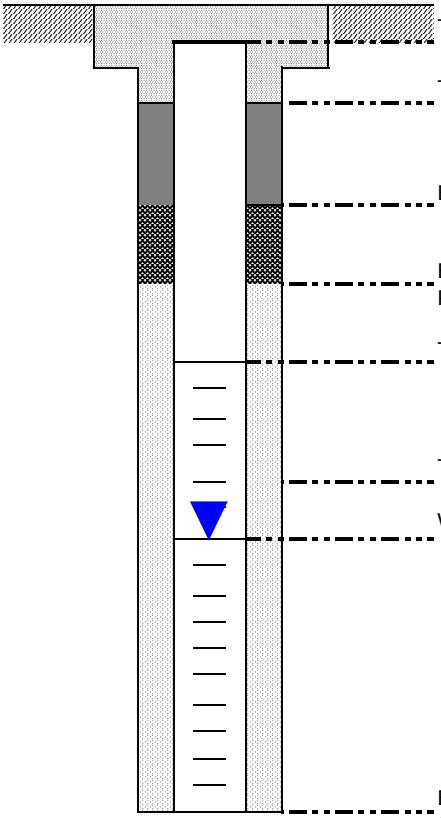
[1]Feet below arbitrary datum point which was given an elevation of 100 feet. Groundwater monitoring well was surveyed by Perfect Point Land Surveying on August 31, 2012.

[2]Feet below top of casing

TRC Engineers, Inc. 1430 Broadway, 10th Floor New York, New York 10018 Phone 212 221 7822	**WELL INSTALLATION LOG**	**WELL: PS96X-TRC-MW-10** **SHEET 1 OF 1**

JOB NAME:	Public School 96X	DRILLING METHOD:	Air Rotary Rig
ADDRESS:	650 Waring Avenue	DRILLER:	Aquifer Drilling & Testing, Inc.
	Bronx, New York	INSTALLATION DATE:	8/10/2012
ELEVATION[1]:	93.72	DEVELOPMENT DATE:	8/10/2012
INSPECTOR:	Patrick Narea	DEPTH TO WATER[2]:	9.25
		PRODUCT THICKNESS:	None detected

Depth from Ground Surface (feet)	Elevation[1]	
0.00	93.72	Protective Manhole Cover, Ground Surface
0.40	93.32	Top of Casing (TOC) 2" PVC
1.00	92.72	Top of Grout
1.40	92.32	Bottom of Grout/Top of Bentonite Seal
2.40	91.32	Bottom of Bentonite Seal/Top of No. 1 Sand Pack
3.40	90.32	Top of Well Screen - Slot Size 0.01
7.00	86.72	Top of Bedrock
9.65	84.07	Water Table
18.40	75.32	Bottom of No. 1 Sand Pack/Bottom of Well Screen



Not to Scale

Notes:

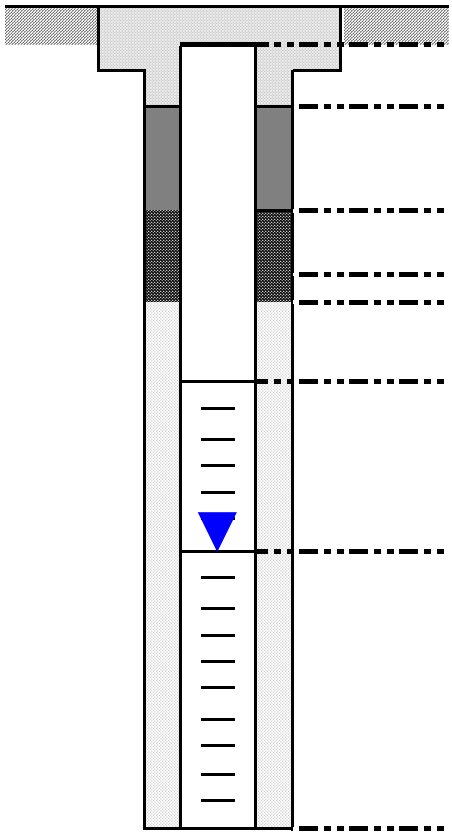
[1]Feet below arbitrary datum point which was given an elevation of 100 feet. Groundwater monitoring well was surveyed by Perfect Point Land Surveying on August 31, 2012.

[2]Feet below top of casing

TRC Engineers, Inc. 1430 Broadway, 10th Floor New York, New York 10018 Phone 212 221 7822	**WELL INSTALLATION LOG**	**WELL: PS96X-TRC-MW-11** **SHEET 1 OF 1**

JOB NAME:	Public School 96X	DRILLING METHOD:	Air Rotary Rig
ADDRESS:	650 Waring Avenue	DRILLER:	Aquifer Drilling & Testing, Inc.
	Bronx, New York	INSTALLATION DATE:	8/8/2012
ELEVATION[1]:	95.79	DEVELOPMENT DATE:	8/8/2012
INSPECTOR:	Patrick Narea	DEPTH TO WATER[2]:	17.76
		PRODUCT THICKNESS:	None detected

Depth from Ground Surface (feet)	Elevation[1]	
0.00	95.79	Protective Manhole Cover, Ground Surface
0.88	94.91	Top of Casing (TOC) 2" PVC
1.00	94.79	Top of Grout
3.88	91.91	Bottom of Grout/Top of Bentonite Seal
5.50	90.29	Top of Bedrock
5.88	89.91	Bottom of Bentonite Seal/Top of No. 1 Sand Pack
8.88	86.91	Top of Well Screen - Slot Size 0.01
18.64	77.15	Water Table
23.88	71.91	Bottom of No. 1 Sand Pack/Bottom of Well Screen



Not to Scale

Notes:

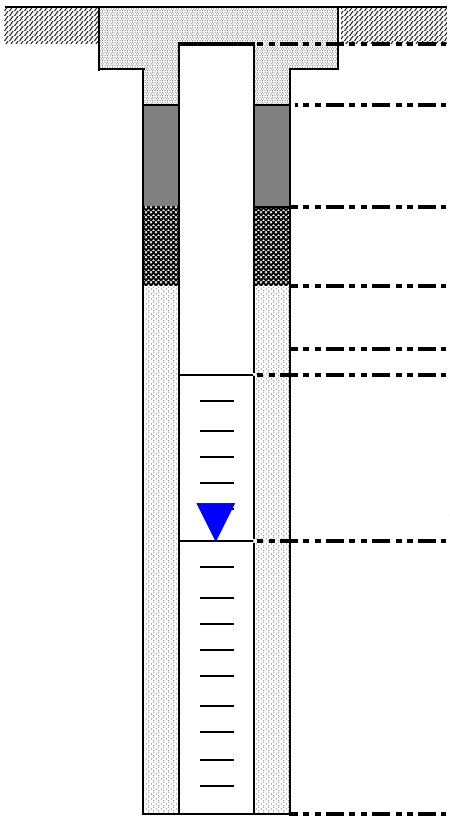
[1]Feet below arbitrary datum point which was given an elevation of 100 feet. Groundwater monitoring well was surveyed by Perfect Point Land Surveying on August 31, 2012.

[2]Feet below top of casing

TRC Engineers, Inc. 1430 Broadway, 10th Floor New York, New York 10018 Phone 212 221 7822	**WELL INSTALLATION LOG**	**WELL: PS96X-TRC-MW-12** **SHEET 1 OF 1**

JOB NAME:	Public School 96X	DRILLING METHOD:	Air Rotary Rig
ADDRESS:	650 Waring Avenue	DRILLER:	Aquifer Drilling & Testing, Inc.
	Bronx, New York	INSTALLATION DATE:	8/7/2012
ELEVATION[1]:	99.49	DEVELOPMENT DATE:	8/7/2012
INSPECTOR:	Patrick Narea	DEPTH TO WATER[2]:	14.46
		PRODUCT THICKNESS:	None detected

Depth from Ground Surface (feet)	Elevation[1]	
0.00	99.49	Protective Manhole Cover, Ground Surface
0.79	98.70	Top of Casing (TOC) 2" PVC
1.00	98.49	Top of Grout
2.79	96.70	Bottom of Grout/Top of Bentonite Seal
3.79	95.70	Bottom of Bentonite Seal/Top of No. 1 Sand Pack
5.00	94.49	Top of Bedrock
5.79	93.70	Top of Well Screen - Slot Size 0.01
15.25	84.24	Water Table
20.79	78.70	Bottom of No. 1 Sand Pack/Bottom of Well Screen



Not to Scale

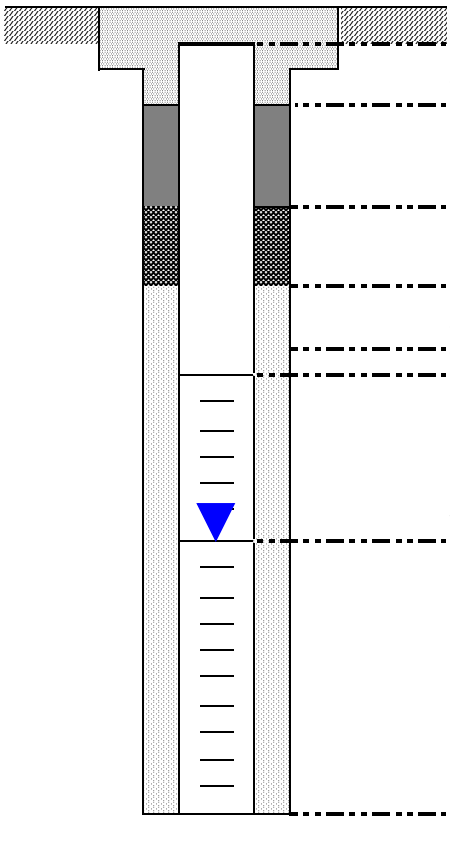
Notes:

[1]Feet below arbitrary datum point which was given an elevation of 100 feet. Groundwater monitoring well was surveyed by Perfect Point Land Surveying on August 31, 2012.

[2]Feet below top of casing

TRC Engineers, Inc. 1430 Broadway, 10th Floor New York, New York 10018 Phone 212 221 7822	**WELL INSTALLATION LOG**	**WELL: PS96X-TRC-MW-13** **SHEET 1 OF 1**

JOB NAME:	Public School 96X	DRILLING METHOD:	Air Rotary Rig
ADDRESS:	650 Waring Avenue	DRILLER:	Aquifer Drilling & Testing, Inc.
	Bronx, New York	INSTALLATION DATE:	8/16/2012
ELEVATION[1]:	105.15	DEVELOPMENT DATE:	8/16/2012
INSPECTOR:	Patrick Narea	DEPTH TO WATER[2]:	12.32
		PRODUCT THICKNESS:	None detected



Depth from Ground Surface (feet)	Elevation[1]	
0.00	105.15	Protective Manhole Cover, Ground Surface
0.39	104.76	Top of Casing (TOC) 2" PVC
1.00	104.15	Top of Grout
1.29	103.86	Bottom of Grout/Top of Bentonite Seal
2.29	102.86	Bottom of Bentonite Seal/Top of No. 1 Sand Pack
3.00	102.15	Top of Bedrock
3.39	101.76	Top of Well Screen - Slot Size 0.01
12.71	92.44	Water Table
18.39	86.76	Bottom of No. 1 Sand Pack/Bottom of Well Screen

Not to Scale

Notes:

[1]Feet below arbitrary datum point which was given an elevation of 100 feet. Groundwater monitoring well was surveyed by Perfect Point Land Surveying on August 31, 2012.

[2]Feet below top of casing

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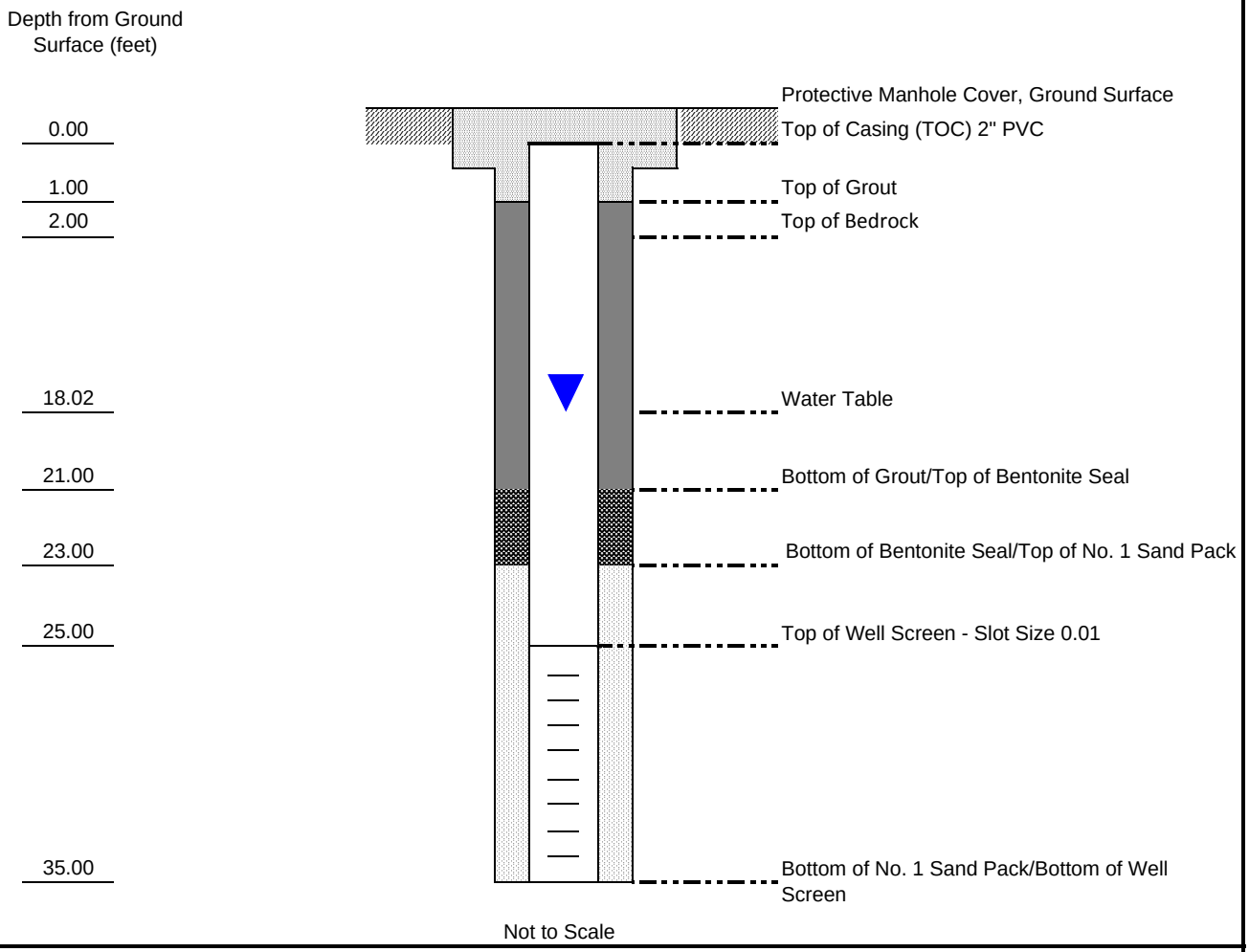
Phone 212 221 7822

WELL INSTALLATION LOG

WELL: PS96X-TRC-MW-14

SHEET 1 OF 1

JOB NAME:	Public School 96X	DRILLING METHOD:	Air Rotary Rig
ADDRESS:	650 Waring Avenue	DRILLER:	Aquifer Drilling & Testing, Inc.
	Bronx, New York	INSTALLATION DATE:	10/6/2012
ELEVATION[1]:	Well not surveyed	DEVELOPMENT DATE:	10/6/2012
INSPECTOR:	Lindsay Metcalf	DEPTH TO WATER[1]:	18.02
		PRODUCT THICKNESS:	None detected



Not to Scale

Notes:

[1]Feet below top of casing

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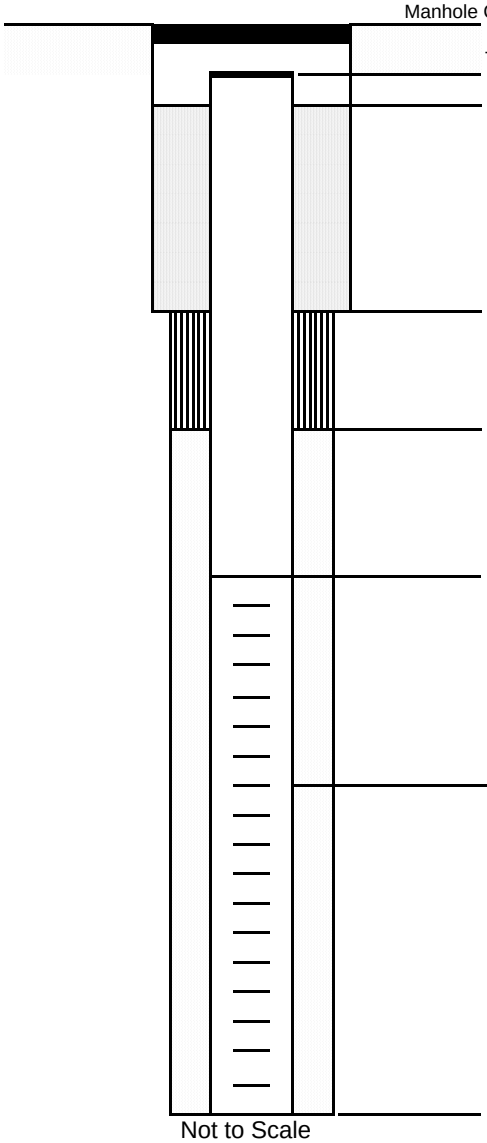
WELL INSTALLATION LOG

WELL: PS96X-TRC-MW-15
SHEET 1 OF 1

JOB NAME:	Proposed Addition 96X	WELL NUMBER:	PS96X-TRC-MW-15
ADDRESS:	650 Waring Avenue, Bronx, NY	DRILLING METHOD:	Air Rotary
INSTALLATION DATE:	11/7/13	DRILLER:	Aquifer Drilling and Testing
DEVELOPMENT DATE:	11/7/13	GAUGING DATE:	11/15/13
ELEVATION/ DATUM:	NAVD 1988 Datum	DEPTH TO WATER[2]:	7.05
INSPECTOR:	P.Castellano	DEPTH TO PRODUCT:	None detected

Depth from Ground Surface (feet)	Elevation[1] (feet)	
0.00	93.84	Manhole Cover, Ground Surface
0.55	93.29	Top of Casing (TOC) 2" PVC
1.00	92.84	Top of Concrete Collar
2.00	91.84	Top of Bentonite Slurry/Bottom of Concrete Collar
3.00	90.84	Top of No. 1 Sand Pack/ Bottom of Bentonite Seal
4.00	89.84	Top of Well Screen
7.05	86.79	Depth to water
19.00	74.84	End of Well Screen / End of Boring



Not to Scale

Notes:

[1]Elevation is in NAVD 1988 Datum. Groundwater monitoring well was surveyed by Perfect Point Land Surveying on November 15, 2013.

[2]Feet below top of casing.

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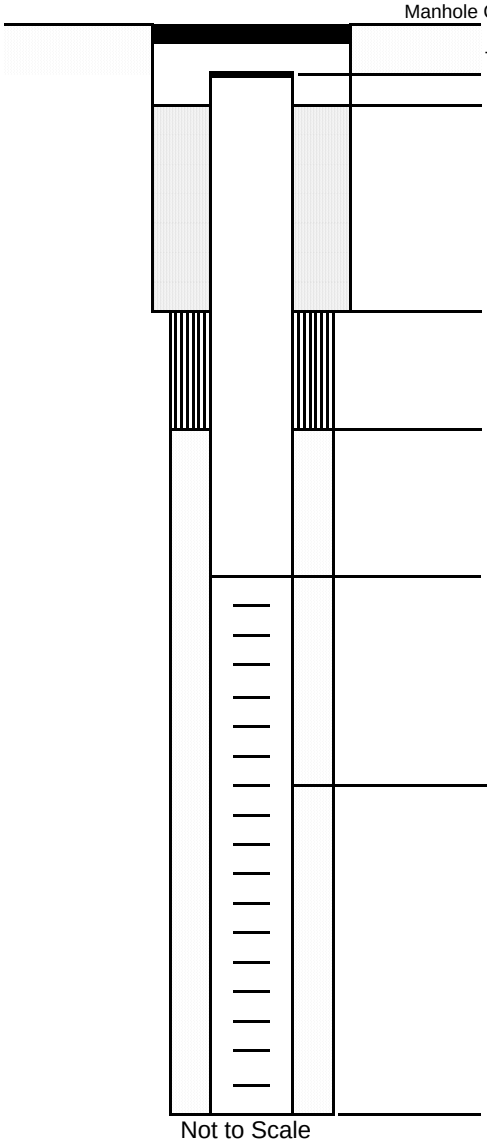
New York, New York 10018
Phone 212 221 7822

WELL INSTALLATION LOG

WELL: PS96X-TRC-MW-16
SHEET 1 OF 1

JOB NAME:	Proposed Addition 96X	WELL NUMBER:	PS96X-TRC-MW-16
ADDRESS:	650 Waring Avenue, Bronx, NY	DRILLING METHOD:	Air Rotary
INSTALLATION DATE:	11/7/13	DRILLER:	Aquifer Drilling and Testing
DEVELOPMENT DATE:	11/7/13	GAUGING DATE:	11/16/13
ELEVATION/ DATUM:	NAVD 1988 Datum	DEPTH TO WATER[2]:	9.31
INSPECTOR:	P.Castellano	DEPTH TO PRODUCT:	None detected

Depth from Ground Surface (feet)	Elevation[1] (feet)	
0.00	93.67	Manhole Cover, Ground Surface
0.35	93.32	Top of Casing (TOC) 2" PVC
1.00	92.67	Top of Concrete Collar
2.00	91.67	Top of Bentonite Slurry/Bottom of Concrete Collar
3.00	90.67	Top of No. 1 Sand Pack/ Bottom of Betonite Seal
4.00	89.67	Top of Well Screen
9.31	84.36	Depth to water
19.00	74.67	End of Well Screen End of Boring



Not to Scale

Notes:

[1]Elevation is in NAVD 1988 Datum. Groundwater monitoring well was surveyed by Perfect Point Land Surveying on November 15, 2013.

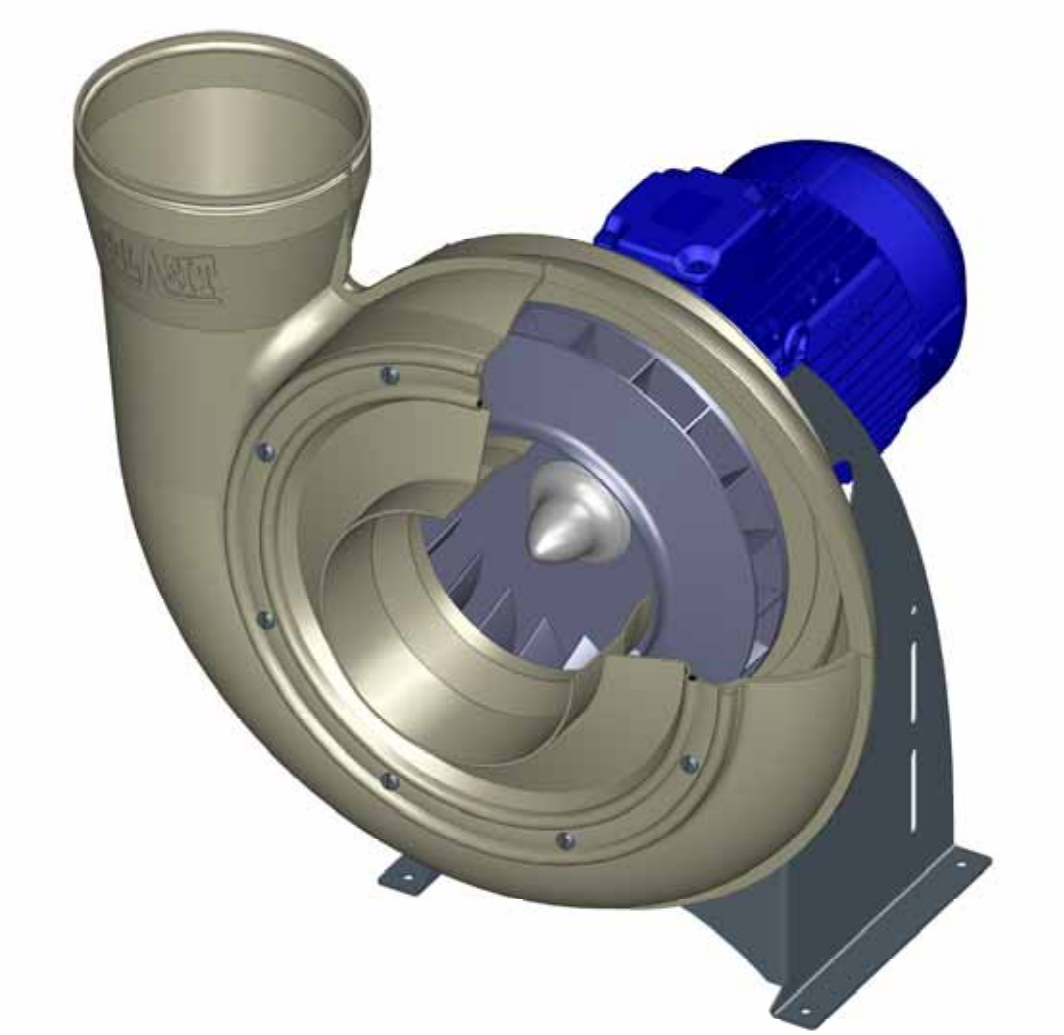
[2]Feet below top of casing.

NOT TO SCALE

APPENDIX D
O&M MANUAL

SSDS Manuals and Gas Vapor Barrier Repair Details

Plastic industrial fan



Agent:	COLASIT AG – Faulenbachweg 63 – CH-3700 Spiez Phone: +41 33 655 61 61 – Fax: +41 33 654 81 61 e-mail: info@colasit.ch
COLASIT Order No.:	
Fan type:	
Year of manufacture:	
☐ For use in Ex zones	☐ Not for use in Ex zones

TD-000 674-E

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1.8 General risk matrix

Operation

The safety regulations prevailing at the operator's location are mandatory and must be observed at all times. Before making an intervention, the process must be stopped, i.e. all mechanical movement must be stopped and it must be ensured that no automatic motion can occur.

Missing safety devices

If the fan is equipped with safety devices, they may neither be modified nor removed. Further safety devices of suitable design must be fitted by the operator and are subject to his control.

Disregard of safety precautions

Please implement all safety measures so that the fan, together with its associated equipment, can operate properly and any danger to persons, materials and products can be excluded.

Putting the fan out of operation

In the case of damage to or failure of safety devices, the fan must be stopped and put out of operation. It may only be put into operation again when the safety devices are fully functional again.

Overpressure

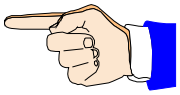
If the fan is operated in overpressure conditions with normal seals, there is a danger of gas escaping.
For operation in overpressure conditions, special seals must be fitted.

Electricity

When any work is carried out on the fan, the electric motor must be deenergised and secured to prevent it from switching on. The main power switch must be secured against operation by third parties using a lockable device (e.g. padlock) by the persons working on the fan. **Full disconnection of the motor is only permissible in case of complete removal!**
The safety regulations for work on electrical equipment prevailing at the place of operation must be observed at all times and be available for reference at the place of operation.

Electrostatic charge

Media flowing through the plastic components may cause the buildup of electrostatic charge. These are harmless to persons who do not react to electrical impulses in the body



Unsuitable materials

Through the use of inappropriate materials, the fan and/or parts may be damaged or become non-functional. Please always use original spare parts and contact the manufacturer in any case of doubt.

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Dangerous media

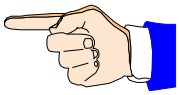
Depending on the mode of operation, fan parts may come in contact with dangerous media.
Work on the fan or carrying out maintenance work is not allowed during operation. Before carrying out any work, any dangerous media must be removed from the system and, when required, must be neutralized and secured in such a way that an inflow of dangerous media is prevented.

1.9 EC conformity of the COLASIT fan

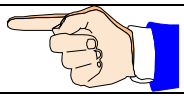
The fan was designed, built and tested to Directive 2006/42 EC.
In addition to this EC Directive and EN standards which have the equivalent status of a Swiss standard, Swiss safety and accident-prevention regulations have also been taken into account.
An EC Declaration of Conformity in terms of the EC guidelines 2006/42 EC on machines will be issued along with the fan.

1.10 Restrictions when commissioning

We stipulate that putting into operation is prohibited as long as the fan, including all parts belonging to it or equipment connected to it, has not been installed and checked out and until the operating manual has been read completely before commissioning.



We stipulate that the fan may only be put into operation when the safety inspector has given his approval. He is obliged to record this approval in a protocol.

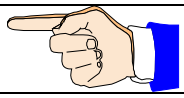


The disregard of these stipulations constitutes negligence.

1.11 General operation conditions

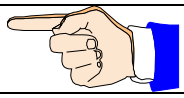
The permissible operating conditions are indicated on the manufacturer‘s plate.

The fan is not suitable for the transport of solids in the air flow. This operating mode will lead to the destruction of the fan.

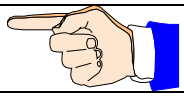


The ducts on the intake and delivery sides must always be open. A closed duct will lead to a rise in temperature which could cause the destruction of the fan.

The minimum air speed through the fan is 3 meters per second.

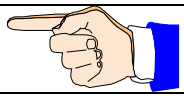


The maximum air speed may not exceed 30 meters per second through the fan.



The standard motors are designed for normal operating conditions (ambient temperature +40°C, altitude below 1000 m above sea level, air pressure up to 1050 hPa). In case of any divergence from these conditions, please contact COLASIT.

Compliance with these operating conditions is the responsibility of the operator.



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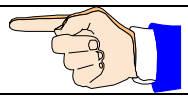
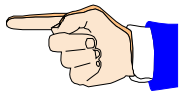
2 Explosion protection

COLASIT plastic fans are suitable for the conveyance of gases in Zone 1 or 2 (Equipment Category 1 or 2) depending on the model. COLASIT plastic fans are not suitable for the conveyance of gases in Zone 0 (Equipment Category 1).
The zone classification of the conveyed medium and the site of installation must be made known by the fan operator so that COLASIT can take the necessary measures to prevent the risk of ignition.

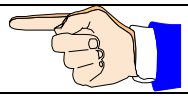
The explosion-proof COLASIT fans are not suitable for the conveyance of explosive dusts



No modifications may be made to ATEX-certified fans. All work on the fan may only be carried out by ATEX-trained skilled personnel.
Otherwise the ATEX Certificate will lose its validity.

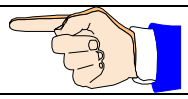


On ATEX certified fans, the external grounding terminal of the motor and fan must be connected to a potential equalization system.

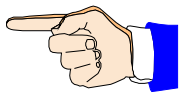


Motors with protection type "e" are standard for using in the explosion-proof design of our fans. The standard version of the motors used complies with temperature class T3 (maximum surface temperature 200ºC). As special-purpose design, motors with protection type "d" or motors with temperature class T4 (maximum surface temperature 135°C) are also available.

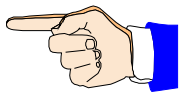
The user must define a suitable temperature class for his application that does not reach the ignition temperature of his conveyed medium.



Please also observe the specifications in the operating instructions of the motor manufacturer.
The thermal motor protection must be connected in compliance with the manufacturer's specifications (operating instructions).



If a frequency converter is fitted, we recommend using pressure-proof enclosed motors. In addition, a certified PTC resistor releasing device must be fitted.
The following specifications must be included on the motor rating plate: min and max frequencies, min and max speeds, min and max torque or output, limit temperature PTC and PTC release time.



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2.1 Fan Ex marking

The Ex marking is located on the rating plate of each ATEX fan. On a fan of Equipment Category 2 (Zone 1), it looks like this

Ⓔx II 2/3G c T3

CE	CE-marking
Ⓔx	Marking denoting prevention of explosions
II	Equipment Category II, for all Ex applications which do not fall in Class I (mines and surface workings).
2/3G	Equipment Category inside/outside the fan Equipment Category 2 is the equivalent of Zone 1 and Equipment Category 3 is the equivalent of Zone 2 “G“ fan fort he conveyance of expolosive gases
c	Protection type „design safety“
T3	Temperature class T3: Max. surface temp. 200 °C T4: Max. surface temp.. 135 °C

2.2 Correct installation of ATEX fan

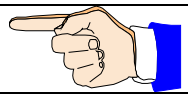
The fan must be installed properly to guarantee trouble-free operation. To document proper installation, you will find a form on the last pages of this operating manual. The fitter must confirm the proper installation item for item on this form.
The signed form must be kept by the safety officer or operating company.

COLASIT also offers a comprehensive installation service for fans.

3 Shipping, unpacking, inspection, storage

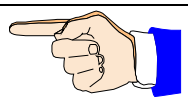
The fan is completely assembled and can be delivered in a closed film wrapping.
Please make sure the delivery corresponds to the shipping documents.

Please examine the packaging for external damage and report any damage immediately to the transport company, the supervisor and the manufacturer.

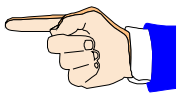


Please handle the fan with care. During transportation, only apply strain on the steel parts. Plastic is sensitive to impact and knocks, especially in the temperature range under +5°C.

When the film is removed, the intake and pressure nozzles are open and unprotected against the intrusion of foreign objects. Therefore, please do not remove the protective film until shortly before final installation.



Storage
If the fans are not put into operation immediately, store them in a clean dry place where they are protected from impacts, vibrations, and temperature fluctuations and where the air humidity is under 90%.
If these storage conditions are not available, switch the fans on at regular intervals to exclude the risk of condensate forming. Before switching on, unscrew the condensate drain plugs each time and replace them afterwards.



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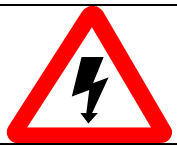
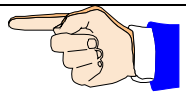
Store the fan in a dry, weather-protected place and cover with a tarpaulin to protect it from dust and soiling.
If stored for over one year, test whether the fan bearings rotate freely before putting into operation.

4 Installation, configuration

Before installation, check whether all the locking screws (including the motor screws) are tightened properly.
Check the electrical connections if wired at the factory.



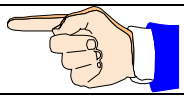
Before installation, check that there are no foreign bodies in the coil or in the intake and pressure connections.



The fan must be installed at a location provided and prepared by the customer and must be secured and connected in such a way that any possible vibration occurring can be absorbed by the vibration dampers supplied by COLASIT.
If no ducting is foreseen on the intake side, the intake connection should be protected by a sturdy protective grating (10mm mesh) to be provided by the customer.
Connection ducting on the pressure side must be routed to prevent the backflow of foreign bodies, rainwater or condensate into the fan. To ensure this, please use the COLASIT condensate drain nozzles.
Due to the possibility of noise nuisance, we recommend that the fan should not be installed in the immediate vicinity of workplaces.

5 Commissioning, initial startup, test run

The fan should only be put into operation after inspection and approval by the safety officer.



5.1 Inspection of the installation and settings

Check list:
Prior to commissioning and initial start-up, it must be guaranteed that

- ☐ the fan is installed vibration-free and mechanically secured,
- ☐ all components are cleaned both on the inside and the outside and are free from foreign bodies,
- ☐ all intake and pressure ducts connections are leak-proofed
- ☐ all rotating parts are protected against unintentional contact,
- ☐ the electrical connections are installed and their function tested,
- ☐ a lockable main control switch is available to which the fan is connected
- ☐ the EMERGENCY-STOP equipment is functionally tested,
- ☐ the safety inspector has made sure that safety equipment exists,
- ☐ the operating personnel is familiar with the operating manual,
- ☐ the safety inspector has given his approval fort he operation of the installation and that no external persons are present in the plant area

If envisaged by procedural regulations provided by the operator, minutes have to be taken on the commissioning work, including the observance of the check list.

