SITE CHARACTERIZATION WORK PLAN FOR THE FORMER EAST 99TH STREET WORKS SITE

SITE NUMBER V00538

Prepared For:

ConEdison

Consolidated Edison Company of New York, Inc.

31-01 20th Avenue
Long Island City, NY 11105

Prepared By:

PARSONS

Liverpool, New York 13088

NOVEMBER 2004

Reviewed and Approved by:	**Name**	**Date**
Project Manager:	Megan Miller	11/4/04
Technical Director:	Vipul Srivastava	11/4/04

TABLE OF CONTENTS

TABLE OF CONTENTS
(continued)

LIST OF FIGURES

LIST OF TABLES

LIST OF APPENDICES

SECTION 1

INTRODUCTION

1.1 PROJECT BACKGROUND

Consolidated Edison Company of New York (Con Edison) has entered into a comprehensive Voluntary Cleanup Agreement (VCA) with the New York State Department of Environmental Conservation (NYSDEC) to investigate and, where necessary, remediate former manufactured gas plant (MGP) and gasholder sites. The Former East 99th Street Works (the Site) was located between 99th and 98th Street extending eastward from Second Avenue to the Harlem River on Tax Block 1669 Lot 1 and Block 1691 Lot 1 in the Borough of Manhattan, New York City and New York County, New York (Figure 1). Historical information indicates that from sometime prior to 1896, Consolidated Gas Company, a predecessor of Con Edison, operated a MGP at the site. The plant was operated until sometime before 1939, when Sanborn Insurance maps depicted the lot as being vacant. The site is currently occupied by Metropolitan Hospital (Figure 2), which was built in approximately 1960. The main hospital building encompasses the area between 99th Street and 97th Street and between First and Second Avenue. The associated Nurses Residence building currently occupies the area between 99th Street and 97th Street between First Avenue and FDR Drive.

The Former East 99th Street Works Site is located in the vicinity of the future Second Avenue Subway project. The Federal Transit Administration (FTA) and the Metropolitan Transportation Authority (MTA), in cooperation with MTA New York City Transit (NYCT), plan to construct a new subway line along Second Avenue in Manhattan. The first phase of the project which is scheduled to begin in December 2004 will involve the relocation of utilities along Second Avenue between East 92nd Street and East 99th Street. In anticipation of the construction activities associated with the new subway line, Con Edison is undertaking a Site Characterization of the Former East 99th Street Works Site.

1.2 PROJECT OBJECTIVES

The objectives of the Site Characterization include the following:

- To characterize and identify potential subsurface conditions associated with the former MGP that may pose a risk to the health and safety of workers and the public during construction;
- To identify any special precautions or procedures required to mitigate the presence of MGP-related or other constituents, and to address handling, transportation, and disposal of impacted groundwater and soils, if any; and
- To assess whether MGP byproducts have been released to the environment and may be present onsite; if they may have migrated offsite; and whether they may have impacted human health or the environment.

If no potential impacts are identified, a "no further action" conclusion may be warranted. If potential impacts are verified, additional sampling may be needed to determine the nature and extent of those impacts, and evaluate the need for remediation and/or interim measures to protect site workers, occupants, and the surrounding community.

1.3 PLANNED CONSTRUCTION ACTIVITIES

The Second Avenue Subway will be a new, two-track, approximately 8.5-mile rail line extending the length of Manhattan's East Side corridor from 125th Street to Hanover Square. The project will be implemented in several phases. The first phase of construction is scheduled to begin in the Spring of 2005 and will involve the relocation of utilities currently located in the Second Avenue roadway between East 92nd Street and East 99th Street. The second phase of construction will involve tunneling activities below Second Avenue, which is scheduled to commence in late 2005.

Based on the design plans (dated March 22, 2004) for the Second Avenue Subway project which were provided to Con Edison by DMJM & Harris Arup Joint Venture (DHAJV), the approximate excavation areas and depths required for the utility relocation and subway construction in the vicinity of the Site are shown on Figure 3.

1.4 WORK PLAN ORGANIZATION

This work plan is organized as follows:

- Section 1 describes the project background and objectives;
- Section 2 describes the site background;
- Section 3 describes the scope of work to be conducted during the Site Characterization;
- Section 4 describes the project organization;
- Section 5 describes the project schedule;
- Section 6 presents the references used in the work plan preparation;
- Appendix A provides a memorandum documenting previous sampling results in the vicinity of the Site;
- Appendix B is the Field Sampling Plan (FSP);
- Appendix C is the Quality Assurance Project Plan (QAPP); and
- Appendix D is the Health and Safety Plan (HASP).

SECTION 2

SITE BACKGROUND

2.1 SITE DESCRIPTION

The Former East 99th Street Works was located between 99th and 98th Street extending eastward from Second Avenue to the Harlem River. The site previously occupied former Tax Block 1692 Lots 1 & 17 and Block 1670 Lot 1. Sanborn Insurance Maps dated 1911 indicate the MGP Site previously contained four gasholders (capacities of 105,000, 500,000, 210,000, and 300,000 cubic feet), a purifying house, condenser house, retort house, meter house, engine room, office, and a coal house. Sanborn Insurance Maps of 1896 also indicate that a coal yard existed between First Avenue and Harlem River. The approximate locations of the former MGP structures are shown on Figure 4. By 1960, the property had been purchased by the City of New York, and combined to current Tax Blocks 1669 Lot 1 and Block 1691 Lot 1, at which point, the Metropolitan Hospital was built. The main hospital building encompasses the area between 99th Street and 97th Street between First and Second Avenue, and the associated Nurses Residence building currently occupies the area between 99th and 97th Streets between First Avenue and FDR Drive (Figure 2). 98th Street, located between First and Second Avenue, was removed during the construction of the hospital. No remnants of the former MGP facility are evident at the site.

2.2 ADJOINING PROPERTY DESCRIPTION

The surrounding properties consist of 99th Street to the north beyond which (from east to west) is a public school (Manhattan East Center for Arts), New York City Sanitation Department, and a parking lot. FDR Drive is located to the east, beyond which is Harlem River. 97th Street is located to the south, beyond which are a park, a commercial building, and a baseball field. Second Avenue is located to the west, beyond which is a high-rise apartment complex (Washington Houses).

2.3 SITE HISTORY

Con Edison retained ENSR to conduct historical research of the East 99th Street Works Property. The results of the historical research are documented in the Site History Research Report which was submitted to the NYSDEC (ENSR, 2002). According to information provided by Sanborn Insurance Maps, the East 99th Street Works was constructed sometime prior to 1896 by Consolidated Gas Company and was in operation until sometime prior to 1939.

A 1911 Sanborn Insurance Map depicts the area as containing four gasholders, a purifying house, condenser house, retort house, meter house, engine room, office, and a coal house. According to the Sanborn map, the gasholders had a maximum storage capacity of approximately 1,115,000 cubic feet. The 1896 and 1911 Sanborn maps show a coal yard associated with the East 99th Street Works located between First Avenue and the East River. A 1939 Sanborn Map depicts the site as being predominantly vacant with some automobile

parking, sales and service located fronting on First Avenue. According to the Chain of Title Report prepared by Commonwealth, Con Edison sold portions of the site to the City of New York between 1947 and 1960 (ENSR, 2002). The lot was recorded as vacant in 1951, and remained vacant until the Metropolitan Hospital was constructed in approximately 1960.

2.4 PREVIOUS INVESTIGATIONS

A General Alignment and Potentially Contaminated Sites environmental sampling program was conducted for the Second Avenue Subway project between August 2003 and May 2004. The sampling program was conducted by the DHAJV, the MTA's consultant team for the Second Avenue Subway project. The sampling program was conducted to assess environmental conditions that may be encountered in areas where construction will occur, as well as in areas where available documentation indicated the potential presence of soil and/or groundwater contamination emanating from a specific source and/or location.

The Former East 99th Street Works Site was identified during a review of historic maps and regulatory databases/records as a potential source of contamination. Therefore, sampling activities were performed in the general vicinity of the Site. The results of these sampling activities are documented in an internal DHAJV memorandum dated May 6, 2004 (provided as Appendix A) and briefly summarized below.

- A total of 28 soil samples were collected from twelve soil borings and two test pits located in the vicinity of the Site along Second Avenue between 96th Street and 100th Street. Six groundwater monitoring wells were also installed in this area. Only one monitoring well and one soil boring were installed immediately adjacent to the former MGP site. The remaining borings and wells were installed well to the north or south of the former MGP site along Second Avenue.
- Field screening results indicated volatile organic compound (VOC) vapors present in one of the soil borings and the two test pit locations. Hydrogen cyanide (HCN) vapors were also detected at two of the soil boring locations. These locations were all located more than 200 feet south of the former MGP site.
- VOCs (petroleum-related compounds), semi-volatile organic compounds (SVOCs), metals, and mercury were detected in several soil samples at levels exceeding NYSDEC recommended soil cleanup objectives (NYSDEC, 1994). VOCs and SVOCs were not detected at concentrations exceeding cleanup objectives at the two locations immediately adjacent to the former MGP site.
- VOCs, naphthalene, and metals were detected at levels exceeding NYSDEC standards and guidance values (NYSDEC, 1998) in groundwater samples.

2.5 SITE SETTING

2.5.1 Topography and Zoning

The site is relatively flat with a slight pitch to the east towards the Harlem River. The site is at an elevation of approximately 10 to 20 feet above mean sea level. According to the New York

City Zoning Department, the subject property is zoned as "R7-2", zoning for medium residential and community.

2.5.2 Surface Water and Drainage

The nearest surface water body is the Harlem River, which abuts the Site to the east. According to the NYSDEC Classification of Surface Waters and Groundwaters, the Harlem River is deemed a Class I water body consisting of saline surface water (6 NYCRR Part 701.10). Storm water runoff from paved areas on-site likely discharges into storm drains located on surrounding streets. The storm drains in the area discharge into the Harlem River (ENSR, 2002).

2.5.3 Geology

According to a bedrock geologic map of the Metropolitan New York area, the subject property consists of Early Paleozoic material (mostly metamorphic). According to an EDR report (EDR, 2002), the bedrock unit lies within the Paleozoic Era and part of the Ordovician system (middle Ordovician Series). Due to urban development of the land and the Harlem River to the east, depth to bedrock is inferred to be greater than 50 feet below ground surface (bgs) (ENSR, 2002).

Logs for borings conducted in 1969 prior to construction of a nearby building on East 111th Street (approximately ½ mile north) were obtained from the New York City Department of Building (NYCDOB). The boring logs indicated that the first 0 to 14 feet bgs consisted of fill material; 30 to 40 feet bgs consisted of sand, trace silt and gravel; and 40 to 50 feet consisted of sandy silt (no information was provided for soils from 15 to 29 feet bgs) (ENSR, 2002).

2.5.4 Hydrogeology

Due to Manhattan's heavy metamorphic bedrock, aquifers are less abundant. The surficial upper glacial aquifer is generally of poor permeability and is underlain by bedrock. As a result, groundwater is not used as a potable water source in Manhattan. Instead, New York City obtains its water from the Catskill Mountains of New York. According to the NYSDEC, groundwater at the site is classified as Class GA Fresh Groundwater. Based on topographic gradient, groundwater flow at the Site is inferred to the east toward the Harlem River. Based on topographic maps and the EDR Report, depth to groundwater is estimated to be six feet bgs (ENSR, 2002).

SECTION 3

SCOPE OF WORK

The following sections present the scope of work to be conducted during this Site Characterization.

3.1 PHASED INVESTIGATION APPROACH

As discussed in Section 1, the Second Avenue Subway project will be implemented in several phases. The first phase of construction is scheduled to begin in the Spring of 2005 and will affect areas of Second Avenue adjacent to the Site (see Figure 3). In order to obtain information regarding subsurface conditions adjacent to the site prior to the start of construction, the Site Characterization will be implemented in two Phases.

- **Phase I** will involve the investigation of areas to be affected by the utility relocation and subway construction activities along Second Avenue. This will allow evaluation of the Phase I investigation results prior to the start of construction in order to identify any special precautions or procedures required to mitigate the presence of MGP-impacted materials that may be encountered, and to address handling, transportation, and disposal of impacted groundwater and soils, if any. Phase I will also include investigation of areas adjacent to the remaining portions of the former MGP accessible via adjacent public right-of-ways (e.g., sidewalks and streets). It is anticipated that securing the necessary access agreements with private property owners will not be accomplished in time to include the investigation of private property during Phase I.
- **Phase II** will be conducted once the Phase I results have been evaluated and access agreements has been secured with the owners of private property comprising the former MGP Site. The scope of the Phase II investigation as described herein may be modified to address any data gaps and/or to further delineate areas of concern identified during Phase I. Any modifications to the Phase II investigation scope will be done in consultation with, and under the approval of, the NYSDEC.

Activities proposed for both the Phase I and Phase II investigations are described in the following sections and identified on Figure 5.

3.2 SITE INSPECTION AND PRELIMINARY INVESTIGATION ACTIVITIES

Prior to field mobilization for each investigation phase, a site inspection will be conducted to refine the locations of the proposed investigation points. The proposed scope of work will be reviewed with representatives of Con Edison and property owners. As-built diagrams will be reviewed for access, feasibility, occupant health and safety, worker health and safety, and crowd control. Subsurface utility locations will also be reviewed. The site inspection will allow the most efficient and most effective methods to be employed during the Site Characterization. Proposed locations and proposed methods may be altered in the field based on site conditions, access, utilities, and public safety.

3.3 UNDERGROUND UTILITY CLEARANCE

Prior to beginning each phase of the field investigation, the New York City and Long Island One-Call Center will be contacted for a Code 753 utility mark-out. No drilling will be conducted until the following minimum requirements have been met:

- The Parsons Project Manager and/or field team leader have thoroughly inspected the drilling location and surrounding area for the Code 753 mark-out and the location is clear of marked utilities;
- All drilling locations have been M-scoped by Con Edison, or a private utility locating contractor has performed a below-ground (e.g., ground penetrating radar) survey for utility location;
- All drilling locations have been cleared with a metal detector by Parsons;
- Utility plates for the site and surrounding area have been provided to Parsons by Con Edison's Construction Management staff and reviewed;
- Parsons has met with and reviewed all of the drilling locations with a facility representative, a Con Edison Construction Management representative, and/or Con Edison's Project Manager, and verified that all drilling locations have been marked; and
- Each drilling location has either been hand-augered to a minimum depth of 5 feet, or a 4-foot by 4-foot test pit has been hand-dug to a minimum depth of 5 feet, as determined by Con Edison during the site inspection.

Additional utility clearance measures may be required based on the site inspection and/or Con Edison requirements.

3.4 AIR MONITORING

The proposed investigation and sampling activities may generate fugitive dust or organic vapors. Worker breathing zone air monitoring will be conducted as described in Section 3.4.1. A community air monitoring program will also be implemented as described in Section 3.4.2.

3.4.1 Worker Air Monitoring

Air monitoring of the worker breathing zone will be conducted continuously during all drilling and sampling activities to assure proper health and safety protection for the team and any occupants of the facilities. Initially, air monitoring will be conducted at the site of the investigation (potential source area). If air monitoring identifies the presence of volatile organic compounds in the worker breathing zone, guidelines in the HASP (Appendix D) will be followed regarding action levels, permissible exposure limits, engineering controls, and personal protective equipment. The following equipment will be used to conduct air monitoring:

- A PID (RaeSystems MiniRae 2000 or equivalent) will be used to monitor for organic vapors and benzene;

- A MiniRAM Portable Aerosol Monitor will be used to monitor particulate dust and aerosolized vapors; and
- Cyanide color detector tubes will be used to monitor for cyanide vapor.

Air monitoring results will be recorded in the field book during investigation activities and made available for NYSDEC and New York State Department of Health (NYSDOH) review.

3.4.2 Community Air Monitoring

Community air monitoring will be conducted in compliance with the NYSDOH's Generic Community Air Monitoring Plan (NYSDOH, 2000). Real-time air monitoring for volatile compounds and particulates at the perimeter of the hot zone will be performed as described below.

Organic Vapor Monitoring

Periodic monitoring for VOCs will be conducted during non-intrusive activities such as the collection of soil and groundwater samples. Periodic monitoring may include obtaining measurements upon arrival at a location, while opening a monitoring well cap, when bailing and purging a well, and upon leaving the location. In some instances, depending on the proximity of exposed individuals, continuous monitoring may be conducted during these activities.

Continuous monitoring for VOCs will be conducted during all ground intrusive activities (i.e., soil boring installation and monitoring well installation). Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background concentrations. VOCs will be monitored continuously at the downwind perimeter of the hot zone. Monitoring will be conducted with a PID equipped with a 10.6 eV lamp capable of calculating 15-minute running average concentrations. The following actions will be taken based on organic vapor levels measured:

- If total organic vapor levels exceed 5 ppm above background levels or concentrations during the 15-minute average at the perimeter, work activities will be temporarily halted and monitoring continued. If levels readily decrease (per instantaneous readings) below 5 ppm above background, work activities will resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the hot zone persist at levels in excess of 5 ppm above background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level 200 feet downwind of the hot zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less – but in no case less than 20 feet, is below 5 ppm above background for the 15-minute average.
- If the total organic vapor level is above 25 ppm at the perimeter of the hot zone, activities will be shutdown.

All 15-minute readings will be recorded and available for NYSDEC and NYSDOH personnel to review. Instantaneous readings, if any, will also be recorded.

Particulate Monitoring

During ground intrusive activities, particulate concentrations will be monitored continuously at the downwind perimeter of the hot zone with a portable real-time particulate monitor capable of measuring particulate matter less than 10 micrometers in size and capable of integrating over a period of 15 minutes (or less). The equipment will include an audible alarm to indicate exceedence of the action level. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background concentrations. The following actions will be taken based on particulate concentrations measured:

- If the downwind particulate level is 100 micrograms per cubic meter ($\mu g/m^3$) above background for the 15-minute period or if dust is observed leaving the work area, then dust suppression techniques will be employed. Work will continue with dust suppression provided that the downwind particulate level does not exceed 150 $\mu g/m^3$ above background and no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, the downwind particulate level is greater than 150 $\mu g/m^3$ above background, work will be stopped and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind particulate level to within 150 $\mu g/m^3$ of the background (upwind) level and in preventing visible dust migration.

3.4.3 Indoor Air Monitoring

In the event soil borings are advanced within the on-site building, measures will be taken to mitigate dust, odors, and vapor release.. Indoor drilling activities will be conducted at times of minimal occupancy to reduce the disturbance to building operations. The building does not contain a HVAC system that may rapidly spread vapor release. The work will be executed while the building's heating system is operating which is expected to generate a positive pressure in the basement that will assist in excluding vapor intrusion. If necessary, screening, logging, and sampling of soils will be conducted outside the building. Drager tubes will be used upon commencing work at each boring location, and periodically through the boring activity. In the event of a detection of cyanide vapor, the hole will be sealed with bentonite.

The area around each drilling location will be isolated to the extent possible by closing doors to other rooms while leaving open all windows and doors to the outside (if any) during work within the isolated work zone. In extreme cases where vapor and/or dust generation is excessive, a small portable tent may be erected over the boring location, enclosed with sidewalls, and ducted to the outside. Polyethylene tarps or other covers may be used to protect the materials stored in the vicinity of the work area.

Each boring advanced within the building will be abandoned as quickly as possible upon completion. Filtering and/or other treatment at the discharge point is not anticipated, but may be implemented if conditions warrant. Fugitive dust migration from the work area will be monitored in conjunction with the community air monitoring activities.

Air monitoring for VOCs, dust, carbon monoxide, and cyanide will be performed continuously during all work within the on-site building in accordance with the HASP. If an action level is exceeded, work will cease until adequate mechanical ventilation can be setup to control the hazard.

All readings will be recorded and be available for NYSDEC and NYSDOH personnel to review.

3.5 MONITORING WELL INSTALLATION

Three monitoring wells (MW-1 through MW-3) will be installed during Phase I and three monitoring wells (MW-4 through MW-6) will be installed during Phase II at the proposed locations shown on Figure 5. All drilling locations are subject to change based on accessibility, utility clearance, and site conditions encountered during the site inspection and field activities. Groundwater is anticipated to be approximately 6 feet bgs (ENSR, 2002); therefore, monitoring wells will be installed to approximately 15 to 20 feet bgs. The data collected from the monitoring wells will be used to: characterize background conditions of groundwater, assess groundwater flow direction, determine downgradient groundwater quality, and evaluate the presence of non-aqueous phase liquid (NAPL).

Monitoring well borings will be advanced to total depth with 4.25-inch inner diameter (ID) hollow stem augers. Soil samples will be collected continuously to the bottom of the borings using 2-foot long discrete samplers. Soil samples retrieved from each monitoring well boring will be visually classified for soil type, grain size, texture, moisture content, and visible evidence of staining or impacts. Each sampler will be screened for the presence of VOCs with a PID. In addition, a sample from each 2-foot interval will be collected in a sealed plastic bag and the sample headspace will be screened for the presence of VOCs with a PID.

Two soil samples will be selected from each monitoring well boring location and submitted to the laboratory for chemical analysis. The two samples will be collected as follows:

- One sample will be collected from the zone with the highest PID readings or visual impacts from either the test pit (hand auger) or boring. If no visual impacts or elevated PID readings are observed, a sample will be collected from directly above the water table.
- One sample will be collected below the impacted zone or near the base of the boring to define the vertical extent of impacts at that location.

Additional soil samples may be collected based on field observations. The soil samples will be analyzed for MGP and other indicator compounds including TCL VOCs and SVOCs, cyanide, and TAL metals.

The monitoring wells will be constructed with two-inch ID, threaded, flush-joint, PVC casing and approximately ten feet of 0.02-inch slot screens. A two-foot sump will be placed below the screens to monitor for potential dense non-aqueous phase liquid (DNAPL). The screens will be placed across the water table interface to allow for the monitoring of light non-

aqueous phase liquid (LNAPL), if present. The wells will be contained in flush-mounted vaults to maintain accessibility to the area after completion.

After a minimum of 24 hours, the monitoring wells will be developed until the well is reasonably free of sediment (50 NTU if possible) or until the pH, temperature and conductivity stabilize. Monitoring well installation, construction, development, decontamination, and investigation-derived waste handling procedures are specified in the FSP (Appendix B).

3.6 INSIDE SOIL BORINGS AND SOIL GAS SAMPLING

To determine whether impacts exist beneath the hospital building, soil gas sampling and soil borings may be conducted within the basement of the building. Prior to any intrusive activities within the building, the ground water elevations at the site will be determined during monitoring well installation activities conducted outside of the building. In addition, existing sumps in the building basement will be checked for the presence of standing water. If groundwater elevations are below the basement floor of the building, and if no water is present in basement sumps, then soil gas sampling and borings will be conducted at the proposed sampling locations (SB-8, SB-12, SB-15, SB-16, and SB-17) within the subsurface basement areas of the hospital. However, if the groundwater elevations at the site are above the basement floor, or if water is present in the basement sumps, no soil gas sampling points or soil borings will be installed within the building at that time to prevent flooding of this area.

3.6.1 Soil Gas Sampling

Soil gas sampling will be conducted to evaluate soil gas quality beneath the hospital and to identify the potential presence of MGP residuals in the subsurface, if any. The soil gas samples will be collected immediately following slab coring and prior to the drilling of the soil boring at each location. Soil gas samples will be collected from each location within the basement of the hospital building (SB-8, SB-12, SB-15, SB-16, and SB-17).