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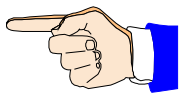
5.2 Drive

The fan is driven by an electric motor which is connected to the impeller shaft either directly or via a V-belt.

The motor electrical specifications are indicated on the motor's rating plate or in the motor manufacturer's data sheet.

When speed is controlled by means of a frequency converter, the maximum speed is limited by COLASIT to the value indicated on the manufacturer's rating plate.

If the frequency converter is not supplied by COLASIT, the operator is responsible for compliance with the maximum speed limitation. In this case, COLASIT will not assume any liability for damage that may be attributed to exceeding the maximum speed.



In the case of motor outputs over 3kW, we recommend the use of a soft starter or a star-delta connection.

5.3 Electrical installations, EMERCENCY STOP

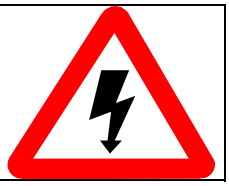
The electrical installations may only be carried out by an authorised electrician in accordance with the regulations prevailing at the site at which the fan is installed.

To interrupt the power supply, an EMERGENCY STOP switch must be provided. It is advisable to mount this switch in the vicinity of the emergency exit.

Please request confirmation from an in-house electrician that the electrical installations were carried out and tested in accordance with regulations, that all functions were tested (or simulated) and that the rotational direction is correct.

Warning

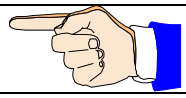
Do not turn power on or off without prior warning to persons in the area where the fan is operating. Switching operations must be co-ordinated with other functions in the working area of the fan.



6 Operation

6.1 Safety instructions

The fan must be operated according to this manual. This will avoid the occurrence of any damage.



Supervision

The fan must not be operated unattended as long as it conveys substances whose reactions are unknown or if unexpected reactions are anticipated.
If supervision must be withdrawn for operational reasons, this must be reported to the safety officer and the system must be secured in such a way that no unauthorized intervention can be carried out. The safety officer must decide on issues regarding supervision.

6.2 Putting out of operation

An internal process instruction must regulate the work to be carried out as well as the preparatory work for putting back into operation (e.g. cleaning).

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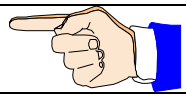
7 Maintenance, repair, cleaning

7.1 Preparation

Before any work is carried out on the fan, the fan must be set to its "safety position".



The „safety position“ is defined as follows:

- The drive must be currentless and the main switch secured against switching on,
- The fan impeller can be manually rotated,
- Fan must be flushed with fresh air and be condensate-free,
- Fan must be at room temperature,
- Personal protective equipment must be available and it must be worn. (Use of protective gloves because of sharp edges, ear protectors if necessary).
- A sign, e.g. „Under-repair“, must be attached to the system,
- The safety devices may be removed,
- The work to be carried out must not be done under time pressure,
- The general and specific regulations on accident prevention as well as the EKAS guidelines (Switzerland) must be observed,
- The safety officer must be informed about the nature and course of the work,

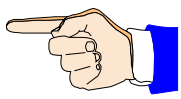
If the intake and delivery ducts of the fan are dismounted for a longer period of time, the openings must be closed off.

7.2 Performance

The fan must be maintained in accordance with the Maintenance Plan below. The maintenance work carried out must be noted down in the logbook (see the section on Logbook).

Every week	Every month	Every year
• Make a visual inspection of fan for damage, leaks, corrosion and attachment. • Check the smooth running of the fan and electric motor. • Check state and tension of the V-belt and replace if necessary.	• Check the impeller and casing for deposits and clean if necessary. • Check the shaft bearing for smooth running and vibrations. Bearing maintenance -> see chart below for regreasing intervals. • Remove any dust deposits on the fan and motor. • Check the flexible transitions from fan to duct system for leaks and state. • Check the function of the condensate nozzle. • Check the state of the vibration dampers. • Check the state of the hub gasket (if fitted).	• Carry out a thorough cleaning of the entire fan (including impeller). • Check the parts in contact with the conveyed medium for corrosion. • Check the minimum clearance between the impeller and casing (minimum 1% of intake diameter, maximum 20mm). • Measure the vibrations at bearings (KA) or motor (DA). Permitted value acc. to ISO 14694 Class BV-3, 5.1mm/s. • Check the safety devices (e.g. splinter protection or intake grating) for condition and function. • Check the stands for damage and stability. • Check all screw unions for firm seating.

Normally the bearings are designed for a service life of 40,000 hrs. After this period the bearings must be replaced. The service life of the bearings is reduced when subjected to increased requirements (e.g. high temperature, aggressive ambient air or operation with frequency converter).



On drives with V-belts, check the tension regularly and monitor the belts closely particularly during the first weeks of operation. This also applies after long periods of downtime. Excessive tension leads to bearing damage, insufficient tension leads to slip, wear and frictional heat.

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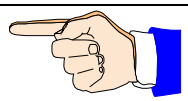
After replacing a V-belt, check the tension after 1 to 4 hours of operation and retension as necessary.
The fan bearings are maintenance-free.
The bearing temperature of 70ºC may not be exceeded. In cases of high stress (environment) the grease quantity loses its lubricity over time due to mechanical stresses, ageing and increasing contamination. This issue can reduce the service life of the bearings.

Components which are not intended for repair by the operator must be sent to the manufacturer or agent for repair or replacement (e.g. damaged impeller).

Your agent or COLASIT also offers customer services

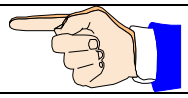
Manufacturer	**COLASIT AG** P.O. 85 CH 3700 Spiez / Switzerland	
	Tel.:	0041 (0)33 655 61 61
	Fax.:	0041 (0)33 654 81 61
	e-mail	info@colasit.ch
Agent	see front page	

Deposits on the impeller and soiling lead to imbalance and as a result to vibrations with undesirable side effects.
If vibration occurs, switch the fan off immediately



Contamination and encrustations should be removed with a soft tool without damaging the surface (e.g. with a wooden spatula or scraper).If possible, use water and a household cleaning agent

Solvents can corrode the material. These may only be used with the written consent of COLASIT.



To carry out cleaning work, we recommend the production of a process instruction

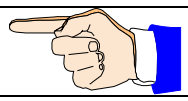
8 Spare parts

Please identify components by means of the position and drawing numbers as well as the order number and type designation.
Use only original spare parts. Our warranty becomes null and void if other or unapproved components are used.
Please address your spare parts order to our customer service department.

9 Operating instructions

To operate the fan, we recommend the production of process instructions. These documents are intended to simplify repetitive workflows, reduce the risk of incorrect operation and are a valuable aid for training and when personnel changes occur.
If the fan must be qualified, process instructions are an absolute prerequisite.
You will find important instructions on how to produce process instructions in various chapters of this operating manual.

To help ensure the safe operation of the fan, COLASIT offers the service of reviewing process instructions prepared by the operator



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10 Logbook

For your own safety and as an aid to personal responsibility, we recommend the keeping of a logbook for the entire period during which the fan is in service.
All events should be recorded in the logbook.
In case of damage and also in case of an accident, this document is the first source of information.
For example, enter the date and your signature:

- Start and end of a work cycle
- Special events, even if they do not concern the fan itself (e.g. power failure, alarm)
- Change of supervision staff (e.g. in case of shift operation),
- Repairs carried out and spare parts installed,
- Putting out of operation,
- Special instructions,
- etc.

11 Disposal

Before disposing of plastics and other components (complete or as broken parts), please clean them as necessary to avoid any danger to the environment.
Dispose of the components properly. Instruct a waste disposal company to do this or return them to us for disposal.

12 Troubleshooting

If faults occur, we recommend you identify and clear them using the following table.
If the fault cannot be cleared, please contact our customer service department.

Fault	Possible causes	Remedy
Fan not running smoothly	Impeller imbalance	Rebalance by specialist company
	Impeller caked up	Clean carefully rebalance if necessary
	Material corrosion on impeller due to aggressive conveyed medium.	Consult the manufacturer
	Impeller deformed due to high temperature.	Consult the manufacturer. Install new impeller. Check bearings
	V-belt drive not correctly aligned.	Adjust belt drive
V-belt torn or damaged	Normal wear and tear	Replace V-belts in sets
	V-belt pretensioned too strongly	Tension replacement belt to manufacturer's specifications
V-belts slip due to	Incorrect pretension	Check belt tension and retighten if necessary
	Foreign bodies or soiling in grooves or pulleys	Clean pulleys and check belt profile
Leak at shaft bushing	Seal not suitable for application	Consult the manufacturer
Leak on sleeves	Sleeves defective	Replace sleeves
	Tensioning straps not tight enough	Retighten tensioning straps
Fan output too low	Incorrect rotation direction of impeller	Change rotation direction
	Pressure losses in ducts too high	Change duct arrangement
	Restrictors not or only partly open	Check opening on site

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Fault	Possible causes	Remedy
	Intake or pressure duct blocked	Remove blockage
Fan fails to reach its rated speed	Electrical switching mechanisms incorrectly adjusted	Check motor protection setting and reset if necessary
	Motor winding defective	Please consult the manufacturer
	Drive motor drive not correctly designed	Please consult manufacturer to verify starting torque
Grinding noises when fan is running or starting	Intake duct fitted under tension	Remove intake duct an realign
Rise in temperature of roller bearings	Bearing was not greased	Change bearing and grease at regular intervals as stipulated in the maintenance instructions

13 Retrofittable original accessories

If not already a part of our scope of supply, these original parts are available ex stock when ordered.
- Frequency converters
- Elastic sleeves
- Vibration dampers
- Condensats drains
- Motor cover for outdoor installation
- Splinter protection

14 Fan identification

The following rating plate is affixed to each COLASIT fan:

1 Manufacturer

2 Field for CE marking and applicable standards

3 ATEX-identification, for details see the section on Explosion Protection

4 Fan specifications: fan type, casing design, material of casing and impeller, order number and date of manufacture.

5 Technical specifications

Part 2: Units

15 Design and function of the CMVeco 125 - 400

All impellers in this series are balanced to better than Q6.3 according to VDI 2060.
The casing with its thermoplastic rear panel is screwed onto the support base and can be easily dismantled for inspection or cleaning purposes.

The fans are available in 2 standard designs
- Direct drive
- V-belt drive

As a basic principle, plastic fans are to be installed on the intake side in order to avoid leaks.

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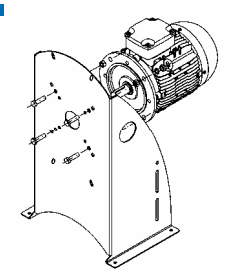
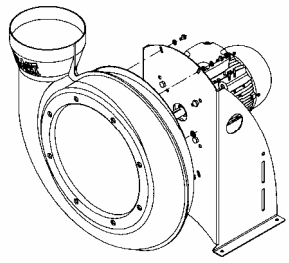
17 Assembly instructions

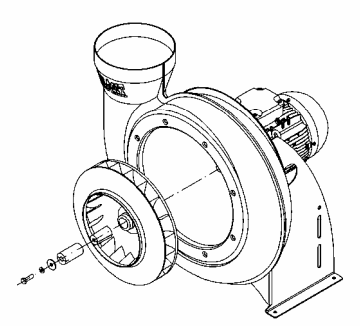
17.1 Assembly instructions CMVeco 125 – 400 with direct drive



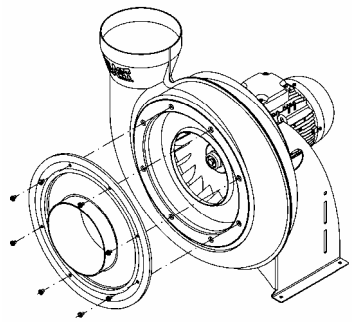
1. Attach motor to the support



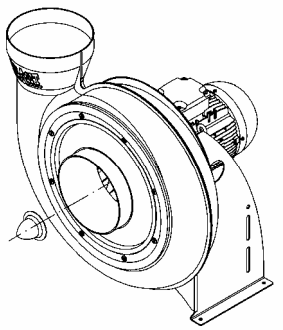
2. Attach casing to the support



3. Fasten impeller with the clamp adapter set on motor shaft
   (do not tight yet the clamp adapter)



4. Fasten inlet section on the casing



5. Adjust impeller, tighten clamp adapter set.
   Mount hub cap

Dismantling in the same way but in reverse order

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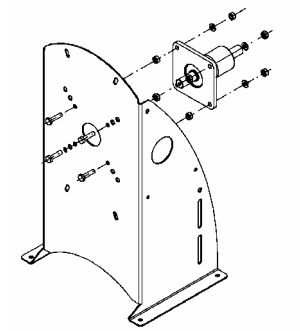
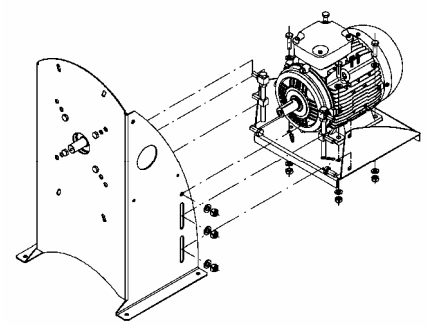
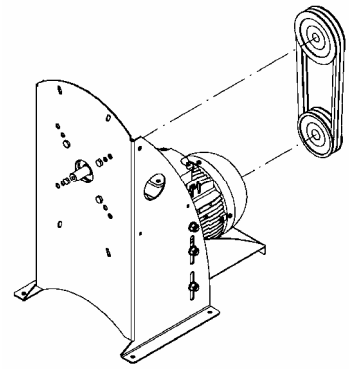
17.2 Assembly instructions for CMVeco 125 – 400 with V-belt drive



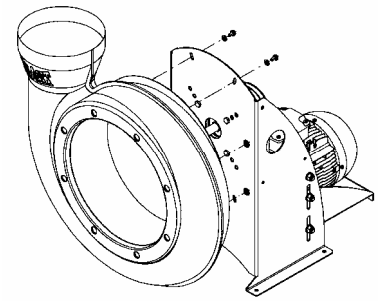
1. Install flanged bearings and support plates



2. Bolt motor bracket together and attach motor



3. Install V-belt drive. Tension drive belt



4. Attach casing to the support

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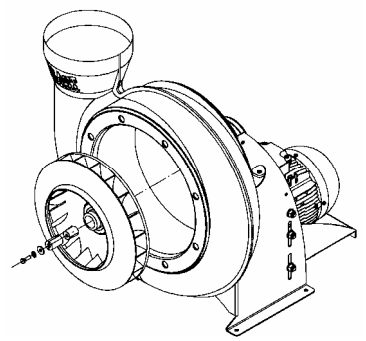
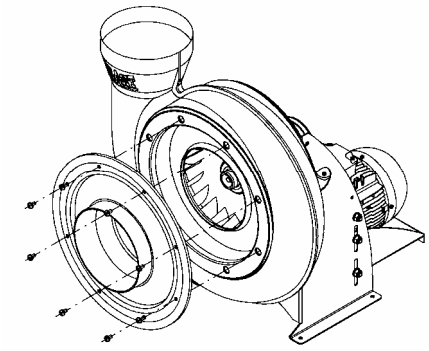
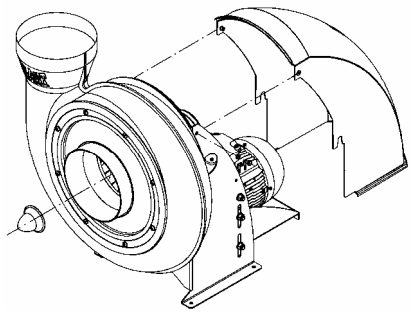


5. Fasten impeller with clamp adapter set on motor shaft
   (Do not tight yet the clamp adapter)



6. Fasten inlet section on the casing



7. Adjust impeller, tighten clamp adapter set
   Mount hub cap. Mount V-belt protection

Dismantling in the same way but in reverse order

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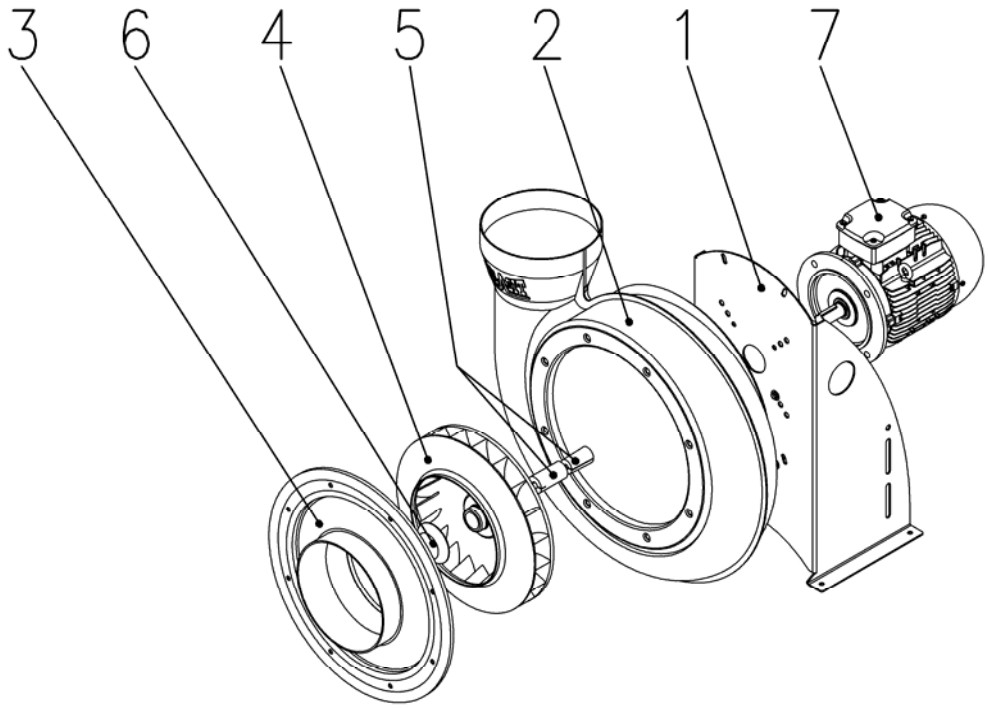
18 Spare parts lists

18.1 Spare parts list for CMVeco 125 – 400 with direct drive



1 Support
2 Casing
3 Inlet section
4 Impeller
5 Clamp adapter set
6 Hub cap
7 Flange motor

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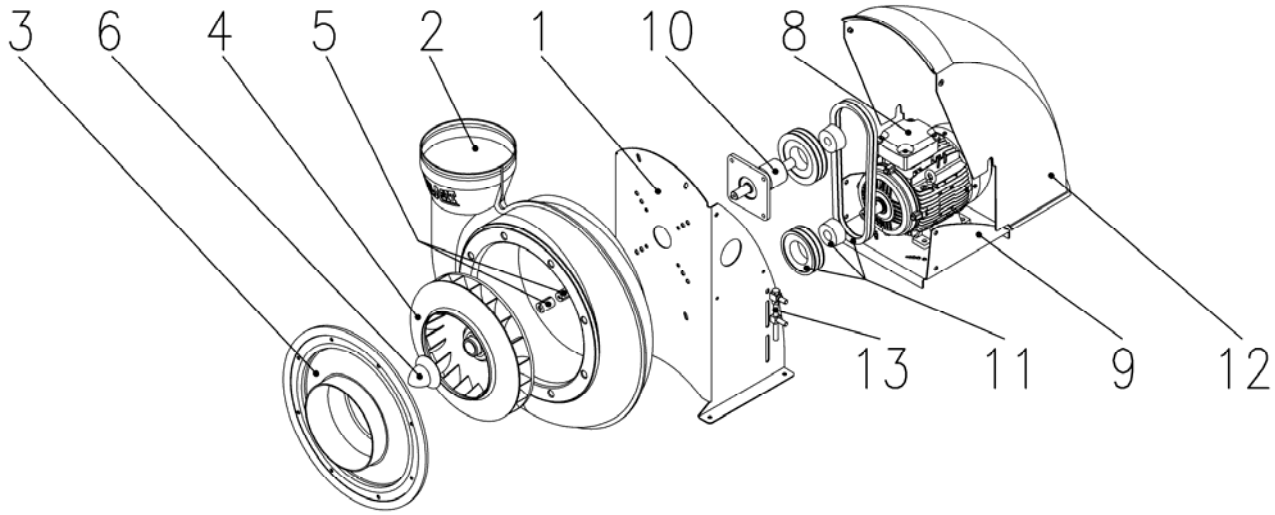
18.2 Spare parts list for CMVeco 125 – 400 with V-belt drive



1	Support	8	Feet motor
2	Casing	9	Motor plate with bracket
3	Inlet section	10	Flange bearing unit
4	Impeller	11	V-belt
5	Clamp adapter set	12	V-belt protection
6	Hub cap	13	Setting screw

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Part 3: Certification

19 Certifications

19.1 CE Manufacturer's declaration

EG-Konformitätserklärung
CE Déclaration de conformité
EC Declaration of conformity

Wir
Nous
We

COLASIT AG
Postfach 85
CH-3700 Spiez

erklären in alleiniger Verantwortung, dass das Produkt
déclarons de notre seule responsabilité que le produit
bearing sole responsibility, hereby declare that the product

Kunststoff-Industrieventilator
Ventilateur industriel en plastique
Plastic industrial fan
CMVeco 125-400

auf das sich diese Erklärung bezieht, mit der/den folgenden Norm(en) oder normativen Dokumenten übereinstimmt:
auquel se rapporte la présente déclaration est conforme aux normes ou aux documents normatifs suivants:
referred to by this declaration is in conformity with the following standards or normative documents:

Bestimmungen der Richtlinie Désignation de la directive Provisions of the directive	**Titel und/oder Nummer sowie Ausgabedatum der Norm(en):** Titre et/ou numéro ainsi que date d'émission de la/des norme(s): Title and/or number and date of issue of the standard(s):	
2006/42/EG: Maschinensicherheit 2006/42/CE: Sûreté des machines 2006/42/EC: Machinery safety	**EN ISO 12100-1: 2004** **EN ISO 12100-2: 2004** **EN ISO 14121-1: 2007** **EN ISO 13857: 2008** **EN 60204-1: 2006**	
2004/108/EG: Elektromagnetische Verträglichkeit 2004/108/CE: Compatibilité électromagnétique 2004/108/EC: Electromagnetic compatibility	**EN 61000-6-2: 2005**	
Name und Adresse des Dokumentationsverantwortlichen: Nom et addresse de la personne responsable de la documentation: Name and address of the person authorised to compile the relevant technical documentation:	**Urs Wenger** **COLASIT AG** **Faulenbachweg 63** **CH-3700 Spiez**	
Bei Verwendung im Ex-Bereich Pour utilisation dans zone Ex For use in Ex zones		
94/9 EG: Geräte und Schutzsysteme zur bestimmungsgemässen Verwendung in explosionsgefährdeten Bereichen 94/9 CE: Appareils et système de protection destinés à une utilisation correcte en atmosphère explosibles 94/9 EC: Equipment and protective systems intended for use in potentially explosive atmospheres	**EN 1127-1: 2008** **EN 13463-1: 2009** **EN 13463-5: 2005** **EN 14986: 2007**	
Ex-Kennzeichnung: Marquage Ex: Ex Marking:	Ex	**II 3/- G** **II 3/3G** **II 2/3G** **II 2/2G** — **c T4** **c T4** **c T4** **c T4**

Spiez, 22-12-2010

U.Moser (Leiter Technik/Responsable dép. technique/Chief technical officer)

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19.2 ATEX-Declaration of Conformity

ATEX-Declaration of Conformity

Equipment, components and protection systems for use for their intended purpose in explosion protected zones – **Directive RL 94/9/EC (ATEX)**

Document number : **TD-000 744**

Product designation: Medium pressure radial fan CMVeco 125-400 ATEX

Hersteller: COLASIT AG
Postfach 85
3700 Spiez

Product description: Plastic industrial fan fort he conveyance of chemically aggressive gases, vapour or correspondingly contaminated air.

The conformity assessment process was conducted in compliance with Directive 94/9/EC (ATEX).
The results are recorded in the confidential **Test Report TD-T586-21-3**. All related documents are kept at the centres named below:

QS Zürich AG, named centre CE 1254
Wehntalerstrasse 3
CH-8057 Zürich

COLASIT hereby certifies compliance with the basic health and safety requirements for the design and manufacture of equipment and protection systems for use for their intended purpose in explosive atmospheres in compliance with Annex II of the Directive.

The following harmonised standards were applied:

EN 1127-1: Explosive atmospheres – Explosion protection, Part 1, 2008
EN 13463-1: Non-electrical equipment for potentially explosive atmospheres, Part 1, 2009
EN 13463-5: Non-electrical equipment for potentially explosive atmospheres, Part 5, 2005
EN 14986: Design of fans working in potentially explosive atmospheres, 2007

The marking on the appliance must comprise the following information:

- Ex II 3/- G c T4 (conveyed medium Zone 2, site of installation no zone)
- Ex II 3/3 G c T4 (conveyed medium Zone 2, site of installation no Zone 2)
- Ex II 2/3 G c T4 (conveyed medium Zone 1, site of installation no Zone 2)
- Ex II 2/2 G c T4 (conveyed medium Zone 1, site of installation no Zone 1)

The associated operating instructions contain important safety instructions and regulations for putting the named equipment into operation in compliance with Directive 94/9/EC (ATEX).

Changes to the named equipment are prohibited except with the manufacturer's express approval in writing.

If the named equipment is built into a higher level machine, the new risks ensuing from the integration must be assessed by the manufacturer of the new machine.

Spiez, 21st. September 2009

Der ATEX-Officer

On behalf of the executive management

COLASIT AG
Plastic construction
CH-3700 Spiez

Phone +41 (0)33 655 61 61 Fax +41 (0)33 654 81 61

www.colasit.com

Enclosure

Declaration of Conformity No. TD-000 744

Description of appliance or protective system

The radial fans CMVeco 125-400 ATEX with direct drive and V-belt drive extract room air or process exhaust air. They are directly or indirectly driven by electric motors via V-belts.

Special conditions	:	If the fans are operated within explosive atmospheres in Zone 1 or 2, they may only be driven by motors for which an appropriate approval (EC type test certificate) has already been issued. Temperature Class T4: If the site of installation is Zone 1/2, an explosion proof motor with temperature class T4 must be fitted. If an explosion proof motor with temperature class T3 is used, temperature class T3 shall apply to the entire fan Ambient temperature: T 0-40°C Maximum temperature of intake medium: 60°C The minimum flow velocity through the fan has to be minimum 3m/s. On versions with V-belt drive, only V-belts may be used if they conform with the requirements of EN 13463-5 Chap. 7.2 and possess an appropriate factory certificate in compliance with EN 10204-2.1. All service and repair work must be carried out by trained service personnel.
Additional information:		The radial fans of Equipment Category 3 may only be used to extract gases where the frequency of occurrence of combustible or explosive atmospheres is equivalent to Ex-Zone 2.

Basic safety and health requirements:

Fulfilled by standards.

This certificate may only be copied in full without any changes.

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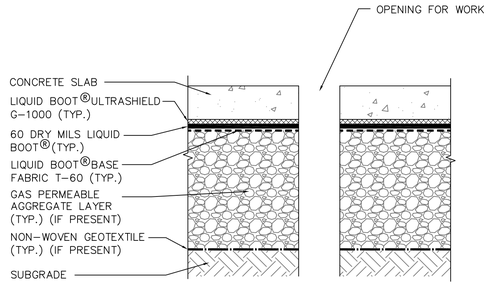
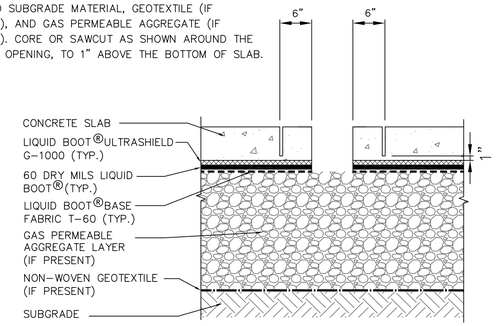
STEP 1:

REMOVE FLOOR COVERINGS, CONCRETE SLAB, AND SUB-GRADE MATERIALS REQUIRED TO PERFORM THE WORK. MEASURE THE SLAB THICKNESS.



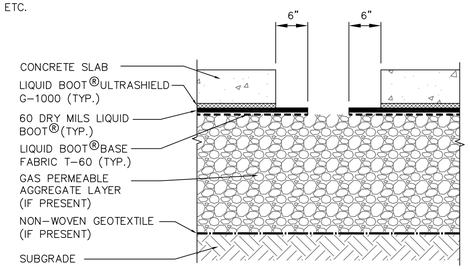
STEP 2:

AFTER INTRUSIVE ACTIVITIES ARE COMPLETE, REPLACE REMOVED SUBGRADE MATERIAL, GEOTEXTILE (IF PRESENT), AND GAS PERMEABLE AGGREGATE (IF PRESENT). CORE OR SAWCUT AS SHOWN AROUND THE EXISTING OPENING, TO 1" ABOVE THE BOTTOM OF SLAB.



STEP 3:

USE A CHIPPING HAMMER TO CAREFULLY REMOVE CONCRETE AS SHOWN. EXPOSE EXISTING LIQUID BOOT® MEMBRANE. CAREFULLY REMOVE EXPOSED LIQUID BOOT® G-1000 ULTRASHIELD WHILE LEAVING THE 60 DRY MILS OF LIQUID BOOT AND LIQUID BOOT® BASE FABRIC INTACT. CLEAN THE EXPOSED LIQUID BOOT® TO ENSURE MEMBRANE IS FREE OF ALL DUST, DIRT, GREASE, CURING COMPOUNDS, AND RELEASING AGENTS, ETC.

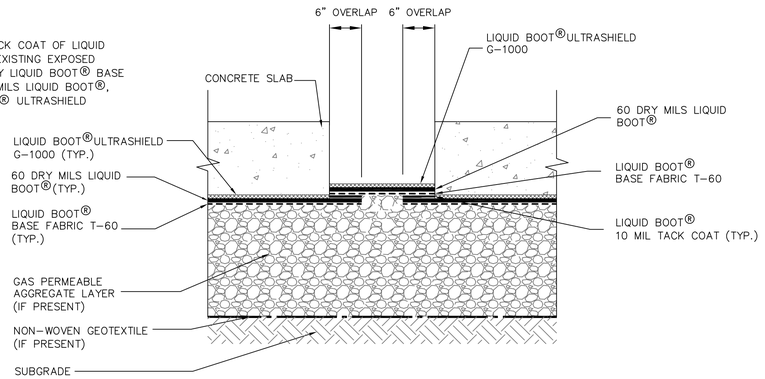


NOTES:

1. DETAILS SHOW TYPICAL CONDITIONS. ACTUAL CONDITIONS MAY VARY. PRIOR TO MOBILIZING CONSULT WITH IEH DIVISION OF THE AUTHORITY REGARDING SITE SPECIFIC REQUIREMENTS.
2. RELATIVE THICKNESS OF GAS VAPOR BARRIER SHOWN IS EXAGGERATED FOR ILLUSTRATIVE PURPOSES.
3. DRAWING NOT TO BE USED FOR STRUCTURAL, ARCHITECTURAL OR OTHER REFERENCE EXCEPT FOR GAS VAPOR BARRIER DETAILS.
4. ANY DEVIATION FROM THIS INSTALLATION MUST BE SUBMITTED TO AUTHORITY FOR APPROVAL.
5. ALL GAS VAPOR BARRIER WORK MUST BE COMPLETED BY A MANUFACTURER-CERTIFIED CONTRACTOR.
6. THE IEH DIVISION OF THE AUTHORITY MUST BE NOTIFIED FIVE (5) BUSINESS DAYS PRIOR TO START OF WORK.
7. DO NOT USE FOR INSTALLATION OF NEW PENETRATIONS (SUCH AS PIPING OR CONDUIT) THROUGH FLOOR SLAB.
8. FOR HORIZONTAL SURFACES ONLY.

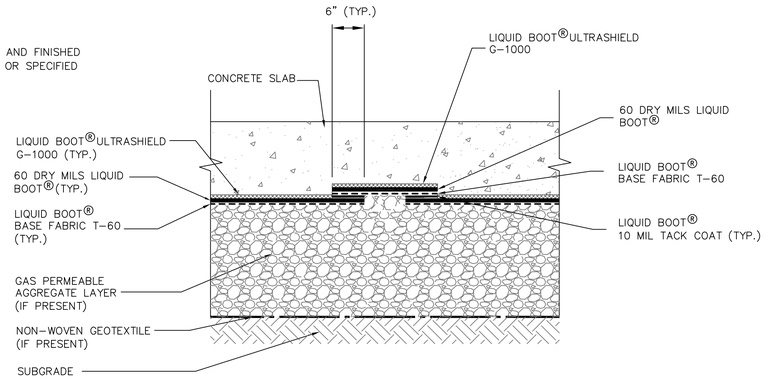
STEP 4:

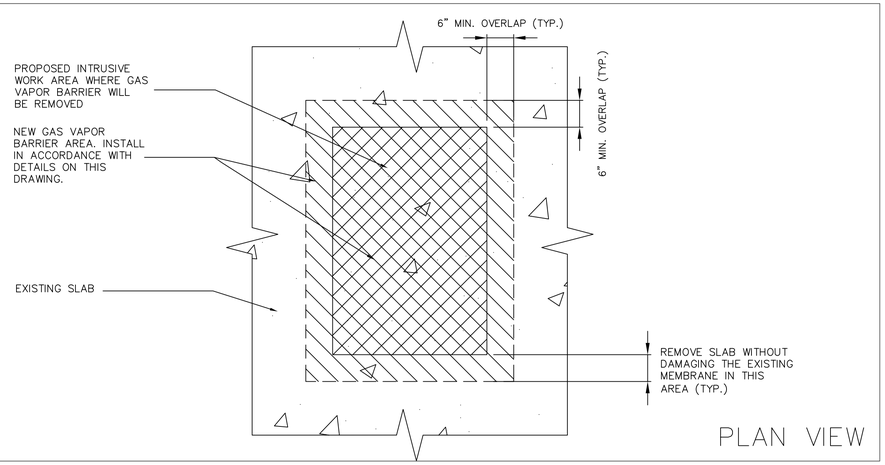
APPLY 10 MIL TACK COAT OF LIQUID BOOT® TO THE EXISTING EXPOSED MEMBRANE. APPLY LIQUID BOOT® BASE FABRIC, 60 DRY MILS LIQUID BOOT®, AND LIQUID BOOT® ULTRASHIELD G-1000.



STEP 5:

RESTORE CONCRETE AND FINISHED FLOOR TO ORIGINAL OR SPECIFIED CONDITIONS.





PLAN VIEW

LIQUID BOOT REPAIR – PRODUCT LIST:

1. LIQUID BOOT (FLUID APPLIED)
2. LIQUID BOOT ULTRASHIELD G-1000
3. LIQUID BOOT BASE FABRIC T-60

REVISIONS				
NO.	DESCRIPTION	BY	DATE	PAPER SIZE: 24" x 36"

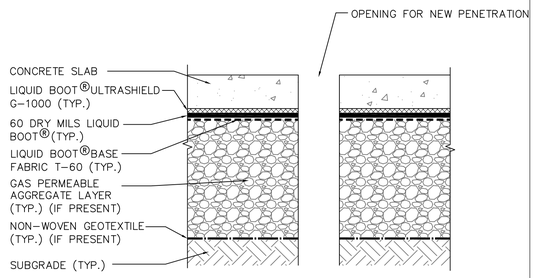
TRC
1430 BROADWAY, 10TH FLOOR
NEW YORK, NEW YORK 10018
212-221-7822

DESIGNED BY: PC	PROJECT NAME: XXXXXX
DRAWNED BY: HD	
CHECKED BY: KB	
DATE: MAY 2012	DRAWING TITLE: TYPICAL LIQUID BOOT AREA REPAIR DETAILS
SCALE: NOT TO SCALE	
PROJECT NUMBER: 191151.0000.0000	

DRAWING 001

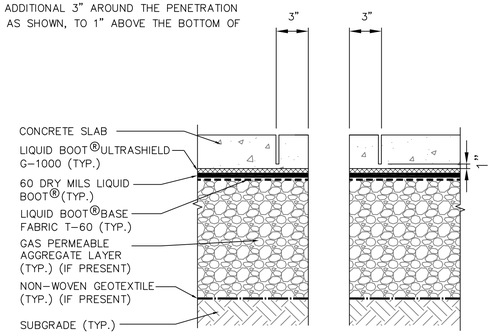
STEP 1:

REMOVE FLOOR COVERINGS AND CORE TO DIMENSION REQUIRED FOR INSTALLATION OF THE PENETRATION. REMOVE SUB-GRADE MATERIAL REQUIRED TO PERFORM THE WORK. MEASURE THE SLAB THICKNESS.