The soil gas sampling procedures will conform to the protocols described by ASTM Method D5314-92. If the basement of the building is constructed of poured concrete, a hole (approximately 2 inches in diameter) will be drilled through the slab and a hand auger will be used to reach a depth of one foot below the slab. A sample of the soil gas from beneath the slab will be collected using a 1/4 –inch OD stainless steel probe. The probe assembly will contain a slotted screened portion and will be connected to a length of disposal Teflon tubing. The screen will be exposed to the soil when an expendable drive point head is detached from the bottom of the probe assembly and the probe is pulled-back to a depth of two feet below the concrete floor. Approximately 0.5 feet of slotted screen will then be exposed for collection of the soil gas sample from 2.5 to 2.0 feet below the slab. The sample probe intake will be in communication with the slab/soil interface so that potentially intruded soil air is sampled. The annulus around the probe assembly at the concrete floor will be sealed with granular bentonite, which will be hydrated to form an airtight seal. Soil gas air samples will be collected in stainless steel canisters over a 60-minute period by drawing air through the slotted screen and tubing. The combined soil gas probe and tubing will be purged to remove at least one volume before collecting the soil gas sample at each location. A vacuum gauge will be used to check both the initial and final vacuum in the canisters. The sample probe will be installed and removed the same day that the sample is

collected. A vacuum gauge will be used to check both the initial and final vacuum in the canisters. The sample probe will be installed and removed the same day that the sample is collected.

If the inspection of the basement indicates that a competent slab does not exist (i.e., dirt floor, cracks in the slab, etc.) then a soil gas sample will still be collected, but from a minimum soil gas probe depth of 5 feet. The condition of the floor will be documented during the sampling activities.

Each soil gas sample will be submitted to STL for laboratory analysis of VOCs using an EPA Method TO-15 with Extended Analytes list.

3.6.2 Inside Soil Borings

If groundwater elevations are below the basement floor of the building, and if no water is present in basement sumps, soil borings will be advanced at each of the soil gas sampling locations (SB-8, SB-12, SB-15, SB-16, and SB-17). Prior to initiating the soil borings, the holes drilled in the concrete floor during soil gas sampling may be over-cored to allow access with drilling rods and soil coring tools. Soil borings within the building will be drilled to a depth of approximately 12 to 15 feet or to refusal. If visually impacted material is present at the bottom of the boring, the boring will be continued until "clean" material is encountered, bedrock is encountered, or the limit of the drilling equipment is reached. This depth is assumed to be at or below the depth of former MGP structures

The amount of access to drilling locations will determine the drilling techniques used for the inside soil borings. To accommodate the potential low ceilings and tight quarters, a variety of drilling equipment may be required. A Dingo® (small direct push drill rig) or hand carried equipment may be required in areas with tight access.

Soil samples will be collected continuously to the bottom of the borings using 2-foot long, 2-inch diameter discrete samplers or augers will be extended after each split spoon to ensure the sample represents the targeted depth interval. Soil samples retrieved from each boring will be visually classified for soil type, grain size, texture, moisture content, and visible evidence of staining or impacts. Each sampler will be screened for the presence of VOCs with a PID. In addition, a sample from each 2-foot interval will be collected in a sealed plastic bag and the sample headspace will be screened for the presence of VOCs with a PID.

Two soil samples will be selected from each location and submitted to the laboratory for chemical analysis. The two samples will be collected as follows:

- One sample will be collected from the zone with the highest PID readings or visual impacts from either the test pit (hand auger) or boring. If no visual impacts or elevated PID readings are observed, a sample will be collected from directly above the water table.
- One sample will be collected below the impacted zone or near the base of the boring to define the vertical extent of impacts at that location.

Additional soil samples may be collected based on field observations. The soil samples will be analyzed for MGP and other indicator compounds including TCL VOCs and SVOCs, cyanide, and TAL metals.

All borings will be grouted to the surface following completion. Drilling equipment will be decontaminated between each boring in accordance with procedures specified in the FSP. Drill cuttings and decontamination water will be containerized in accordance with procedures specified in the FSP.

3.6 OUTDOOR SOIL BORINGS

A total of seven outdoor soil borings (SB-1 through SB-7) will be installed during Phase I and 10 outdoor soil borings (SB-9 through SB-11, SB-13, SB-14, and SB-18 through SB-22) will be installed during Phase II at the proposed locations shown on Figure 5. All drilling locations are subject to change based on accessibility, utility clearance, and site conditions encountered during the site inspection and field activities.

The amount of access to drilling locations will determine the drilling techniques used for soil borings. Where possible, outdoor soil borings will be advanced using a hollow stem auger (HSA) drilling method. Geoprobe[tm] or direct-push drilling methods may be necessary at locations where space and access is limited. All outdoor Phase I soil borings (SB-1 through SB-7) will be drilled to a depth of approximately 50 feet or to refusal. This will ensure that the anticipated extent of construction activities associated with the subway project will be characterized. The depths of the Phase II outdoor soil borings will be determined based on the results of the Phase I investigation. If visually impacted material is present at the bottom of the boring, the boring will be continued until unaffected soils are encountered, bedrock is encountered, or the limit of the drilling equipment is reached.

Soil samples will be collected continuously to the bottom of the borings using 2-foot long, 2-inch diameter discrete samplers to ensure the sample represents the targeted depth interval. Soil samples retrieved from each boring will be visually classified for soil type, grain size, texture, moisture content, and visible evidence of impacts. Each sampler will be screened for the presence of VOCs with a PID. In addition, a sample from each 2-foot interval will be collected in a sealed plastic bag and the sample headspace will be screened for the presence of VOCs with a PID.

Two soil samples will be selected from each location and submitted to the laboratory for chemical analysis. The two samples will be collected as follows:

- One sample will be collected from the zone with the highest PID readings or visual impacts from either the test pit or boring. If no visual impacts or elevated PID readings are observed, a sample will be collected from directly above the water table.
- One sample will be collected below the impacted zone or near the base of the boring to define the vertical extent of impacts at that location.

Additional soil samples may be collected based on field observations. The soil samples will be analyzed for MGP and other indicator compounds including TCL VOCs and SVOCs, cyanide, and TAL metals.

All borings will be grouted to the surface following completion. Drilling equipment will be decontaminated between each boring in accordance with procedures specified in the FSP (Appendix B). Drill cuttings and decontamination water will be containerized in accordance with procedures also specified in the FSP.

3.7 SITE SURVEY

The locations and elevations of the monitoring wells and soil borings will be surveyed. A map will be prepared showing the locations for each monitoring well and soil boring location. Vertical control of elevations for soil borings and monitoring wells will be established to the nearest 0.01-foot and will be based on a USGS datum and benchmarks established onsite. Horizontal control will be based on a site-specific coordinate system with established and referenced control points.

3.8 GROUNDWATER SAMPLING AND ANALYSIS

Groundwater samples will be collected from each new monitoring well to characterize groundwater quality. Prior to sampling, the headspace within each well will be measured with a PID. An oil/water level interface probe and/or a water level indicator will be used to measure the depths to the water table and thickness of any free product in the wells. The monitoring wells will be purged by removing a minimum of three times the volume of standing water in the well to allow for collection of a representative sample. Groundwater samples will then be collected. Samples for metals will not be filtered; however, sample aliquots for metals and cyanide may be allowed to settle for several hours in laboratory-supplied bottles to decrease the sample turbidity. The lab analysis samples can then be decanted off into fresh laboratory bottles.

Prior to filling the sample bottles, the turbidity, pH, temperature, and conductivity of the sample will be measured and recorded. The groundwater samples will be analyzed for TCL VOCs and SVOCs, cyanide (total and available), and TAL metals. In addition, if free phase NAPL is encountered in a well, a representative sample of the NAPL, if possible, will be collected and submitted to the NYSDOH for their analysis of MGP tars from across the state for hydrocarbon fingerprinting. The NAPL samples will be collected in 250-mL glass jars, and filled allowing no headspace above the samples. One sample of the NAPL will also be submitted to META Environmental or an alternative lab capable of performing fingerprinting analysis.

Sampling procedures are described in detail in the FSP (Appendix B). QA/QC procedures are described in the QAPP (Appendix C).

3.9 WASTE MANAGEMENT

All investigation-derived wastes (IDW) generated during the Site Characterization will be containerized. Soils will be segregated by boring or location and placed in 55-gallon NYSDOT

approved drums which are labeled appropriately. Plastic sheeting and personal protective equipment will be consolidated in NYSDOT-approved drum(s). Fluids will be placed in NYSDOT-approved fluid drums with closed tops. The drums will be staged in a secure area on site as determined by Con Edison and facility representatives prior to proper characterization and disposal.

3.10 LABORATORY ANALYSIS AND DATA VALIDATION

Laboratory analyses of soil and groundwater samples will be conducted by a New York State Department of Health Environmental Laboratory Analysis Program (ELAP) approved laboratory certified for analyses using the most recent Analytical Services Protocol (ASP). Laboratory analyses will be conducted in accordance with USEPA SW-846 methods and standard deliverable format.

Table 1 summarizes the anticipated analytical methods and quality control samples required. QA/QC procedures required by the SW-846 methods will be followed, including initial and continuing instrument calibrations, standard compound spikes, surrogate compound spikes, and analysis of other samples (blanks, laboratory control samples, matrix spikes/matrix spike duplicates, etc.). The laboratory will provide sample bottles, which have been pre-cleaned and preserved in accordance with the SW-846 methods. NYSDEC ASP holding times will be adhered to. Where there are differences in the SW-846 and NYSDEC ASP requirements, the NYSDEC ASP shall take precedence.

Data validation will be performed in accordance with USEPA validation guidelines for organic and inorganic data review. Validation will include the following:

- Verification of 100% of all QC sample results (both qualitative and quantitative);
- Verification of the identification of 100% of all sample results (both positive hits and non-detects);
- Recalculation of 10% of all investigative sample results; and
- Preparation of a Data Usability Summary Report (DUSR).

Data reduction, validation, and reporting procedures are provided in the QAPP (Appendix C).

SECTION 4

REPORTING REQUIREMENTS

4.1 PROGRESS REPORTS

A monthly progress report, describing the activities conducted during the respective month as outlined in this work plan, will be submitted to the NYSDEC in accordance with the requirements and provisions of the Voluntary Cleanup Agreement (Index No. D2-0003-02-08) between the NYSDEC and Con Edison. The progress reports will include the following:

- Activities relative to the site during the previous reporting period and those anticipated for the next reporting period;
- Description of approved activity modifications including changes of work scope and/or schedule;
- Sampling results received following internal data review and validation, as applicable; and
- Update of schedule including percentage of project completion, unresolved delays encountered or anticipated that may affect the future schedule, and efforts made to mitigate such delays.

4.2. INVESTIGATION REPORTS

Data Summary Report

Upon completion of Phase I fieldwork and receipt of laboratory analytical results, a Data Summary Report documenting the investigation activities and results will be prepared. The Data Summary Report will include tabulated data and figures, field notes, boring, well, and sampling field logs, and a DUSR. The Data Summary Report will be submitted to NYSDEC and shared with DHAJV in order to support the MTA Second Avenue Subway project.

Site Characterization Report

Upon completion of Phase II fieldwork and receipt of laboratory analytical results, a Site Characterization Report (SCR) documenting the overall site investigation activities and results from both Phase I and Phase II field investigations will be prepared. The general outline of the SCR will be as follows:

- Section 1 (Introduction) will include a site overview and history;
- Section 2 (Site Characterization Activities) will describe both the Phase I and Phase II investigation activities completed and any deviations from this work plan;

- Section 3 (Site Characterization Results) will present the results of both the Phase I and Phase II investigations, including extent of MGP-related impacts and a human health exposure assessment; and
- Section 4 (Conclusions and Recommendations) will summarize the results of the Phase I and Phase II investigations and present any conclusions and recommendations for future investigation or remediation of the Site.

The Site Characterization Report will also include at a minimum summary tables and figures; boring, well, and sampling field logs; and a DUSR.