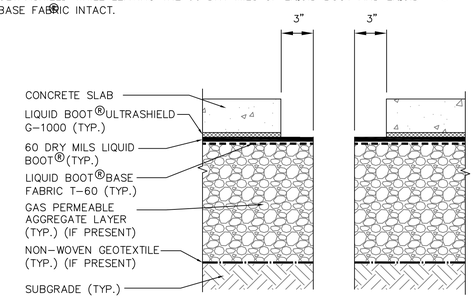
STEP 2:

CORE AN ADDITIONAL 3" AROUND THE PENETRATION DIAMETER AS SHOWN, TO 1" ABOVE THE BOTTOM OF SLAB.



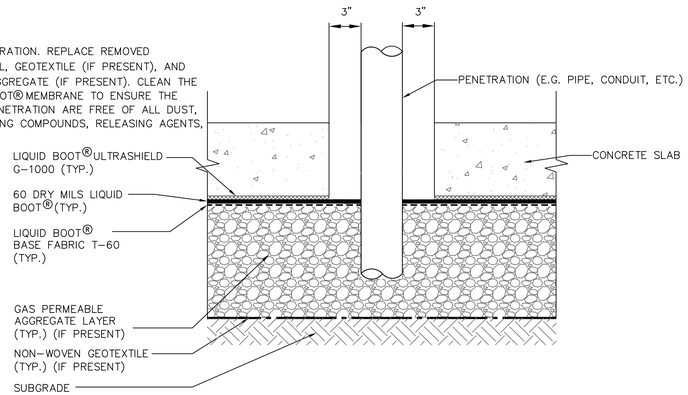
STEP 3:

USE A CHIPPING HAMMER TO CAREFULLY REMOVE AN ADDITIONAL 3" RING OF CONCRETE. EXPOSE EXISTING LIQUID BOOT® MEMBRANE. CAREFULLY REMOVE EXPOSED LIQUID BOOT® G-1000 ULTRASHIELD WHILE LEAVING THE 60 DRY MILS OF LIQUID BOOT® AND LIQUID BOOT® BASE FABRIC INTACT.



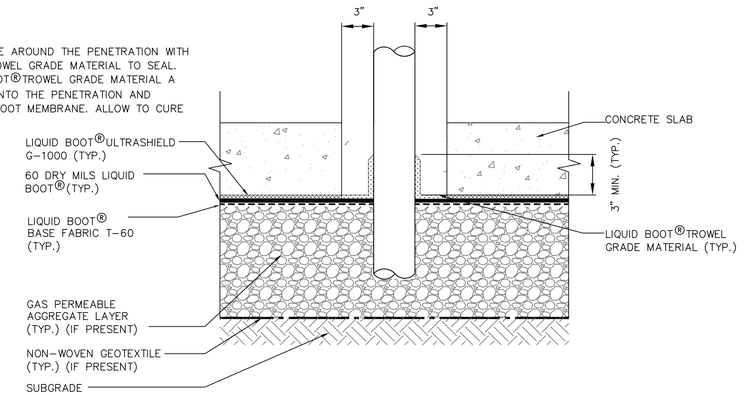
STEP 4:

INSTALL THE PENETRATION. REPLACE REMOVED SUBGRADE MATERIAL, GEOTEXTILE (IF PRESENT), AND GAS PERMEABLE AGGREGATE (IF PRESENT). CLEAN THE EXPOSED LIQUID BOOT® MEMBRANE TO ENSURE THE MEMBRANE AND PENETRATION ARE FREE OF ALL DUST, DIRT, GREASE, CURING COMPOUNDS, RELEASING AGENTS, ETC.



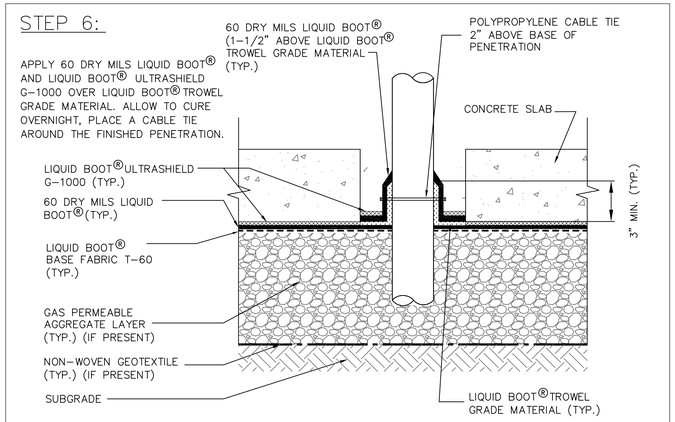
STEP 5:

FILL IN ALL SPACE AROUND THE PENETRATION WITH LIQUID BOOT® TROWEL GRADE MATERIAL TO SEAL. APPLY LIQUID BOOT® TROWEL GRADE MATERIAL A MINIMUM OF 3" ONTO THE PENETRATION AND EXISTING LIQUID BOOT MEMBRANE. ALLOW TO CURE OVERNIGHT.



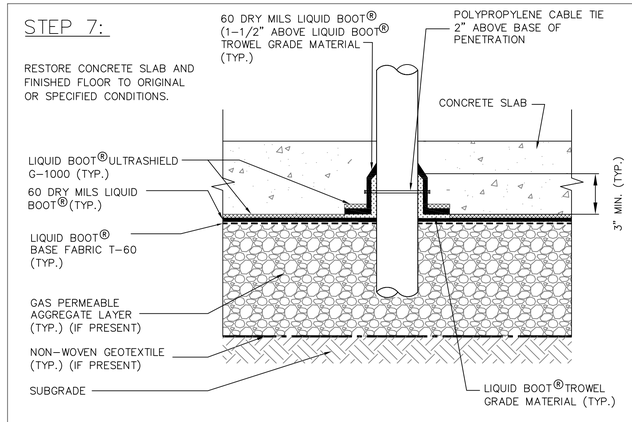
STEP 6:

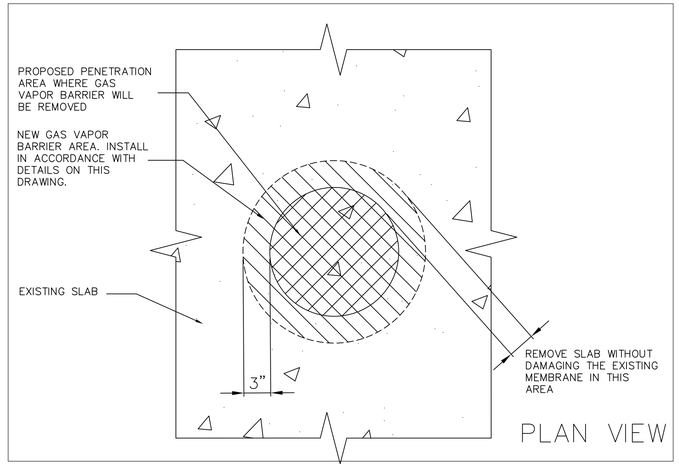
APPLY 60 DRY MILS LIQUID BOOT® AND LIQUID BOOT® ULTRASHIELD G-1000 OVER LIQUID BOOT® TROWEL GRADE MATERIAL. ALLOW TO CURE OVERNIGHT, PLACE A CABLE TIE AROUND THE FINISHED PENETRATION.



STEP 7:

RESTORE CONCRETE SLAB AND FINISHED FLOOR TO ORIGINAL OR SPECIFIED CONDITIONS.





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8. FOR PENETRATIONS THROUGH HORIZONTAL SURFACES ONLY.

LIQUID BOOT REPAIR – PRODUCT LIST:

1. LIQUID BOOT (FLUID APPLIED)
2. LIQUID BOOT (TROWEL-GRADE)
3. LIQUID BOOT ULTRASHIELD G-1000
4. LIQUID BOOT BASE FABRIC T-60

REVISIONS

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PAPER SIZE: 24" x 36"

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CHECKED BY: KB	DRAWING TITLE: TYPICAL LIQUID BOOT PENETRATION REPAIR DETAILS
DATE: MAY 2012	
SCALE: NOT TO SCALE	
PROJECT NUMBER: 191151.0000.0000	

DRAWING 002

Path\Name: I:\Projects\NYCSCA Contract C000012279\191151 - 133K\GVB repair\Pipe Penetration Details\xxx - Liquid Boot Pipe Penetration Details.dwg - Date\Time: Mon, 21 May 2012 - 9:48am - User Name: kbager - Layout Tab: XXX

APPENDIX E – QUALITY ASSURANCE PROJECT PLAN

QUALITY ASSURANCE PROJECT PLAN

This Section presents the organization, objectives, planned activities, and specific quality assurance/quality control (QA/QC) procedures associated with the field activities described in the scope of work. The Section also describes specific protocols for field sampling, sampling handling and storage, and laboratory analysis. The data generated from the analysis of samples will be used to document post-IRM groundwater, soil vapor, indoor air and ambient air conditions.

Project Organization and Responsibility

A qualified person will coordinate and manage the sampling and analysis program, data reduction, QA/QC, data validation, analysis, and reporting. TRC will direct the sampling activities and coordinate laboratory activities. The TRC Project QA Officer will be Elizabeth Denly and will report directly to the project manager, Jenna Raup.

A qualified person will insure that the QAPP is implemented and will oversee data validation. A qualified person will provide oversight and technical support for the sampling and analytical procedures followed in this project. This individual has the broad authority to approve or disapprove project plans, specific analyses, and final reports. The Project QA Officer is independent from the data generation activities. In general, the QA officer will be responsible for reviewing and advising on all QA/QC aspects of this program.

Laboratories used will be NYSDOH ELAP certified laboratories. The laboratories will communicate directly with the sampler regarding the analytical results and reporting and will be responsible for providing all labels, sample containers, trip blanks, shipping coolers, and laboratory documentation.

QA Objectives for Data Management

The analytical data will be provided by the laboratory using the New York State ASP Category B deliverable format.

All analytical measurements will be made so that the results are representative of the media sampled and the conditions measured. Data will be reported in consistent µg/L or mg/L for aqueous samples or $\mu g/m^3$ or ppbV for air samples. Table 1 presents the proposed samples, sampling and analytical parameters, analytical methods, sample preservation requirements, containers and QA/QC samples.

Quantitation Limits (QLs) are laboratory-specific and reflect those values achievable by the laboratory performing the analyses. Data Quality Levels (DQLs) are those reporting limits required to meet the objectives of the program (i.e., program action levels, cleanup standards, etc.). Data Quality Objectives (DQOs) define the quality of data and documentation required to support decisions made in the various phases of the data collection activities. The DQOs are dependent on the end uses of the data to be collected and are also expressed in terms of objectives for precision, accuracy, representativeness, completeness, and comparability.

The analytical methods to be used at this site provide the highest level of data quality and can be used for purposes of risk assessment, evaluation of remedial alternatives and verification that cleanup standards have been met. However, in order to ensure that the analytical methodologies are capable of achieving the DQOs, measurement performance criteria have been set for the analytical measurements in terms of accuracy and precision.

The overall QA objective is to develop and implement procedures for field sampling, chain-of-custody, laboratory analysis, and reporting which will provide results that are scientifically valid, and the levels of which are sufficient to meet DQOs.

For quantitation limits for parameters associated with groundwater samples, the laboratory will be required to attempt to meet or surpass the parameter-specific limits for groundwater from the Division of Water Technical and Operational Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values.

The QA objectives are defined as follows:

- ***Accuracy*** is the closeness of agreement between an observed value and an accepted reference value. The difference between the observed value and the reference value includes components of both systematic error (bias) and random error.

  Accuracy in the field is assessed through the adherence to all field instrument calibration procedures, sample handling, preservation, and holding time requirements, and through the collection of equipment blanks prior to the collection of samples for each type of equipment being.

  The laboratory will assess the overall accuracy of their instruments and analytical methods (independent of sample or matrix effects) through the measurement of "standards," materials of accepted reference value. Accuracy will vary from analysis to analysis because of individual sample and matrix effects. In an individual analysis, accuracy will be measured in terms of blank results, the percent recovery (%R) of surrogate compounds in organic analyses and/or laboratory control samples (LCSs). This gives an indication of expected recovery for analytes tending to behave chemically like the spiked or surrogate compounds. Table 2 summarizes the laboratory accuracy requirements.

- ***Precision*** is the agreement among a set of replicate measurements without consideration of the "true" or accurate value: i.e., variability between measurements of the same material for the same analyte. Precision is measured in a variety of ways including statistically, such as calculating variance or standard deviation.

  Precision in the field is assessed through the collection and measurement of field duplicates (one extra sample in addition to the original field sample). Field duplicates will be collected at a frequency of one per twenty investigative samples per matrix per analytical parameter. Precision will be measured through the calculation of relative percent differences (RPDs). The resulting information will be used to assess sampling and analytical variability. Field duplicate RPDs must be $\leq$ 30 for aqueous samples. These criteria apply only if the sample and/or duplicate results are >5x the quantitation limit; if both results are $\leq$ 5x the quantitation limit, the criterion will be doubled. Due to the uncertainty of available representative soil gas volume, field duplicates will not be collected for this matrix.

  Precision in the laboratory is assessed through the calculation of RPD for duplicate samples. For organic groundwater analyses, laboratory precision will be assessed through the analysis of field duplicates.

- ***Completeness*** is a measure of the amount of valid data obtained from a measurement system compared to the amount that was expected to be obtained under normal conditions. "Normal conditions" are defined as the conditions expected if the sampling plan was implemented as planned.

Field completeness is a measure of the amount of (1) valid measurements obtained from all the measurements taken in the project and (2) valid samples collected. The field completeness objective is greater than 90 percent.

Laboratory completeness is a measure of the amount of valid measurements obtained from all valid samples submitted to the laboratory. The laboratory completeness objective is greater than 95 percent.

- ***Representativeness*** is a qualitative parameter that expresses the degree to which data accurately and precisely represents either a characteristic of a population, parameter variations at a sampling point, a process condition, or an environmental condition within a defined spatial and/or temporal boundary. To ensure representativeness, the sampling locations have been selected to provide coverage over a wide area and to highlight potential trends in the data. In addition, field duplicate samples will provide an additional measure of representativeness at a given location.

  Representativeness is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the Work Plan are followed and that proper sampling, sample handling, and sample preservation techniques are used.

  Representativeness in the laboratory is ensured by using the proper analytical procedures, appropriate methods, and meeting sample holding times.

- ***Comparability*** expresses the confidence with which one data set can be compared to another. Comparability is dependent upon the proper design of the sampling program and will be satisfied by ensuring that the Work Plan are followed and that proper sampling techniques are used. Maximization of comparability with previous data sets is expected because the sampling design and field protocols are consistent with those previously used.

  Comparability is dependent on the use of recognized EPA or equivalent analytical methods and the reporting of data in standardized units. Laboratory procedures are consistent with those used for previous sampling efforts.

Table 1
Analytical Parameters, Methods, Preservation, Holding Time and Container Requirements

Sample Matrix	Analytical Parameter	Sample Type	No. of Samples[1]	No. of QA/QC Samples	Analytical Method	Sample Preservation	Holding Time[2]	Sample Container[3]
Groundwater	VOCs	Grab	16 per year	Trip Blank: as necessary Equipment Blank: 1/20 Duplicate: 1/20	SW-846 Method 8260C	pH<2 with HCl; Cool to 4^0 C; no headspace	14 days to analysis	(3) 40 mL VOA vials
Groundwater	Sulfate and Chloride	Grab	3	Equipment Blank: 1/20 Duplicate: 1/20	300.0 Rev 2.1	Cool to 4^0 C	28 days to analysis	(1) 250 mL poly container
Groundwater	Total Organic Carbon	Grab	3	Equipment Blank: 1/20 Duplicate: 1/20	415.2	pH<2 with H_2SO4; Cool to 4^0 C	28 days to analysis	(1) 250 mL poly container
Groundwater	Volatile Fatty Acids	Grab	3	Equipment Blank: 1/20 Duplicate: 1/20	SM-5560D	Cool, 4°C	14 days to analysis	(2) 40 mL VOA vials
Groundwater	Soluble Iron	Grab	3	Equipment Blank: 1/20 Duplicate: 1/20	6020A	Cool to 4^0 C	28 days to analysis	(1) 250 mL poly container
Soil Vapor / Indoor Air/ Ambient Air	VOCs	Grab	4 per year	None	TO-15	None	30 days to analysis	(1) 6 L Summa Canister

[1] Actual number of samples may vary depending on field conditions, sample material availability, and field observations.
[2] From date of sample collection
[3] Trip blank bottleware = (3) 40 mL VOA vials

Table 2
Laboratory Data Quality Objectives: Precision and Accuracy: Groundwater Samples

Parameter	Analytical Method	Matrix	Accuracy Control Limits	Accuracy Frequency Requirements	Precision (RPD) Control Limits	Precision Frequency Requirements
VOCs (TCL)	SW-846 Method 8260C	Groundwater	Surrogates % Rec. 1,2-Dichloroethane-d4 78-122 p-Bromofluorobenzene 87-112 Toluene-d8 91-110	Surrogates: All samples, standards, QC samples	Field Duplicates RPD ≤30	Field Duplicates: One per 20
Sulfate and Chloride	300.0 Rev 2.1	Groundwater	Matrix Spikes 85-115% recovery	Matrix Spikes: One per 20 per matrix per batch	Field Duplicates RPD ≤ 30 Matrix Duplicates RPD ≤ 30	Field Duplicates: One per 20
Total Organic Carbon	415.2	Groundwater	Matrix Spikes 70-130% recovery	Matrix Spikes: One per 20 per matrix per batch	Field Duplicates RPD ≤ 30 Matrix Duplicates RPD ≤ 30	Field Duplicates: One per 20
Volatile Fatty Acids	SM-5560D	Groundwater	Matrix Spikes 75-125% recovery			
Soluble Iron	6020A	Groundwater	Matrix Spikes 75-125% recovery	Matrix Spikes: One per 20 per matrix per batch	Field Duplicates RPD ≤ 30 Matrix Duplicates RPD ≤ 30	Field Duplicates: One per 20

Sampling Plan

Environmental sampling will include groundwater, soil vapor, indoor air, and ambient air. Groundwater samples will be collected from permanent monitoring wells using low flow pumps and new dedicated Teflon tubing. Soil vapor samples will be collected from permanent soil vapor probes using sampling equipment. Indoor air and ambient air samples will be collected from approximately 3 to 5 feet above the ground to simulate breathing conditions.

Groundwater Sampling

Groundwater samples will be collected from permanent monitoring wells. Groundwater from each well will be purged via a bladder pump (QED SamplePro® MicroPurge 1.75-inch outer diameter pump) lined with a Teflon bladder operated by an air compressor until parameters have stabilized in accordance with USEPA Low-Stress (Low-Flow) sampling procedures. A turbidity level of fifty NTUs or less is the well purging goal, but not an absolute value before sampling. Other field parameters including temperature, conductivity, pH, and dissolved oxygen (DO) will also be monitored. As practical, all field measurements will be taken from the flow cell and will be recorded during and after purging, and before sampling. Field parameters should generally be within ±10 percent for three consecutive readings, prior to sampling.

It is anticipated that no more than three well volumes will be purged in order for turbidity to reach a minimum and the other parameters to stabilize. Ideally, pumping rates will be at a rate maintained between 100 and 500 milliliters per minute (ml/min) so that no drawdown of the groundwater level occurs (i.e., pumping rate is less than recharge rate). During purging, the sampler will actively monitor and track the volume of water purged and the field parameter readings. Data will be recorded in the field logbook. For example, the sampler will record the running total volume purged from each well and note the readings for the corresponding field parameters.

Once groundwater conditions have stabilized and groundwater levels have recovered, samples will be collected. Sampling will be performed with the pump intake at the same location used for purging. Pumping rates for withdrawing the samples will be similar to those followed for well purging.

The samples will be collected in sample bottles (pre-preserved, if appropriate), placed in iced coolers and removed from light immediately after collection. In addition, all sample bottles must be filled to the top so that no aeration of the samples occurs during transport. All bottles will be filled to avoid cascading and aeration of the samples, the goal being to minimize any precipitation of colloidal matter.

Soil Vapor, Indoor Air, and Ambient Air Sampling

Soil gas sampling will be conducted in accordance with the New York State Department of Health (NYSDOH) "Guidance for Evaluating Soil Vapor Intrusion in the State of New York (October 2006)" and ASTM Standard E 2600-10.

The sub-slab soil vapor samples will be collected from immediately below the floor slab. The floor slab will be cored with a 3/8-inch or 1-inch diameter drill bit and a sub-slab vapor probe will be installed. Each probe will be constructed with polyethylene tubing extending approximately two inches below the base of the floor slab. At the surface, the implant will be sealed to the floor slab with a non-VOC emitting surface sealing material (i.e., bentonite, cement, beeswax, modeling clay). In accordance with the NYSDOH Guidance, tracer gas (i.e., helium) will be used at every sampling location to confirm that an adequate surface seal has been created, and the soil vapor probes will be purged prior to sampling.

Each probe will be purged using a PID to evacuate one to three volumes of sub-slab vapor. Sub-slab vapor purge volume and length of purge time will be calculated based on the depth of installation and pumping rate of the instrument used. Purge time calculations will be provided in the final report. Purged vapor from the sample probes within the building will be discharged into containment (i.e., Tedlar™ bag or similar) to minimize the possibility of exposure to building occupants. The probes will each be connected via Teflon tubing to a laboratory-supplied individually certified SUMMA canister with an 8-hour flow regulator.

Additionally, four 8-hour duration indoor/ambient air samples in SUMMA canisters will be collected each sampling event. In accordance with the NYSDOH Guidance, three (3) indoor air samples, PS96X-TRC-IA-01, -02, and -03, will be collected in the school building basement adjacent to and simultaneously with the sub-slab vapor samples. Additionally, one canister, PS96X-TRC-AMB will be placed outside of the building to collect a sample of ambient outdoor air.

Analysis of the sub-slab vapor, indoor air, and ambient air samples by USEPA Method TO-15. Based on previous investigations performed on the Site and adjacent parcels, the sub-slab vapor, indoor air, and ambient air samples will be analyzed for tetrachloroethene (PCE) and its degradation byproducts trichloroethene (TCE), cis-1,2-dichloroethene, trans-1,2-dichloroethene, and vinyl chloride.

Each SUMMA canister will be individually certified by the analytical laboratory and low level sensitivity analyses (i.e., low level detection limits, in accordance with NYSDOH guidance) will be performed on the samples.

After sample collection, the sub-slab vapor, indoor air, and ambient air samples will be shipped overnight to a NYSDOH ELAP certified laboratory for analysis for VOCs by Method TO-15 with SIM. Method TO-15 with SIM will provide detection limits of 1.0 micrograms per cubic meter for all analytes except for vinyl chloride and TCE. The detection limits for vinyl chloride and TCE will be 0.25 micrograms per cubic meter. This will allow for comparison with the lowest action levels for these compounds in the NYSDOH Guidance.

QC Sample Collection

QC samples will include trip blanks and field duplicates for groundwater samples.

Trip blanks will consist of distilled water (supplied by the laboratory) and will be used to assess the potential for volatile organic compound contamination of groundwater samples due to contaminant migration during sample shipment and storage. Trip blanks will be transported to the site unopened, stored with the investigative samples, and kept closed until analyzed by the laboratory. Trip blanks will be submitted to the laboratory at a frequency of one per cooler that contains groundwater samples for analysis for VOCs.

Equipment blanks will consist of distilled water and will be used to check for potential contamination of the equipment which may cause sample contamination. Equipment blanks will be collected by routing the distilled water through the sampling equipment prior to sample collection. Equipment blanks will be submitted to the laboratory at a frequency of one per 20 samples per matrix per type of non-dedicated equipment being used per parameter. Equipment blanks will not be collected with samples submitted for soil gas samples.

Field duplicates are an additional aliquot of the same sample submitted for the same parameters as the original sample. Field duplicates will be used to assess the sampling and analytical reproducibility. Field duplicates will be collected by alternately filling sample bottles from the source being sampled. Field duplicates will be submitted at a frequency of one per 20 samples for all matrices and all parameters with the exception of soil gas samples.

Refer to Table 1 for a summary of QC sample preservation and container requirements.

Sample Preservation and Containerization

The analytical laboratory will supply the sample containers for the chemical samples. These containers will be cleaned by the manufacturer to meet or exceed all analyte specifications established in the latest U.S. EPA's *Specifications and Guidance for Contaminant-Free Sample Containers*. Certificates of analysis are provided with each bottle lot and maintained on file to document conformance to EPA specifications. Soil vapor samples will be collected in laboratory-provided individually certified clean Summa canisters. Groundwater samples will be placed in iced coolers immediately after collection.

Equipment Decontamination

Re-usable Teflon®, stainless steel, and aluminum sampling equipment shall be cleaned between each use in the following manner:

- Wash and scrub with Alconox and water mixture
- Tap water rinse
- Wash/scrub with a biodegradable degreaser ("ZEP") if there is oily residue on equipment surface
- Tap water rinse
- Distilled/deionized water rinse
- Air dry

Cleaned equipment shall be wrapped in aluminum foil if not used immediately after air-drying.

Groundwater sampling pumps will be cleaned by washing and scrubbing with an Alconox/water mixture, rinsing with tap water and irrigating with deionized water.

Field Custody Procedures

Sample chain-of-custody and packaging procedures are summarized below. These procedures are intended to ensure that the samples will arrive at the laboratory with the chain-of-custody intact.

- The field sampler is personally responsible for the care and custody of the samples until they are transferred or dispatched properly. Field procedures have been designed such that as few people as possible will handle the samples.

- All bottles will be identified by the use of sample labels with sample numbers, sampling locations, date/time of collection, and type of analysis.

- Sample labels will be completed for each sample using waterproof ink unless prohibited by weather conditions. For example, a logbook notation would explain that a pencil was used to fill out the sample label because the pen would not function in wet weather.

- Samples will be accompanied by a properly completed chain-of-custody form. The sample numbers and locations will be listed on the chain-of-custody form. When transferring the possession of samples, the individuals relinquishing and receiving will sign, date, and note the time on the record. This record documents the transfer of custody of samples from the sampler to another person, to a mobile laboratory, to the permanent laboratory, or to/from a secure storage location.

- All shipments will be accompanied by the chain-of-custody record identifying the contents. The original record will accompany the shipment, and copies will be retained by the sampler and placed in the project files.

- Samples will be properly packaged for shipment and dispatched to the appropriate laboratory for analysis, with a separate signed custody record enclosed in and secured to the inside top of each sample box or cooler. Shipping containers will be secured with strapping tape and custody seals for shipment to the laboratory. The custody seals will be attached to the front right and back left of the cooler and covered with clear plastic tape after being signed by field personnel. The cooler will be strapped shut with strapping tape in at least two locations.

- If the samples are sent by common carrier, the air bill will be used. Air bills will be retained as part of the permanent documentation. Commercial carriers are not required to sign off on the custody forms since the custody forms will be sealed inside the sample cooler and the custody seals will remain intact.

- Samples remain in the custody of the sampler until transfer of custody is completed. This consists of delivery of samples to the laboratory sample custodian, and signature of the laboratory sample custodian on chain-of-custody document as receiving the samples and signature of sampler as relinquishing samples.

APPENDIX F – HEALTH AND SAFETY PLAN

SITE-SPECIFIC HEALTH AND SAFETY PLAN FOR IMPLEMENTATION OF THE SITE MANAGEMENT PLAN

PUBLIC SCHOOL 96X
650 Waring Avenue
Bronx, New York 10467

Prepared by:

TRC Engineers, Inc.
1430 Broadway, 10th Floor
New York, New York 10018

TRC Project Number 211646.0000.0000
AUGUST 2015

DISCLAIMER

STRICT ADHERENCE TO THE HEALTH AND SAFETY GUIDELINES SET FORTH HEREIN WILL REDUCE, BUT NOT ELIMINATE, THE POTENTIAL FOR INJURY AT THESE SITES. THE HEALTH AND SAFETY GUIDELINES IN THIS HEALTH AND SAFETY PLAN WERE PREPARED SPECIFICALLY FOR THIS PROJECT AND SHOULD NOT BE USED ON ANY OTHER SITE OR PROJECT WITHOUT PRIOR RESEARCH AND EVALUATION BY TRAINED HEALTH AND SAFETY SPECIALISTS.

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Appendices

1.0 SITE-SPECIFIC TRAINING

TRC provides training to all its employees whose work entails potential exposure to toxic chemicals or hazardous environments. The training is taught by experienced professionals and promotes safe work conditions through both classroom and field instruction.

TRC provides the following training to its employees:

1. 40-Hour Hazardous Materials Training

Supervisors receive additional training that is geared toward responsibilities and skills in project management.

2. 8-Hour Hazardous Materials Annual Refresher Training

3. Training required under specific OSHA Standards

4. First Aid/CPR

2.0 SITE-SPECIFIC SAFETY PLAN

2.1 Introduction

The following is the Health and Safety Plan (HASP) for the Interim Remedial Measures proposed at PS 96X, located at 650 Waring Avenue, Bronx, New York 10467 (the "Site") by TRC Engineers, Inc. (TRC). A Site Location Map is shown in the attached Figure 1. Activities to be performed on-site consist of groundwater, sub-slab soil vapor, indoor air and ambient air sampling on an annual basis.

The site-specific safety plan was developed from previous Site investigations. Revisions and/or alterations to this HASP may become necessary as more information becomes available. Any proposed changes to this HASP will be approved by the Health & Safety Coordinator prior to implementation. All on-site personnel are required to read, review and strictly comply with the HASP. It is the responsibility of the Project Manager or designee to ensure that the HASP is implemented and enforced.

2.2 Purpose

Based on the result of a Supplemental Site Investigation, Confirmatory Groundwater Sampling and Phase I Remedial Investigation performed by TRC, vapor intrusion into the building is not currently a concern. However, because of the elevated groundwater concentrations remedial action via in-situ groundwater treatment is required.

2.3 Site Description and History

The Site is located at 650 Waring Avenue (Block 4341, Lot 13) in the Bronx, New York. The Site is located on the city block bordered by Waring Avenue to the north, Olinville Avenue to the east, multi-story residential buildings followed by Thwaites Place to the south, and Barker Avenue to the west. The area surrounding the Site is developed primarily with residential and commercial buildings. A Site Plan is presented in Figure 2.

The Site is an approximately 79,000-square-foot lot improved with a four-story public school building with an unoccupied basement and an asphalt-paved playground. Until recently there were eleven (11) temporary classroom units (TCUs) at the Site. The TCUs were demolished as

part of the new school addition project currently under construction. The addition to the PS 96X school building is located south and east of the existing school building. Surrounding properties are primarily characterized by residential and commercial buildings. Figure 2 presents a Site Plan.

Based on a review of historical records and prior reports, the Site contained a two-story residential dwelling and two one-story structures constructed on vacant land in 1919. The current four-story building was constructed in 1929, and is currently occupied by a school (Public School 96X). The first of the eleven (11) existing TCUs were constructed circa 2001.

Prior Investigations

Several previous Site investigations were performed by Tetra Tech EC, Inc. (Tetra Tech) in 2009 and 2010 in support of a proposed new addition to PS 96X. Groundwater, soil, soil vapor, and ambient air samples were collected and submitted for laboratory analysis by Tetra Tech as part of the investigations. The investigations performed by Tetra Tech identified the chlorinated volatile organic compound (VOC) tetrachloroethene (PCE) in a soil vapor sample at a concentration above the New York State Department of Health (NYSDOH) Air Guideline Value (AGV). Nine (9) VOCs, including PCE and trichloroethene (TCE), were detected in groundwater samples collected by Tetra Tech at concentrations above New York State Department of Environmental Conservation (NYSDEC) standards and guidance values (Class GA Values). Tetra Tech attributed the VOCs detected in soil vapor and groundwater to an unknown, off-site source.

Sub-slab vapor and indoor air sampling performed by Tetra Tech in October 2009, indoor air sampling conducted by Tetra Tech in March 2010, and sub-slab vapor sampling conducted by TRC in January 2012 confirmed the presence of elevated concentrations of chlorinated solvent-related VOCs in sub-slab vapor, but not in indoor air. Based on the sampling results, it was determined that soil vapor intrusion is not occurring in the school building. It should be noted that the basement is unoccupied and is comprised of crawl spaces and finished areas containing mechanical equipment, boilers, custodial shops, and storage spaces.

A Supplemental Site Investigation (SSI) was completed by TRC in November 2012. The SSI consisted of two geophysical surveys; advancement of eleven (11) soil borings; installation of

eleven (11) monitoring wells; the collection of soil and groundwater samples for laboratory analysis; and, the surveying and gauging of monitoring wells to determine groundwater surface elevation and flow direction. Groundwater was first encountered in the bedrock layer beneath the Site. The results of the SSI showed elevated concentrations of chlorinated solvent-related VOCs in on-site wells. The source of the chlorinated VOCs is unknown since elevated VOCs were detected in bedrock wells, chlorinated solvent-related VOCs were not detected in soil above 6 NYCRR Part 375 Unrestricted Use Soil Cleanup Objectives (SCOs), and based on a review of historical records, there is no history of commercial or industrial activity at the Site. PCE and TCE were also detected at estimated concentrations, below the Class GA Values, in samples collected from two off-site wells located up-gradient and cross-gradient to the Site.

The SSI Report was submitted to the NYSDEC and a conference call among the NYCSCA, TRC and NYSDEC was held on January 8, 2013 to discuss the results. Based on the results, the NYSDEC requested that the NYCSCA confirm groundwater flow direction and perform a second round of groundwater sampling to confirm previous results. The NYSDEC indicated that an Order on Consent would be the mechanism for the NYSDEC to provide oversight on the project and an Order on Consent was executed between the NYCSCA and NYSDEC on June 21, 2013.

TRC prepared a Work Plan for Confirmatory Groundwater Sampling (Work Plan), dated February 26, 2013. The Work Plan proposed the collection of groundwater samples, groundwater elevation measurements, and review of geotechnical reports. The Work Plan was implemented in May 2013 and a Confirmatory Groundwater Sampling Report was prepared and submitted to the NYSDEC on July 9, 2013. The findings of the report confirmed southerly groundwater flow direction and, with the exception of monitoring well PS96X-TRC-MW-04, concentrations of chlorinated VOCs in the bedrock aquifer consistent with previous results. Based on the results, TRC recommended the implementation of institutional and engineering controls (i.e., sub-slab depressurization system (SSDS) for the new school building), and focused in-situ remediation, followed by groundwater monitoring. In a conference call on October 1, 2013, the NYSDEC agreed with the conclusions and recommendations. In addition, NYSDEC requested an IRM Work Plan (“Phase I”) describing in-situ groundwater treatment in the vicinity of PS96X-TRC-MW-04, the installation and sampling of monitoring wells downgradient of the treatment zone, the decommissioning of monitoring wells PS96X-TRC-MW-01, -02, and -03,

and soil vapor intrusion monitoring in the main school building. The IRM Work Plan was approved on December 3, 2013 and the IRM Phase I Construction Completion Report (CCR) was submitted in March 2015.

The IRM Phase II Work Plan was submitted to NYSDEC and is currently under review. The scope of services includes:

- Geophysical survey;
- Installation of three permanent monitoring wells;
- In-situ groundwater treatment consisting of the injection of sodium lactate;
- Pre-injection and post-injection monitoring of dissolved oxygen, specific conductivity, temperature, pH, and oxygen reduction potential on a bi-weekly basis prior to injection and two months following the injection to document changes in water chemistry; and,
- Selection of soil vapor, indoor air, ambient air, and groundwater samples for laboratory analysis.

3.0 SCOPE OF WORK

The Site Management Plan consists of the following:

- Collection and analysis of groundwater samples on an annual basis from 16 groundwater sampling locations and collection.
- Collection and analysis of sub-slab vapor and indoor air samples from three collocated locations within the original school building on an annual basis.
- Collection and analysis of one ambient air sample on an annual basis.

A Sample Location Plan depicting the monitoring well locations and locations of permanent groundwater monitoring wells are shown in the attached Figure 2.

4.0 CONTAMINANTS OF CONCERN

Based on previous investigations and the history of the Site, the following chemical hazards have been identified:

- Chlorinated solvents, most notably tetrachloroethylene (PCE) and its degradation byproducts trichloroethylene (TCE), *trans*-1,2-dichloroethene, *cis*-1,2-dichloroethene, and vinyl chloride.

Material Safety Data Sheets (MSDS) for contaminants of concern are provided in **Attachment B**.

5.0 EMERGENCY AND TRC CONTACT NUMBERS

5.1 Emergency Contact Information

Ambulance: **911** Fire Department: **911** Police Department: **911**

Hospital: **St. Barnabas Hospital**

Phone No.: **(718) 960-9000**

Hospital Address: **4422 3rd Avenue, Bronx, NY 10457**

HOSPITAL DIRECTIONS:

1. Head **East** on **Waring Ave** toward **Olinville Ave**	**0.1 Miles**
2. Turn **Right** onto **Boston Rd**	**0.3 Miles**
3. Turn **Right** onto **Bronx and Pelham Pkwy**	**0.4 Miles**
4. Continue onto **E. Fordham Rd**	**0.9 Miles**
5. Turn **Left** onto **3rd Ave**	**0.6 Miles**
Destination will be on the left	

Hospital: **Calvary Hospital**

Phone No.: **(718) 518-2000**

Hospital Address: **1740 Eastchester Road, Bronx, NY 10461**

1. Head **East** on **Waring Ave** toward **Olinville Ave**	**0.6 Miles**
2. Turn **Right** onto **Washington Rd**	**0.8 Miles**
3. Turn **Left** onto **Morris Park Ave**	**0.4 Miles**
4. Turn **Right** onto **Eastchester Rd**	**0.2 Miles**
Destination will be on the left	

NOTE: FOR ANY TYPE OF SERIOUS MEDICAL EMERGENCY, CALL 911 AND REQUEST AN AMBULANCE. NEW YORK CITY STREETS ARE OFTEN CONGESTED DUE TO HEAVY TRAFFIC, CONSTRUCTION AND DOUBLE-PARKED VEHICLES AND IT MAY BE DIFFICULT TO DRIVE TO THE EMERGENCY ROOM.

Refer to **Attachment C** for Hospital Route Direction with maps.

5.2 TRC Contacts

1. Project Manager

   Name: Jenna Raup

   Office/Division: New York City

   Office Telephone: 212-221-7822 ext 133

2. Certified Industrial Hygienist

   Name: Jack Springston, CIH

   Office/Division: New York, NY

   Office Telephone: 212-221-7822

3. National Safety Director

   Name: Mike Glenn

   Office/Division: Irvine, CA

   Office Telephone: 949-727-7347

4. WorkCare can provide assistance in providing first aid advice and directing an injured worker to non-emergency medical care. WorkCare is a service that provides 24/7 access to an Occupational Healthcare physician or clinician.

   WorkCare Incident Intervention
   888-449-7787

5. Human Resource Manager

   Name: Suzanne Micallef

   Office/Division: Administrative

   Office Telephone: 978-656-3628

5.3 Level of Protection

The Project Manager will continually evaluate levels of protection to be utilized by on-site personnel, with assistance from the Health & Safety Coordinator and the Industrial Hygienist. The levels of protection may be downgraded or upgraded, as necessary, with approval by the PM.

5.4 Personal Protective Equipment (PPE)

It is anticipated that only Level D PPE will be required. Level D protection is applicable when no respiratory protection and minimal skin protection is required. Level D can be used in the following circumstances:

- The atmosphere contains no known hazard
- Work functions preclude splashes, immersion, or the potential for unexpected inhalation of or contact with hazardous levels of any chemicals.

The Level D recommended equipment for this site includes:

- Work clothes (no shorts or cutoffs)
- Safety boots/shoes
- Safety glasses or chemical splash goggles: Eye protection will be worn when personnel are exposed to flying debris, liquids, chemical vapors or particulates.
- Hard hats: Appropriately rated hard hats will be worn by personnel for protection against overhead hazards, when present.
- Hearing protection: To be worn by all personnel exposed to at least 85 dB of sound during the workday.
- Work gloves or chemically protective gloves when potentially exposed to contaminants (i.e., during soil and groundwater sampling).

If excessive ionizable organic vapors containing of volatile organic compounds (VOCs) are detected at or above the action levels (See Section 6.1), workers will cease work in the area until organic vapor levels decrease for Level D PPE.

6.0 ON-SITE OPERATION

Chemical hazards are expected to be low. These chemical hazards potentially can include chlorinated solvent related VOCs.

First Aid Procedures for Chemical Exposures

EYE: If any chemicals come in contact with eyes, immediately wash the eyes with large amounts of water, occasionally lifting lower and upper lids. Get medical attention immediately.

BREATH: If person breathes large amounts of any chemicals, remove person to fresh air. If breathing has stopped, perform artificial respiration. Keep affected person warm and rested. Get medical attention as soon as possible.

SKIN: If any chemicals except those listed below come in contact with the skin, immediately wash skin with soap and water. Get medical attention promptly. If chemical penetrates clothing, immediately remove clothing and wash with soap and water.

Soap should not be used if the following chemicals (sample preservatives) potentially encountered at the site contact skin or clothing, **water wash only**:

Hydrochloric acid
Nitric acid
Sodium hydroxide
Sulfuric acid

Special attention must be paid to not using soap with these chemicals in particular.

SWALLOW: If any chemicals are swallowed get medical attention immediately.

6.2 Biological Hazards

No biological hazards are anticipated for any of the tasks.

6.3 Physical Hazards

The physical hazards are anticipated to be low and are outlined in Table A-1 below.

TABLE A-1
PHYSICAL HAZARDS

HAZARD TYPE	KNOWN	POTENTIAL
Heat Stress/Cold Stress		**X**
Severe Weather (lightning, snow, sleet)		**X**
Excessive Noise		**X**
Facility Operations (machinery, structures)		**X**
Unstable ground (wet areas)		**X**
Site Operations (drilling, hand and power tool use, steam cleaning)		**X**
Heavy lifting/moving	**X**	
Hazardous materials use & storage		**X**
Fire		**X**
Slips, trips, and falls		**X**
Cuts, punctures		**X**

TRC personnel can avoid most of the hazards listed above including hand tools, hazardous materials use, slips, trips and falls, and punctures and cuts by remaining alert and performing safe work practices during all site activities. Other proper work practices are outlined below.

1. To avoid falling objects:
   a. Do not walk or stand under suspended/overhead loads (including scaffolding).
   b. Be aware of falling objects in the work area.
   c. Secure overhead objects.
2. When using hand tools:
   a. Hand tools will meet the manufacturer's safety standards.
   b. Hand tools will not be altered in any way.
   c. Makeshift tools will not be used.
   d. At a minimum, eye protection will be used when working with hand tools.

e. Wrenches, including adjustable, pipe, end and socket wrenches, will not be used when jaws are sprung to the point that slippage occurs.

f. Impact tools such as drift pins, wedges and chisels, will be kept free of mushroom heads.

g. Wooden handles will be free of splinters or cracks and secured tightly to the tool.

3. Overhead Wires:

   If contact is possible (i.e., ladder, equipment, crane lift, 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; and
   - Object will get no closer than 12' to prevent arcing.

4. Slips, Trips and Falls:

   a. Proper lighting will be maintained at all times.

   b. Walkways will remain clear and unobstructed at all times.

   c. When possible, cords, hose lines, etc., will be raised to reduce or eliminate trip hazards.

Noise

Approved hearing protection will be required in work areas involving heavy equipment, impact tools, drilling, etc. In general, hearing protection should be worn if an individual cannot be heard in a normal speaking voice at a distance of two feet.

6.4 Electrical Utility Hazards

TRC will implement the following subsurface utility clearance procedure:

- TRC will review available site plans for work involving activities at or near utilities.
- For environmental drilling, TRC's utility mark-out subcontractor will conduct a geophysical survey around all proposed sampling locations to identify subsurface electric utilities and mark the centerline of underground lines.
- The drilling contractor will notify the NYC One Call Center at (800) 272-4480, in accordance with Code 753, a minimum of 5 working days prior to any drilling on streets and sidewalks.

6.5 Mechanical Hazards

The mechanical hazards are anticipated to be low and are associated with use of a submersible pump.

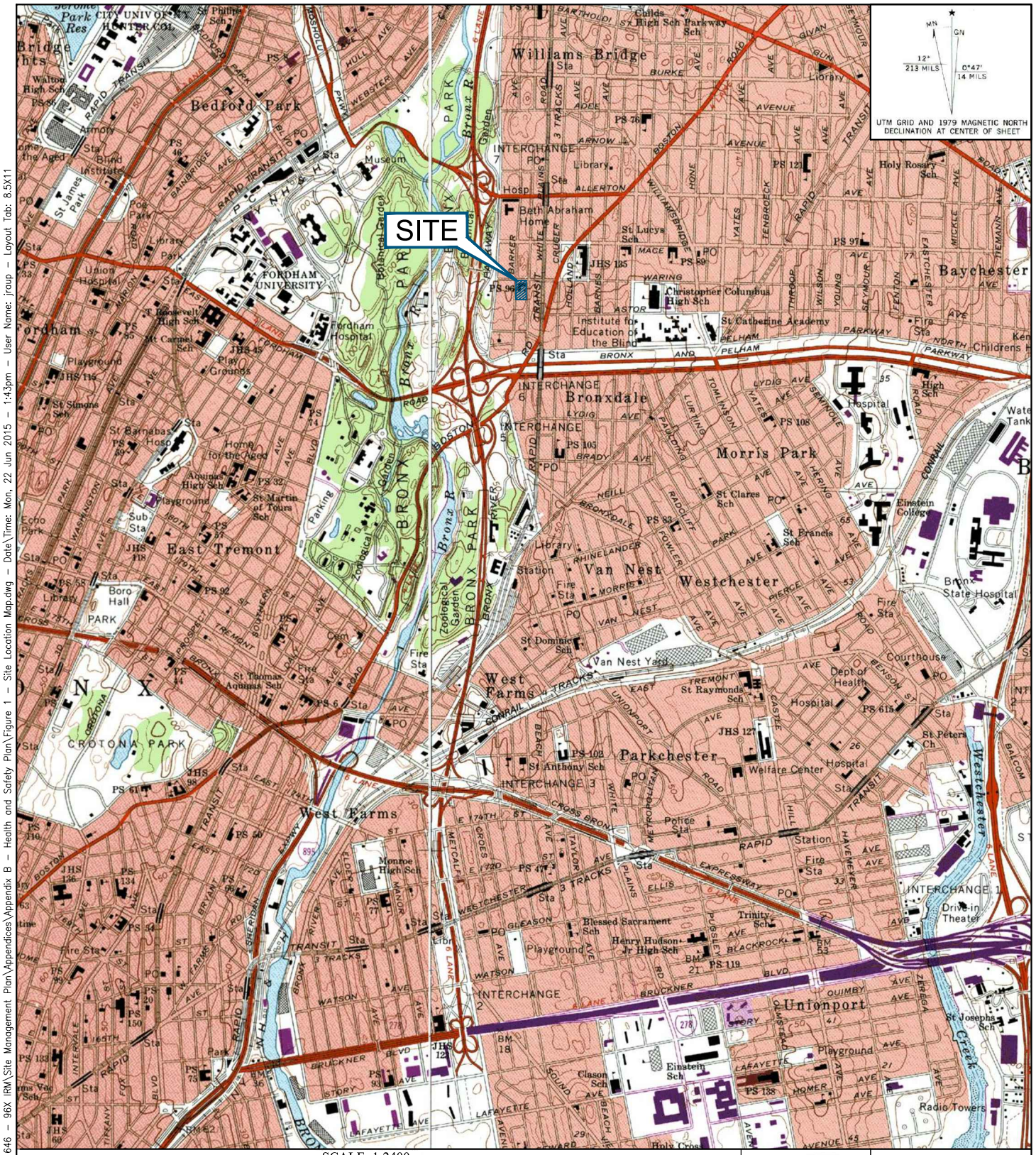
6.6 Communication

TRC team-sampling members shall be equipped with cellular telephones. If an emergency occurs, and the team members are not in close proximity to each other, communication will occur via telephone.

7.0 SITE MAPS

A site location map is provided in the attached Figure 1. A Site Plan depicting the proposed monitoring well locations is shown in the attached Figure 2.

Figures



SCALE: 1:2400

1 MILE
1000 0 1000 2000 3000 4000 5000 6000 7000 FEET
1 KILOMETER

CONTOUR INTERVAL 10 FEET
NATIONAL GEODETIC VERTICAL DATUM OF 1929
DEPTH CURVES AND SOUNDINGS IN FEET—DATUM IS MEAN LOW WATER

QUADRANGLE LOCATION

FLUSHING, N. Y.
SE/4 HARLEM 15' QUADRANGLE
40073-G7-TF-024
1966
PHOTOREVISED 1979
DMA 6265 IV SE—SERIES V821

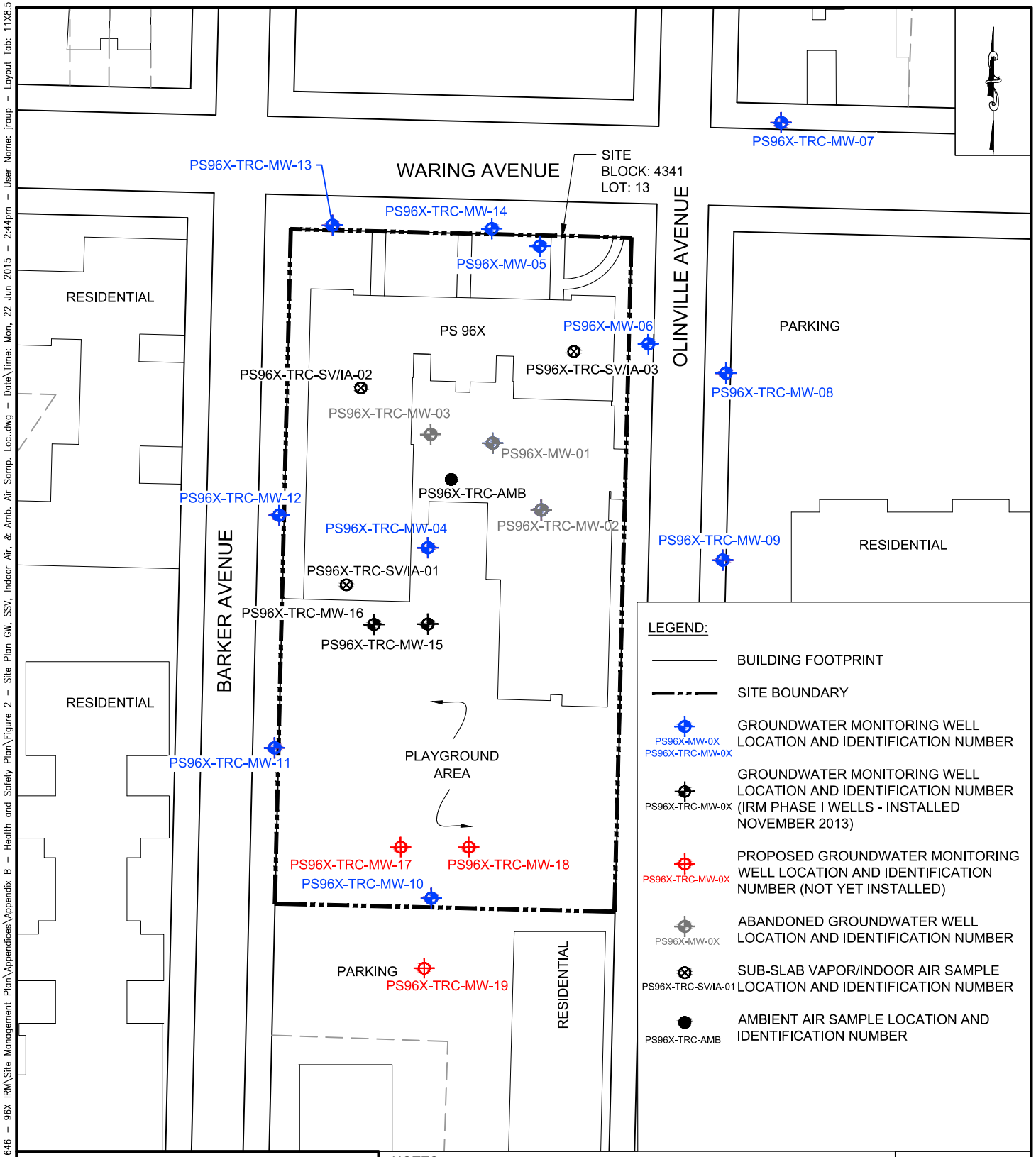
MAP OBTAINED THROUGH USE OF MAPTECH TERRAIN NAVIGATOR PRO SOFTWARE.

TRC
1430 BROADWAY, 10TH FLOOR
NEW YORK, NEW YORK 10018
212-221-7822

DESIGNED BY: JR	PROJECT NAME: NEW YORK CITY SCHOOL CONSTRUCTION AUTHORITY HEALTH AND SAFETY PLAN - PS 96X - 650 WARING AVENUE BLOCK: 4341, LOT: 13 BRONX, NEW YORK 10467
DRAWN BY: HD	
CHECKED BY: CG	
DATE: JUNE 2015	DRAWING TITLE: SITE LOCATION MAP
SCALE: AS SHOWN	
PROJECT NUMBER: 211646.0000.0000	

FIGURE 1

Path\Name: I:\Projects\NYCSCA Contract C000012279\211646 – 96X IRM\Site Management Plan\Appendices\Appendix B – Health and Safety Plan\Figure 1 – Site Location Map.dwg – Date\Time: Mon, 22 Jun 2015 – 1:43pm – User Name: jraup – Layout Tab: 8.5X11



0 80 160 FT.

APPROXIMATE SCALE: 1"=80'
PAPER SIZE: 8½" x 11"

NOTES:

1. MONITORING WELLS SURVEYED ON AUGUST 31, 2012 AND NOVEMBER 15, 2013 BY PERFECT POINT.
2. MONITORING WELLS PS96X-TRC-MW-01, PS96X-TRC-MW-02 AND PS96X-TRC-MW-03 WERE ABANDONED IN NOVEMBER 2013 DURING IMPLEMENTATION OF IRM PHASE I.

GROUNDWATER FLOW

TRC
1430 BROADWAY, 10TH FLOOR
NEW YORK, NEW YORK 10018
212-221-7822

DESIGNED BY: JR	PROJECT NAME: NEW YORK CITY SCHOOL CONSTRUCTION AUTHORITY HEALTH AND SAFETY PLAN - PS 96X - 650 WARING AVENUE BLOCK: 4341, LOT: 13 BRONX, NEW YORK 10467
DRAWN BY: HD	
CHECKED BY: CG	
DATE: JUNE 2015	DRAWING TITLE: SITE PLAN
SCALE: AS SHOWN	
PROJECT NUMBER: 211646.0000.0000	

FIGURE 2

Attachment A
Health and Safety Plan Acceptance

ATTACHMENT A

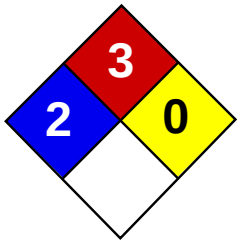
HEALTH AND SAFETY PLAN ACCEPTANCE

SITE: 650 Waring Avenue, Bronx, New York

I have received a copy of the Health and Safety Plan for this site and have read, understand and will abide by the procedures set forth in this Health and Safety Plan and any amendments to this plan.

Printed Name	**Signature**	**Date**

Attachment B
Fact Sheets for Potential Contaminants of Concern



Material Safety Data Sheet
Xylenes MSDS

Section 1: Chemical Product and Company Identification

Product Name: Xylenes

Catalog Codes: SLX1075, SLX1129, SLX1042, SLX1096

CAS#: 1330-20-7

RTECS: ZE2100000

TSCA: TSCA 8(b) inventory: Xylenes

CI#: Not available.

Synonym: Xylenes; Dimethylbenzene; xylol; methyltoluene

Chemical Name: Xylenes (o-, m-, p- isomers)

Chemical Formula: C6H4(CH3)2

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Xylenes	1330-20-7	100

Toxicological Data on Ingredients: Xylenes: ORAL (LD50): Acute: 4300 mg/kg [Rat]. 2119 mg/kg [Mouse]. DERMAL (LD50): Acute: >1700 mg/kg [Rabbit].

Section 3: Hazards Identification

Potential Acute Health Effects: Hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, liver, mucous membranes, bone marrow, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 464°C (867.2°F)

Flash Points: CLOSED CUP: 24°C (75.2°F). (Tagliabue.) OPEN CUP: 37.8°C (100°F).

Flammable Limits: LOWER: 1% UPPER: 7%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:
Highly flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Slightly explosive in presence of open flames and sparks, of heat.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards: Vapors may travel to source of ignition and flash back.

Special Remarks on Explosion Hazards:
Vapors may form explosive mixtures with air. Containers may explode when heated. May polymerize explosively when heated. An attempt to chlorinate xylene with 1,3-Dichloro-5,5-dimethyl-2,4-imidazolidindione (dichlorohydrantoin) caused a violent explosion

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined

areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 100 (ppm) [Canada] TWA: 435 (mg/m3) [Canada] TWA: 434 STEL: 651 (mg/m3) from ACGIH (TLV) [United States] TWA: 100 STEL: 150 (ppm) from ACGIH (TLV) [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Sweetish.

Taste: Not available.

Molecular Weight: 106.17 g/mole

Color: Colorless. Clear

pH (1% soln/water): Not available.

Boiling Point: 138.5°C (281.3°F)

Melting Point: -47.4°C (-53.3°F)

Critical Temperature: Not available.

Specific Gravity: 0.864 (Water = 1)

Vapor Pressure: 0.9 kPa (@ 20°C)

Vapor Density: 3.7 (Air = 1)

Volatility: Not available.

Odor Threshold: 1 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 3.1

Ionicity (in Water): Not available.

Dispersion Properties: Not available.

Solubility:
Insoluble in cold water, hot water. Miscible with absolute alcohol, ether, and many other organic liquids.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources, incompatibles

Incompatibility with various substances: Reactive with oxidizing agents, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Store away from acetic acid, nitric acid, chlorine, bromine, and fluorine.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 2119 mg/kg [Mouse]. Acute dermal toxicity (LD50): >1700 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 5000 4 hours [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, liver, mucous membranes, bone marrow, central nervous system (CNS).

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant, permeator), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals:
Lowest Lethal Dose: LDL [Human] - Route: Oral; Dose: 50 mg/kg LCL [Man] - Route: Oral; Dose: 10000 ppm/6H

Special Remarks on Chronic Effects on Humans:
Detected in maternal milk in human. Passes through the placental barrier in animal. Embryotoxic and/or foetotoxic in animal. May cause adverse reproductive effects (male and femael fertility (spontaneous abortion and fetotoxicity)) and birth defects based animal data.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes skin irritation. Can be absorbed through skin. Eyes: Causes eye irritation. Inhalation: Vapor causes respiratory tract and mucous membrane irritation. May affect central nervous system and behavior (General anesthetic/CNS depressant with effects including headache, weakness, memory loss, irritability, dizziness, giddiness, loss of coordination and judgement, respiratory depression/arrest or difficulty breathing, loss of appetite, nausea, vomiting, shivering, and possible coma and death). May also affects blood, sense organs, liver, and peripheral nerves. Ingestion: May cause gastrointestinal irritation including abdominal pain, vomiting, and nausea. May also affect liver and urinary system/ kidneys. May cause effects similar to those of acute inhalation. Chronic Potential Health Effects: Chronic inhalation may affect the urinary system (kidneys) blood (anemia), bone marrow (hyperplasia of bone marrow) brain/behavior/Central Nervous system. Chronic inhalation may alsocause mucosal bleeding. Chronic ingestion may affect the liver and metabolism (loss of appetite) and may affect urinary system (kidney damage)

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Xylenes UNNA: 1307 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Xylenes Illinois chemical safety act: Xylenes New York acutely hazardous substances: Xylenes Rhode Island RTK hazardous substances: Xylenes Pennsylvania RTK: Xylenes Minnesota: Xylenes Michigan critical material: Xylenes Massachusetts RTK: Xylenes Massachusetts spill list: Xylenes New Jersey: Xylenes New Jersey spill list: Xylenes Louisiana spill reporting: Xylenes California Director's List of Hazardous Substances: Xylenes TSCA 8(b) inventory: Xylenes SARA 302/304/311/312 hazardous chemicals: Xylenes SARA 313 toxic chemical notification and release reporting: Xylenes CERCLA: Hazardous substances.: Xylenes: 100 lbs. (45.36 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R10- Flammable. R21- Harmful in contact with skin. R36/38- Irritating to eyes and skin. S2- Keep out of the reach of children. S36/37- Wear suitable protective clothing and gloves. S46- If swallowed, seek medical advice immediately and show this container or label.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

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MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MATHESON TRI-GAS, INC.
150 Allen Road Suite 302
Basking Ridge, New Jersey 07920
Information: 1-800-416-2505

Emergency Contact:
CHEMTREC 1-800-424-9300
Calls Originating Outside the US:
703-527-3887 (Collect Calls Accepted)

SUBSTANCE: VINYL CHLORIDE

TRADE NAMES/SYNONYMS:
MTG MSDS 97; 1-CHLOROETHYLENE; 1-CHLOROETHENE; CHLOROETHYLENE; CHLOROETHENE; CHLORETHENE; CHLORETHYLENE; ETHYLENE MONOCHLORIDE; MONOCHLOROETHYLENE; MONOCHLORO ETHENE; MONOCHLOROETHENE; VINYL CHLORIDE MONOMER; VINYL CHLORIDE, INHIBITED; VINYL C MONOMER; RCRA U043; UN 1086; C2H3Cl; MAT24940; RTECS KU9625000

CHEMICAL FAMILY: halogenated, aliphatic

CREATION DATE: Jan 24 1989
REVISION DATE: Dec 11 2008

2. COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: VINYL CHLORIDE
CAS NUMBER: 75-01-4
PERCENTAGE: >99.9

COMPONENT: PHENOL
CAS NUMBER: 108-95-2
PERCENTAGE: <0.1

COMPONENT: INHIBITORS
CAS NUMBER: Not assigned.
PERCENTAGE: <0.1

3. HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=4 REACTIVITY=1

EMERGENCY OVERVIEW:
COLOR: colorless
PHYSICAL FORM: gas
ODOR: faint odor, sweet odor
MAJOR HEALTH HAZARDS: harmful if swallowed, skin irritation, eye irritation, central nervous system depression, cancer hazard (in humans)
PHYSICAL HAZARDS: Flammable gas. May cause flash fire. May polymerize. Containers may rupture or explode.

POTENTIAL HEALTH EFFECTS:
INHALATION:
SHORT TERM EXPOSURE: irritation, nausea, difficulty breathing, irregular heartbeat, headache, drowsiness, dizziness, disorientation, joint pain, loss of coordination, hearing loss, lung congestion
LONG TERM EXPOSURE: impotence, bluish skin color, blood disorders, liver damage, cancer
SKIN CONTACT:
SHORT TERM EXPOSURE: irritation, blisters
LONG TERM EXPOSURE: irritation, blisters
EYE CONTACT:
SHORT TERM EXPOSURE: irritation, eye damage
LONG TERM EXPOSURE: irritation, eye damage
INGESTION:
SHORT TERM EXPOSURE: frostbite
LONG TERM EXPOSURE: cancer

4. FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

SKIN CONTACT: If frostbite or freezing occur, immediately flush with plenty of lukewarm water (105-115 F; 41-46 C). DO NOT USE HOT WATER. If warm water is not available, gently wrap affected parts in blankets. Get immediate medical attention.

EYE CONTACT: Wash eyes immediately with large amounts of water, occasionally lifting upper and lower lids, until no evidence of chemical remains. Get medical attention immediately.

INGESTION: If a large amount is swallowed, get medical attention.

NOTE TO PHYSICIAN: For inhalation, consider oxygen.

5. FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Severe fire hazard. Severe explosion hazard. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back. Vapor/air mixtures are explosive. Electrostatic discharges may be generated by flow or agitation resulting in ignition or explosion.

EXTINGUISHING MEDIA: carbon dioxide, regular dry chemical

Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. For tank, rail car or tank truck: Stop leak if possible without personal risk. Let burn unless leak can be stopped immediately. For smaller tanks or cylinders, extinguish and isolate from other flammables. Evacuation radius: 800 meters (1/2 mile). Do not attempt to extinguish fire unless flow of material can be stopped first. Flood with fine water spray. Cool containers with water spray until well after the fire is out. Apply water from a protected location or from a safe distance. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Evacuate if fire gets out of control or containers are directly exposed to fire. Evacuation radius: 500 meters (1/3 mile). Consider downwind evacuation if material is leaking.

FLASH POINT: -108 F (-78 C) (CC)
LOWER FLAMMABLE LIMIT: 3.6%
UPPER FLAMMABLE LIMIT: 33%
AUTOIGNITION: 882 F (472 C)

6. ACCIDENTAL RELEASE MEASURES

WATER RELEASE:
Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers.

OCCUPATIONAL RELEASE:
Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk. Reduce vapors with water spray. Keep unnecessary people away, isolate hazard area and deny entry. Remove sources of ignition. Ventilate closed spaces before entering. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

7. HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Protect from physical damage. Store outside or in a detached building. Inside storage: Store in a cool, dry place. Store in a

well-ventilated area. Avoid heat, flames, sparks and other sources of ignition. Grounding and bonding required. Subject to storage regulations: U.S. OSHA 29 CFR 1910.101. See original container for storage recommendations. Keep separated from incompatible substances.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
VINYL CHLORIDE:
1.0 ppm OSHA TWA
5 ppm OSHA STEL 15 minute(s)
0.5 ppm OSHA action level 8 hour(s)
1 ppm ACGIH TWA
NIOSH TWA (lowest feasible concentration)

VENTILATION: Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: For the gas: Wear appropriate chemical resistant gloves. For the liquid: Wear insulated gloves.
OSHA REGULATED SUBSTANCES: U.S. OSHA 29 CFR 1910.1017.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.
OSHA Standard:
Respirator selection should comply with 29 CFR 1910.134, 29 CFR 1910.1017, and the final rule published in the Federal Register on August 24, 2006.
NIOSH Recommendations:
At any detectable concentration -
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.
Escape -
Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted canister providing protection against the compound of concern.
Any appropriate escape-type, self-contained breathing apparatus.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: gas
COLOR: colorless
ODOR: faint odor, sweet odor
MOLECULAR WEIGHT: 62.50
MOLECULAR FORMULA: C-H2-C-H-Cl
BOILING POINT: 9 F (-13 C)
FREEZING POINT: -245 F (-154 C)
VAPOR PRESSURE: 2515.6 mmHg @ 21.1 C
VAPOR DENSITY (air=1): 2.2
SPECIFIC GRAVITY (water=1): 0.9106
WATER SOLUBILITY: 0.25%
PH: Not applicable
VOLATILITY: Not applicable
ODOR THRESHOLD: 260 ppm
EVAPORATION RATE: Not applicable
VISCOSITY: 0.01072 cP @ 20 C
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not applicable
SOLVENT SOLUBILITY:
Soluble: alcohol, ether, carbon tetrachloride, benzene

10. STABILITY AND REACTIVITY

REACTIVITY: May polymerize. Avoid contact with light or storage and use above room temperature.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat.

INCOMPATIBILITIES: metal carbide, metals, oxidizing materials, peroxides

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: halogenated compounds, oxides of carbon, phosgene

POLYMERIZATION: May polymerize. Avoid contact with heat, light, air, water or incompatible materials. Closed containers may rupture violently.

11. TOXICOLOGICAL INFORMATION

VINYL CHLORIDE:
TOXICITY DATA: 18 pph/15 minute(s) inhalation-rat LC50; 500 mg/kg oral-rat LD50
CARCINOGEN STATUS: OSHA: Carcinogen; NTP: Known Human Carcinogen; IARC: Human Sufficient Evidence, Animal Sufficient Evidence, Group 1; ACGIH: A1 -Confirmed Human Carcinogen;

EC: Category 1
LOCAL EFFECTS:
Irritant: skin, eye
ACUTE TOXICITY LEVEL:
Toxic: ingestion
Relatively Non-toxic: inhalation
TARGET ORGANS: central nervous system
TUMORIGENIC DATA: Available.
MUTAGENIC DATA: Available.
REPRODUCTIVE EFFECTS DATA: Available.
ADDITIONAL DATA: Stimulants such as epinephrine may induce ventricular fibrillation. May cause birth defects.

12. ECOLOGICAL INFORMATION

ECOTOXICITY DATA:
FISH TOXICITY: 388000 ug/L 10 month(s) LETH (Mortality) Northern pike (Esox lucius)

INVERTEBRATE TOXICITY: 41.74 ug/L 72 day(s) (Residue) Mosquito (Culex pipiens quinquefasciata)

ALGAL TOXICITY: 41.74 ug/L 72 day(s) (Residue) Green algae (Oedogonium cardiacum)

13. DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations. Hazardous Waste Number(s): D043. Dispose of in accordance with U.S. EPA 40 CFR 262 for concentrations at or above the Regulatory level. Regulatory level- 0.2 mg/L. U043.

14. TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Vinyl chloride, stabilized
ID NUMBER: UN1086
HAZARD CLASS OR DIVISION: 2.1
LABELING REQUIREMENTS: 2.1
QUANTITY LIMITATIONS:
PASSENGER AIRCRAFT OR RAILCAR: Forbidden
CARGO AIRCRAFT ONLY: 150 kg

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
SHIPPING NAME: Vinyl chloride, stabilized
UN NUMBER: UN1086
CLASS: 2.1

15. REGULATORY INFORMATION

U.S. REGULATIONS:
CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):
Vinyl chloride: 1 LBS RQ
PHENOL: 1000 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355 Subpart B): Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355 Subpart C): Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370 Subparts B and C):
ACUTE: Yes
CHRONIC: Yes
FIRE: Yes
REACTIVE: Yes
SUDDEN RELEASE: Yes

SARA TITLE III SECTION 313 (40 CFR 372.65):
Vinyl chloride

OSHA PROCESS SAFETY (29 CFR 1910.119): Not regulated.

STATE REGULATIONS:
California Proposition 65:
Known to the state of California to cause the following:
Vinyl chloride
Cancer (Feb 27, 1987)

CANADIAN REGULATIONS:
WHMIS CLASSIFICATION: ABD2

NATIONAL INVENTORY STATUS:
U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

CANADA INVENTORY (DSL/NDSL): Not determined.

16. OTHER INFORMATION

Material Safety Data Sheet

Vinyl Chloride (Chloroethylene)

Section 1. Chemical product and company identification

Product name : Vinyl Chloride (Chloroethylene)

Supplier : AIRGAS INC., on behalf of its subsidiaries
259 North Radnor-Chester Road
Suite 100
Radnor, PA 19087-5283
1-610-687-5253

Product use : Synthetic/Analytical chemistry.