SECTION 5

PROJECT ORGANIZATION

This Site Characterization will be completed for Con Edison by Parsons. Key members of the project team and their responsibilities are described below:

Key Position	Contact Name	Responsibility
Con Edison		
Project Manager:	Mr. Charles Leary Telephone: (718) 204-4347 Fax: (718) 932-2687 E-mail: learyc@coned.com	Con Edison's Project Manager is responsible for managing the project within Con Edison and for ensuring the consultant completes the work in accordance with the Work Plan.
Consultant		
Project Manager:	Ms. Megan Miller, P.E. Telephone: (315) 451-9560 Fax: (315) 451-9570 E-mail: megan.miller@parsons.com	The Project Manager is responsible for maintaining the project schedule, keeping the project within budget, and ensuring the technical adequacy of the work performed. The Project Manager will be the primary contact with Con Edison on all technical, scheduling, and budget issues.
Field Supervisor:	Mr. Paul Kies Telephone: (732) 537-3619 Fax: (732) 868-3110 E-mail: paul.kies@parsons.com	The Field Supervisor will be responsible for working with the Project Manager to coordinate, oversee and ensure that all requirements are strictly adhered to on field activities.
Technical Director	Mr. Vipul Srivastava Telephone: (630) 371-1827 Fax: (630) 371-1818 E-mail: vipul.srivastava@parsons.com	The Technical Director will provide technical support and overall quality assurance for the project. The primary objective of the Technical Director is to ensure compliance with all regulatory guidance and regulations.

Key Position	Contact Name	Responsibilities
Health and Safety Officer	Mr. Gregory Beck Telephone: (732) 537-3502 Fax: (732) 868-3110 E-mail: gregory.beck@parsons.com	The Health and Safety Officer will ensure that the health and safety plan is properly implemented and that all personnel and subcontractor site personnel are trained in the site-specific project health and safety requirements, as well as those of Con Edison. The Health and Safety Officer will have authority to stop work if unsafe conditions are observed.
Subcontractors		
Drilling/Well Installation	TBD	Installation of soil borings and monitoring wells.
Surveyor	The Chazen Companies	Survey sampling locations.
Laboratory	Chemtech	Conduct laboratory analyses of soil and water samples in accordance with the QAPP.
Laboratory	META Environmental	Conduct laboratory analyses of free product samples in accordance with the QAPP.

SECTION 6

PROJECT SCHEDULE

The anticipated project schedule for implementation of this work plan, including both Phase I and Phase II investigations, is provided on Figure 6. This schedule is subject to change and highly dependent on several factors, including the NYSDEC's and NYSDOH's review and approval and the securing of necessary access agreements with property owners. The most critical element of the project schedule is the completion of the Phase I Investigation and evaluation of results prior to the start of construction activities associated with the Second Avenue Subway project, currently scheduled to begin in the Spring of 2005.

SECTION 7

REFERENCES

ENSR International, Inc., 2002. Manufactures Gas Plant Site History Research Report for the Former East 99th Street Works, New York, New York, October, 2002.

Consolidated Edison Archive information obtained at 4 Irving Place New York, NY containing deed notices, maps, historical photographs, and memorandums.

Commonwealth Land Title Search Company, title search information for Blocks property Block 1669 Lot 1 and Block 1691 Lot 1.

Environmental Data Resources (EDR) Inc., 2002. Report of E. 99th St. Works, E. 99th St./Second Avenue, Manhattan, NY 10029 Inquiry Number 745374.1s. March 14, 2002.

New York City Zoning Office, New York, NY, zoning information.

New York City Department of Building, 60 Hudson Street, site reference information including boring logs.

New York State Department of Environmental Conservation (NYSDEC). 1994. Determination of Soil Cleanup Objectives and Cleanup Levels. New York State Department of Environmental Conservation Division Technical Administrative Guidance Memorandum HWR-94-4046. January 1994.

NYSDEC. 1998. Ambient Water Quality Standards and Guidance Values. New York State Department of Environmental Conservation Division of Water Technical and Operational Guidance Series (1.1.1). October 1998.

New York State Department of Health (NYSDOH), 2000. Generic Community Air Monitoring Plan. Revised June 2000.

Sanborn Insurance Maps Supplied by EDR for years 1911, 1939, 1951, 1969, 1980, 1986, 1991, 1994, and 1996.

1999 Sanborn Book. Contained current owners, block and lot information, and property boundary.

United States Geological Survey 7.5 Minute Topographical Map, Central Park, NY Quadrangle dated 1966 photorevised 1979.

United States Geological Survey Map, New York City Metropolitan Bedrock Geology Map (no date available).

TABLES

TABLE 1

SUMMARY OF SAMPLES AND ANALYSES

Matrix	Parameter	Analytical Method	Field Samples				QC Blanks		Total
			Field Samples	Field Duplicate	MS/MSD[a] (Total)	Sub-Total	Trip Blank	Rinse Blank[b]	
PHASE I									
Soil Samples	TCL VOCs	EPA SW 8260	20	1	1/1	23	0	8	31
	TCL SVOCs	EPA SW 8270B	20	1	1/1	23	0	8	31
	Cyanide	EPA SW 335.2	20	1	1/1	23	0	8	31
	TAL Metals	EPA SW 6010, 7470/7471, 7841, 9010	20	1	1/1	23	0	8	31
Groundwater Samples	TCL VOCs	EPA SW 8260	3	1	1/1	6	1	0	7
	TCL SVOCs	EPA SW 8270	3	1	1/1	6	-	0	6
	Cyanide (total)	EPA SW 335.2	3	1	1/1	6	-	0	6
	Cyanide (available)	EPA SW OIA-1677	3	1	1/1	6	-	0	6
	TAL Metals	EPA SW 6010, 7470/7471, 7841, 9010	3	1	1/1	6	-	0	6
Free Product Samples	Hydrocarbon Fingerprinting	Modified Method 8100	?()	-	-	-	-	-	?

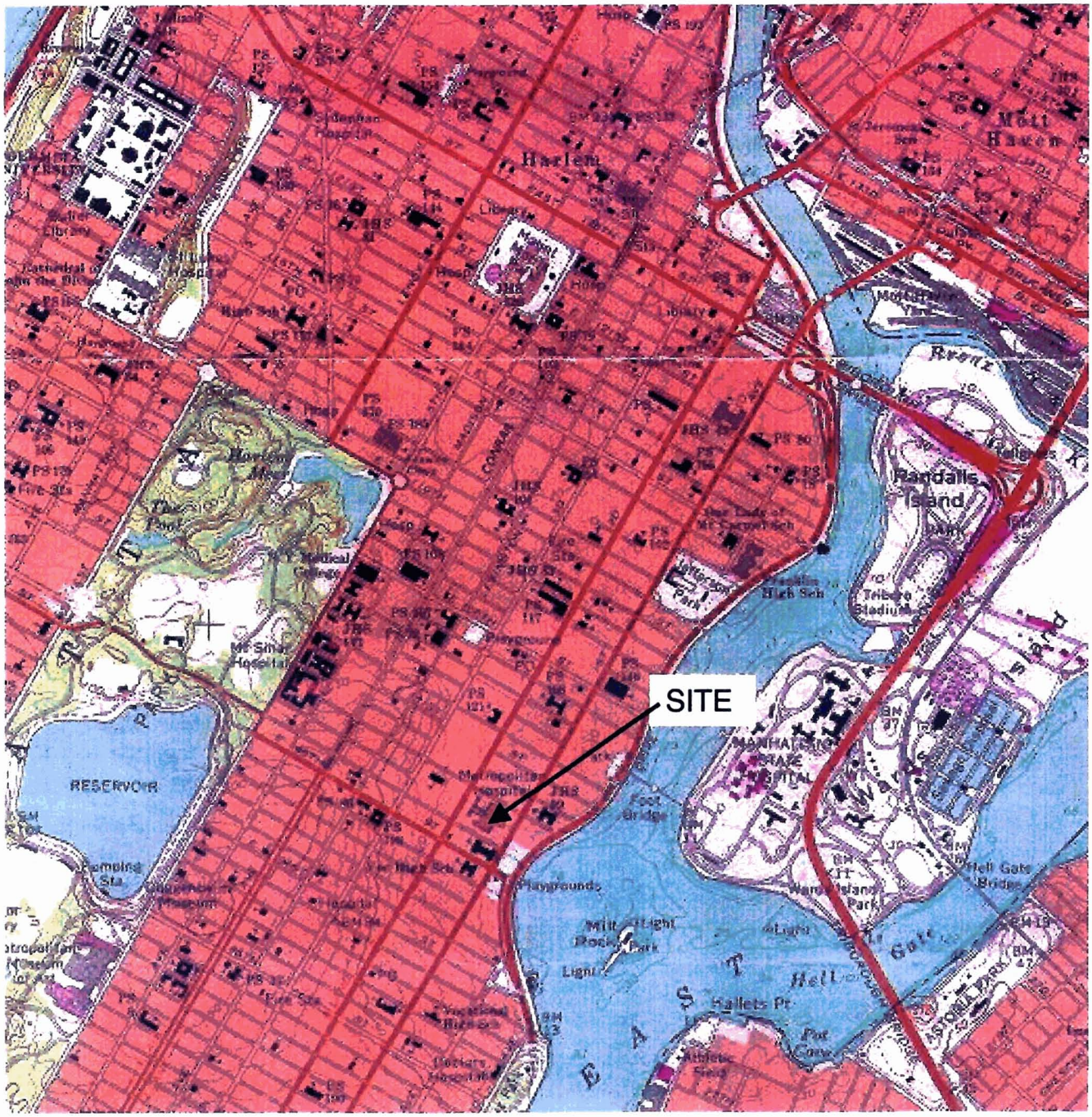
TABLE 1
(CONTINUED)

SUMMARY OF SAMPLES AND ANALYSES

Matrix	Parameter	Analytical Method	Field Samples				QC Blanks		
			Field Samples	Field Duplicate	MS/MSD[a] (Total)	Sub-Total	Trip Blank	Rinse Blank[b]	Total
PHASE II									
Soil Samples	TCL VOCs	EPA SW 8260	36	2	1/1	40	0	10	50
	TCL SVOCs	EPA SW 8270B	36	2	1/1	40	0	10	50
	Cyanide	EPA SW 335.2	36	2	1/1	40	0	10	50
	TAL Metals	EPA SW 6010, 7470/7471, 7841, 9010	36	2	1/1	40	0	10	50
Groundwater Samples	TCL VOCs	EPA SW 8260	3	1	1/1	6	1	0	7
	TCL SVOCs	EPA SW 8270	3	1	1/1	6	-	0	6
	Cyanide (total)	EPA SW 335.2	3	1	1/1	6	-	0	6
	Cyanide (available)	EPA SW OIA-1677	3	1	1/1	6	-	0	6
	TAL Metals	EPA SW 6010, 7470/7471, 7841, 9010	3	1	1/1	6	-	0	6
Soil Gas Samples	VOCs	EPA TO-15 Modified	5	1	1/1	8	-	0	8
Free Product Samples	Hydrocarbon Fingerprinting	Modified Method 8100	?[c]	-	-	-	-	-	?

(a) Matrix spike/matrix spike duplicate for organic analyses; matrix spike and laboratory duplicate for inorganic analysis (1 each per 20 samples).
(b) Rinse blanks will be collected for each day non-disposable sampling equipment is used.
(c) Number of free product samples collected for analysis (if any) will be determined in the field.