Synonym : Ethylene, chloro-; Chloroethene; Chloroethylene; Monochloroethylene; Vinyl chloride; Vinyl chloride monomer; Vinyl C monomer; C2H3Cl; Ethylene monochloride; Monochloroethene; Chlorethene; Chlorethylene; Chlorure de vinyle; Cloruro di vinile; Rcra waste number U043; Trovidur; UN 1086; VC; VCM; Vinile; Vinylchlorid; Vinyl chloride, inhibited; Vinyle(chlorure de); Winylu chlorek; 1-Chloroethylene

MSDS # : 001067

Date of Preparation/Revision : **4/27/2010.**

In case of emergency : 1-866-734-3438

Section 2. Hazards identification

Physical state : Gas. [COLORLESS GAS OR LIQUID (BELOW 7 F) WITH A PLEASANT ODOR AT HIGH CONCENTRATIONS. [NOTE: SHIPPED AS A LIQUEFIED COMPRESSED GAS.]]

Emergency overview : WARNING!

FLAMMABLE GAS.
MAY CAUSE FLASH FIRE.
HARMFUL IF SWALLOWED.
MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.
CANCER HAZARD - CAN CAUSE CANCER.
CONTENTS UNDER PRESSURE.

Keep away from heat, sparks and flame. Do not puncture or incinerate container. Do not ingest. May cause target organ damage, based on animal data. Risk of cancer depends on duration and level of exposure. Use only with adequate ventilation. Wash thoroughly after handling. Keep container closed.

Contact with rapidly expanding gases can cause frostbite.

Target organs : May cause damage to the following organs: blood, kidneys, liver, mucous membranes, lymphatic system, upper respiratory tract, skin, eyes, central nervous system (CNS).

Routes of entry : Inhalation

Potential acute health effects

Eyes : Irritating to eyes.

Skin : Irritating to skin.

Inhalation : Acts as a simple asphyxiant.

Ingestion : Ingestion is not a normal route of exposure for gases

Potential chronic health effects : **CARCINOGENIC EFFECTS**: Classified A1 (Confirmed for humans.) by ACGIH, 1 (Proven for humans.) by IARC, 1 (Known to be human carcinogens.) by NTP, + (Proven.) by OSHA, + (Proven.) by NIOSH, 1 (Proven for humans.) by European Union.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.

Medical conditions aggravated by over-exposure : Pre-existing disorders involving any target organs mentioned in this MSDS as being at risk may be aggravated by over-exposure to this product.

See toxicological information (section 11)

Section 3. Composition, Information on Ingredients

Name	CAS number	% Volume	Exposure limits
Vinyl Chloride (Chloroethylene)	75-01-4	100	**ACGIH TLV (United States, 1/2009).** TWA: 1 ppm 8 hour(s). **OSHA PEL (United States, 11/2006).** STEL: 5 ppm 15 minute(s). TWA: 1 ppm 8 hour(s). **OSHA PEL 1989 (United States, 3/1989).** STEL: 5 ppm 15 minute(s). TWA: 1 ppm 8 hour(s).

Section 4. First aid measures

No action shall be taken involving any personal risk or without suitable training.If it is suspected that fumes are still present, the rescuer should wear an appropriate mask or self-contained breathing apparatus.It may be dangerous to the person providing aid to give mouth-to-mouth resuscitation.

Eye contact : Check for and remove any contact lenses. Immediately flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical attention immediately.

Skin contact : In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. To avoid the risk of static discharges and gas ignition, soak contaminated clothing thoroughly with water before removing it. Wash clothing before reuse. Clean shoes thoroughly before reuse. Get medical attention immediately.

Frostbite : Try to warm up the frozen tissues and seek medical attention.

Inhalation : Move exposed person to fresh air. If not breathing, if breathing is irregular or if respiratory arrest occurs, provide artificial respiration or oxygen by trained personnel. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention immediately.

Ingestion : As this product is a gas, refer to the inhalation section.

Section 5. Fire-fighting measures

Flammability of the product : Flammable.

Auto-ignition temperature : 471.85°C (881.3°F)

Flash point : Open cup: -79.15°C (-110.5°F).

Flammable limits : Lower: 4% Upper: 22%

Products of combustion : Decomposition products may include the following materials:
carbon dioxide
carbon monoxide
halogenated compounds

Fire-fighting media and instructions : In case of fire, use water spray (fog), foam or dry chemical.

In case of fire, allow gas to burn if flow cannot be shut off immediately. Apply water from a safe distance to cool container and protect surrounding area. If involved in fire, shut off flow immediately if it can be done without risk.

Contains gas under pressure. Flammable gas. In a fire or if heated, a pressure increase will occur and the container may burst, with the risk of a subsequent explosion.

Special protective equipment for fire-fighters : Fire-fighters should wear appropriate protective equipment and self-contained breathing apparatus (SCBA) with a full face-piece operated in positive pressure mode.

Section 6. Accidental release measures

Personal precautions : Immediately contact emergency personnel. Keep unnecessary personnel away. Use suitable protective equipment (section 8). Shut off gas supply if this can be done safely. Isolate area until gas has dispersed.

Environmental precautions : Avoid dispersal of spilled material and runoff and contact with soil, waterways, drains and sewers.

Methods for cleaning up : Immediately contact emergency personnel. Stop leak if without risk. Use spark-proof tools and explosion-proof equipment. Note: see section 1 for emergency contact information and section 13 for waste disposal.

Section 7. Handling and storage

Handling : Use only with adequate ventilation. Use explosion-proof electrical (ventilating, lighting and material handling) equipment. Wash thoroughly after handling. High pressure gas. Do not puncture or incinerate container. Use equipment rated for cylinder pressure. Close valve after each use and when empty. Do not ingest. Keep container closed. Keep away from heat, sparks and flame. To avoid fire, eliminate ignition sources. Protect cylinders from physical damage; do not drag, roll, slide, or drop. Use a suitable hand truck for cylinder movement.

Storage : Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Segregate from oxidizing materials. Cylinders should be stored upright, with valve protection cap in place, and firmly secured to prevent falling or being knocked over. Cylinder temperatures should not exceed 52 °C (125 °F).

Section 8. Exposure controls/personal protection

Engineering controls : Use only with adequate ventilation. Use process enclosures, local exhaust ventilation or other engineering controls to keep worker exposure to airborne contaminants below any recommended or statutory limits. The engineering controls also need to keep gas, vapor or dust concentrations below any lower explosive limits. Use explosion-proof ventilation equipment.

Personal protection

Eyes : Safety eyewear complying with an approved standard should be used when a risk assessment indicates this is necessary to avoid exposure to liquid splashes, mists or dusts.

Skin : Personal protective equipment for the body should be selected based on the task being performed and the risks involved and should be approved by a specialist before handling this product.

Respiratory : Use a properly fitted, air-purifying or air-fed respirator complying with an approved standard if a risk assessment indicates this is necessary. Respirator selection must be based on known or anticipated exposure levels, the hazards of the product and the safe working limits of the selected respirator.

The applicable standards are (US) 29 CFR 1910.134 and (Canada) Z94.4-93

Hands : Chemical-resistant, impervious gloves complying with an approved standard should be worn at all times when handling chemical products if a risk assessment indicates this is necessary.

Personal protection in case of a large spill : Self-contained breathing apparatus (SCBA) should be used to avoid inhalation of the product.

Product name

vinyl chloride

ACGIH TLV (United States, 1/2009).
TWA: 1 ppm 8 hour(s).
OSHA PEL (United States, 11/2006).
STEL: 5 ppm 15 minute(s).
TWA: 1 ppm 8 hour(s).
OSHA PEL 1989 (United States, 3/1989).
STEL: 5 ppm 15 minute(s).
TWA: 1 ppm 8 hour(s).

Consult local authorities for acceptable exposure limits.

Section 9. Physical and chemical properties

Molecular weight : 62.5 g/mole

Molecular formula : C2-H3-Cl

Boiling/condensation point : -13.8°C (7.2°F)

Melting/freezing point : -160°C (-256°F)

Critical temperature : 158.5°C (317.3°F)

Vapor density : 2.21 (Air = 1)

Specific Volume (ft^3/lb) : 6.25

Gas Density (lb/ft^3) : 0.16

Section 10. Stability and reactivity

Stability and reactivity : The product is stable.

Incompatibility with various substances : Extremely reactive or incompatible with the following materials: oxidizing materials.

Hazardous decomposition products : Under normal conditions of storage and use, hazardous decomposition products should not be produced.

Hazardous polymerization : Under normal conditions of storage and use, hazardous polymerization will not occur.

Section 11. Toxicological information

Toxicity data

Product/ingredient name	Result	Species	Dose	Exposure
vinyl chloride	LD50 Oral	Rat	500 mg/kg	-
	LC50 Inhalation Gas.	Rat	18 pph	15 minutes
	LC50 Inhalation Gas.	Rat	5000 ppm	1 hours

Chronic effects on humans : **CARCINOGENIC EFFECTS**: Classified A1 (Confirmed for humans.) by ACGIH, 1 (Proven for humans.) by IARC, 1 (Known to be human carcinogens.) by NTP, + (Proven.) by OSHA, + (Proven.) by NIOSH, 1 (Proven for humans.) by European Union. May cause damage to the following organs: blood, kidneys, liver, mucous membranes, lymphatic system, upper respiratory tract, skin, eyes, central nervous system (CNS).

Other toxic effects on humans : No specific information is available in our database regarding the other toxic effects of this material to humans.

Specific effects

Carcinogenic effects : Can cause cancer. Risk of cancer depends on duration and level of exposure.

Mutagenic effects : No known significant effects or critical hazards.

Reproduction toxicity : No known significant effects or critical hazards.

Section 12. Ecological information

Aquatic ecotoxicity

Not available.

Products of degradation : Products of degradation: carbon oxides (CO, CO_2) and water, halogenated compounds.

Environmental fate : Not available.

Environmental hazards : No known significant effects or critical hazards.

Toxicity to the environment : Not available.

Section 13. Disposal considerations

Product removed from the cylinder must be disposed of in accordance with appropriate Federal, State, local regulation.Return cylinders with residual product to Airgas, Inc.Do not dispose of locally.

Section 14. Transport information

Regulatory information	UN number	Proper shipping name	Class	Packing group	Label	Additional information
DOT Classification	UN1086	VINYL CHLORIDE, STABILIZED	2.1	Not applicable (gas).		**Reportable quantity** 1 lb. (0.454 kg) **Limited quantity** Yes. **Packaging instruction** **Passenger aircraft** Quantity limitation: Forbidden. **Cargo aircraft** Quantity limitation: 150 kg **Special provisions** 21, B44, T50
TDG Classification	UN1086	VINYL CHLORIDE, STABILIZED	2.1	Not applicable (gas).		**Explosive Limit and Limited Quantity Index** 0.125 **ERAP Index** 3000 **Passenger Carrying Road or Rail Index** Forbidden
Mexico Classification	UN1086	VINYL CHLORIDE, STABILIZED	2.1	Not applicable (gas).		-

"Refer to CFR 49 (or authority having jurisdiction) to determine the information required for shipment of the product."

Section 15. Regulatory information

United States

U.S. Federal regulations :

United States inventory (TSCA 8b): This material is listed or exempted.

SARA 302/304/311/312 extremely hazardous substances: No products were found.
SARA 302/304 emergency planning and notification: No products were found.
SARA 302/304/311/312 hazardous chemicals: vinyl chloride
SARA 311/312 MSDS distribution - chemical inventory - hazard identification: vinyl chloride: Fire hazard, reactive, Sudden release of pressure, Immediate (acute) health hazard, Delayed (chronic) health hazard

Clean Water Act (CWA) 307: vinyl chloride

Clean Water Act (CWA) 311: No products were found.

Clean Air Act (CAA) 112 accidental release prevention: vinyl chloride

Clean Air Act (CAA) 112 regulated flammable substances: vinyl chloride

Clean Air Act (CAA) 112 regulated toxic substances: No products were found.

SARA 313

		Product name	CAS number	Concentration
Form R - Reporting requirements	:	Vinyl Chloride (Chloroethylene)	75-01-4	100
Supplier notification	:	Vinyl Chloride (Chloroethylene)	75-01-4	100

SARA 313 notifications must not be detached from the MSDS and any copying and redistribution of the MSDS shall include copying and redistribution of the notice attached to copies of the MSDS subsequently redistributed.

State regulations :

Connecticut Carcinogen Reporting: This material is not listed.
Connecticut Hazardous Material Survey: This material is not listed.
Florida substances: This material is not listed.
Illinois Chemical Safety Act: This material is not listed.
Illinois Toxic Substances Disclosure to Employee Act: This material is not listed.
Louisiana Reporting: This material is not listed.
Louisiana Spill: This material is not listed.
Massachusetts Spill: This material is not listed.
Massachusetts Substances: This material is listed.
Michigan Critical Material: This material is not listed.
Minnesota Hazardous Substances: This material is not listed.
New Jersey Hazardous Substances: This material is listed.
New Jersey Spill: This material is not listed.
New Jersey Toxic Catastrophe Prevention Act: This material is not listed.
New York Acutely Hazardous Substances: This material is listed.
New York Toxic Chemical Release Reporting: This material is not listed.
Pennsylvania RTK Hazardous Substances: This material is listed.
Rhode Island Hazardous Substances: This material is not listed.

California Prop. 65 :

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

Ingredient name	Cancer	Reproductive	No significant risk level	Maximum acceptable dosage level
Vinyl Chloride (Chloroethylene)	Yes.	No.	Yes.	No.

Canada

WHMIS (Canada) :

Class A: Compressed gas.
Class B-1: Flammable gas.
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).
Class F: Dangerously reactive material.

CEPA Toxic substances: This material is listed.
Canadian ARET: This material is not listed.
Canadian NPRI: This material is listed.
Alberta Designated Substances: This material is not listed.
Ontario Designated Substances: This material is not listed.
Quebec Designated Substances: This material is not listed.

Section 16. Other information

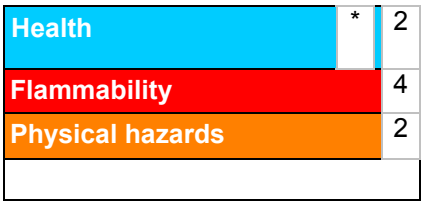
United States

Label requirements : FLAMMABLE GAS.
MAY CAUSE FLASH FIRE.
HARMFUL IF SWALLOWED.
MAY CAUSE TARGET ORGAN DAMAGE, BASED ON ANIMAL DATA.
CANCER HAZARD - CAN CAUSE CANCER.
CONTENTS UNDER PRESSURE.

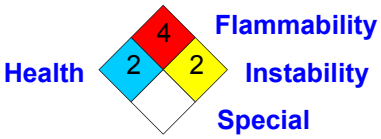
Canada

Label requirements : Class A: Compressed gas.
Class B-1: Flammable gas.
Class D-2A: Material causing other toxic effects (Very toxic).
Class D-2B: Material causing other toxic effects (Toxic).
Class F: Dangerously reactive material.

Hazardous Material Information System (U.S.A.) :

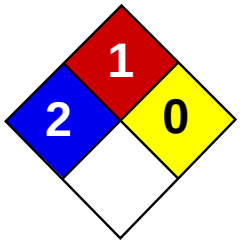


National Fire Protection Association (U.S.A.) :



Notice to reader

To the best of our knowledge, the information contained herein is accurate. However, neither the above-named supplier, nor any of its subsidiaries, assumes any liability whatsoever for the accuracy or completeness of the information contained herein.
Final determination of suitability of any material is the sole responsibility of the user. All materials may present unknown hazards and should be used with caution. Although certain hazards are described herein, we cannot guarantee that these are the only hazards that exist.



Material Safety Data Sheet
Trichloroethylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Trichloroethylene

Catalog Codes: SLT3310, SLT2590

CAS#: 79-01-6

RTECS: KX4560000

TSCA: TSCA 8(b) inventory: Trichloroethylene

CI#: Not available.

Synonym:

Chemical Formula: C2HCl3

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Trichloroethylene	79-01-6	100

Toxicological Data on Ingredients: Trichloroethylene: ORAL (LD50): Acute: 5650 mg/kg [Rat]. 2402 mg/kg [Mouse]. DERMAL (LD50): Acute: 20001 mg/kg [Rabbit].

Section 3: Hazards Identification

Potential Acute Health Effects: Hazardous in case of skin contact (irritant, permeator), of eye contact (irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified A5 (Not suspected for human.) by ACGIH. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance is toxic to kidneys, the nervous system, liver, heart, upper respiratory tract. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. Immediately flush eyes with running water for at least 15 minutes, keeping eyelids open. Cold water may be used. Do not use an eye ointment. Seek medical attention.

Skin Contact:
After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: May be combustible at high temperature.

Auto-Ignition Temperature: 420°C (788°F)

Flash Points: Not available.

Flammable Limits: LOWER: 8% UPPER: 10.5%

Products of Combustion: These products are carbon oxides (CO, CO2), halogenated compounds.

Fire Hazards in Presence of Various Substances: Not available.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray, fog or foam. Do not use water jet.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Absorb with an inert material and put the spilled material in an appropriate waste disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up Keep away from heat. Keep away from sources of ignition. Empty containers pose a fire risk, evaporate the residue under a fume hood. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/

spray. Wear suitable protective clothing In case of insufficient ventilation, wear suitable respiratory equipment If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes

Storage:
Keep container dry. Keep in a cool place. Ground all equipment containing material. Carcinogenic, teratogenic or mutagenic materials should be stored in a separate locked safety storage cabinet or room.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 50 STEL: 200 (ppm) from ACGIH (TLV) TWA: 269 STEL: 1070 (mg/m3) from ACGIH Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Not available.

Taste: Not available.

Molecular Weight: 131.39 g/mole

Color: Clear Colorless.

pH (1% soln/water): Not available.

Boiling Point: 86.7°C (188.1°F)

Melting Point: -87.1°C (-124.8°F)

Critical Temperature: Not available.

Specific Gravity: 1.4649 (Water = 1)

Vapor Pressure: 58 mm of Hg (@ 20°C)

Vapor Density: 4.53 (Air = 1)

Volatility: Not available.

Odor Threshold: 20 ppm

Water/Oil Dist. Coeff.: The product is equally soluble in oil and water; log(oil/water) = 0

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether, acetone.

Solubility:
Easily soluble in methanol, diethyl ether, acetone. Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Not available.

Corrosivity:
Extremely corrosive in presence of aluminum. Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
Acute oral toxicity (LD50): 2402 mg/kg [Mouse]. Acute dermal toxicity (LD50): 20001 mg/kg [Rabbit].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified + (PROVEN) by OSHA. Classified A5 (Not suspected for human.) by ACGIH. The substance is toxic to kidneys, the nervous system, liver, heart, upper respiratory tract.

Other Toxic Effects on Humans: Hazardous in case of skin contact (irritant, permeator), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Passes through the placental barrier in human. Detected in maternal milk in human.

Special Remarks on other Toxic Effects on Humans: Not available.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: CLASS 6.1: Poisonous material.

Identification: : Trichloroethylene : UN1710 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Trichloroethylene California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer which would require a warning under the statute: Trichloroethylene Pennsylvania RTK: Trichloroethylene Florida: Trichloroethylene Minnesota: Trichloroethylene Massachusetts RTK: Trichloroethylene New Jersey: Trichloroethylene TSCA 8(b) inventory: Trichloroethylene CERCLA: Hazardous substances.: Trichloroethylene

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):
CLASS D-1B: Material causing immediate and serious toxic effects (TOXIC). CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R36/38- Irritating to eyes and skin. R45- May cause cancer.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 1

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 1

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:54 PM

Last Updated: 11/01/2010 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MATHESON TRI-GAS, INC.
150 Allen Road Suite 302
Basking Ridge, New Jersey 07920
Information: 1-800-416-2505

Emergency Contact:
CHEMTREC 1-800-424-9300
Calls Originating Outside the US:
703-527-3887 (Collect Calls Accepted)

SUBSTANCE: TRANS-1,2-DICHLOROETHYLENE

TRADE NAMES/SYNONYMS:
MTG MSDS 196; TRANS-ACETYLENE DICHLORIDE; TRANS-DICHLOROETHYLENE; TRANS-1,2-DICHLOROETHENE; 1,2-DICHLOROETHYLENE; RCRA U079; C2H2CL2; MAT23670; RTECS KV9400000

CHEMICAL FAMILY: halogenated, aliphatic

CREATION DATE: Jan 24 1989
REVISION DATE: Dec 11 2008

2. COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: TRANS-1,2-DICHLOROETHYLENE
CAS NUMBER: 156-60-5
PERCENTAGE: 100.0

3. HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=3 REACTIVITY=2

EMERGENCY OVERVIEW:
COLOR: colorless
PHYSICAL FORM: liquid
ODOR: pleasant odor
MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation, central nervous system depression
PHYSICAL HAZARDS: Flammable liquid and vapor. Vapor may cause flash fire. May react on contact with air, heat, light or water.

POTENTIAL HEALTH EFFECTS:

INHALATION:
SHORT TERM EXPOSURE: irritation, nausea, vomiting, drowsiness, symptoms of drunkenness
LONG TERM EXPOSURE: no information on significant adverse effects
SKIN CONTACT:
SHORT TERM EXPOSURE: irritation
LONG TERM EXPOSURE: same as effects reported in short term exposure
EYE CONTACT:
SHORT TERM EXPOSURE: irritation
LONG TERM EXPOSURE: same as effects reported in short term exposure
INGESTION:
SHORT TERM EXPOSURE: symptoms of drunkenness
LONG TERM EXPOSURE: no information on significant adverse effects

4. FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: If vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.

NOTE TO PHYSICIAN: For ingestion, consider gastric lavage. Consider oxygen.

5. FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Severe fire hazard. Vapor/air mixtures are explosive above flash point. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back.

EXTINGUISHING MEDIA: regular dry chemical, carbon dioxide, water, regular foam

Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any

discoloration of tanks due to fire. For tank, rail car or tank truck: Evacuation radius: 800 meters (1/2 mile). Do not attempt to extinguish fire unless flow of material can be stopped first. Flood with fine water spray. Do not scatter spilled material with high-pressure water streams. Cool containers with water spray until well after the fire is out. Apply water from a protected location or from a safe distance. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Water may be ineffective.

FLASH POINT: 36 F (2 C) (CC)
LOWER FLAMMABLE LIMIT: 9.7%
UPPER FLAMMABLE LIMIT: 12.8%
AUTOIGNITION: 860 F (460 C)
FLAMMABILITY CLASS (OSHA): IB

6. ACCIDENTAL RELEASE MEASURES

OCCUPATIONAL RELEASE:
Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk. Reduce vapors with water spray. Small spills: Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Large spills: Dike for later disposal. Remove sources of ignition. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

7. HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Subject to storage regulations: U.S. OSHA 29 CFR 1910.106. Grounding and bonding required. Keep separated from incompatible substances.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
TRANS-1,2-DICHLOROETHYLENE:
1,2-DICHLOROETHYLENE (ALL ISOMERS):
200 ppm (790 mg/m3) OSHA TWA
200 ppm ACGIH TWA
200 ppm (790 mg/m3) NIOSH recommended TWA 10 hour(s)

VENTILATION: Provide local exhaust ventilation system. Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles with a faceshield. Provide an emergency eye

wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.
2000 ppm
Any supplied-air respirator operated in a continuous-flow mode.
Any powered, air-purifying respirator with organic vapor cartridge(s).
Any air-purifying respirator with a full facepiece and an organic vapor canister.
Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted organic vapor canister.
Any self-contained breathing apparatus with a full facepiece.
Any supplied-air respirator with a full facepiece.
Emergency or planned entry into unknown concentrations or IDLH conditions -
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.
Escape -
Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted organic vapor canister.
Any appropriate escape-type, self-contained breathing apparatus.
For Unknown Concentrations or Immediately Dangerous to Life or Health -
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid
COLOR: colorless
ODOR: pleasant odor
MOLECULAR WEIGHT: 96.94
MOLECULAR FORMULA: C2-H2-CL2
BOILING POINT: 118 F (48 C)
FREEZING POINT: -58 F (-50 C)
VAPOR PRESSURE: 400 mmHg @ 31 C
VAPOR DENSITY (air=1): 3.34
SPECIFIC GRAVITY (water=1): 1.2565
WATER SOLUBILITY: slightly soluble

PH: Not available
VOLATILITY: Not available
ODOR THRESHOLD: Not available
EVAPORATION RATE: Not available
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available
SOLVENT SOLUBILITY:
Soluble: ethanol, ether

10. STABILITY AND REACTIVITY

REACTIVITY: May decompose on contact with air, light, moisture, heat or storage and use above room temperature. Releases toxic, corrosive, flammable or explosive gases.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat. Keep out of water supplies and sewers.

INCOMPATIBILITIES: bases, metals, combustible materials, oxidizing materials, acids

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: phosgene, halogenated compounds, oxides of carbon

POLYMERIZATION: May polymerize. Avoid contact with incompatible materials.

11. TOXICOLOGICAL INFORMATION

TRANS-1,2-DICHLOROETHYLENE:
IRRITATION DATA: 500 mg/24 hour(s) skin-rabbit moderate; 10 mg eyes-rabbit moderate
TOXICITY DATA: 24100 ppm inhalation-rat LC50; >5 gm/kg skin-rabbit LD50; 1235 mg/kg oral-rat LD50
LOCAL EFFECTS:
Irritant: inhalation, skin, eye
ACUTE TOXICITY LEVEL:
Moderately Toxic: ingestion
Slightly Toxic: inhalation
TARGET ORGANS: central nervous system
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: respiratory disorders
MUTAGENIC DATA: Available.
REPRODUCTIVE EFFECTS DATA: Available.

12. ECOLOGICAL INFORMATION

ECOTOXICITY DATA:
INVERTEBRATE TOXICITY: <110000 ug/L 48 hour(s) (Mortality) Water flea (Daphnia magna)

13. DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations. Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): U079.

14. TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Trichlorobenzenes, liquid
ID NUMBER: UN2321
HAZARD CLASS OR DIVISION: 6.1
PACKING GROUP: III
LABELING REQUIREMENTS: 6.1

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
SHIPPING NAME: Trichlorobenzenes, liquid
UN NUMBER: UN2321
CLASS: 6.1
PACKING GROUP/CATEGORY: III

15. REGULATORY INFORMATION

U.S. REGULATIONS:
CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4): Not regulated.

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355 Subpart B): Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355 Subpart C): Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370 Subparts B and C):
ACUTE: Yes
CHRONIC: No
FIRE: Yes
REACTIVE: Yes
SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65):
1,2-DICHLOROETHYLENE (ALL ISOMERS)

OSHA PROCESS SAFETY (29 CFR 1910.119): Not regulated.

STATE REGULATIONS:
California Proposition 65: Not regulated.

CANADIAN REGULATIONS:
WHMIS CLASSIFICATION: Not determined.

NATIONAL INVENTORY STATUS:
U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

CANADA INVENTORY (DSL/NDSL): Not determined.

16. OTHER INFORMATION

MATHESON TRI-GAS, INC. MAKES NO EXPRESS OR IMPLIED WARRANTIES, GUARANTEES OR REPRESENTATIONS REGARDING THE PRODUCT OR THE INFORMATION HEREIN, INCLUDING BUT NOT LIMITED TO ANY IMPLIED WARRANTY OF MERCHANTABILITY OR FITNESS FOR USE. MATHESON TRI-GAS, INC. SHALL NOT BE LIABLE FOR ANY PERSONAL INJURY, PROPERTY OR OTHER DAMAGES OF ANY NATURE, WHETHER COMPENSATORY, CONSEQUENTIAL, EXEMPLARY, OR OTHERWISE, RESULTING FROM ANY PUBLICATION, USE OR RELIANCE UPON THE INFORMATION HEREIN.

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MATHESON TRI-GAS, INC.
150 Allen Road Suite 302
Basking Ridge, New Jersey 07920
Information: 1-800-416-2505

Emergency Contact:
CHEMTREC 1-800-424-9300
Calls Originating Outside the US:
703-527-3887 (Collect Calls Accepted)

SUBSTANCE: TETRACHLOROETHYLENE

TRADE NAMES/SYNONYMS:
MTG MSDS 238; PERCHLOROETHYLENE; 1,1,2,2-TETRACHLOROETHYLENE; ETHYLENE TETRACHLORIDE; PERC; TETRACHLORETHYLENE; PERCHLORETHYLENE; TETRACHLOROETHENE; PCE; RCRA U210; UN 1897; C2Cl4; MAT22900; RTECS KX3850000

CHEMICAL FAMILY: halogenated, aliphatic

CREATION DATE: Jan 24 1989
REVISION DATE: Dec 11 2008

2. COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: TETRACHLOROETHYLENE
CAS NUMBER: 127-18-4
PERCENTAGE: 100.0

3. HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=3 FIRE=0 REACTIVITY=0

EMERGENCY OVERVIEW:
COLOR: colorless
PHYSICAL FORM: volatile liquid
ODOR: faint odor, sweet odor
MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation, central nervous system depression, cancer hazard (in humans)

POTENTIAL HEALTH EFFECTS:
INHALATION:
SHORT TERM EXPOSURE: irritation, nausea, vomiting, chest pain, difficulty breathing, irregular

heartbeat, headache, drowsiness, dizziness, disorientation, mood swings, loss of coordination, blurred vision, lung congestion, kidney damage, liver damage
LONG TERM EXPOSURE: irritation, nausea, stomach pain, loss of appetite, headache, drowsiness, dizziness, disorientation, sleep disturbances, pain in extremities, loss of coordination, blurred vision, hormonal disorders, internal bleeding, heart damage, liver damage, birth defects, brain damage, tumors, cancer
SKIN CONTACT:
SHORT TERM EXPOSURE: irritation (possibly severe)
LONG TERM EXPOSURE: irritation
EYE CONTACT:
SHORT TERM EXPOSURE: irritation
LONG TERM EXPOSURE: irritation
INGESTION:
SHORT TERM EXPOSURE: same as effects reported in short term inhalation
LONG TERM EXPOSURE: same as effects reported in long term inhalation

4. FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: If vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.

NOTE TO PHYSICIAN: For inhalation, consider oxygen. For ingestion, consider gastric lavage. Consider oxygen.

5. FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Negligible fire hazard.

EXTINGUISHING MEDIA: carbon dioxide, regular dry chemical

Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Cool containers with water spray until well after the fire is out. Stay away from the ends

of tanks. For tank, rail car or tank truck, evacuation radius: 800 meters (1/2 mile).

FLASH POINT: No data available.

6. ACCIDENTAL RELEASE MEASURES

SOIL RELEASE:
Dig holding area such as lagoon, pond or pit for containment. Dike for later disposal. Absorb with sand or other non-combustible material.

WATER RELEASE:
Absorb with activated carbon. Remove trapped material with suction hoses. Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers.

OCCUPATIONAL RELEASE:
Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk. Small liquid spills: Absorb with sand or other non-combustible material. Large spills: Dike for later disposal. Remove sources of ignition. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

7. HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Store in a cool, dry place. Store in a well-ventilated area. Avoid heat, flames, sparks and other sources of ignition. Keep separated from incompatible substances.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
TETRACHLOROETHYLENE:
TETRACHLOROETHYLENE (PERCHLOROETHYLENE):
100 ppm OSHA TWA
200 ppm OSHA ceiling
300 ppm OSHA peak (5 minutes in any 3 hours)
25 ppm (170 mg/m3) OSHA TWA (vacated by 58 FR 35338, June 30, 1993)
25 ppm ACGIH TWA
100 ppm ACGIH STEL
NIOSH TWA (lowest feasible concentration)

VENTILATION: Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.
At any detectable concentration -
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.
Escape -
Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted organic vapor canister.
Any appropriate escape-type, self-contained breathing apparatus.
For Unknown Concentrations or Immediately Dangerous to Life or Health -
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid
APPEARANCE: clear
COLOR: colorless
PHYSICAL FORM: volatile liquid
ODOR: faint odor, sweet odor
MOLECULAR WEIGHT: 165.83
MOLECULAR FORMULA: Cl2-C-C-Cl2
BOILING POINT: 250 F (121 C)
FREEZING POINT: -2 F (-19 C)
VAPOR PRESSURE: 14 mmHg @ 20 C
VAPOR DENSITY (air=1): 5.83
SPECIFIC GRAVITY (water=1): 1.6227
WATER SOLUBILITY: 0.015%
PH: Not available
VOLATILITY: Not available
ODOR THRESHOLD: 50 ppm
EVAPORATION RATE: 2.8 (butyl acetate=1)

COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available
SOLVENT SOLUBILITY:
Soluble: alcohol, ether, benzene, chloroform, oils

10. STABILITY AND REACTIVITY

REACTIVITY: Stable at normal temperatures and pressure.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat.

INCOMPATIBILITIES: acids, metals, bases, oxidizing materials, combustible materials

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: phosgene, halogenated compounds, oxides of carbon

POLYMERIZATION: Will not polymerize.

11. TOXICOLOGICAL INFORMATION

TETRACHLOROETHYLENE:
IRRITATION DATA: 810 mg/24 hour(s) skin-rabbit severe; 500 mg/24 hour(s) skin-rabbit mild; 162 mg eyes-rabbit mild; 500 mg/24 hour(s) eyes-rabbit mild
TOXICITY DATA: 4100 ppm/6 hour(s) inhalation-rat LC50; >10000 mg/kg skin-rabbit LD50 (Dow); 2629 mg/kg oral-rat LD50
CARCINOGEN STATUS: NTP: Anticipated Human Carcinogen; IARC: Human Limited Evidence, Animal Sufficient Evidence, Group 2A; ACGIH: A3 -Confirmed Animal Carcinogen; EC: Category 2
LOCAL EFFECTS:
Irritant: inhalation, skin, eye
ACUTE TOXICITY LEVEL:
Moderately Toxic: ingestion
Slightly Toxic: inhalation
TARGET ORGANS: central nervous system
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: eye disorders, heart or cardiovascular disorders, kidney disorders, liver disorders, nervous system disorders, skin disorders and allergies
TUMORIGENIC DATA: Available.
MUTAGENIC DATA: Available.
REPRODUCTIVE EFFECTS DATA: Available.
ADDITIONAL DATA: May be excreted in breast milk. Alcohol may enhance the toxic effects. Stimulants such as epinephrine may induce ventricular fibrillation.

12. ECOLOGICAL INFORMATION

ECOTOXICITY DATA:
FISH TOXICITY: 8430 ug/L 96 hour(s) LC50 (Mortality) Flagfish (Jordanella floridae)

INVERTEBRATE TOXICITY: 7500 ug/L 48 hour(s) EC50 (Immobilization) Water flea (Daphnia magna)

ALGAL TOXICITY: 509000 ug/L 96 hour(s) EC50 (Photosynthesis) Diatom (Skeletonema costatum)

FATE AND TRANSPORT:
BIOCONCENTRATION: 49 ug/L 1-21 hour(s) BCF (Residue) Bluegill (Lepomis macrochirus) 3.43 ug/L

13. DISPOSAL CONSIDERATIONS

Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): U210. Hazardous Waste Number(s): D039. Dispose of in accordance with U.S. EPA 40 CFR 262 for concentrations at or above the Regulatory level. Regulatory level- 0.7 mg/L. Dispose in accordance with all applicable regulations.

14. TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Tetrachloroethylene
ID NUMBER: UN1897
HAZARD CLASS OR DIVISION: 6.1
PACKING GROUP: III
LABELING REQUIREMENTS: 6.1
MARINE POLLUTANT: TETRACHLOROETHYLENE

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
SHIPPING NAME: Tetrachloroethylene
UN NUMBER: UN1897
CLASS: 6.1
PACKING GROUP/CATEGORY: III

15. REGULATORY INFORMATION

U.S. REGULATIONS:
CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):
TETRACHLOROETHYLENE (PERCHLOROETHYLENE): 100 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355 Subpart B): Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355 Subpart

C): Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370 Subparts B and C):
ACUTE: Yes
CHRONIC: Yes
FIRE: No
REACTIVE: No
SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65):
TETRACHLOROETHYLENE (PERCHLOROETHYLENE)

OSHA PROCESS SAFETY (29 CFR 1910.119): Not regulated.

STATE REGULATIONS:
California Proposition 65:
Known to the state of California to cause the following:
TETRACHLOROETHYLENE (PERCHLOROETHYLENE)
Cancer (Apr 01, 1988)

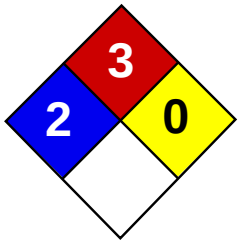
CANADIAN REGULATIONS:
WHMIS CLASSIFICATION: D2

NATIONAL INVENTORY STATUS:
U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

CANADA INVENTORY (DSL/NDSL): Not determined.

16. OTHER INFORMATION



Material Safety Data Sheet
Toluene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Toluene

Catalog Codes: SLT2857, SLT3277

CAS#: 108-88-3

RTECS: XS5250000

TSCA: TSCA 8(b) inventory: Toluene

CI#: Not available.

Synonym: Toluol, Tolu-Sol; Methylbenzene; Methacide; Phenylmethane; Methylbenzol

Chemical Name: Toluene

Chemical Formula: C6-H5-CH3 or C7-H8

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Toluene	108-88-3	100

Toxicological Data on Ingredients: Toluene: ORAL (LD50): Acute: 636 mg/kg [Rat]. DERMAL (LD50): Acute: 14100 mg/kg [Rabbit]. VAPOR (LC50): Acute: 49000 mg/m 4 hours [Rat]. 440 ppm 24 hours [Mouse].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of skin contact (irritant), of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. MUTAGENIC EFFECTS: Not available. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to blood, kidneys, the nervous system, liver, brain, central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Get medical attention.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 480°C (896°F)

Flash Points: CLOSED CUP: 4.4444°C (40°F). (Setaflash) OPEN CUP: 16°C (60.8°F).

Flammable Limits: LOWER: 1.1% UPPER: 7.1%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:
Flammable in presence of open flames and sparks, of heat. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:
Flammable liquid, insoluble in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use water spray or fog.

Special Remarks on Fire Hazards: Not available.

Special Remarks on Explosion Hazards:
Toluene forms explosive reaction with 1,3-dichloro-5,5-dimethyl-2,4-imidazolididione; dinitrogen tetraoxide; concentrated nitric acid, sulfuric acid + nitric acid; N2O4; AgClO4; BrF3; Uranium hexafluoride; sulfur dichloride. Also forms an explosive mixture with tetranitromethane.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Toxic flammable liquid, insoluble or very slightly soluble in water. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 200 STEL: 500 CEIL: 300 (ppm) from OSHA (PEL) [United States] TWA: 50 (ppm) from ACGIH (TLV) [United States] SKIN TWA: 100 STEL: 150 from NIOSH [United States] TWA: 375 STEL: 560 (mg/m3) from NIOSH [United States] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Sweet, pungent, Benzene-like.

Taste: Not available.

Molecular Weight: 92.14 g/mole

Color: Colorless.

pH (1% soln/water): Not applicable.

Boiling Point: 110.6°C (231.1°F)

Melting Point: -95°C (-139°F)

Critical Temperature: 318.6°C (605.5°F)

Specific Gravity: 0.8636 (Water = 1)

Vapor Pressure: 3.8 kPa (@ 25°C)

Vapor Density: 3.1 (Air = 1)

Volatility: Not available.

Odor Threshold: 1.6 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 2.7

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether, acetone.

Solubility:
Soluble in diethyl ether, acetone. Practically insoluble in cold water. Soluble in ethanol, benzene, chloroform, glacial acetic acid, carbon disulfide. Solubility in water: 0.561 g/l @ 25 deg. C.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources (flames, sparks, static), incompatible materials

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Incompatible with strong oxidizers, silver perchlorate, sodium difluoride, Tetranitromethane, Uranium Hexafluoride. Frozen Bromine Trifluoride reacts violently with Toluene at -80 deg. C. Reacts chemically with nitrogen oxides, or halogens to form nitrotoluene, nitrobenzene, and nitrophenol and halogenated products, respectively.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation. Ingestion.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 636 mg/kg [Rat]. Acute dermal toxicity (LD50): 14100 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 440 24 hours [Mouse].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: A4 (Not classifiable for human or animal.) by ACGIH, 3 (Not classifiable for human.) by IARC. May cause damage to the following organs: blood, kidneys, the nervous system, liver, brain, central nervous system (CNS).

Other Toxic Effects on Humans:
Hazardous in case of skin contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (permeator).

Special Remarks on Toxicity to Animals:
Lowest Published Lethal Dose: LDL [Human] - Route: Oral; Dose: 50 mg/kg LCL [Rabbit] - Route: Inhalation; Dose: 55000 ppm/40min

Special Remarks on Chronic Effects on Humans:
Detected in maternal milk in human. Passes through the placental barrier in human. Embryotoxic and/or foetotoxic in animal. May cause adverse reproductive effects and birth defects (teratogenic). May affect genetic material (mutagenic)

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects: Skin: Causes mild to moderate skin irritation. It can be absorbed to some extent through the skin. Eyes: Cauess mild to moderate eye irritation with a burning sensation. Splash contact with eyes also causes conjunctivitis, blepharospasm, corneal edema, corneal abraisons. This usually resolves in 2 days. Inhalation: Inhalation of vapor may cause respiratory tract irritation causing coughing and wheezing, and nasal discharge. Inhalation of high concentrations may affect behavior and cause central nervous system effects characterized by nausea, headache, dizziness, tremors, restlessness, lightheadedness, exhilaration, memory loss, insomnia, impaired reaction time, drowsiness, ataxia, hallucinations, somnolence, muscle contraction or spasticity, unconsciousness and coma. Inhalation of high concentration of vapor may also affect the cardiovascular system (rapid heart beat, heart palpitations, increased or decreased blood pressure, dysrhythmia,), respiration (acute pulmonary edema, respiratory depression, apnea, asphyxia), cause vision disturbances and dilated pupils, and cause loss of appetite. Ingestion: Aspiration hazard. Aspiration of Toluene into the lungs may cause chemical pneumonitis. May cause irritation of the digestive tract with nausea, vomiting, pain. May have effects similar to that of acute inhalation. Chronic Potential Health Effects: Inhalation and Ingestion: Prolonged or repeated exposure via inhalation may cause central nervous system and cardiovascular symptoms similar to that of acute inhalation and ingestion as well liver damage/failure, kidney damage/failure (with hematuria, proteinuria, oliguria, renal tubular acidosis), brain damage, weight loss, blood (pigmented or nucleated red blood cells, changes in white blood cell count), bone marrow changes, electrolyte imbalances (Hypokalemia, Hypophostatemia), severe, muscle weakness and Rhabdomyolysis. Skin: Repeated or prolonged skin contact may cause defatting dermatitis.

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 313 mg/l 48 hours [Daphnia (daphnia)]. 17 mg/l 24 hours [Fish (Blue Gill)]. 13 mg/l 96 hours [Fish (Blue Gill)]. 56 mg/l 24 hours [Fish (Fathead minnow)]. 34 mg/l 96 hours [Fish (Fathead minnow)]. 56.8 ppm any hours [Fish (Goldfish)].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Toluene UNNA: 1294 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Toluene California prop. 65 (no significant risk level): Toluene: 7 mg/day (value) California prop. 65 (acceptable daily intake level): Toluene: 7 mg/day (value) California prop. 65: This product contains the following ingredients for which the State of California has found to cause birth defects which would require a warning under the statute: Toluene Connecticut hazardous material survey.: Toluene Illinois

toxic substances disclosure to employee act: Toluene Illinois chemical safety act: Toluene New York release reporting list: Toluene Rhode Island RTK hazardous substances: Toluene Pennsylvania RTK: Toluene Florida: Toluene Minnesota: Toluene Michigan critical material: Toluene Massachusetts RTK: Toluene Massachusetts spill list: Toluene New Jersey: Toluene New Jersey spill list: Toluene Louisiana spill reporting: Toluene California Director's List of Hazardous Substances.: Toluene TSCA 8(b) inventory: Toluene TSCA 8(d) H and S data reporting: Toluene: Effective date: 10/04/82; Sunset Date: 10/0/92 SARA 313 toxic chemical notification and release reporting: Toluene CERCLA: Hazardous substances.: Toluene: 1000 lbs. (453.6 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R11- Highly flammable. R20- Harmful by inhalation. S16- Keep away from sources of ignition - No smoking. S25- Avoid contact with eyes. S29- Do not empty into drains. S33- Take precautionary measures against static discharges.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

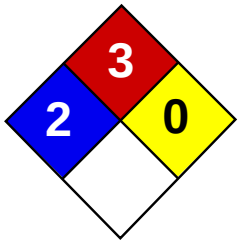
Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/10/2005 08:30 PM

Last Updated: 11/01/2010 12:00 PM



Material Safety Data Sheet
Ethylbenzene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Ethylbenzene

Catalog Codes: SLE2044

CAS#: 100-41-4

RTECS: DA0700000

TSCA: TSCA 8(b) inventory: Ethylbenzene

CI#: Not available.

Synonym: Ethyl Benzene; Ethylbenzol; Phenylethane

Chemical Name: Ethylbenzene

Chemical Formula: C8H10

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Ethylbenzene	100-41-4	100

Toxicological Data on Ingredients: Ethylbenzene: ORAL (LD50): Acute: 3500 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Hazardous in case of eye contact (irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, permeator).

Potential Chronic Health Effects:
Slightly hazardous in case of skin contact (irritant, sensitizer). CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Not available. The substance may be toxic to central nervous system (CNS). Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 432°C (809.6°F)

Flash Points:
CLOSED CUP: 15°C (59°F). (Tagliabue.) OPEN CUP: 26.667°C (80°F) (Cleveland) (CHRIS, 2001) CLOSED CUP: 12.8 C (55 F) (Bingham et al, 2001; NIOSH, 2001) CLOSED CUP: 21 C (70 F) (NFPA)

Flammable Limits: LOWER: 0.8% - 1.6%UPPER: 6.7% - 7%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances: Highly flammable in presence of open flames and sparks, of heat.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Slightly explosive in presence of heat.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards:
Vapor may travel considerable distance to source of ignition and flash back. Vapors may form explosive mixtures with air. When heated to decomposition it emits acrid smoke and irritating fumes.

Special Remarks on Explosion Hazards: Vapors may form explosive mixtures in air.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with eyes. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Sensitive to light. Store in light-resistant containers.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 100 STEL: 125 (ppm) from OSHA (PEL) [United States] TWA: 435 STEL: 545 from OSHA (PEL) [United States] TWA: 435 STEL: 545 (mg/m3) from NIOSH [United States] TWA: 100 STEL: 125 (ppm) from NIOSH [United States] TWA: 100 STEL: 125 (ppm) from ACGIH (TLV) [United States] TWA: 100 STEL: 125 (ppm) [United Kingdom (UK)] TWA: 100 STEL: 125 (ppm) [Belgium] TWA: 100 STEL: 125 (ppm) [Finland] TWA: 50 (ppm) [Norway] Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Sweetish. Gasoline-like. Aromatic.

Taste: Not available.

Molecular Weight: 106.16 g/mole

Color: Colorless.

pH (1% soln/water): Not available.

Boiling Point: 136°C (276.8°F)

Melting Point: -94.9 (-138.8°F)

Critical Temperature: 617.15°C (1142.9°F)

Specific Gravity: 0.867 (Water = 1)

Vapor Pressure: 0.9 kPa (@ 20°C)

Vapor Density: 3.66 (Air = 1)

Volatility: 100% (v/v).

Odor Threshold: 140 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 3.1

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility:
Easily soluble in diethyl ether. Very slightly soluble in cold water or practically insoluble in water. Soluble in all proportions in Ethyl alcohol. Soluble in Carbon tetrachloride, Benzene. Insoluble in Ammonia. Slightly soluble in Chloroform. Solubility in Water: 169 mg/l @ 25 deg. C.; 0.014 g/100 ml @ 15 deg. C.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ingnition sources (flames, sparks, static), incompatible materials, light

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Not considered to be corrosive for metals and glass.

Special Remarks on Reactivity:
Can react vigorously with oxidizing materials. Sensitive to light.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Inhalation.

Toxicity to Animals: Acute oral toxicity (LD50): 3500 mg/kg [Rat].

Chronic Effects on Humans:
CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC. MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. May cause damage to the following organs: central nervous system (CNS).

Other Toxic Effects on Humans:
Hazardous in case of ingestion, of inhalation. Slightly hazardous in case of skin contact (irritant, permeator).

Special Remarks on Toxicity to Animals:
Lethal Dose/Conc 50% Kill: LD50 [Rabbit] - Route: Skin; Dose: 17800 ul/kg Lowest Published Lethal Dose/Conc: LDL[Rat] - Route: Inhalation (vapor); Dose: 4000 ppm/4 H

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects and birth defects (teratogenic) based on animal test data. May cause cancer based on animals data. IARC evidence for carcinogenicity in animals is sufficient. IARC evidence of carcinogenicity in humans inadequate. May affect genetic material (mutagenic).

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Can cause mild skin irritation. It can be absorbed through intact skin. Eyes: Contact with vapor or liquid can cause severe eye irritation depending on concentration. It may also cause conjunctivitis. At a vapor exposure level of 85 - 200 ppm , it is mildly and transiently irritating to the eyes; 1000 ppm causes further irritation and tearing; 2000 ppm results in immediate and severe irritation and tearing; 5,000 ppm is intolerable (ACGIH, 1991; Clayton and Clayton, 1994). Standard draize test for eye irritation using 500 mg resulted in severe irritation (RTECS) Inhalation: Exposure to high concentrations can cause nasal, mucous membrane and respiratory tract irritation and can also result in chest constriction and, trouble breathing, respiratory failure, and even death. It can also affect behavior/Central Nervous System. The effective dose for CNS depression in experimental animals was 10,000 ppm (ACGIH, 1991). Symptoms of CNS depression include

headache, nausea, weakness, dizziness, vertigo, irritability, fatigue, lightheadedness, sleepiness, tremor, loss of coordination, judgement and conciousness, coma, and death. It can also cause pulmonary edema. Inhalation of 85 ppm can produce fatigue, insomnia, headache, and mild irritation of the respiratory tract (Haley & Berndt, 1987). Ingestion: Do not drink, pipet or siphon by mouth. May cause gastroinestinal/digestive tract irritation with Abdominal pain, nausea, vomiting. Ethylbenzene is a pulmonary aspiration hazard. Pulmonary aspiration of even small amounts of the liquid may cause fatal pneumonitis. It may also affect behavior/central nervous system with

Section 12: Ecological Information

Ecotoxicity:
Ecotoxicity in water (LC50): 14 mg/l 96 hours [Fish (Trout)] (static). 12.1 mg/l 96 hours [Fish (Fathead Minnow)] (flow-through)]. 150 mg/l 96 hours [Fish (Blue Gill/Sunfish)] (static). 275 mg/l 96 hours [Fish (Sheepshead Minnow)]. 42.3 mg/l 96 hours [Fish (Fathead Minnow)](soft water). 87.6mg/l 96 hours [Shrimp].

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Ethylbenzene UNNA: 1175 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
Connecticut hazardous material survey.: Ethylbenzene Illinois toxic substances disclosure to employee act: Ethylbenzene Illinois chemical safety act: Ethylbenzene New York release reporting list: Ethylbenzene Rhode Island RTK hazardous substances: Ethylbenzene Pennsylvania RTK: Ethylbenzene Minnesota: Ethylbenzene Massachusetts RTK: Ethylbenzene Massachusetts spill list: Ethylbenzene New Jersey: Ethylbenzene New Jersey spill list: Ethylbenzene Louisiana spill reporting: Ethylbenzene California Director's List of Hazardous Substances: Ethylbenzene TSCA 8(b) inventory: Ethylbenzene TSCA 4(a) proposed test rules: Ethylbenzene TSCA 8(d) H and S data reporting: Ethylbenzene: Effective Date: 6/19/87; Sunset Date: 6/19/97 SARA 313 toxic chemical notification and release reporting: Ethylbenzene

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC). CLASSE D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):
R11- Highly flammable. R20- Harmful by inhalation. S16- Keep away from sources of ignition - No smoking. S24/25- Avoid contact with skin and eyes. S29- Do not empty into drains.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References:
-Manufacturer's Material Safety Data Sheet. -Fire Protection Guide to Hazardous Materials, 13th ed., National Fire Protection Association (NFPA) -Registry of Toxic Effects of Chemical Substances (RTECS) -Chemical Hazard Response Information System (CHRIS) -Hazardous Substance Data Bank (HSDB) -New Jersey Hazardous Substance Fact Sheet -Ariel Global View -Reprotext System

Other Special Considerations: Not available.

Created: 10/09/2005 05:28 PM

Last Updated: 11/01/2010 12:00 PM

Material Safety Data Sheet

SECTION 1: PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: Isobutylene Replacement Gas 10PPM, 100 PPM Isobutylene/Air
MANUFACTURER: 3M
DIVISION: Occupational Health & Environ. Safety

ADDRESS: 3M Center
St. Paul, MN 55144-1000

EMERGENCY PHONE: 1-800-364-3577 or (651) 737-6501 (24 hours)

Issue Date: 05/05/10
Supercedes Date: 06/13/07

Document Group: 23-0006-9

Product Use:
Intended Use: Calibration Gas

SECTION 2: INGREDIENTS

Ingredient	C.A.S. No.	% by Wt
NITROGEN	7727-37-9	Approximately 82
OXYGEN	7782-44-7	Approximately 18
ISOBUTYLENE	115-11-7	< 0.02

SECTION 3: HAZARDS IDENTIFICATION

3.1 EMERGENCY OVERVIEW

Specific Physical Form: Compressed Gas Cylinder under pressure (typically 500-1000 psig)
Odor, Color, Grade: colorless, no odor
General Physical Form: Gas
Immediate health, physical, and environmental hazards: Closed containers exposed to heat from fire may build pressure and explode. May cause target organ effects.

3.2 POTENTIAL HEALTH EFFECTS

Eye Contact:
No health effects are expected.

Skin Contact:
No health effects are expected.

Inhalation:
May be absorbed following inhalation and cause target organ effects.

Ingestion:
No health effects are expected.

Target Organ Effects:
Central Nervous System (CNS) Depression: Signs/symptoms may include headache, dizziness, drowsiness, incoordination, nausea, slowed reaction time, slurred speech, giddiness, and unconsciousness.

SECTION 4: FIRST AID MEASURES

4.1 FIRST AID PROCEDURES

The following first aid recommendations are based on an assumption that appropriate personal and industrial hygiene practices are followed.

Eye Contact: No need for first aid is anticipated.

Skin Contact: No need for first aid is anticipated.

Inhalation: If signs/symptoms develop, remove person to fresh air. If signs/symptoms persist, get medical attention.

If Swallowed: No need for first aid is anticipated.

SECTION 5: FIRE FIGHTING MEASURES

5.1 FLAMMABLE PROPERTIES

Autoignition temperature	*Not Applicable*
Flash Point	*Not Applicable*
Flammable Limits - LEL	*Not Applicable*
Flammable Limits - UEL	*Not Applicable*
OSHA Flammability Classification:	Not Determined

5.2 EXTINGUISHING MEDIA
Material will not burn.

5.3 PROTECTION OF FIRE FIGHTERS

Special Fire Fighting Procedures: Wear full protective equipment (Bunker Gear) and a self-contained breathing apparatus (SCBA).

Unusual Fire and Explosion Hazards: Closed containers exposed to heat from fire may build pressure and explode. No container should be exposed to a temperature higher than 82 degrees C (approximately 125 degrees F).

Note: See STABILITY AND REACTIVITY (SECTION 10) for hazardous combustion and thermal decomposition information.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Accidental Release Measures:
Evacuate unprotected and untrained personnel from hazard area. The spill should be cleaned up by qualified personnel. Ventilate the area with fresh air. Close cylinder. If the cylinder can't be closed, place in a well-ventilated area, preferably an operating exhaust hood, or if necessary outdoors.
Place in a closed container approved for transportation by appropriate authorities. Dispose of collected material as soon as possible. Observe precautions from other sections. Call 3M- HELPS line (1-800-364-3577) for more information on handling and managing the spill. Clean up residue.

In the event of a release of this material, the user should determine if the release qualifies as reportable according to local, state, and federal regulations.

SECTION 7: HANDLING AND STORAGE

7.1 HANDLING
For industrial or professional use only. Use general dilution ventilation and/or local exhaust ventilation to control airborne exposures to below Occupational Exposure Limits. If ventilation is not adequate, use respiratory protection equipment.

7.2 STORAGE
Store away from heat. Store out of direct sunlight.

SECTION 8: EXPOSURE CONTROLS/PERSONAL PROTECTION

8.1 ENGINEERING CONTROLS
Not applicable.

8.2 PERSONAL PROTECTIVE EQUIPMENT (PPE)

8.2.1 Eye/Face Protection
Avoid eye contact.
The following eye protection(s) are recommended: Safety Glasses with side shields
.

8.2.2 Skin Protection
Not applicable. Gloves are not required.

8.2.3 Respiratory Protection
Under normal use conditions, airborne exposures are not expected to be significant enough to require respiratory protection.

8.2.4 Prevention of Swallowing
Not applicable.

8.3 EXPOSURE GUIDELINES

Ingredient	Authority	Type	Limit	Additional Information
BUTENES	ACGIH	TWA	250 ppm	
ISOBUTYLENE	ACGIH	TWA	250 ppm	

SOURCE OF EXPOSURE LIMIT DATA:
ACGIH: American Conference of Governmental Industrial Hygienists
CMRG: Chemical Manufacturer Recommended Guideline
OSHA: Occupational Safety and Health Administration
AIHA: American Industrial Hygiene Association Workplace Environmental Exposure Level (WEEL)

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Specific Physical Form:	Compressed Gas Cylinder under pressure (typically 500-1000 psig)
Odor, Color, Grade:	colorless, no odor
General Physical Form:	Gas
Autoignition temperature	*Not Applicable*
Flash Point	*Not Applicable*
Flammable Limits - LEL	*Not Applicable*
Flammable Limits - UEL	*Not Applicable*
Boiling point	-317.8 ºF
Density	1.25 g/l
Vapor Density	1.00 [*Ref Std:* AIR=1]
Vapor Pressure	*Not Applicable*
Specific Gravity	*No Data Available*
pH	*Not Applicable*
Melting point	*Not Applicable*
Solubility In Water	*Not Applicable*
Evaporation rate	*Not Applicable*
Volatile Organic Compounds	*Not Applicable*
Kow - Oct/Water partition coef	*No Data Available*
Percent volatile	100 %
VOC Less H2O & Exempt Solvents	*Not Applicable*
Viscosity	*Not Applicable*
Conditions to avoid	Heat

SECTION 10: STABILITY AND REACTIVITY

Stability: Stable.

Materials and Conditions to Avoid:
10.1 Conditions to avoid

Heat

10.2 Materials to avoid
None known

Hazardous Polymerization: Hazardous polymerization will not occur.

Hazardous Decomposition or By-Products

Substance	Condition
None known.	Not Specified

SECTION 11: TOXICOLOGICAL INFORMATION

Please contact the address listed on the first page of the MSDS for Toxicological Information on this material and/or its components.

SECTION 12: ECOLOGICAL INFORMATION

ECOTOXICOLOGICAL INFORMATION

Not determined.

CHEMICAL FATE INFORMATION

Not determined.

SECTION 13: DISPOSAL CONSIDERATIONS

Waste Disposal Method: Dispose of waste product in a facility permitted to accept chemical waste. Vent cylinder or pressurized container in an operating exhaust hood or remote area.
Dispose of empty cylinders in a landfill.

EPA Hazardous Waste Number (RCRA): Not regulated

Since regulations vary, consult applicable regulations or authorities before disposal.

SECTION 14:TRANSPORT INFORMATION

ID Number(s):
70-0714-8414-4, 70-0714-8416-9, 70-0714-8441-7, 70-0715-8274-9, 70-0715-8717-7

Please contact the emergency numbers listed on the first page of the MSDS for Transportation Information for this material.

SECTION 15: REGULATORY INFORMATION

US FEDERAL REGULATIONS
Contact 3M for more information.

311/312 Hazard Categories:
Fire Hazard - No Pressure Hazard - Yes Reactivity Hazard - No Immediate Hazard - Yes Delayed Hazard - No

STATE REGULATIONS
Contact 3M for more information.

CHEMICAL INVENTORIES
The components of this product are in compliance with the chemical notification requirements of TSCA.

Contact 3M for more information.

INTERNATIONAL REGULATIONS
Contact 3M for more information.

This MSDS has been prepared to meet the U.S. OSHA Hazard Communication Standard, 29 CFR 1910.1200.

SECTION 16: OTHER INFORMATION

NFPA Hazard Classification
Health: 0 **Flammability:** 0 **Reactivity:** 0 **Special Hazards:** None

National Fire Protection Association (NFPA) hazard ratings are designed for use by emergency response personnel to address the hazards that are presented by short-term, acute exposure to a material under conditions of fire, spill, or similar emergencies. Hazard ratings are primarily based on the inherent physical and toxic properties of the material but also include the toxic properties of combustion or decomposition products that are known to be generated in significant quantities.

Revision Changes:
Section 1: Product name was modified.
Copyright was modified.
Section 3: Potential effects from inhalation information was modified.
Section 7: Handling information was modified.
Section 8: Skin protection phrase was modified.
Section 8: Eye/face protection information was modified.
Page Heading: Product name was modified.
Section 15: 311/312 Immediate Hazard score was modified.
Section 9: Property description for optional properties was modified.
Section 1: Initial issue message was modified.
Section 3: Other potential health effects heading was added.
Section 4: First aid for inhalation - termination of exposure - was added.
Section 4: First aid for inhalation - medical assistance - was added.
Section 3: Immediate other hazard(s) was added.
Section 3: Other health effects information was added.
Section 9: Property description for required properties was added.
Section 14: ID Number Heading Template 1 was added.
Section 14: ID Number(s) Template 1 was added.
Section 2: Ingredient table was added.
Section 8: Exposure guidelines ingredient information was added.
Section 8: Exposure guidelines data source legend was added.
Section 10.1 Conditions to avoid heading was added.
Section 10.2 Materials to avoid heading was added.
Section 6: Personal precautions information was added.
Section 6: Environmental procedures information was added.
Section 6: Methods for cleaning up information was added.
Section 10: Materials to avoid physical property was added.
Section 10: Conditions to avoid physical property was added.
Section 8: Hand protection information was added.
Section 6: Release measures information was deleted.
Section 10: Materials and conditions to avoid physical property was deleted.
Section 4: First aid for inhalation - none - was deleted.

3M MSDSs are available at www.3M.com

Safety data for dibenz(a,h)anthracene

Glossary of terms on this data sheet.

The information on this web page is provided to help you to work safely, but it is intended to be an overview of hazards, not a replacement for a full Material Safety Data Sheet (MSDS). MSDS forms can be downloaded from the web sites of many chemical suppliers.

General

Synonyms: 1,2:5,6-benzanthracene, 1,2:5,6-dibenzanthracene, dibenzo(a,h) anthracene, DBA, 1,2,5,6-DBA
Use: a common pollutant in smoke and used oils
Molecular formula: $C_{22}H_{14}$
CAS No: 53-70-3
EINECS No: 200-181-8
Annex I Index. No: 601-041-00-2

Physical data

Appearance: white to light yellow crystalline solid
Melting point: 266 - 267 C
Boiling point: 524 C
Vapour density:
Vapour pressure:
Density (g cm^{-3}): 1.28
Flash point:
Explosion limits:
Autoignition temperature:
Water solubility:

Stability

Stable. Combustible. Incompatible with strong oxidizing agents.

Toxicology

Harmful if swallowed or inhaled. Experimental carcinogen, tumorigen and neoplastigen. IARC probable human carcinogen.

Toxicity data

(The meaning of any toxicological abbreviations which appear in this section is given here.)

IVN-MUS LDLO 10 mg kg^{-1}

Risk phrases

(The meaning of any risk phrases which appear in this section is given here.)
R45 R50 R53.

Environmental information

Harmful in the environment - may cause long-term damage.

Transport information

(The meaning of any UN hazard codes which appear in this section is given here.)
Non-hazardous for air, sea and road freight.

Personal protection

Safety glasses, gloves, good ventilation. Handle as a possible carcinogen.

Safety phrases

(The meaning of any safety phrases which appear in this section is given here.)
S45 S53 S60 S61.

[Return to Physical & Theoretical Chemistry Lab. Safety home page.]

MATERIAL SAFETY DATA SHEET

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MATHESON TRI-GAS, INC.
150 Allen Road Suite 302
Basking Ridge, New Jersey 07920
Information: 1-800-416-2505

Emergency Contact:
CHEMTREC 1-800-424-9300
Calls Originating Outside the US:
703-527-3887 (Collect Calls Accepted)

SUBSTANCE: CIS-1,2-DICHLOROETHYLENE

TRADE NAMES/SYNONYMS:
CIS-ACETYLENE DICHLORIDE; 1,2-DICHLOROETHYLENE; C2H2CL2; MAT05125; RTECS KV9420000

CHEMICAL FAMILY: halogenated, aliphatic

CREATION DATE: Jan 24 1989
REVISION DATE: Dec 11 2008

2. COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: CIS-1,2-DICHLOROETHYLENE
CAS NUMBER: 156-59-2
PERCENTAGE: 100.0

3. HAZARDS IDENTIFICATION

NFPA RATINGS (SCALE 0-4): HEALTH=2 FIRE=3 REACTIVITY=2

EMERGENCY OVERVIEW:
COLOR: colorless
PHYSICAL FORM: liquid
ODOR: pleasant odor
MAJOR HEALTH HAZARDS: respiratory tract irritation, skin irritation, eye irritation, central nervous system depression
PHYSICAL HAZARDS: Flammable liquid and vapor. Vapor may cause flash fire. May react on contact with air, heat, light or water.

POTENTIAL HEALTH EFFECTS:
INHALATION:

SHORT TERM EXPOSURE: irritation, nausea, vomiting, drowsiness, symptoms of drunkenness
LONG TERM EXPOSURE: no information on significant adverse effects
SKIN CONTACT:
SHORT TERM EXPOSURE: irritation
LONG TERM EXPOSURE: same as effects reported in short term exposure
EYE CONTACT:
SHORT TERM EXPOSURE: irritation
LONG TERM EXPOSURE: same as effects reported in short term exposure
INGESTION:
SHORT TERM EXPOSURE: symptoms of drunkenness
LONG TERM EXPOSURE: no information on significant adverse effects

4. FIRST AID MEASURES

INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: If vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.

NOTE TO PHYSICIAN: For ingestion, consider gastric lavage. Consider oxygen.

5. FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Severe fire hazard. Moderate explosion hazard. Vapor/air mixtures are explosive above flash point. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back.

EXTINGUISHING MEDIA: regular dry chemical, carbon dioxide, water, regular foam

Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles until well after fire is out. If this is impossible then take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any

discoloration of tanks due to fire. For tank, rail car or tank truck: Evacuation radius: 800 meters (1/2 mile). Do not attempt to extinguish fire unless flow of material can be stopped first. Flood with fine water spray. Do not scatter spilled material with high-pressure water streams. Cool containers with water spray until well after the fire is out. Apply water from a protected location or from a safe distance. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas. Water may be ineffective.

FLASH POINT: 39 F (4 C) (CC)
LOWER FLAMMABLE LIMIT: 9.7%
UPPER FLAMMABLE LIMIT: 12.8%
FLAMMABILITY CLASS (OSHA): IB

6. ACCIDENTAL RELEASE MEASURES

OCCUPATIONAL RELEASE:
Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk. Reduce vapors with water spray. Small spills: Absorb with sand or other non-combustible material. Collect spilled material in appropriate container for disposal. Large spills: Dike for later disposal. Remove sources of ignition. Keep unnecessary people away, isolate hazard area and deny entry.

7. HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Subject to storage regulations: U.S. OSHA 29 CFR 1910.106. Grounding and bonding required. Keep separated from incompatible substances.

8. EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
CIS-1,2-DICHLOROETHYLENE:
1,2-DICHLOROETHYLENE (ALL ISOMERS):
200 ppm (790 mg/m3) OSHA TWA
200 ppm ACGIH TWA
200 ppm (790 mg/m3) NIOSH recommended TWA 10 hour(s)

VENTILATION: Provide local exhaust ventilation system. Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.
2000 ppm
Any supplied-air respirator operated in a continuous-flow mode.
Any powered, air-purifying respirator with organic vapor cartridge(s).
Any air-purifying respirator with a full facepiece and an organic vapor canister.
Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted organic vapor canister.
Any self-contained breathing apparatus with a full facepiece.
Any supplied-air respirator with a full facepiece.
Emergency or planned entry into unknown concentrations or IDLH conditions -
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.
Escape -
Any air-purifying full-facepiece respirator (gas mask) with a chin-style, front-mounted or back-mounted organic vapor canister.
Any appropriate escape-type, self-contained breathing apparatus.
For Unknown Concentrations or Immediately Dangerous to Life or Health -
Any supplied-air respirator with a full facepiece that is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in pressure-demand or other positive-pressure mode.
Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode.

9. PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid
COLOR: colorless
ODOR: pleasant odor
MOLECULAR WEIGHT: 96.94
MOLECULAR FORMULA: C2-H2-CL2
BOILING POINT: 140 F (60 C)
FREEZING POINT: -114 F (-81 C)
VAPOR PRESSURE: 400 mmHg @ 41 C
VAPOR DENSITY (air=1): 3.34
SPECIFIC GRAVITY (water=1): 1.2837
WATER SOLUBILITY: insoluble
PH: Not available
VOLATILITY: Not available
ODOR THRESHOLD: Not available
EVAPORATION RATE: Not available

COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available
SOLVENT SOLUBILITY:
Soluble: acetone, benzene, ether, alcohol

10. STABILITY AND REACTIVITY

REACTIVITY: May decompose on contact with air, light, moisture, heat or storage and use above room temperature. Releases toxic, corrosive, flammable or explosive gases.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat. Keep out of water supplies and sewers.

INCOMPATIBILITIES: bases, metals, combustible materials, oxidizing materials, acids

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: phosgene, halogenated compounds, oxides of carbon

POLYMERIZATION: May polymerize. Avoid contact with incompatible materials.

11. TOXICOLOGICAL INFORMATION

CIS-1,2-DICHLOROETHYLENE:
TOXICITY DATA: 13700 ppm inhalation-rat LC50
LOCAL EFFECTS:
Irritant: inhalation, skin, eye
ACUTE TOXICITY LEVEL:
Slightly Toxic: inhalation
TARGET ORGANS: central nervous system
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: respiratory disorders
MUTAGENIC DATA: Available.

12. ECOLOGICAL INFORMATION

Not available

13. DISPOSAL CONSIDERATIONS

Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): D001. Dispose in accordance with all applicable regulations.

14. TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: 1,2-Dichloroethylene
ID NUMBER: UN1150
HAZARD CLASS OR DIVISION: 3
PACKING GROUP: II
LABELING REQUIREMENTS: 3

CANADIAN TRANSPORTATION OF DANGEROUS GOODS:
SHIPPING NAME: 1,2-Dichloroethylene
UN NUMBER: UN1150
CLASS: 3
PACKING GROUP/CATEGORY: II

15. REGULATORY INFORMATION

U.S. REGULATIONS:
CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4): Not regulated.

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355 Subpart B): Not regulated.

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355 Subpart C): Not regulated.

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370 Subparts B and C):
ACUTE: Yes
CHRONIC: No
FIRE: Yes
REACTIVE: Yes
SUDDEN RELEASE: No

SARA TITLE III SECTION 313 (40 CFR 372.65):
1,2-DICHLOROETHYLENE (ALL ISOMERS)

OSHA PROCESS SAFETY (29 CFR 1910.119): Not regulated.

STATE REGULATIONS:
California Proposition 65: Not regulated.

CANADIAN REGULATIONS:
WHMIS CLASSIFICATION: BD2

NATIONAL INVENTORY STATUS:
U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

CANADA INVENTORY (DSL/NDSL): Not determined.