FIGURES



New York
Quadrangle

LATITUDE: N40° 47' 06"
LONGITUDE: W73° 56' 41"

N

SOURCE: DeLORME 3-D
TOPOQUAD PROGRAM

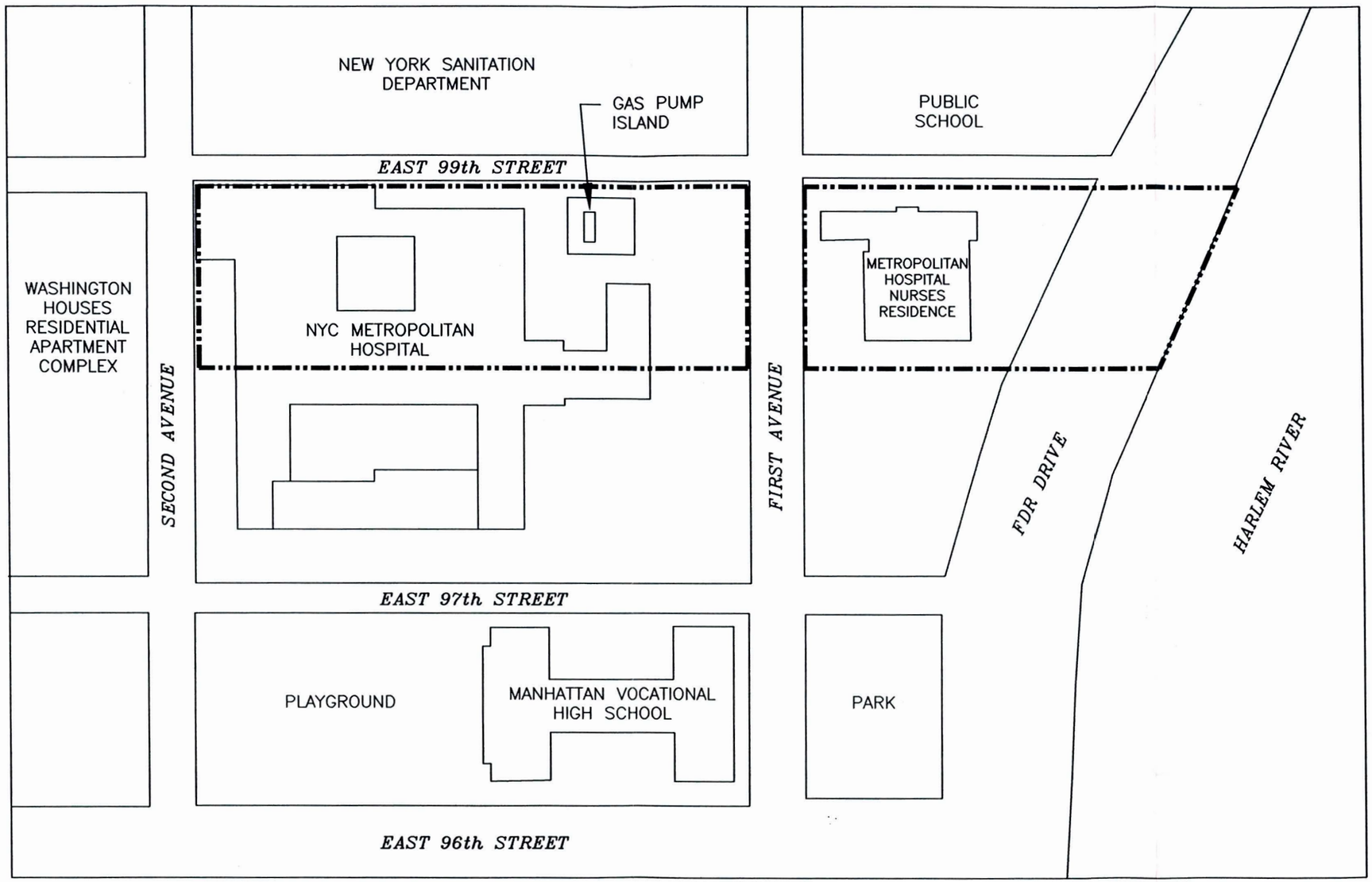
FIGURE 1

CON EDISON
FORMER EAST 99th STREET WORKS
NEW YORK, NEW YORK

SITE LOCATION MAP

PARSONS
290 ELWOOD DAVIS ROAD, SUITE 312, LIVERPOOL, NY 13088 PHONE: (315) 451-9560

P:\CON ED\441240\GRAPHICS\SITEMAP.PPT



LEGEND:

FORMER SITE BOUNDARY

180 90 0 180

APPROXIMATE SCALE IN FEET

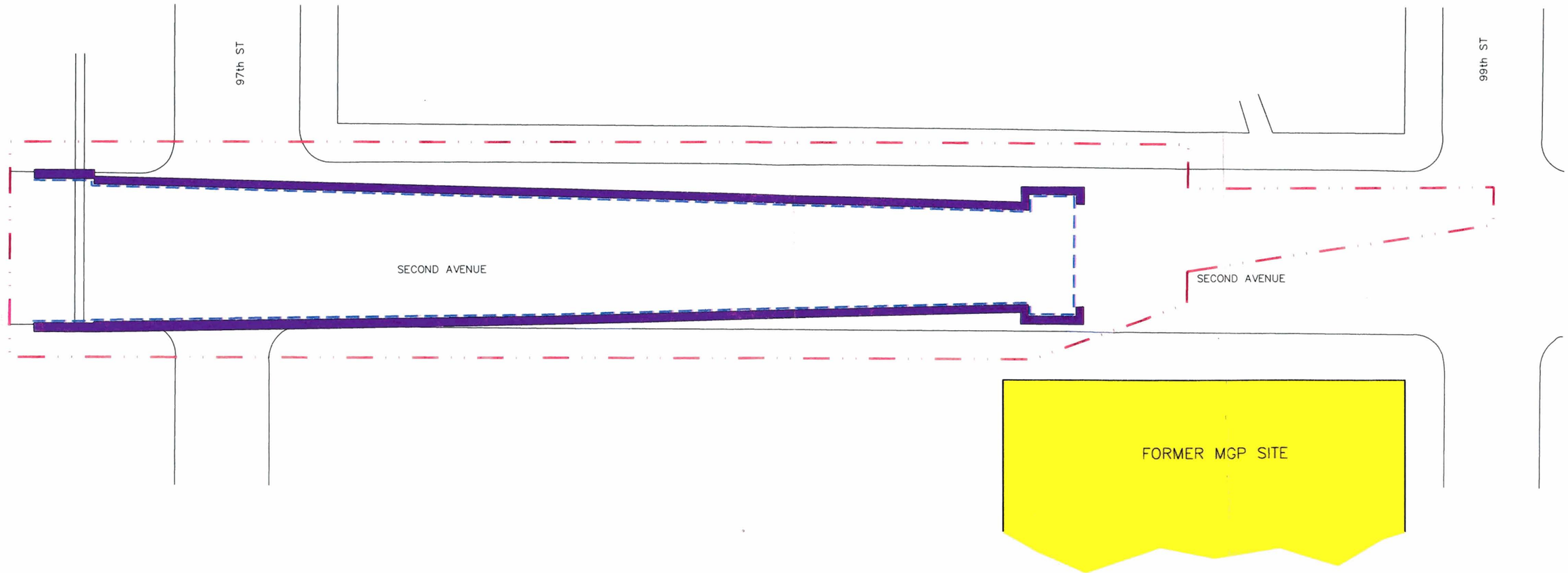
FIGURE 2

CON EDISON
FORMER EAST 99TH STREET WORKS
NEW YORK, NEW YORK

SITE PLAN

PARSONS
290 ELWOOD DAVIS ROAD, SUITE 312, LIVERPOOL, N.Y. 13088, PHONE: 315-451-956

No XREFs
p:\CONED\441240\cad\440240C002.dwg, 05/19/04 at 13:23, CLW, 1=1



LEGEND:

SUBWAY STRUCTURE TO BE INSTALLED FROM 0–50 FT BGS

SUBWAY STRUCTURE TO BE INSTALLED FROM 23–46 FT BGS

UTILITY WORK TO BE CONDUCTED IN THIS AREA <10' BGS

500 250 0 500 1000

SCALE: 1"=500'

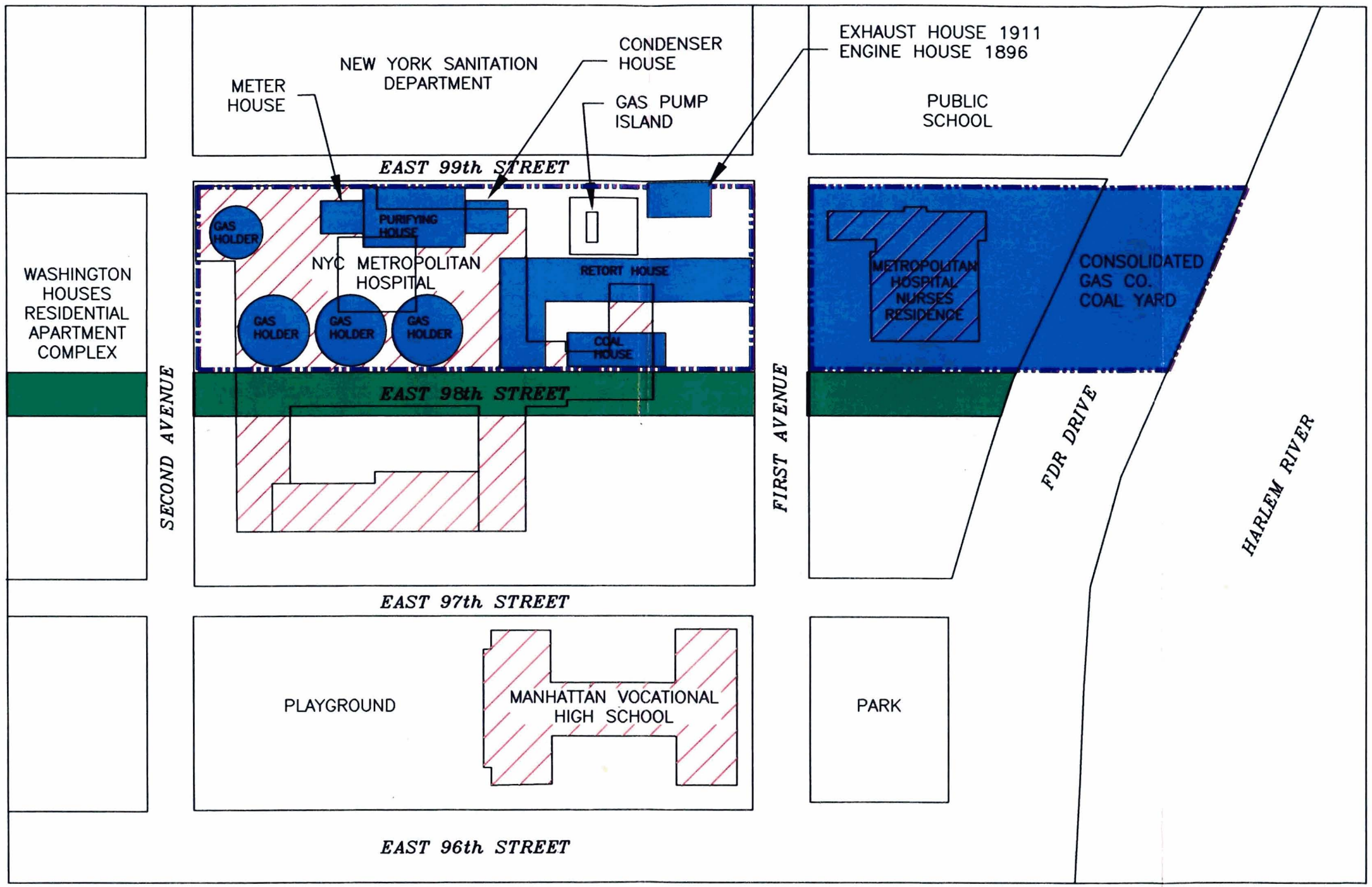
FIGURE 3

CON EDISON
FORMER EAST 99TH STREET WORKS
NEW YORK, NEW YORK

AREAS OF CONSTRUCTION ASSOCIATED WITH THE 2nd AVE SUBWAY CONSTRUCTION

PARSONS
290 ELWOOD DAVIS ROAD, SUITE 312, LIVERPOOL, N.Y. 13088, PHONE: 315-451-9560

o XREFs
:\CONED\441240\CAD\440240C001.DWG, 5/21/04, 10:20, JR



LEGEND:

- FORMER MGP SITE BOUNDARY
- PRESENT IN 1896 AND 1911
- PRESENT UNTIL APPROXIMATELY 1951
- CURRENTLY EXISTING BUILDING FOOTPRINT

180 90 0 180

APPROXIMATE SCALE IN FEET

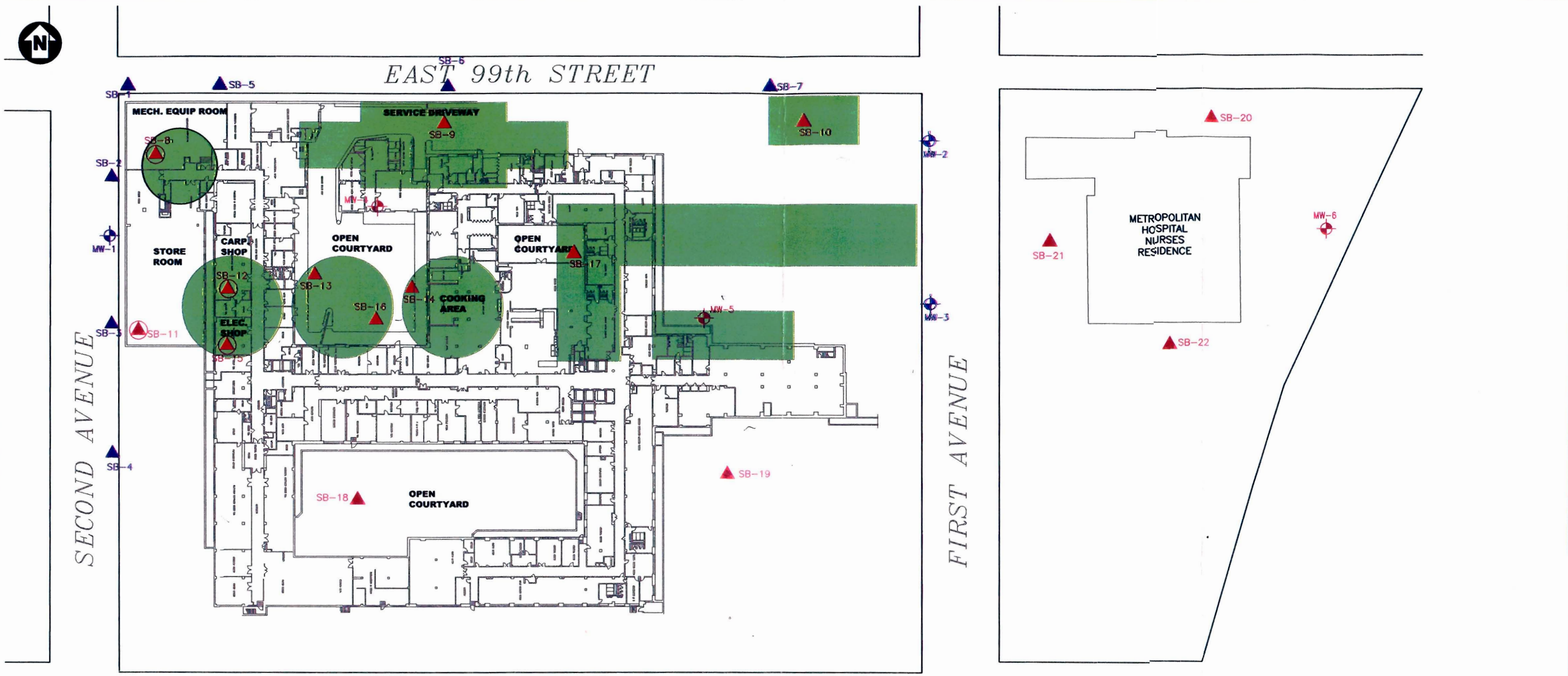
FIGURE 4

CON EDISON
FORMER EAST 99TH STREET WORKS
NEW YORK, NEW YORK

FORMER MGP STRUCTURES

PARSONS
290 ELWOOD DAVIS ROAD, SUITE 312, LIVERPOOL, N.Y. 13088, PHONE: 315-451-9560

No XREFs
p:\CONED\441240\cad\440240C003.dwg, 05/19/04 at 13:23, CLW, 1=1



No XREFs
P:\CONED\441240\CAD\PROPOSED SAMPLING.DWG; 10/8/04; CLW

FIGURE 5

CON EDISON
FORMER EAST 99TH STREET WORKS
NEW YORK, NEW YORK

PROPOSED SAMPLING LOCATIONS

PARSONS
290 ELWOOD DAVIS ROAD, SUITE 312, LIVERPOOL, N.Y. 13088, PHONE: 315-451-9560

FIGURE 6

Anticipated Schedule for Implementation of Site Characterization

Con Edison - Former East 99th Street Gas Works

ACTIVITY	Nov-04	Dec-04	Jan-05	Feb-05	Mar-05	Apr-05	May-05	Jun-05	Jul-05	Aug-05	Sep-05	Oct-05
Submission of Site Characterization Work Plan to NYSDEC/ NYSDOH	X											
NYSDEC/NYSDOH Review	■	■										
Field Investigation			■	■								
Laboratory Analysis				■	■							
Preparation of Phase I Data Summary Report					■	■						
Submission of Phase I Data Summary Report to NYSDEC/NYSDOH						X						
Start of Construction Activities for Second Avenue Subway Project							X					
Negotiation of Access Agreements	■	■	■	■	■							
Field Investigation						■	■	■				
Laboratory Analysis							■	■	■			
Preparation of Site Characterization Report									■	■	■	
Submission of Site Characterization Report to NYSDEC/NYSDOH												X

Note: Schedule is dependent on NYSDEC/NYSDOH review and approval of work plans and reports, and ability to secure necessary access agreements with property owners.

APPENDIX A

DHAJV MEMORANDUM

To	Edward Bradshaw, DHAJV	Reference number CM1188
cc	Keith Ryan, P.G., DHAJV Michael Brady, P.E., DHAJV	File reference
From	William Spronz, P.G., DHAJV	Date May 6, 2004
Subject	Environmental Sampling Results in the vicinity of the former 99th Street Works (MGP) Site	

This memorandum presents a summary of the environmental sampling results that were generated during the General Alignment and Potentially Contaminated Sites (PCS) environmental sampling program conducted for the Second Avenue Subway project in the vicinity of the former manufactured gas plant (MGP) site at 99th Street Works (approximately 200 feet north of 97th Street to 99th Street along Second Avenue). The environmental sampling programs for the Second Avenue Subway were conducted to assess environmental conditions that may be encountered in areas where construction will occur, as well as in areas where available documentation indicated the potential presence of soil and/or groundwater contamination emanating from a specific source and/or location.

The General Alignment environmental sampling program was conducted concurrently with the Geotechnical Investigation/Sampling program. Soil and groundwater samples were collected throughout the Second Avenue project area at regularly spaced intervals to provide a general assessment of environmental conditions along the proposed subway alignment. The soil and groundwater samples collected during the General Alignment sampling program were analyzed for a wide variety of potential contaminant compounds (Priority Pollutants plus 40 [PP+40]). The PCS environmental sampling program was conducted at sites and/or locations where available documentation identified potential soil and groundwater impacts, based primarily on historic and/or current land use. The soil and groundwater samples collected during the PCS sampling program were analyzed for compounds documented and/or suspected from historic and/or current land use.

This portion of the Second Avenue Subway will require cut-and-cover excavation for the proposed 96th Street Station and Tunnel construction. The former 99th Street Works site was identified during a review of historic maps and regulatory databases/record as a potential source of contamination. Therefore, PCS sampling activities were performed in the general vicinity of the 99th Street Works site. General Alignment sampling results are also available for this area.

Table 1 presents a summary of field screening results collected during the environmental sampling programs. Field screening was conducted using a variety of instruments including photoionization detectors (PID), multi-gas meter, combustible gas instruments, Draeger tubes, and in some cases, personal exposure badges. Table 2 presents a summary of contaminants detected at levels exceeding regulatory criteria, the New York State Department of Environmental Conservation (NYSDEC) Technical Administrative Guidance Memorandum (TAGM) 4046 (soil criteria) and Technical and Operational Guidance Series (TOGS) (1.1.1) Ambient Water Quality Standards (groundwater criteria). Tables 3 and 4 list the compounds detected at levels exceeding the method detection limit (MDL) with the regulatory criteria exceedances highlighted. Figure 1 illustrates the locations of the borings, wells, test pit, and former MGP site discussed in this memo. Figures 2 and 3 provide the locations and analytical results for compounds that exceeded the NYSDEC soil (Figure 2) and groundwater (Figure 3) criteria.

Former 99th Street Works (MGP) Site Area of Interest (96th – 100th Streets):

Twelve soil borings were advanced, 2 test pits excavated, and six boring locations were converted into groundwater monitoring wells during the General Alignment and PCS sampling programs. The field screening, soil, and groundwater results indicate the presence of subsurface contamination which has impacted the environmental quality along this portion of the proposed Second Avenue Subway alignment.

Field Screening Results:

Twelve soil borings and 2 test pits were advanced/excavated in the vicinity of the former 99th Street Works (MGP) site (Figure 1). Field screening results collected during these sampling activities indicated that volatile organic compound (VOC) vapors were present in 2 samples collected from 1 boring and 2 samples collected from 2 test pit locations. Hydrogen cyanide (HCN) vapors were detected in 6 samples from 2 boring locations (Table 1). As per New York City Transit (NYCT) spill reporting requirements for the Second Avenue Subway project sampling program, PID readings greater than 10 parts per million (ppm) and HCN readings greater than 4.7 ppm were reported to NYSDEC as spill events. Within the area of interest, spill events were reported to NYSDEC at 6 locations: H97-2, B97-1, BMVP-2, BMVP-4, TP-96-1, and TP-96-8&9.

Soil Results:

Twenty-eight soil samples were collected from 12 soil borings and 2 test pits located in the vicinity of the former 99th Street Works (MGP) site (Figures 1 & 2, and Tables 2 & 3).

VOCs were detected at levels exceeding the soil criteria in 3 of the 28 samples analyzed for VOCs. The 2 samples from borings were collected in the native soil and the 1 test pit sample was collected in the fill material. These VOC exceedances were due to the presence of petroleum related compounds. Semivolatile organics compounds (SVOCs) (primarily Polycyclic Aromatic Hydrocarbons [PAHs]) were detected at levels exceeding the soil criteria in 10 of the 28 soil samples that were analyzed for SVOCs. Eight of these 10 samples were collected in fill material and 2 were collected in native soil. Diesel Range Organics (DRO) were detected at levels exceeding the soil criteria in 5 of the 19 samples that were analyzed for DRO. All 5 of these samples were collected in fill material. Gasoline Range Organics (GRO) was detected above the soil criteria in 2 of the 19 samples that were analyzed for GRO. These samples were collected from fill material. Target Analyte List (TAL) Metals were detected at levels exceeding the soil criteria in 26 of the 27 samples analyzed for TAL Metals. These exceedances were detected in samples collected in fill material and native soil. Mercury was detected at levels exceeding the soil criteria in 13 of the 27 soil samples analyzed for mercury.

Groundwater Results:

Six groundwater monitoring wells were installed in the vicinity of the former 99th Street Works (MGP) site (Figures 1 & 3, and Tables 2 & 4).

VOCs were detected at levels exceeding the groundwater criteria in 2 of the 6 samples analyzed for VOCs. These 2 VOC exceedances were due to the presence of petroleum-related compounds. The SVOC Naphthalene was detected in 1 of the 6 groundwater samples analyzed for SVOCs. TAL Metals were detected at levels exceeding the groundwater criteria in all 6 of the samples collected from these wells.

We trust this memorandum and its attachments provide sufficient information regarding potential soil and groundwater near the former 98th Street MGP site. Please contact me at bill.spronz@m-e.com (908) 947-0266 or Michael Brady at michael.brady@m-e.com (908) 947-0276 if you have further questions.