16. OTHER INFORMATION

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Institute for Reference Materials and Measurements

SAFETY DATA SHEET

Based on Regulation (EC) No. 1907/2006 (REACH) Article 31 and Annex II

BCR-269: chrysene

1. Identification of the substance/preparation and of the company/undertaking

1.1 Identification of the substance or preparation:

Product name: BCR-269: chrysene

CAS number	218-01-9
EC index number	601-048-00-0
EINECS number	205-923-4
RTECS number	GC0700000
Molecular mass	228.30 g/mol
Formula	C18H12

1.2 Use of the substance/preparation:

Certified reference material for laboratory use only

1.3 Company/undertaking identification:

Institute for Reference Materials and Measurements
Retieseweg
B-2440 Geel
Tel: +32 14 57 12 11
Fax: +32 14 59 04 06
JRC-IRMM-RM-Sales@ec.europa.eu

1.4 Emergency telephone:

Poison Centre: +32 70 245 245

2. Hazards identification

DSD/DPD

May cause cancer
Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment
Possible risk of irreversible effects

Other hazards

Its dust is explosive with air
Dust cloud can be ignited by a spark
No certainty about human mutagenic properties
Highly bioaccumulative
Literature reports: not readily degradable in water

CLP

Muta. 2	Suspected of causing genetic defects. (H341)
Carc. 1B	May cause cancer. (H350)
Aquatic Acute 1	Very toxic to aquatic life. (H400)
Aquatic Chronic 1	Very toxic to aquatic life with long lasting effects. (H410)

Other hazards

Its dust is explosive with air
Dust cloud can be ignited by a spark
No certainty about human mutagenic properties
Highly bioaccumulative
Literature reports: not readily degradable in water

3. Composition/information on ingredients

Name	CAS No EINECS/ELINCS	Conc.	Classification according to DSD/DPD	Classification according to CLP	Note

chrysene	218-01-9 205-923-4		Carc. Cat. 2; R45 Muta. Cat. 3; R68 N; R50-53	Carc. 1B; H350 Muta. 2; H341 Aquatic Acute 1; H400 Aquatic Chronic 1; H410	

4. First aid measures

4.1 After inhalation:

Remove the victim into fresh air

Respiratory problems: consult a doctor/medical service

4.2 Skin contact:

Wash with water and soap

Take victim to a doctor if irritation persists

4.3 Eye contact:

Rinse with water

Take victim to an ophthalmologist if irritation persists

4.4 After ingestion:

Rinse mouth with water

Consult a doctor/medical service if you feel unwell

5. Fire-fighting measures

5.1 Suitable extinguishing media:

Water spray

Alcohol-resistant foam

Polymer foam

ABC powder

Carbon dioxide

5.2 Unsuitable extinguishing media:

Solid water jet ineffective as extinguishing medium

5.3 Special exposure hazards:

Heating increases the fire hazard

Dust cloud can be ignited by a spark

Upon combustion CO and CO2 are formed

5.4 Instructions:

Take account of toxic fire-fighting water

Use water moderately and if possible collect or contain it

5.5 Special protective equipment for fire-fighters:

Gloves

Protective clothing

Heat/fire exposure: compressed air/oxygen apparatus

6. Accidental release measures

6.1 Personal precautions:

See heading 8.2

6.2 Environmental precautions:

Dam up the solid spill

Prevent soil and water pollution

Prevent spreading in sewers

See heading 13

6.3 Methods for cleaning up:

Scoop solid spill into closing containers

Carefully collect the spill/leftovers

Clean contaminated surfaces with an excess of water

Take collected spill to manufacturer/competent authority

Wash clothing and equipment after handling

7. Handling and storage

7.1 Handling:

Avoid raising dust
Warning! Avoid exposure
Keep away from naked flames/heat
Obtain special instructions before use
Observe strict hygiene
Finely divided: spark- and explosionproof appliances
Keep container tightly closed
Finely divided: keep away from ignition sources/sparks
Do not discharge the waste into the drain

7.2 Storage:

Safe storage requirements:

Store in a cool area
Store in a dry area
Store in a dark area
Keep container in a well-ventilated place
Keep locked up
Unauthorized persons are not admitted
Store only in a limited quantity
Meet the legal requirements

Keep away from:

oxidizing agents
(strong) acids

7.3 Specific use(s):

See information supplied by the manufacturer for the identified use(s)

8. Exposure controls/Personal protection

8.1 Exposure limit values:

8.1.1 Occupational exposure:

If limit values are applicable and available these will be listed below.

TLV (USA)

Chrysene	Short time value	- ppm
	Time-weighted average exposure limit	- ppm

8.1.2 Sampling methods:

Product name	Test	Number	Sampling method	Remarks
1,2-benzophenanthrene	NIOSH	OSHA-58		
Chrysene	OSHA	CSI		
Chrysene	OSHA	58	filter	
Chrysene (Polynuclear aromatic Hydrocarbons)	NIOSH	5515	adsorption tubes	
Chrysene (Polynuclear aromatic Hydrocarbons)	NIOSH	5506	adsorption tubes	

8.2 Exposure controls:

8.2.1 Occupational exposure controls:

Measure the concentration in the air regularly
Carry operations in the open/under local exhaust/ventilation or with respiratory protection
Personal protective equipment:

a) Respiratory protection:

Dust production: dust mask with filter type P3

b) Hand protection:

Gloves

c) Eye protection:

Safety glasses
In case of dust production: protective goggles

d) Skin protection:

Protective clothing

In case of dust production: head/neck protection

In case of dust production: dustproof clothing

8.2.2 Environmental exposure controls:

See headings 6.2, 6.3 and 13

9. Physical and chemical properties

9.1 General information:

Physical form	Crystalline solid
	Flakes
Odour	Odourless
Colour	White
	On exposure to light: fluorescent blue

9.2 Important health, safety and environmental information:

Boiling point	448 °C
Relative density	1.27
Solubility in water	0.00000020 g/100 ml
Log Pow	(experimental) 5.81-5.86

9.3 Other information:

Melting point	256 °C

10. Stability and reactivity

10.1 Conditions to avoid:

Possible fire hazard

heat sources

ignition sources

Stability

Stable under normal conditions

Reactions

Reacts violently with (strong) oxidizers

Decomposes on exposure to (strong) acids

10.2 Materials to avoid:

oxidizing agents

(strong) acids

10.3 Hazardous decomposition products:

Upon combustion CO and CO2 are formed

11. Toxicological information

11.1 Acute toxicity:

No (test)data available.

11.2 Chronic toxicity:

Probably human carcinogenic

No certainty about human mutagenic properties

Not classified as toxic to reproduction (EC)

BCR-269: chrysene

EC carc cat	2
EC muta cat	3
Listed in SZW - List of carcinogenic substances	yes
IARC - classification	3
TLV - Carcinogen	A3
MAK - Krebserzeugend Kategorie	2
MAK - Schwangerschaft Gruppe	-
CLP carc cat	category 1B

CLP muta cat	category 2

11.3 Acute effects/symptoms:

Inhalation:
No data available

Skin contact:
No data available

Eye contact:
No data available

Ingestion:
No data available

11.4 Chronic effects:

ON CONTINUOUS/REPEATED EXPOSURE/CONTACT:
No specific information available
SIMILAR PRODUCTS CAUSE FOLLOWING SYMPTOMS:
Feeling of weakness
Photoallergy
Cracking of the skin
Skin rash/inflammation
Skin cancer
Lung tissue affection/degeneration
Enlargement/affection of the liver
Affection of the renal tissue

12. Ecological information

12.1 Ecotoxicity:

BCR-269: chrysene

TLM fishes

species	value	duration (h)	remarks
NEANTHES ARENACEODENTATA	>1 ppm	96 h	STATIC SYSTEM

Threshold limit algae

species	value	duration (h)	remarks
CYANOPHYTA	0.001 mg/l		GROWTH

12.2 Mobility:

Volatile organic compounds (VOC)	0 %
Solubility in/reaction with water	Insoluble in water
	Substance sinks in water
Water physicochemical processes	Forming sediments in water
Soil physicochemical processes	Adsorbs into the soil

12.3 Persistence and degradability:

Half-life soil > 77 days
Literature reports: not readily degradable in water

12.4 Bioaccumulative potential:

Log Pow (experimental) 5.81-5.86
Highly bioaccumulative

12.5 Results of PBT assessment:

Not applicable, based on available data

12.6 Other adverse effects:

Not dangerous for the ozone layer (Council Regulation (EC) no 1005/2009)

13. Disposal considerations

13.1 Provisions relating to waste:

Waste material code (Directive 2008/98/EC, decision 2001/118/EC)
16 05 06* : laboratory chemicals, consisting of or containing dangerous substances, including mixtures of laboratory chemicals
Depending on branch of industry and production process, also other EURAL codes may be applicable
Hazardous waste according to Directive 2008/98/EC

13.2 Disposal methods:

Dissolve or mix with a combustible solvent
Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber with energy recovery
Remove waste in accordance with local and/or national regulations
Do not discharge into surface water (2000/60/EC, Council decision 2455/2001/EC, O.J. L331 of 15/12/2001)

13.3 Packaging/Container:

Waste material code packaging (Directive 2008/98/EC)
15 01 10* : packaging containing residues of or contaminated by dangerous substances

14. Transport information

ADR

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ADR	chrysene
UN number	3077
Class	9
Packing group	III
Hazard identification number	90
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

RID

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name RID	chrysene
UN number	3077
Class	9
Packing group	III
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

ADNR

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ADNR	chrysene
UN number	3077
Class	9
Packing group	III
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

IMO

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name IMO	chrysene
UN number	3077
Class	9
Packing group	III
Labels	9
Marine pollutant	P
Environmentally hazardous substance mark	yes

ICAO

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ICAO	chrysene
UN number	3077
Class	9
Packing group	III
Labels	9
Environmentally hazardous substance mark	yes

15. Regulatory information

15.1 EU Legislation:

DSD/DPD

Labelling in accordance with 29th adaptation of EC directive 67/548/EEC

Dangerous for the environment

R-phrases

45	May cause cancer
50/53	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment
68	Possible risk of irreversible effects

S-phrases

53	Avoid exposure - obtain special instructions before use
45	In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible)
60	This material and its container must be disposed of as hazardous waste
61	Avoid release to the environment. Refer to special instructions/safety data sheets.

Additional recommendations

	Restricted to professional users.

CLP

Classification and labelling according to Regulation (EC) No 1272/2008 – Annex VI and after evaluation of available test data

Signal word

Dgr	Danger

H-statements

H350	May cause cancer.
H341	Suspected of causing genetic defects.
H410	Very toxic to aquatic life with long lasting effects.

P-statements

P202	Do not handle until all safety precautions have been read and understood.
P281	Use personal protective equipment as required.
P273	Avoid release to the environment.
P308 + P313	IF exposed or concerned: Get medical advice/attention.
P391	Collect spillage.
P405	Store locked up.

Supplemental information

	Restricted to professional users.

15.2 National provisions:

15.3 Specific community rules:

Enumerated in Annex XVII of Regulation (EC) No. 1907/2006: Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles.

Legislation	Reference legislation
EG/552/2009	See column 1: 28.
EG/552/2009	See column 1: 50. d)

16. Other information

The information in this safety data sheet is based on data and samples provided to BIG. The sheet was written to the best of our ability and according to the state of knowledge at that time. The safety data sheet only constitutes a guideline for the safe handling, use, consumption, storage, transport and disposal of the substances/preparations/mixtures mentioned under point 1. New safety data sheets are written from time to time. Only the most recent versions may be used. Old versions must be destroyed. Unless indicated otherwise word for word on the safety data sheet, the information does not apply to substances/preparations/mixtures in purer form, mixed with other substances or in processes. The safety data sheet offers no quality specification for the substances/preparations/mixtures in question.

Compliance with the instructions in this safety data sheet does not release the user from the obligation to take all measures dictated by common sense, regulations and recommendations or which are necessary and/or useful based on the real applicable circumstances. BIG does not guarantee the accuracy or exhaustiveness of the information provided. Use of this safety data sheet is subject to the licence and liability limiting conditions as stated in your BIG licence agreement. All intellectual property rights to this sheet are the property of BIG and its distribution and reproduction are limited. Consult your BIG licence agreement for details.

(*) = INTERNAL CLASSIFICATION (NFPA)

PBT-substances = persistent, bioaccumulative and toxic substances

DSD Dangerous Substance Directive
DPD Dangerous Preparation Directive
CLP (EU-GHS) Classification, labelling and packaging (Globally Harmonised System in Europe)

Full text of any R-phrases referred to under headings 2 and 3:

R45	May cause cancer
R50/53	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment
R68	Possible risk of irreversible effects

Full text of any H-statements referred to under headings 2 and 3:

H341	Suspected of causing genetic defects.
H350	May cause cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

Full text of any classes referred to under headings 2 and 3:

Aquatic Acute	Hazardous to the aquatic environment - acute
Aquatic Chronic	Hazardous to the aquatic environment - chronic
Carc.	Carcinogenicity
Muta.	Germ cell mutagenicity

Institute for Reference Materials and Measurements

SAFETY DATA SHEET

Based on Regulation (EC) No. 1907/2006 (REACH) Article 31 and Annex II

BCR-048R: benzo[k]fluoranthene

1. Identification of the substance/preparation and of the company/undertaking

1.1 Identification of the substance or preparation:

Product name: BCR-048R: benzo[k]fluoranthene

CAS number	207-08-9
EC index number	601-036-00-5
EINECS number	205-916-6
RTECS number	DF6350000
Molecular mass	252.32 g/mol
Formula	C20H12

1.2 Use of the substance/preparation:

Certified reference material for laboratory use only

1.3 Company/undertaking identification:

Institute for Reference Materials and Measurements
Retieseweg
B-2440 Geel
Tel: +32 14 57 12 11
Fax: +32 14 59 04 06
JRC-IRMM-RM-Sales@ec.europa.eu

1.4 Emergency telephone:

Poison Centre: +32 70 245 245

2. Hazards identification

NFPA: 1-1-2(*)

DSD/DPD

May cause cancer

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Other hazards

Its dust is explosive with air

Dust cloud can be ignited by a spark

Slightly irritant to skin

Slightly irritant to eyes

Caution! Substance is absorbed through the skin

No certainty about human mutagenic properties

Highly bioaccumulative

Not readily biodegradable in water

CLP

Carc. 1B	May cause cancer. (H350)
Aquatic Acute 1	Very toxic to aquatic life. (H400)
Aquatic Chronic 1	Very toxic to aquatic life with long lasting effects. (H410)

Other hazards

Its dust is explosive with air

Dust cloud can be ignited by a spark

Slightly irritant to skin

Slightly irritant to eyes

Caution! Substance is absorbed through the skin

No certainty about human mutagenic properties

Highly bioaccumulative

Not readily biodegradable in water

3. Composition/information on ingredients

Name	CAS No EINECS/ELINCS	Conc.	Classification according to DSD/DPD	Classification according to CLP	Note
benzo[k]fluoranthene	207-08-9 205-916-6		Carc. Cat. 2; R45 N; R50-53	Carc. 1B; H350 Aquatic Acute 1; H400 Aquatic Chronic 1; H410	

4. First aid measures

4.1 After inhalation:

Remove the victim into fresh air

Respiratory problems: consult a doctor/medical service

4.2 Skin contact:

Rinse with water

Do not apply (chemical) neutralizing agents

Take victim to a doctor if irritation persists

4.3 Eye contact:

Rinse with water

Do not apply neutralizing agents

Take victim to an ophthalmologist if irritation persists

4.4 After ingestion:

Rinse mouth with water

Immediately after ingestion: give lots of water to drink

Do not induce vomiting

Consult a doctor/medical service if you feel unwell

5. Fire-fighting measures

5.1 Suitable extinguishing media:

Water spray

Polyvalent foam

ABC powder

Carbon dioxide

5.2 Unsuitable extinguishing media:

No unsuitable extinguishing media known

5.3 Special exposure hazards:

Heating increases the fire hazard

Dust cloud can be ignited by a spark

Upon combustion CO and CO2 are formed

5.4 Instructions:

Take account of toxic fire-fighting water

Use water moderately and if possible collect or contain it

5.5 Special protective equipment for fire-fighters:

Gloves

Protective clothing

Heat/fire exposure: compressed air/oxygen apparatus

6. Accidental release measures

6.1 Personal precautions:

See heading 8.2

6.2 Environmental precautions:

Dam up the solid spill

Prevent soil and water pollution

Prevent spreading in sewers

See heading 13

6.3 Methods for cleaning up:

Scoop solid spill into closing containers
Carefully collect the spill/leftovers
Clean contaminated surfaces with an excess of water
Take collected spill to manufacturer/competent authority
Wash clothing and equipment after handling

7. Handling and storage

7.1 Handling:

Avoid raising dust
Warning! Avoid exposure
Keep away from naked flames/heat
Obtain special instructions before use
Observe strict hygiene
Keep container tightly closed
Do not discharge the waste into the drain

7.2 Storage:

Safe storage requirements:

Store in a cool area
Store in a dry area
Keep container in a well-ventilated place
Keep locked up
Unauthorized persons are not admitted
Meet the legal requirements

Keep away from:

oxidizing agents
(strong) acids

7.3 Specific use(s):

See information supplied by the manufacturer for the identified use(s)

8. Exposure controls/Personal protection

8.1 Exposure limit values:

8.1.1 Occupational exposure:

If limit values are applicable and available these will be listed below.

8.1.2 Sampling methods:

Product name	Test	Number	Sampling method	Remarks
Benz(a)Anthracene	OSHA	CSI		
Benz(a)Anthracene (Polynuclear aromatic hydrocarbons)	NIOSH	5506	adsorption tubes	
Benz(a)Anthracene (Polynuclear aromatic hydrocarbons)	NIOSH	5515	adsorption tubes	

8.2 Exposure controls:

8.2.1 Occupational exposure controls:

Measure the concentration in the air regularly
Carry operations in the open/under local exhaust/ventilation or with respiratory protection
Personal protective equipment:

a) Respiratory protection:

Dust production: dust mask with filter type P3

b) Hand protection:

Gloves

c) Eye protection:

Safety glasses
In case of dust production: protective goggles

d) Skin protection:

Protective clothing

8.2.2 Environmental exposure controls:

See headings 6.2, 6.3 and 13

9. Physical and chemical properties

9.1 General information:

Physical form	Crystalline solid
	Needles
Colour	Light yellow

9.2 Important health, safety and environmental information:

Boiling point	480 °C
Vapour pressure (20°C)	< 0.00001 hPa
Solubility in water	< 0.00001 g/100 ml
Solubility in solvents	Soluble in ethanol
	Soluble in acetic acid
	Soluble in oils/fats
Log Pow	6.84

9.3 Other information:

Melting point	217 °C

10. Stability and reactivity

10.1 Conditions to avoid:

Possible fire hazard

heat sources

ignition sources

Stability

No data available

Reactions

Reacts violently with (strong) oxidizers

10.2 Materials to avoid:

oxidizing agents

(strong) acids

10.3 Hazardous decomposition products:

Upon combustion CO and CO2 are formed

11. Toxicological information

11.1 Acute toxicity:

No (test)data available.

11.2 Chronic toxicity:

Probably human carcinogenic

No certainty about human mutagenic properties

Not classified as toxic to reproduction (EC)

BCR-048R: benzo[k]fluoranthene

EC carc cat	2
Listed in SZW - List of carcinogenic substances	yes
IARC - classification	2B
MAK - Krebserzeugend Kategorie	2
MAK - Keimzellmutagen Kategorie	3B
MAK - Schwangerschaft Gruppe	-
CLP carc cat	category 1B

11.3 Acute effects/symptoms:

Inhalation:

No data available

Skin contact:

Slight irritation

Eye contact:

Slight irritation

Ingestion:

No data available

11.4 Chronic effects:

ON CONTINUOUS/REPEATED EXPOSURE/CONTACT:
No specific information available
SIMILAR PRODUCTS CAUSE FOLLOWING SYMPTOMS:
Feeling of weakness
Cracking of the skin
Skin rash/inflammation
Photoallergy
Skin cancer
Lung tissue affection/degeneration
Enlargement/affection of the liver
Affection of the renal tissue

12. Ecological information

12.1 Ecotoxicity:

No (test)data available.

12.2 Mobility:

Volatile organic compounds (VOC)	0 %
Solubility in/reaction with water	Insoluble in water
Water physicochemical processes	Forming sediments in water
Soil physicochemical processes	Adsorbs into the soil

12.3 Persistence and degradability:

Water abiotic degradation processes	Ozonation in water
Half-life soil	65 - 1400 days

Not readily biodegradable in water

12.4 Bioaccumulative potential:

Log Pow	6.84

Highly bioaccumulative

12.5 Results of PBT assessment:

Not applicable, based on available data

12.6 Other adverse effects:

Not dangerous for the ozone layer (Council Regulation (EC) no 1005/2009)

13. Disposal considerations

13.1 Provisions relating to waste:

Waste material code (Directive 2008/98/EC, decision 2001/118/EC)
16 05 06* : laboratory chemicals, consisting of or containing dangerous substances, including mixtures of laboratory chemicals
Depending on branch of industry and production process, also other EURAL codes may be applicable
Hazardous waste according to Directive 2008/98/EC

13.2 Disposal methods:

Dissolve or mix with a combustible solvent
Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber with energy recovery
Remove waste in accordance with local and/or national regulations
Do not discharge into surface water (2000/60/EC, Council decision 2455/2001/EC, O.J. L331 of 15/12/2001)

13.3 Packaging/Container:

Waste material code packaging (Directive 2008/98/EC)
15 01 10* : packaging containing residues of or contaminated by dangerous substances

{13.4 Entsorgung verschmutzter Gebinde:}

14. Transport information

ADR

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ADR	benzo[k]fluoranthene
UN number	3077
Class	9
Packing group	III
Hazard identification number	90
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

RID

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name RID	benzo[k]fluoranthene
UN number	3077
Class	9
Packing group	III
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

ADNR

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ADNR	benzo[k]fluoranthene
UN number	3077
Class	9
Packing group	III
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

IMO

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name IMO	benzo[k]fluoranthene
UN number	3077
Class	9
Packing group	III
Labels	9
Marine pollutant	P
Environmentally hazardous substance mark	yes

ICAO

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ICAO	benzo[k]fluoranthene
UN number	3077
Class	9
Packing group	III
Labels	9
Environmentally hazardous substance mark	yes

15. Regulatory information

15.1 EU Legislation:

DSD/DPD

Enumerated in substance list Annex I of directive 67/548/EEC et sequens

Dangerous for the environment

R-phrases

45	May cause cancer
50/53	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

S-phrases

53	Avoid exposure - obtain special instructions before use
45	In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible)
60	This material and its container must be disposed of as hazardous waste
61	Avoid release to the environment. Refer to special instructions/safety data sheets.

Additional recommendations

	Restricted to professional users.

CLP

Classification and labelling according to Regulation (EC) No 1272/2008 – Annex VI and after evaluation of available test data

Signal word

Dgr	Danger

H-statements

H350	May cause cancer.
H410	Very toxic to aquatic life with long lasting effects.

P-statements

P202	Do not handle until all safety precautions have been read and understood.
P281	Use personal protective equipment as required.
P273	Avoid release to the environment.
P308 + P313	IF exposed or concerned: Get medical advice/attention.
P391	Collect spillage.
P405	Store locked up.

Supplemental information

	Restricted to professional users.

15.2 National provisions:

15.3 Specific community rules:

Enumerated in Annex XVII of Regulation (EC) No. 1907/2006: Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles.

Legislation	Reference legislation
EG/552/2009	See column 1: 28.
EG/552/2009	See column 1: 50. g)

16. Other information

The information in this safety data sheet is based on data and samples provided to BIG. The sheet was written to the best of our ability and according to the state of knowledge at that time. The safety data sheet only constitutes a guideline for the safe handling, use, consumption, storage, transport and disposal of the substances/preparations/mixtures mentioned under point 1. New safety data sheets are written from time to time. Only the most recent versions may be used. Old versions must be destroyed. Unless indicated otherwise word for word on the safety data sheet, the information does not apply to substances/preparations/mixtures in purer form, mixed with other substances or in processes. The safety data sheet offers no quality specification for the substances/preparations/mixtures in question.

Compliance with the instructions in this safety data sheet does not release the user from the obligation to take all measures dictated by common sense, regulations and recommendations or which are necessary and/or useful based on the real applicable circumstances. BIG does not guarantee the accuracy or exhaustiveness of the information provided. Use of this safety data sheet is subject to the licence and liability limiting conditions as stated in your BIG licence agreement. All intellectual property rights to this sheet are the property of BIG and its distribution and reproduction are limited. Consult your BIG licence agreement for details.

(*) = INTERNAL CLASSIFICATION (NFPA)

PBT-substances = persistent, bioaccumulative and toxic substances

DSD Dangerous Substance Directive
DPD Dangerous Preparation Directive
CLP (EU-GHS) Classification, labelling and packaging (Globally Harmonised System in Europe)

Full text of any R-phrases referred to under headings 2 and 3:

R45	May cause cancer
R50/53	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Full text of any H-statements referred to under headings 2 and 3:

H350	May cause cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

Full text of any classes referred to under headings 2 and 3:

Aquatic Acute	Hazardous to the aquatic environment - acute
Aquatic Chronic	Hazardous to the aquatic environment - chronic
Carc.	Carcinogenicity

Safety data for benzo[b]fluoranthene

Glossary of terms on this data sheet.

The information on this web page is provided to help you to work safely, but it is intended to be an overview of hazards, not a replacement for a full Material Safety Data Sheet (MSDS). MSDS forms can be downloaded from the web sites of many chemical suppliers.

General

Synonyms: 3,4-benzofluoranthene, benz[e]acenaphthanthrylene, 3,4-benz[e]acenaphthanthrylane, 2,3-benzofluoranthene, benzofluoranthrene, benzo[e]fluoranthene
Use:
Molecular formula: $C_{20}H_{12}$
CAS No: 205-99-2
EINECS No: 205-911-9
EC Index No: 601-024-00-4

Physical data

Appearance: off-white to tan powder
Melting point: 163 - 165 C
Boiling point:
Vapour density:
Vapour pressure:
Density (g cm^{-3}):
Flash point:
Explosion limits:
Autoignition temperature:
Water solubility:

Stability

Stable. Incompatible with strong oxidizing agents.

Toxicology

Toxic. Probable human carcinogen. May act as an irritant.

Toxicity data

(The meaning of any toxicological abbreviations which appear in this section is given here.)

Risk phrases

(The meaning of any risk phrases which appear in this section is given here.)
R45 R50 R53.

Environmental information

Very harmful to aquatic organisms - may cause long-term damage to the environment.

Transport information

(The meaning of any UN hazard codes which appear in this section is given here.)

Personal protection

Safety glasses, good ventilation, disposable gloves. Treat as a possible carcinogen.

Safety phrases

(The meaning of any safety phrases which appear in this section is given here.)
S45 S53 S60 S61.

[Return to Physical & Theoretical Chemistry Lab. Safety home page.]

Safety data for benzo(a)pyrene

Glossary of terms on this data sheet.

The information on this web page is provided to help you to work safely, but it is intended to be an overview of hazards, not a replacement for a full Material Safety Data Sheet (MSDS). MSDS forms can be downloaded from the web sites of many chemical suppliers.

General

Synonyms: 1,2-benzopyrene, 6,7-benzopyrene, benzo[a]pyrene, B(a)P, BP, 3,4-benzopyrene, benzo[d,e,f]chrysene, 3,4-benzpyrene, benzpyrene, 3,4-benzylpyrene, 3,4-benz[a]pyrene, 3,4-BP, 3,4-benzopyrene
Molecular formula: $C_{20}H_{12}$
CAS No: 50-32-8
EINECS No: 200-028-5
EU Index No: 601-032-00-3

Physical data

Appearance: yellow crystals or powder [found in cigarette smoke, coal tar, fuel exhaust gas and in many other sources]
Melting point: 176 C
Boiling point: 495 C
Vapour density: 8.7 (air = 1)
Vapour pressure:
Density (g cm^{-3}): 1.351
Flash point:
Explosion limits:
Autoignition temperature:
Water solubility: slight

Stability

Stable. Incompatible with strong oxidizing agents.

Toxicology

POISON. This material is an experimental carcinogen, mutagen, tumorigen, neoplastigen and teratogen. It is a probable carcinogen in humans and a known human mutagen. IARC Group 2A carcinogen. It is believed to cause bladder, skin and lung cancer. Exposure to it may damage the developing foetus. May cause reproductive damage. May be transferred to nursing infants through mother's milk. Skin, respiratory and eye irritant. May cause changes to the colour and properties of skin. Exposure to sunlight can increase the skin damage caused by this chemical.

Toxicity data

(The meaning of any abbreviations which appear in this section is given here.)

SCU-RAT LD50 50 mg kg^{-1}

IPR-MUS LDLO 500 mg kg^{-1}

IRN-FRG LDLO 11 mg kg^{-1}

Risk phrases

(The meaning of any risk phrases which appear in this section is given here.)
R45 R46 R50 R53 R60 R61.

Transport information

(The meaning of any UN hazard codes which appear in this section is given here.)
Un No 2811. Packing group III. Hazard class 6.1.

Environmental information

Very toxic in the environment - may cause long-term damage.

Personal protection

Restricted material. Only to be used by trained workers. Prepare a full risk assessment before starting work. Safety glasses, gloves, good ventilation. Handle as a carcinogen. Do not dry sweep spills because of the risk of increasing the amount of airborne material.

Safety phrases

(The meaning of any safety phrases which appear in this section is given here.)

S45 S53 S60 S61.

[Return to Physical & Theoretical Chemistry Lab. Safety home page.]

Institute for Reference Materials and Measurements

SAFETY DATA SHEET

Based on Regulation (EC) No. 1907/2006 (REACH) Article 31 and Annex II

BCR-271: benzo[a]anthracene

1. Identification of the substance/preparation and of the company/undertaking

1.1 Identification of the substance or preparation:

Product name: BCR-271: benzo[a]anthracene

CAS number	56-55-3
EC index number	601-033-00-9
EINECS number	200-280-6
RTECS number	CV9275000
Molecular mass	228.30 g/mol
Formula	C18H12

1.2 Use of the substance/preparation:

Certified reference material for laboratory use only

1.3 Company/undertaking identification:

Institute for Reference Materials and Measurements
Retieseweg
B-2440 Geel
Tel: +32 14 57 12 11
Fax: +32 14 59 04 06
JRC-IRMM-RM-Sales@ec.europa.eu

1.4 Emergency telephone:

Poison Centre: +32 70 245 245

2. Hazards identification

NFPA: 1-1-2(*)

DSD/DPD

May cause cancer

Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Other hazards

Its dust is explosive with air

Dust cloud can be ignited by a spark

Slightly irritant to skin

Slightly irritant to eyes

Caution! Substance is absorbed through the skin

No certainty about human mutagenic properties

Highly bioaccumulative

Not readily biodegradable in water

CLP

Carc. 1B	May cause cancer. (H350)
Aquatic Acute 1	Very toxic to aquatic life. (H400)
Aquatic Chronic 1	Very toxic to aquatic life with long lasting effects. (H410)

Other hazards

Its dust is explosive with air

Dust cloud can be ignited by a spark

Slightly irritant to skin

Slightly irritant to eyes

Caution! Substance is absorbed through the skin

No certainty about human mutagenic properties

Highly bioaccumulative

Not readily biodegradable in water

3. Composition/information on ingredients

Name	CAS No EINECS/ELINCS	Conc.	Classification according to DSD/DPD	Classification according to CLP	Note
benz[a]anthracene	56-55-3 200-280-6		Carc. Cat. 2; R45 N; R50-53	Carc. 1B; H350 Aquatic Acute 1; H400 Aquatic Chronic 1; H410	

4. First aid measures

4.1 After inhalation:

Remove the victim into fresh air

Respiratory problems: consult a doctor/medical service

4.2 Skin contact:

Rinse with water

Take victim to a doctor if irritation persists

4.3 Eye contact:

Rinse with water

Take victim to an ophthalmologist if irritation persists

4.4 After ingestion:

Rinse mouth with water

Immediately after ingestion: give lots of water to drink

Consult a doctor/medical service if you feel unwell

5. Fire-fighting measures

5.1 Suitable extinguishing media:

Water spray

Alcohol-resistant foam

Polymer foam

ABC powder

Carbon dioxide

5.2 Unsuitable extinguishing media:

Solid water jet ineffective as extinguishing medium

5.3 Special exposure hazards:

Heating increases the fire hazard

Dust cloud can be ignited by a spark

Upon combustion CO and CO2 are formed

5.4 Instructions:

Take account of toxic fire-fighting water

Use water moderately and if possible collect or contain it

5.5 Special protective equipment for fire-fighters:

Gloves

Protective clothing

Heat/fire exposure: compressed air/oxygen apparatus

6. Accidental release measures

6.1 Personal precautions:

See heading 8.2

6.2 Environmental precautions:

Dam up the solid spill

Prevent soil and water pollution

Prevent spreading in sewers

See heading 13

6.3 Methods for cleaning up:

Scoop solid spill into closing containers
Carefully collect the spill/leftovers
Clean contaminated surfaces with an excess of water
Take collected spill to manufacturer/competent authority
Wash clothing and equipment after handling

7. Handling and storage

7.1 Handling:

Avoid raising dust
Warning! Avoid exposure
Keep away from naked flames/heat
Obtain special instructions before use
Observe strict hygiene
Keep container tightly closed
Do not discharge the waste into the drain

7.2 Storage:

Safe storage requirements:

Store in a cool area
Store in a dry area
Store in a dark area
Keep container in a well-ventilated place
Keep locked up
Unauthorized persons are not admitted
Meet the legal requirements

Keep away from:

oxidizing agents
(strong) acids

7.3 Specific use(s):

See information supplied by the manufacturer for the identified use(s)

8. Exposure controls/Personal protection

8.1 Exposure limit values:

8.1.1 Occupational exposure:

If limit values are applicable and available these will be listed below.

TLV (USA)

Benz(a)anthracene	Short time value	- ppm
	Time-weighted average exposure limit	- ppm

8.1.2 Sampling methods:

Product name	Test	Number	Sampling method	Remarks
Benz(a)Anthracene	OSHA	CSI		
Benz(a)Anthracene (Polynuclear aromatic hydrocarbons)	NIOSH	5506	adsorption tubes	
Benz(a)Anthracene (Polynuclear aromatic hydrocarbons)	NIOSH	5515	adsorption tubes	

8.2 Exposure controls:

8.2.1 Occupational exposure controls:

Measure the concentration in the air regularly
Carry operations in the open/under local exhaust/ventilation or with respiratory protection
Personal protective equipment:

a) Respiratory protection:

Dust production: dust mask with filter type P3

b) Hand protection:

Gloves

c) Eye protection:

Safety glasses
In case of dust production: protective goggles

d) Skin protection:
Protective clothing

8.2.2 Environmental exposure controls:
See headings 6.2, 6.3 and 13

9. Physical and chemical properties

9.1 General information:

Physical form	Crystalline solid
	Scales
Odour	Odourless
Colour	Fluorescent yellow-green to colourless

9.2 Important health, safety and environmental information:

Boiling point	Not applicable
Vapour pressure (20°C)	0.00007 hPa
Relative density	1.3
Solubility in water	0.00001 g/100 ml
Solubility in solvents	Soluble in ether
	Soluble in acetone
	Soluble in oils/fats
Log Pow	5.61 - 5.79

9.3 Other information:

Melting point	160 °C

10. Stability and reactivity

10.1 Conditions to avoid:

Possible fire hazard
heat sources
ignition sources

Stability
Unstable on exposure to light
Unstable on exposure to air

Reactions
Reacts violently with (strong) oxidizers
Decomposes on exposure to (strong) acids

10.2 Materials to avoid:

oxidizing agents
(strong) acids

10.3 Hazardous decomposition products:

Upon combustion CO and CO2 are formed

11. Toxicological information

11.1 Acute toxicity:

No (test)data available.