Attachments

ATTACHMENTS
FORMER 99th STREET WORKS

SUPPORTING DOCUMENTATION

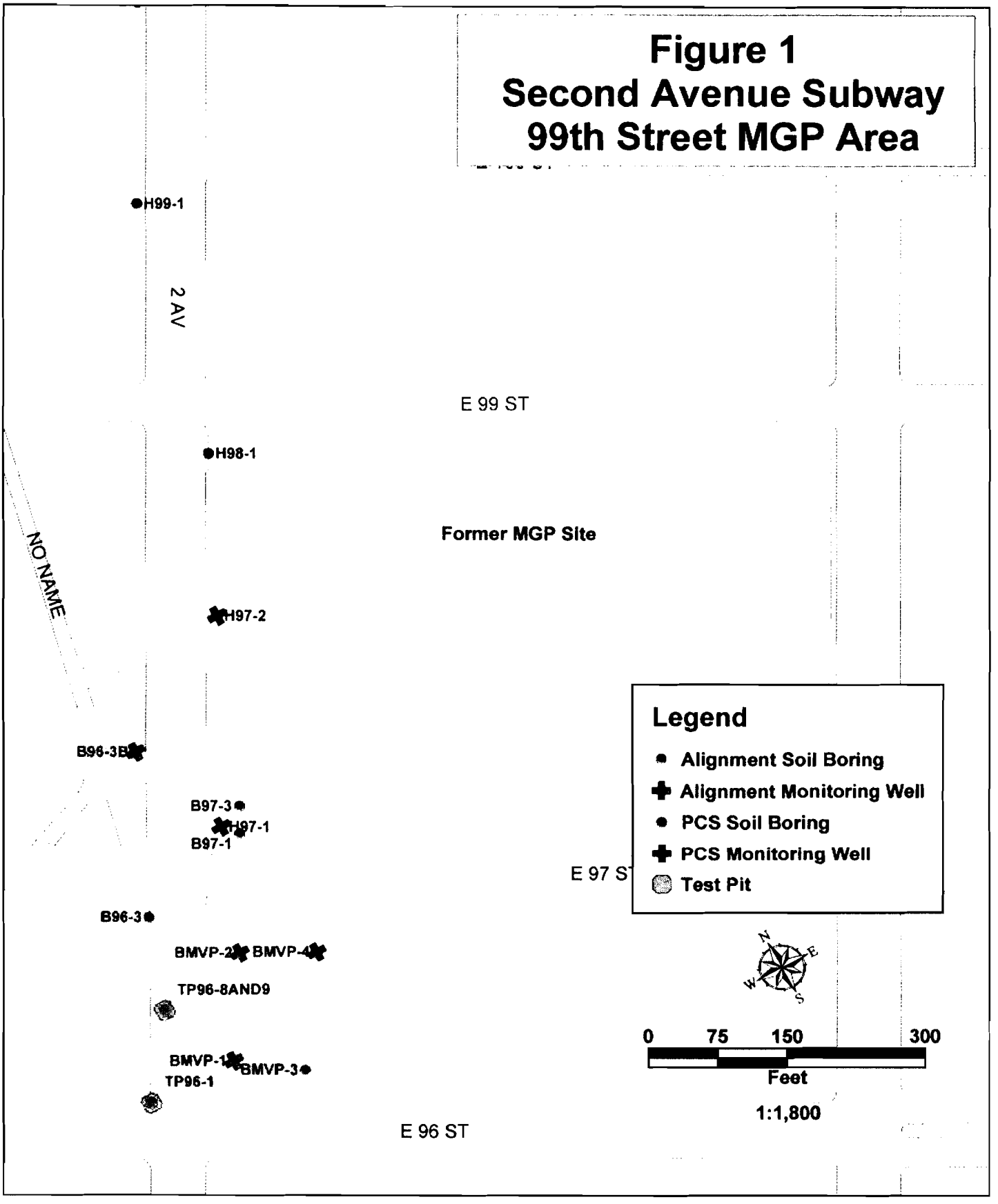


Figure 1
Second Avenue Subway
99th Street MGP Area
H99-1
2 AV
E 99 ST
H98-1
Former MGP Site
NO NAME
H97-2
B96-3B
B97-3
H97-1
B97-1
E 97 ST
B96-3
BMVP-2
BMVP-4
TP96-8AND9
BMVP-1
BMVP-3
TP96-1
E 96 ST
Legend
Alignment Soil Boring
Alignment Monitoring Well
PCS Soil Boring
PCS Monitoring Well
Test Pit
N
E
W
S
0
75
150
300
Feet
1:1,800

Table 1
Second Avenue Subway
Field Screening Results Near the 99th Street MGP Site

Boring Number	Sample Depth	VOCs	HCs
TP96-1	1.5' - 2.0'		
BMVP-1	NVD		
BMVP-2	NVD		
BMVP-3	NVD		
BMVP-4	NVD		
B96-3	NVD		
B96-3B	NVD		
TP96-8AND9	2' - 3'		
H97-1	NVD		
B97-1	25' - 27'		
	29' - 31'		
	31' - 33'		
	35' - 37'		
	29' - 31'		
H97-2	34' - 36'		
	36' - 38'		
B97-3	27' - 29'		
H98-1	NVD		
H99-1	NVD		

NVD: No vapors detected with field screening instruments.

Table 2
Second Avenue Subway
NYSDEC Soil and Groundwater Criteria Exceedances Near the 99th Street MGP Site

Soil Borings									Monitoring Wells							
Boring Number	Sample Depth	VOCs	SVOCs	Pesticides	TAL Metals	Mercury	GRO	DRO	Well Number	Screened Depth	VOCs	SVOCs	Hex Chrom	TAL Metals	Fill Depth	Bedrock Depth
TP96-1	1' - 2'														>2	>2
BMVP-1	2' - 4'								BMVP-1	5' - 20'					13	>15
	10' - 12'															
	13' - 15'															
BMVP-2	2' - 4'								BMVP-2	5' - 15'					16	>17
	10' - 12'						P									
	15' - 17'															
BMVP-3	2' - 4'														16	>18
	10' - 11'							P								
	16' - 18'															
BMVP-4	2' - 4'								BMVP-4	10' - 20'					17	>17
	10' - 11'						P									
	15' - 17'															
B96-3	2' - 4'														7	>4
B96-3B	2' - 4'							P	B96-3B	5' - 25'					18.5	150
	10' - 12'							P								
	15' - 17'							P								
TP96-8AND9	2' - 3'														>3'	>3'
H97-1	10' - 12'															
	40' - 42'								H97-1	24' - 39'	P				12	>42
B97-1	12' - 14'														12	>42
	29' - 31'	P														
H97-2	10' - 12'								H97-2	30' - 40'	P				12	>40
	12' - 14'															
	36' - 38'	P														
B97-3	27' - 29														12'	>40
H98-1	6' - 8'														8'	refusal @ 8'
H99-1	4' - 5'														5'	refusal @ 5'

Table 3
Second Avenue Subway Project
99th Street MGP Area - Soil Hits - May 6, 2004

Boring Number Sample ID Sample Date SDG	NYSDEC TAGM Soil Criteria	BMVP-1 BMVP-1 2-4 08/12/03 R3790		BMVP-1 BMVP-1 10-12 08/22/03 R3950		BMVP-1 BMVP-1 13-15 08/22/03 R3950		BMVP-2 BMVP-2 2-4 08/13/03 R3806		BMVP-2 BMVP-2 10-12 08/22/03 R3950		BMVP-2 BMVP-2 15-17 08/22/03 R3950		BMVP-3 BMVP-3 2-4 08/12/03 R3790	
Volatile Organic Compounds (ug/Kg)															
Methylene Chloride	100							4.3	JB					11	
Benzene	60														
Toluene	1500														
Ethyl Benzene	5500														
m/p-Xylenes	1200									27	J				
o-Xylene	1200														
Total Xylenes	1200									27	CJ				
Total Volatiles	10000							4.3	C	19764	CJ	9.7	C	11	C
Semivolatile Organic Compounds (ug/Kg)															
Naphthalene	13000													49	J
Acenaphthylene	41000													84	J
Acenaphthene	50000													160	J
Diethylphthalate	7100							82	JB						
Fluorene	50000													240	J
Phenanthrene	50000	300	J	120	J									1700	
Anthracene	50000	76	J											480	
Fluoranthene	50000	530		160	J					44	J			2000	
Pyrene	50000	530		190	J					50	J			1800	
Benzo(a)anthracene	224	360	J	120	J									1200	
Chrysene	400	290	J											1100	
bis(2-Ethylhexyl)phthalate	50000														
Di-n-octyl phthalate	50000														
Benzo(b)fluoranthene	1100	300	J	86	J									1000	
Benzo(k)fluoranthene	1100	160	J											620	
Benzo(a)pyrene	61	240	J											820	
Indeno(1,2,3-cd)pyrene	3200													170	J
Dibenzo(a,h)anthracene	14														
Benzo(g,h,i)perylene	50000	58	J											220	J
Total Semivolatiles	500000	6991	C	2386	C	1120	C	992	C	4678	C	10740	C	14676	C
Pesticides (ug/Kg)															
Aldrin	41														
Heptachlor epoxide	20														
4,4-DDE	2100														
gamma-Chlordane	540														

Table 3
Second Avenue Subway Project
99th Street MGP Area - Soil Hits - May 6, 2004

Boring Number Sample ID Sample Date SDG	NYSDEC TAGM Soil Criteria	BMVP-1 BMVP-1 2-4 08/12/03 R3790		BMVP-1 BMVP-1 10-12 08/22/03 R3950		BMVP-1 BMVP-1 13-15 08/22/03 R3950		BMVP-2 BMVP-2 2-4 08/13/03 R3806		BMVP-2 BMVP-2 10-12 08/22/03 R3950		BMVP-2 BMVP-2 15-17 08/22/03 R3950		BMVP-3 BMVP-3 2-4 08/12/03 R3790	
Mercury (mg/Kg)															
Mercury	1	2.6	D	4.8	D	1.9	D	.02		.57		.24		.4	
TAL Metals (mg/Kg)															
Arsenic	7.5	8.4		37.7		13.4		5.1		13.4		8.9		4.5	
Beryllium	1.6	.32	J	.26	J	.26	J	.39	J	.42	J	.76	J	.39	J
Cadmium	1	.23	J					.24	J					.18	J
Chromium	10	11.7		22.8	N	13.8	N	11.4	N	25	N	29.6	N	17	
Copper	25	53.1	N	298	N*	76.8	N*	16		341	N*	14.2	N*	35.4	N
Nickel	13	11.3		29.8	N	12.1	N	9		21.6	N	26.5	N	15	
Selenium	2	1.2		1.7				.59		1.1				.53	J
Zinc	20	157	N	1230	N	102	N	24.5	N	434	N	78.7	N	51.4	N
Gasoline Range Organics (GRO) (ug/Kg)															
GRO	10000									57000				5.6	U
Diesel Range Organics (DRO) (ug/Kg)															
DRO	10000	2000				4100				2600				2100	

Table 3
Second Avenue Subway Project
99th Street MGP Area - Soil Hits - May 6, 2004

Boring Number / Sample ID / Sample Date / SDG	NYSDEC TAGM Soil Criteria	BMVP-3 BMVP-3 10-11 08/22/03 R3950		BMVP-3 BMVP-3 16-18 08/22/03 R3950		BMVP-4 BMVP-4 2-4 08/13/03 R3806		BMVP-4 BMVP-4 10-11 08/22/03 R3950		BMVP-4 BMVP-4 15-17 08/22/03 R3950		TP96-1 TP96-1 1-2 12/09/03 R5308		B96-3 B96-3 2-4 12/13/02 P5504	
Volatile Organic Compounds (ug/Kg)															
Methylene Chloride	100					3.4	JB			15	B				
Benzene	60											18			
Toluene	1500											2.3	J		
Ethyl Benzene	5500											17			
m/p-Xylenes	1200											48			
o-Xylene	1200											6.8			
Total Xylenes	1200											54.8	C		
Total Volatiles	10000					3.4	C	9270	C	85	C	490.1	C		
Semivolatile Organic Compounds (ug/Kg)															
Naphthalene	13000									120	J				
Acenaphthylene	41000														
Acenaphthene	50000									180	J				
Diethylphthalate	7100					53	JB								
Fluorene	50000									210	J				
Phenanthrene	50000	390	J					100	J	1100		1500	J		
Anthracene	50000	78	J							370	J				
Fluoranthene	50000	420	J					110	J	1100		1700	J		
Pyrene	50000	470						110	J	1100		1700	J		
Benzo(a)anthracene	224	250	J					56	J	590					
Chrysene	400	250	J							430	J				
bis(2-Ethylhexyl)phthalate	50000											1100	J		
Di-n-octyl phthalate	50000														
Benzo(b)fluoranthene	1100	260	J							570		1100	J		
Benzo(k)fluoranthene	1100									290	J				
Benzo(a)pyrene	61	220	J							360	J				
Indeno(1,2,3-cd)pyrene	3200	120	J							140	J				
Dibenzo(a,h)anthracene	14														
Benzo(g,h,i)perylene	50000	130	J							150	J				
Total Semivolatiles	500000	4541	C	2030	C	1123	C	4286	C	13650	C	63500	C	1563	C
Pesticides (ug/Kg)															
Aldrin	41														
Heptachlor epoxide	20														
4,4-DDE	2100														
gamma-Chlordane	540														