11.2 Chronic toxicity:

Probably human carcinogenic
Mutagenicity: AMES test positive
No certainty about human mutagenic properties
Not classified as toxic to reproduction (EC)

BCR-271: benzo[a]anthracene

EC carc cat	2
Listed in SZW - List of carcinogenic substances	yes
IARC - classification	2A

TLV - Carcinogen	A2
MAK - Krebserzeugend Kategorie	2
MAK - Keimzellmutagen Kategorie	3A
MAK - Schwangerschaft Gruppe	-
CLP carc cat	category 1B

11.3 Acute effects/symptoms:

Inhalation:
No data available

Skin contact:
Slight irritation

Eye contact:
Slight irritation

Ingestion:
No data available

11.4 Chronic effects:

ON CONTINUOUS/REPEATED EXPOSURE/CONTACT:
No specific information available
SIMILAR PRODUCTS CAUSE FOLLOWING SYMPTOMS:
Feeling of weakness
Photoallergy
Skin rash/inflammation
Cracking of the skin
Skin cancer
Lung tissue affection/degeneration
Enlargement/affection of the liver
Affection of the renal tissue

12. Ecological information

12.1 Ecotoxicity:

BCR-271: benzo[a]anthracene

LC50 fishes

species	value	duration (h)	remarks
PIMEPHALES PROMELAS	0.0018 mg/l	65 h	LETHAL

EC50 Daphnia

species	value	duration (h)	remarks
DAPHNIA PULEX	0.01 mg/l	96 h	STATIC SYSTEM

EC50 other aquatic organisms

species	value	duration (h)	remarks
CYANOPHYTA	0.018 mg/l	336 h	

12.2 Mobility:

Volatile organic compounds (VOC)	0 %
Solubility in/reaction with water	Insoluble in water
	Substance sinks in water
Water physicochemical processes	Forming sediments in water
Soil physicochemical processes	Adsorbs into the soil

12.3 Persistence and degradability:

Water abiotic degradation processes	Photolysis in water
	Ozonation in water
Half-life soil	> 100 days
Not readily biodegradable in water	

12.4 Bioaccumulative potential:

Log Pow	5.61 - 5.79
Highly bioaccumulative	

12.5 Results of PBT assessment:

Not applicable, based on available data

12.6 Other adverse effects:

Not dangerous for the ozone layer (Council Regulation (EC) no 1005/2009)

13. Disposal considerations

13.1 Provisions relating to waste:

Waste material code (Directive 2008/98/EC, decision 2001/118/EC)
16 05 06* : laboratory chemicals, consisting of or containing dangerous substances, including mixtures of laboratory chemicals
Depending on branch of industry and production process, also other EURAL codes may be applicable
Hazardous waste according to Directive 2008/98/EC

13.2 Disposal methods:

Dissolve or mix with a combustible solvent
Remove to an authorized incinerator equipped with an afterburner and a flue gas scrubber with energy recovery
Remove waste in accordance with local and/or national regulations
Do not discharge into surface water (2000/60/EC, Council decision 2455/2001/EC, O.J. L331 of 15/12/2001)

13.3 Packaging/Container:

Waste material code packaging (Directive 2008/98/EC)
15 01 10* : packaging containing residues of or contaminated by dangerous substances

14. Transport information

ADR

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ADR	benzo[a]anthracene
UN number	3077
Class	9
Packing group	III
Hazard identification number	90
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

RID

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name RID	benzo[a]anthracene
UN number	3077
Class	9
Packing group	III
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

ADNR

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ADNR	benzo[a]anthracene
UN number	3077
Class	9
Packing group	III
Classification code	M7
Labels	9
Environmentally hazardous substance mark	yes

IMO

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name IMO	benzo[a]anthracene
UN number	3077
Class	9
Packing group	III
Labels	9
Marine pollutant	P
Environmentally hazardous substance mark	yes

ICAO

Proper shipping name	Environmentally hazardous substance, solid, n.o.s.
Techn./chem. name ICAO	benzo[a]anthracene
UN number	3077
Class	9
Packing group	III
Labels	9
Environmentally hazardous substance mark	yes

15. Regulatory information

15.1 EU Legislation:

DSD/DPD

Labelling according to Directive 2008/58/EC (30th adaptation of Directive 67/548/EEC)

Dangerous for the environment

R-phrases

45	May cause cancer
50/53	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

S-phrases

53	Avoid exposure - obtain special instructions before use
45	In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible)
60	This material and its container must be disposed of as hazardous waste
61	Avoid release to the environment. Refer to special instructions/safety data sheets.

Additional recommendations

	Restricted to professional users.

CLP

Classification and labelling according to Regulation (EC) No 790/2009, 1st adaptation of Regulation (EC) No 1272/2008 – Annex VI and after evaluation of available test data

Signal word

Dgr	Danger

H-statements

H350	May cause cancer.
H410	Very toxic to aquatic life with long lasting effects.

P-statements

P202	Do not handle until all safety precautions have been read and understood.
P281	Use personal protective equipment as required.
P273	Avoid release to the environment.
P308 + P313	IF exposed or concerned: Get medical advice/attention.
P391	Collect spillage.
P405	Store locked up.

Supplemental information

	Restricted to professional users.

15.2 National provisions:

15.3 Specific community rules:

Enumerated in Annex XVII of Regulation (EC) No. 1907/2006: Restrictions on the manufacture, placing on the market and use of certain dangerous substances, mixtures and articles.

Legislation	Reference legislation
EG/552/2009	See column 1: 28.
EG/552/2009	See column 1: 50. b)

16. Other information

The information in this safety data sheet is based on data and samples provided to BIG. The sheet was written to the best of our ability and according to the state of knowledge at that time. The safety data sheet only constitutes a guideline for the safe handling, use, consumption, storage, transport and disposal of the substances/preparations/mixtures mentioned under point 1. New safety data sheets are written from time to time. Only the most recent versions may be used. Old versions must be destroyed. Unless indicated otherwise word for word on the safety data sheet, the information does not apply to substances/preparations/mixtures in purer form, mixed with other substances or in processes. The safety data sheet offers no quality specification for the substances/preparations/mixtures in question.

Compliance with the instructions in this safety data sheet does not release the user from the obligation to take all measures dictated by common sense, regulations and recommendations or which are necessary and/or useful based on the real applicable circumstances. BIG does not guarantee the accuracy or exhaustiveness of the information provided. Use of this safety data sheet is subject to the licence and liability limiting conditions as stated in your BIG licence agreement. All intellectual property rights to this sheet are the property of BIG and its distribution and reproduction are limited. Consult your BIG licence agreement for details.

(*) = INTERNAL CLASSIFICATION (NFPA)

PBT-substances = persistent, bioaccumulative and toxic substances

DSD Dangerous Substance Directive
DPD Dangerous Preparation Directive
CLP (EU-GHS) Classification, labelling and packaging (Globally Harmonised System in Europe)

Full text of any R-phrases referred to under headings 2 and 3:

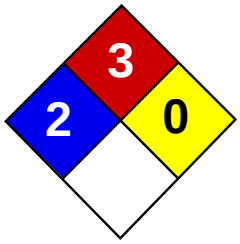
R45	May cause cancer
R50/53	Very toxic to aquatic organisms, may cause long-term adverse effects in the aquatic environment

Full text of any H-statements referred to under headings 2 and 3:

H350	May cause cancer.
H400	Very toxic to aquatic life.
H410	Very toxic to aquatic life with long lasting effects.

Full text of any classes referred to under headings 2 and 3:

Aquatic Acute	Hazardous to the aquatic environment - acute
Aquatic Chronic	Hazardous to the aquatic environment - chronic
Carc.	Carcinogenicity



Material Safety Data Sheet
Benzene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Benzene

Catalog Codes: SLB1564, SLB3055, SLB2881

CAS#: 71-43-2

RTECS: CY1400000

TSCA: TSCA 8(b) inventory: Benzene

CI#: Not available.

Synonym: Benzol; Benzine

Chemical Name: Benzene

Chemical Formula: C6-H6

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: **1-800-901-7247**
International Sales: **1-281-441-4400**

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Benzene	71-43-2	100

Toxicological Data on Ingredients: Benzene: ORAL (LD50): Acute: 930 mg/kg [Rat]. 4700 mg/kg [Mouse]. DERMAL (LD50): Acute: >9400 mg/kg [Rabbit]. VAPOR (LC50): Acute: 10000 ppm 7 hours [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:
Very hazardous in case of eye contact (irritant), of inhalation. Hazardous in case of skin contact (irritant, permeator), of ingestion. Inflammation of the eye is characterized by redness, watering, and itching.

Potential Chronic Health Effects:
CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC. MUTAGENIC EFFECTS: Classified POSSIBLE for human. Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. TERATOGENIC EFFECTS: Not available. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female [POSSIBLE]. The substance is toxic to blood, bone marrow, central nervous system (CNS). The substance may be toxic to liver, Urinary System. Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:
Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention immediately.

Skin Contact:
In case of contact, immediately flush skin with plenty of water. Cover the irritated skin with an emollient. Remove contaminated clothing and shoes. Wash clothing before reuse. Thoroughly clean shoes before reuse. Get medical attention.

Serious Skin Contact:
Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek immediate medical attention.

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention if symptoms appear.

Serious Inhalation:
Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:
Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 497.78°C (928°F)

Flash Points: CLOSED CUP: -11.1°C (12°F). (Setaflash)

Flammable Limits: LOWER: 1.2% UPPER: 7.8%

Products of Combustion: These products are carbon oxides (CO, CO2).

Fire Hazards in Presence of Various Substances:
Highly flammable in presence of open flames and sparks, of heat. Slightly flammable to flammable in presence of oxidizing materials. Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:
Risks of explosion of the product in presence of mechanical impact: Not available. Risks of explosion of the product in presence of static discharge: Not available. Explosive in presence of oxidizing materials, of acids.

Fire Fighting Media and Instructions:
Flammable liquid, soluble or dispersed in water. SMALL FIRE: Use DRY chemical powder. LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards:
Extremely flammable liquid and vapor. Vapor may cause flash fire. Reacts on contact with iodine heptafluoride gas. Dioxygenyl tetrafluoroborate is as very powferful oxidant. The addition of a small particle to small samples of benzene, at ambient temperature, causes ignition. Contact with sodium peroxide with benzene causes ignition. Benzene ignites in contact with powdered chromic anhydride. Virgorous or incandescent reaction with hydrogen + Raney nickel (above 210 C) and bromine trifluoride.

Special Remarks on Explosion Hazards:
Benzene vapors + chlorine and light causes explosion. Reacts explosively with bromine pentafluoride, chlorine, chlorine trifluoride, diborane, nitric acid, nitryl perchlorate, liquid oxygen, ozone, silver perchlorate. Benzene + pentafluoride and methoxide (from arsenic pentafluoride and potassium methoxide) in trichlorotrifluoroethane causes explosion. Interaction

of nitryl perchlorate with benzene gave a slight explosion and flash. The solution of permanganic acid (or its explosive anhydride, dimaganese heptoxide) produced by interaction of permanganates and sulfuric acid will explode on contact with benzene. Peroxodisulfuric acid is a very powferful oxidant. Uncontrolled contact with benzene may cause explosion. Mixtures of peroxomonsulfuric acid with benzene explodes.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:
Flammable liquid. Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:
Keep locked up.. Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents, acids.

Storage:
Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:
Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:
Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:
Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:
TWA: 0.5 STEL: 2.5 (ppm) from ACGIH (TLV) [United States] TWA: 1.6 STEL: 8 (mg/m3) from ACGIH (TLV) [United States] TWA: 0.1 STEL: 1 from NIOSH TWA: 1 STEL: 5 (ppm) from OSHA (PEL) [United States] TWA: 10 (ppm) from OSHA (PEL) [United States] TWA: 3 (ppm) [United Kingdom (UK)] TWA: 1.6 (mg/m3) [United Kingdom (UK)] TWA: 1 (ppm) [Canada] TWA: 3.2 (mg/m3) [Canada] TWA: 0.5 (ppm) [Canada]Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor:
Aromatic. Gasoline-like, rather pleasant. (Strong.)

Taste: Not available.

Molecular Weight: 78.11 g/mole

Color: Clear Colorless. Colorless to light yellow.

pH (1% soln/water): Not available.

Boiling Point: 80.1 (176.2°F)

Melting Point: 5.5°C (41.9°F)

Critical Temperature: 288.9°C (552°F)

Specific Gravity: 0.8787 @ 15 C (Water = 1)

Vapor Pressure: 10 kPa (@ 20°C)

Vapor Density: 2.8 (Air = 1)

Volatility: Not available.

Odor Threshold: 4.68 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; log(oil/water) = 2.1

Ionicity (in Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether, acetone.

Solubility:
Miscible in alcohol, chloroform, carbon disulfide oils, carbon tetrachloride, glacial acetic acid, diethyl ether, acetone. Very slightly soluble in cold water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, ignition sources, incompatibles.

Incompatibility with various substances: Highly reactive with oxidizing agents, acids.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:
Benzene vapors + chlorine and light causes explosion. Reacts explosively with bromine pentafluoride, chlorine, chlorine trifluoride, diborane, nitric acid, nitryl perchlorate, liquid oxygen, ozone, silver perchlorate. Benzene + pentafluoride and methoxide (from arsenic pentafluoride and potassium methoxide) in trichlorotrifluoroethane causes explosion. Interaction of nitryl perchlorate with benzene gave a slight explosion and flash. The solution of permanganic acid (or its explosive anhydride, dimaganese heptoxide) produced by interaction of permanganates and sulfuric acid will explode on contact with benzene. Peroxodisulfuric acid is a very powferful oxidant. Uncontrolled contact with benzene may cause explosion. Mixtures of peroxomonsulfuric acid with benzene explodes.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Dermal contact. Eye contact. Inhalation.

Toxicity to Animals:
WARNING: THE LC50 VALUES HEREUNDER ARE ESTIMATED ON THE BASIS OF A 4-HOUR EXPOSURE. Acute oral toxicity (LD50): 930 mg/kg [Rat]. Acute dermal toxicity (LD50): >9400 mg/kg [Rabbit]. Acute toxicity of the vapor (LC50): 10000 7 hours [Rat].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified A1 (Confirmed for human.) by ACGIH, 1 (Proven for human.) by IARC. MUTAGENIC EFFECTS: Classified POSSIBLE for human. Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast. DEVELOPMENTAL TOXICITY: Classified Reproductive system/toxin/female [POSSIBLE]. Causes damage to the following organs: blood, bone marrow, central nervous system (CNS). May cause damage to the following organs: liver, Urinary System.

Other Toxic Effects on Humans:
Very hazardous in case of inhalation. Hazardous in case of skin contact (irritant, permeator), of ingestion.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:
May cause adverse reproductive effects (female fertility, Embryotoxic and/or foetotoxic in animal) and birth defects. May affect genetic material (mutagenic). May cause cancer (tumorigenic, leukemia)) Human: passes the placental barrier, detected in maternal milk.

Special Remarks on other Toxic Effects on Humans:
Acute Potential Health Effects: Skin: Causes skin irritation. It can be absorbed through intact skin and affect the liver, blood, metabolism,and urinary system. Eyes: Causes eye irritation. Inhalation: Causes respiratory tract and mucous membrane irritation. Can be absorbed through the lungs. May affect behavior/Central and Peripheral nervous systems (somnolence, muscle weakness, general anesthetic, and other symptoms similar to ingestion), gastrointestinal tract (nausea), blood metabolism, urinary system. Ingestion: May be harmful if swallowed. May cause gastrointestinal tract irritation including vomiting. May affect behavior/Central and Peripheral nervous systems (convulsions, seizures, tremor, irritability, initial CNS stimulation followed by depression, loss of coordination, dizziness, headache, weakness, pallor, flushing), respiration (breathlessness and chest constriction), cardiovascular system, (shallow/rapid pulse), and blood.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:
Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:
Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Benzene UNNA: 1114 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:
California prop. 65: This product contains the following ingredients for which the State of California has found to cause cancer, birth defects or other reproductive harm, which would require a warning under the statute: Benzene California prop. 65 (no significant risk level): Benzene: 0.007 mg/day (value) California prop. 65: This product contains the following ingredients

for which the State of California has found to cause cancer which would require a warning under the statute: Benzene Connecticut carcinogen reporting list.: Benzene Connecticut hazardous material survey.: Benzene Illinois toxic substances disclosure to employee act: Benzene Illinois chemical safety act: Benzene New York release reporting list: Benzene Rhode Island RTK hazardous substances: Benzene Pennsylvania RTK: Benzene Minnesota: Benzene Michigan critical material: Benzene Massachusetts RTK: Benzene Massachusetts spill list: Benzene New Jersey: Benzene New Jersey spill list: Benzene Louisiana spill reporting: Benzene California Director's list of Hazardous Substances: Benzene TSCA 8(b) inventory: Benzene SARA 313 toxic chemical notification and release reporting: Benzene CERCLA: Hazardous substances.: Benzene: 10 lbs. (4.536 kg)

Other Regulations:
OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200). EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):
CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F). CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

DSCL (EEC):
R11- Highly flammable. R22- Harmful if swallowed. R38- Irritating to skin. R41- Risk of serious damage to eyes. R45- May cause cancer. R62- Possible risk of impaired fertility. S2- Keep out of the reach of children. S26- In case of contact with eyes, rinse immediately with plenty of water and seek medical advice. S39- Wear eye/face protection. S46- If swallowed, seek medical advice immediately and show this container or label. S53- Avoid exposure - obtain special instructions before use.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:
Gloves. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate. Splash goggles.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

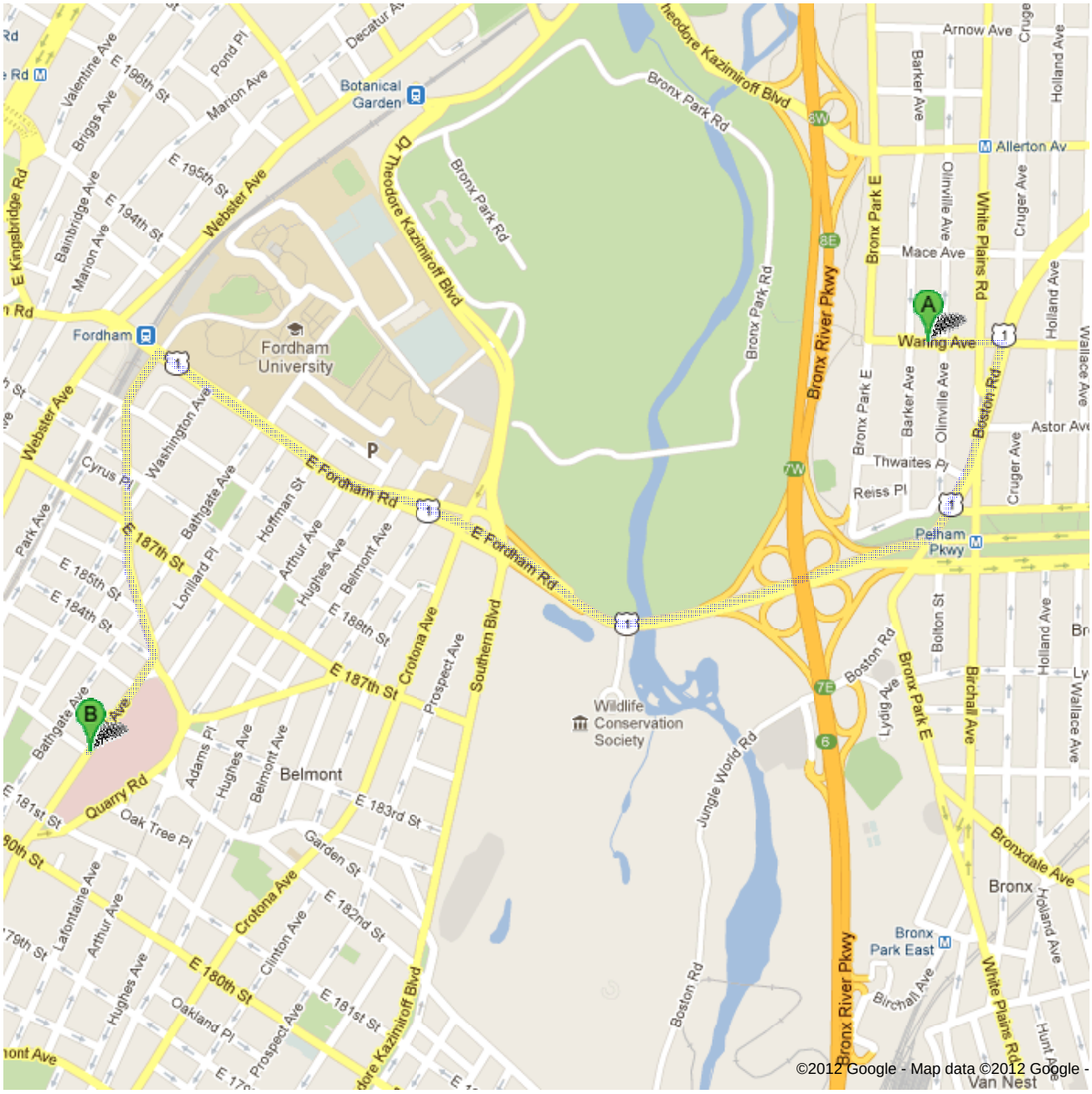
Created: 10/10/2005 08:35 PM

Last Updated: 11/01/2010 12:00 PM

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall ScienceLab.com be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if ScienceLab.com has been advised of the possibility of such damages.

Attachment C
Hospital Routes

Directions to St. Barnabas Hospital, 4422 3rd Avenue, New York, NY 10457
2.3 mi – about **6 mins**



650 Waring Ave, Bronx, NY 10467

	1. Head **east** on **Waring Ave** toward **Olinville Ave**	go 0.1 mi total 0.1 mi
	2. Turn right onto **Boston Rd** About 58 secs	go 0.3 mi total 0.4 mi
	3. Turn right onto **Bronx and Pelham Pkwy** About 47 secs	go 0.4 mi total 0.8 mi
	4. Continue onto **E Fordham Rd** About 58 secs	go 0.9 mi total 1.7 mi
	5. Turn left onto **3rd Ave** Destination will be on the left About 3 mins	go 0.6 mi total 2.3 mi

St. Barnabas Hospital, 4422 3rd Avenue, New York, NY 10457

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

Directions weren't right? Please find your route on maps.google.com and click "Report a problem" at the bottom left.

Attachment D
Incident Reporting Guidelines

TRC Accident Reporting Guidelines

Incident Response:

1. For life threatening injuries and medical emergencies call 911 or go to the closest emergency room.
2. An injured worker must report an injury to their supervisor immediately.
3. Supervisor is required to complete an "Accident Report" within 24 hours of the reported accident and forward to Bill Russell at Sargent & Associates.

   Bill Russell – Sargent &Associates
   Office: 978-256-7459; Fax: 978-256-4941
   bill@sargentandassociates.com

   Ron Severson, Safety Director
   Office: 860-298-6352; Mobile: 860-906-4656
   rseverson@trcsolutions.com

4. WorkCare can provide assistance in providing first aid advice and directing an injured worker to non-emergency medical care. WorkCare is a service that provides 24/7 access to an Occupational Healthcare physician or clinician.

   WorkCare Incident Intervention
   888-449-7787

Return to Work:

1. The injured worker is responsible for providing the Supervisor with a copy of the doctor's note detailing the injury and "return to work" status within 24 hours of the doctor's visit. The supervisor must fax or email the completed Accident Report and Doctor's notes to Sargent & Associates.
2. Sargent & Associates will contact the injured worker and the Supervisor to confirm the facts surrounding the injury.
3. Sargent & Associates will report the injury to the workers' compensation insurance carrier, The Hartford Insurance Co.
4. The Hartford may contact the injured worker and supervisor to conduct an accident investigation.
5. Sargent & Associates will maintain communication with all parties in order to monitor the medical treatment, and the injured worker's return to work status. They will act as liaison between the injured worker, TRC, and The Hartford.
6. Sargent & Associates will work with TRC's Health & Safety, Human Resources, and/or Supervisors to determine if modified duty work is an option, until the injured worker is able to return to full duty work activities.

Incident Investigation:

1. All incidents that result in injuries that require reporting for OSHA recordkeeping purposes and all high potential first aid and near miss events require an incident investigation.
2. The Supervisor with assistance from the Safety Director and/or Safety Coordiantor, must complete the incident investigation report/root cause analysis within 7 days of the incident and must develop a corrective action plan within 14 days of the incident.

Attachment E
TRC Incident Report (Blank)

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)

Incident Category						
☐ Employee Injury/Illness	☐ Near Miss/Loss	☐ Property Damage	☐ Vehicle Accident	☐ Fire	☐ Other: Specify	
1	Incident Location:					
2	Site Identification/Project No.:					
3	Site Address:					
4	Date Incident Occurred:					
5	Time Incident Occurred:					
6	Date Incident Reported to Supervisor:					
7	Date Report Completed:					
8	Was WorkCare Contacted? ☐ Yes ☐ No					
9	Client:					

TRC Employee Information					
10	Name:				
11	Address:				
12	Employee Phone:				
13	Title or Occupation:				
14	Sector/Practice:				
15	Supervisor Name/Phone:				
TRC Employee Information (to be completed by Worker's Compensation Claims Administrator)					
16	Employee Date of Birth:				
17	Employee Social Security Number:				
18	Employee Marital Status:	☐ Married	☐ Single		
19	Number of Dependant under the age of 18:				
20	Date of Hire:				
21	Rate of Pay:		Hours per week:		

Type of Employee Injury or Illness (To be determined by Safety Director)			
22	☐ First Aid Only	20	☐ Extended Time Away From Work (3 days or more)
23	☐ Medical Treatment Only	21	☐ Fatality
24	☐ Restricted Work-case	22	☐ Other (specify):
25	☐ Lost Workday		
26	Estimated Number of Days on Restricted Work:		
27	Estimated Number of Days Away from Work:		

Employee Injury or Illness Description	
28	Describe the Injury or Illness:
29	First Aid/Medical Treatment Administered:
30	Name of Doctor's Office, Clinic, or Hospital: Concentra
31	Address and Phone Number:

Incident Description	
32	Equipment Involved:
33	Site Description:
34	What task was being performed at time of incident?
35	Describe Incident in Detail :
36	Conditions at time of Incident: (weather, lighting, etc.):
37	Motor Vehicle Accident:
38	TRC Vehicle ID:

39	Year/Make/Model:	
☐ DOT Regulated Vehicle ☐ Towed From Scene ☐ Airbag Deployed ☐ Seatbelt in Use ☐ TRC Fleet ☐ Rental ☐ Personal Vehicle		
40	Other Vehicle License Plate	
41	Other Vehicle Year/Make/Model	
42	Other Vehicle Driver Name	
43	Other Vehicle Year/Make/Model	
44	Other Injured Parties ☐ Yes ☐ No	
43	Description of other injuries:	

Subcontractor Involvement / Description of Incident	
44	Subcontractor Involved: ☐ Yes ☐ No
45	Name of Company:
46	Address:
47	Contact Name and Phone Number:
48	Subcontractor Description of Incident:

Witness Involvement / Description of Incident	
49	Witnesses to Incident: ☐ Yes ☐ No
50	Name(s) and Address(s):
51	Phone Number(s):
52	Witness Description of Incident:

Personal Protective Equipment (PPE)	
53	List PPE required to complete the task: (glasses, gloves, shoes, hard hat, respirator, hearing protection, etc.)
54	Was the employee using the proper PPE at the time of the Incident?

Immediate Corrective Actions			
55	Describe the immediate corrective actions taken:		
56	Immediate Supervisor:	Signature:	Date:
57	Employee:	Signature:	Date:

Supervisor's Post-Incident Review and Recommendations

	Safety Violation	☐ Yes ☐ No
58	State the company safety rule, OSHA regulation, or specific training that was violated:	
59	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

60	Root Cause(s)	Identified Root Cause(s):							
		#1	#2	#3	#4	#5	#6	#7	#8
A		☐	☐	☐	☐	☐	☐	☐	☐
B		☐	☐	☐	☐	☐	☐	☐	☐
C		☐	☐	☐	☐	☐	☐	☐	☐
D		☐	☐	☐	☐	☐	☐	☐	☐
E		☐	☐	☐	☐	☐	☐	☐	☐
F		☐	☐	☐	☐	☐	☐	☐	☐
G		☐	☐	☐	☐	☐	☐	☐	☐
H		☐	☐	☐	☐	☐	☐	☐	☐

61 **Conclusion: Why did the Incident Occur?**

62

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 G

SITE MANAGEMENT PERIODIC REVIEW REPORT CERTIFICATION FORM

(TO BE PROVIDED BY NYSDEC)

APPENDIX H
GROUNDWATER MONITORING WELL SAMPLING LOG FORM AND VAPOR INTRUSION SAMPLING LOG FORM

Groundwater Sampling Data Record Form

Project: PS-96X 650 Waring Avenue, Bronx, NY	**Project No.:**	**Date/Time:**	**Sheet_1__of_1_**
TRC Personnel:			

Well Identification:

WELL INTEGRITY

	YES	NO
Protect. Casing Secure		
Concrete Collar Intact		
PVC Stick-up Intact		
Well Cap Present		
Security Lock Present		

Protective Casing Stick-up ____NA____ ft. (from Ground)

WELL DIAMETER

	2 inch
	4 inch
	6 inch

WELL MATERIAL

PVC SS ___

Reference Point:

	historical	
	measured:	
	top of riser	notch
	top of casing	north side
	_____	high pt
		pen mark

Well Depth (ft.):	
Depth to Water (ft):	

Depth of pump intake (ft.): 29.0

Height of water column (ft.):	

	.16 gal/ft (2 in.)
	.65 gal/ft (4 in.)
	1.5 gal/ft (6 in.)
	___ gal/ft (__in.)

Volume of Water in Well (gal):	
Total Gallons Purged:	

[Vol. = $r^2h(0.163)$]

Depth to NAPL (ft.):	
Thickness of NAPL (ft.):	

PID SCREENING (ppmV)

Background		
Well Mouth		(if required)

FIELD WATER QUALITY MEASUREMENTS

Time									
Temp. (C.)									
Conduct.(umhos/com)									
DO (mg/L)									
pH (Std.Units)									
ORP (millivolts)									
Turb. (NTU)									
Flow (ml/min)-approx.									
Depth to water (ft)									
Comments									

Pump Type	Purge	Sample
Peristaltic Pump		
Submersible Pump		
Bladder Pump		
Other:		

Description of Sampling Equipment

Analytical Parameters	Filtered (Y/N)	Preservation	Volume/Containers	Time Collected	Sample ID

REMARKS:

NA	Not Applicable
NM	Not Measured
ND	Non Detect

TRC	**Project:** **Project No.:**	**Date:**	**Sheet ___ of ___**
Sub-Slab Vapor / Indoor Air Sampling Data Record Form	**TRC Personnel:**	**Temperature:** **Wind Direction:**	

Sub-Slab Vapor / Indoor Air Sample ID:

SUB-SLAB VAPOR POINT

OBSERVATIONS: _____

HELIUM CHECK: _____

PID (ppm): _____

Soil Vapor Sample

	Time	Pressure
Start		
Stop		

Indoor Air Sample

	Time	Pressure
Start		
Stop		

PID (ppb): _____

SUB-SLAB VAPOR POINT

OBSERVATIONS: _____

HELIUM CHECK: _____

PID (ppm): _____

	Time	Pressure
Start		
Stop		

	Time	Pressure
Start		
Stop		

PID (ppb): _____

SUB-SLAB VAPOR POINT

OBSERVATIONS: _____

HELIUM CHECK: _____

PID (ppm): _____

	Time	Pressure
Start		
Stop		

	Time	Pressure
Start		
Stop		

PID (ppb): _____

Ambient Air Sample ID:

Ambient Air Sample

	Time	Pressure
Start		
Stop		

APPENDIX I

SSDS INSPECTION AND MAINTENANCE CHECKLIST

PS 96X

Semi-Annual Monitoring Point Inspection Checklist

Inspect all monitoring point locations for obstructions; check the manhole covers (and bolts) along with the quick connections inside the manhole.

Monitoring Point ID	Room Number	Any obstructions over MP	Manhole cover secure and bolts in tact	Comments (status of quick-connect fitting, etc.)
		Y / N	Y / N	
		Y / N	Y / N	
		Y / N	Y / N	
		Y / N	Y / N	
		Y / N	Y / N	
		Y / N	Y / N	

Routine and Preventative Maintenance Checklist

SSDS Fans

Inspector's Name:

Inspection Date/Time:

Purpose: (circle one) **Biannual Inspection** **Fan Malfunction (describe)**

SSDS Fan Maintenance Checklist

Preform the steps below for every SSDS fan during a biannual inspection, or for any SSDS fan experiencing issues	Completed Y/N	List Any Issues or Unusual Behavior
1. Disconnect, lock out, and tag fan electrical power source		
2. Check all SSDS fan bearings		
3. Inspect SSDS fan drive belt for tightness and wear. Adjust/replace if required		
4. Clean/blow down centrifugal fan wheel, inlet, fan, and motor housing		
5. Grease fan shaft bearing pillow blocks		
6. Inspect fan inlet and outlet ductwork flex joints		
7. Inspect damper for proper orientation		
8. Inspect fan stack guy wires		
9. Inspect fan mounting and vibration isolators		

*Notify the DOE EHS of any fan unit/component failure. In the event that a fan component fails, the component will be replaced by DOE EHS. DOE EHS will make appropriate arrangements in advance with suppliers to provide SSDS replacement parts within 12 hours notice. In the event that a fan unit fails, the fan unit will be replaced by DOE EHS. A spare fan will be available on-site for immediate replacement in case of fan failure.

Inspector's Signature:

Annual Inspection Form

P.S. 96X

Inspector's Name:	Weather Conditions:
Inspection Date:	Air Temperature (^{o}F):
Inspection Time:	
Comments:	

A. PRE INSPECTION CHECKLIST

* Schedule Annual Inspection when school is not occupied by students.
* Review 12 Previous Monthly Inspection Checklists.
* Meet with Custodial Engineer and Principal to solicit comments/concerns regarding the operation of the Engineering Controls over the last 12 months.
* Conduct Annual Refresher Training with DOE EHS.
* Follow proper safety protocols including lockout/tagout.
* Comments:

B. SSDS SYSTEM INSPECTION

Walk the entire roof surface of school building

* Inspect fan stack guy wires.
* Inspect monitoring points.
* Record vacuum gauge reading.
* Ensure all SSDS accessories listed in section 15880 are functioning properly.
* Inspect bolts and set screws for tightness and rusty condition.
* Inspect SSDS fan for cleanliness. Clean exterior surfaces only. Remove dust and grease on motor housing,
* Are the indicator lights on the Building Management System functioning properly?
* Is the spare fan unit missing from the school?
* Comments (see or hear anything unusual?):

C. VAPOR BARRIER INSPECTION

Walk all of the cellar floor

* Review all cracks or other openings indentified in cellar floor during previous inspections.
* Any new visible cracks in the cellar floor?
* Any new visible opening (unintended) in the floor?
* Any new visible cracks in accessible pits?
* Note the length of any new cracks/openings in the cellar floor.
* Draw approximate location of floor cracks/openings that appear to have potential leak through vapor barrier.

Comments:

D. Repair

Summarize needed/completed repairs to Engineering Controls:

Inspector's Signature: _____

Custodian Monthly or Severe Condition Inspection Form

Vapor Barrier and SSDS

Inspector's Name:

Inspection Date/Time:

Purpose: (circle one) **Monthly Inspection** **Severe Condition Inspection (describe)**

		Yes / No *	Notified Person / Date
A. VAPOR BARRIER INSPECTION	**1. Walk the entire cellar floor**		
	* Any visible cracks in the floor?		
	* Any other visible openings (unintended) in the floor?		
	* Any construction activities affecting the floor?		
	* Any visible cracks in any accessible pits?		
	** Notification of DOE EHS is required if cracks are noted. Include the following information: - Draw approximate location of floor cracks/openings on site map. - Note the length of the crack/opening. Note the width of the crack/opening.		
B. SSDS INSPECTION	**1. Walk the entire roof surface.**		
	* Any rust or other debris (bird nest, etc.) in or on SSDS Exhaust Stacks?		
	* Are the SSDS fan units functioning at a lower vacuum than the previous inspection?		
	* Is the spare fan unit missing from the school?		
	* Are any lights out on the SSDS Monitoring System (Light panel)? Which one(s)?		
C. ACTIONS TAKEN			
	Inspector's Signature:		

* Any 'Yes' answers require immediate notification of Bernard Orlan, DSF, at 718-361-3808.
If no follow up inspection by DSF within 1 week of notification, re-inspection and re-notification required.