Table 3
Second Avenue Subway Project
99th Street MGP Area - Soil Hits - May 6, 2004

Boring Number Sample ID Sample Date SDG	NYSDEC TAGM Soil Criteria	BMVP-3 BMVP-3 10-11 08/22/03 R3950		BMVP-3 BMVP-3 16-18 08/22/03 R3950		BMVP-4 BMVP-4 2-4 08/13/03 R3806		BMVP-4 BMVP-4 10-11 08/22/03 R3950		BMVP-4 BMVP-4 15-17 08/22/03 R3950		TP96-1 TP96-1 1-2 12/09/03 R5308		B96-3 B96-3 2-4 12/13/02 P5504	
Mercury (mg/Kg)															
Mercury	.1	10.8	D	.02		.13		1.6	D	13.3	D	.18		.03	N
TAL Metals (mg/Kg)															
Arsenic	7.5	12		11.8		1.1	J	24.1		21.1		1.5		74	B
Beryllium	1.6	.43	J	85	J	.18	J	41	J	.35	J	.2	J	.59	
Cadmium	1														
Chromium	10	15.8	N	33	N	8.5	N	8.7	N	13.3	N	9.8		35.8	
Copper	25	208	N*	15.6	N*	11.6		57.7	N*	46.3	N*	26.1	N	38.2	E
Nickel	13	16.7	N	28.7	N	7.5		9	N	10.3	N	8		27.7	E
Selenium	2	1.9						1.8		3					
Zinc	20	205	N	84.4	N	32.8	N	277	N	210	N	63.1	N	94.3	N*
Gasoline Range Organics (GRO) (ug/Kg)															
GRO	10000							11000				26			
Diesel Range Organics (DRO) (ug/Kg)															
DRO	10000	11000													

Table 3
Second Avenue Subway Project
99th Street MGP Area - Soil Hits - May 6, 2004

Boring Number Sample ID Sample Date SDG	NYSDEC TAGM Soil Criteria	B96-3B B96-3B 2-4 01/10/03 R1118		B96-3B B96-3B 10-12 01/29/03 R1351		B96-3B B96-3B 15-17 01/29/03 R1351		TP96-8AND9 TP96-8AND9 2-3 03/25/04 S1897		H97-1 H97-1 10-12 08/13/03 R3808		H97-1 H97-1 40-42 08/13/03 R3808		B97-1 B97-1 12-14 02/10/04 S1399	
Volatile Organic Compounds (ug/Kg)															
Methylene Chloride	100											4.8	JB		
Benzene	60							110	J						
Toluene	1500							13	J						
Ethyl Benzene	5500							8300	DJ						
m/p-Xylenes	1200							4300	DJ						
o-Xylene	1200							71	J						
Total Xylenes	1200							4371	CJ						
Total Volatiles	10000							20605	CJ			4.8	C		
Semivolatile Organic Compounds (ug/Kg)															
Naphthalene	13000							7200	J						
Acenaphthylene	41000							11000	J						
Acenaphthene	50000	360	J												
Diethylphthalate	7100											140	J		
Fluorene	50000	310	J					14000	J						
Phenanthrene	50000	2400						99000	DJ						
Anthracene	50000	580						29000	J						
Fluoranthene	50000	2500						110000	DJ						
Pyrene	50000	2300						100000	DJ						
Benzo(a)anthracene	224	1100						49000	J						
Chrysene	400	1100						42000	J						
bis(2-Ethylhexyl)phthalate	50000	63	J	220	J	61	J							45	J
Di-n-octyl phthalate	50000			65	J										
Benzo(b)fluoranthene	1100	1400						58000	DJ						
Benzo(k)fluoranthene	1100	450						17000	J						
Benzo(a)pyrene	61	970						51000	J						
Indeno(1,2,3-cd)pyrene	3200	190	J					7600	J						
Dibenzo(a,h)anthracene	14							1400	J						
Benzo(g,h,i)perylene	50000	300	J					9800	J						
Total Semivolatiles	500000	18355	C	2909	C	5309	C	691400	CJ	880	C	920	C	535	C
Pesticides (ug/Kg)															
Aldrin	41	3.3	P												
Heptachlor epoxide	20	12													
4,4-DDE	2100	4	P												
gamma-Chlordane	540	3.5													

Table 3
Second Avenue Subway Project
99th Street MGP Area - Soil Hits - May 6, 2004

Boring Number Sample ID Sample Date SDG	NYSDEC TAGM Soil Criteria	B96-3B B96-3B 2-4 01/10/03 R1118		B96-3B B96-3B 10-12 01/29/03 R1351		B96-3B B96-3B 15-17 01/29/03 R1351		TP96-8AND9 TP96-8AND9 2-3 03/25/04 S1897		H97-1 H97-1 10-12 08/13/03 R3808		H97-1 H97-1 40-42 08/13/03 R3808		B97-1 B97-1 12-14 02/10/04 S1399	
Mercury (mg/Kg)															
Mercury	.1	.37	N	.07	N	.02	N	.09						.04	*
TAL Metals (mg/Kg)															
Arsenic	7.5	8.5		2.3		.84	B	4.9		2.8		.29	J	1.6	
Beryllium	1.6	.4	B	.39	B	.2	B	.23	J	.47	J	.24	J	.6	J
Cadmium	1														
Chromium	10	25.3		18		10.5		7.3		12.9	N	6.1	N	10.6	
Copper	25	34.1		15.7		12.2		35.8	N	11.2		11		8.5	
Nickel	13	16.6		13.6		11.2		11.5		11.2		9.6		8.8	
Selenium	2	.93	*	.83		.52	B								
Zinc	20	68.2	*	27.4	N	16.9	N	78.4	N	28.6	N	18.5	N	27.1	N
Gasoline Range Organics (GRO) (ug/Kg)															
GRO	10000							22000							
Diesel Range Organics (DRO) (ug/Kg)															
DRO	10000	10000		20000		18000		883000							

Table 3
Second Avenue Subway Project
99th Street MGP Area - Soil Hits - May 6, 2004

Boring Number / Sample ID / Sample Date / SDG	NYSDEC TAGM Soil Criteria	B97-1 B97-1 29-31 02/10/04 S1399		H97-2 H97-2 10-12 06/06/03 R2796		H97-2 H97-2 12-14 06/06/03 R2796		H97-2 H97-2 36-38 06/06/03 R2796		B97-3 B97-3 27-29 03/05/04 S1678		H98-1 H98-1 6-8 10/29/03 R4884		H99-1 H99-1 4-5 11/11/03 R5033	
Volatile Organic Compounds (ug/Kg)															
Methylene Chloride	100					9.2						8.5	R B	4.5	JB
Benzene	60	75													
Toluene	1500							8800							
Ethyl Benzene	5500	7.8	J					27000							
m/p-Xylenes	1200							44000							
o-Xylene	1200							22000	J						
Total Xylenes	1200							66000	C						
Total Volatiles	10000	99.8	C			9.2	C	762800	C			8.5	CR	4.5	C
Semivolatile Organic Compounds (ug/Kg)															
Naphthalene	13000			89	J			750000	JD					750	J
Acenaphthylene	41000							130000	JD					930	J
Acenaphthene	50000							13000	J					2000	J
Diethylphthalate	7100														
Fluorene	50000							110000	JD					2100	J
Phenanthrene	50000							140000	JD	93	J			27000	DJ
Anthracene	50000							54000	JD					5600	J
Fluoranthene	50000							45000	JD	79	J			35000	DJ
Pyrene	50000							61000	JD	82	J			31000	DJ
Benzo(a)anthracene	224							26000	JD					15000	J
Chrysene	400							12000	J					14000	J
bis(2-Ethylhexyl)phthalate	50000			53	J					120	J				
Di-n-octyl phthalate	50000														
Benzo(b)fluoranthene	1100							11000	J					14000	DJ
Benzo(k)fluoranthene	1100							6600	J					8800	J
Benzo(a)pyrene	61	130	J					22000	JD					13000	J
Indeno(1,2,3-cd)pyrene	3200							930	J						
Dibenzo(a,h)anthracene	14							980	J					380	J
Benzo(g,h,i)perylene	50000							1900	J					3200	J
Total Semivolatiles	500000	1150	C	1062	C	1824	C	1530910	CJ	564	C	160	C	208830	CJ
Pesticides (ug/Kg)															
Aldrin	41														
Heptachlor epoxide	20														
4,4-DDE	2100														
gamma-Chlordane	540														

Table 3
Second Avenue Subway Project
99th Street MGP Area - Soil Hits - May 6, 2004

Boring Number Sample ID Sample Date SDG	NYSDEC TAGM Soil Criteria	B97-1 B97-1 29-31 02/10/04 S1399		H97-2 H97-2 10-12 06/06/03 R2796		H97-2 H97-2 12-14 06/06/03 R2796		H97-2 H97-2 36-38 06/06/03 R2796		B97-3 B97-3 27-29 03/05/04 S1678		H98-1 H98-1 6-8 10/29/03 R4884		H99-1 H99-1 4-5 11/11/03 R5033	
Mercury (mg/Kg)															
Mercury	.1	.03	*	1.1	N	.06	N					.06	*		
TAL Metals (mg/Kg)															
Arsenic	7.5	11		13.3		7.5		1.1	J	5.7		2.4			
Beryllium	1.6	1.3		.43	J	.76		.45	J	.49	J	.42	J		
Cadmium	1			.45	J	.44	J	.18	J						
Chromium	10	29.5		9.8		24.6		15.9		19		13.8			
Copper	25	16.3		82.6	N	14	N	17.2	N	12		11			
Nickel	13	18.4		14.7		21.1		16.3		15.3		9.4			
Selenium	2	1.9		1.1								1.1			
Zinc	20	78.4	N	34.8		41.2		22.7		44.9		22.1			
Gasoline Range Organics (GRO) (ug/Kg)															
GRO	10000														
Diesel Range Organics (DRO) (ug/Kg)															
DRO	10000									4890					

Table 4
Second Avenue Subway Project
99th Street MGP Area - Groundwater Hits - May 6, 2004

Boring Number Sample ID Sample Date SDG	NYSDEC TOGS Groundwater Criteria	BMVP-1 BMVP-1 121803MW 12/18/03 R5442		BMVP-2 BMVP-2 121903MW 12/19/03 R5484		BMVP-4 BMVP-4 011304MW 01/13/04 S1127		BMVP-4 BMVP-4 011404MW 01/14/04 S1127		B96-3B B96-3B 041003MW 04/10/03 R2119		H97-1 H97-1 102903MW 10/29/03 R4868	
Volatile Organic Compounds (ug/l)													
Methyl tert-butyl Ether	10			1.9	J	6.5							
Benzene	1											9.8	
Trichloroethene	5											3.2	J
Toluene	5												
Ethyl Benzene	5												
m/p-Xylenes	10					1.7	J						
o-Xylene	5												
Semivolatile Organic Compounds (ug/l)													
2,4-Dimethylphenol	50												
Naphthalene	10												
2-Chloronaphthalene	10												
Acenaphthene	20												
Fluorene	50												
Phenanthrene	50												
Anthracene	50												
Di-n-butylphthalate	50	3.5	J	1.9	J								
Fluoranthene	50												
Pyrene	50												
TAL Metals (ug/l)													
Antimony	3	8.2	J									2.7	J
Arsenic	25	5.1	J	5.6	J								
Barium	1000	727		236				188	J	157	B	108	J
Beryllium	3			.2	J					.21	B		
Chromium	50	2.6	J	2.6	J							9.7	J
Copper	200	4.2	J									17.6	J
Iron	300	37400		12700				16000		1110		17300	
Lead	25	15.2		5.2				11.1				10	
Magnesium	35000	55000		31700				37600		112000		152000	
Manganese	300	2750		1890				964		917		701	
Nickel	100	8	J							2.2	B	6.1	J
Selenium	10			7.9	J							1.7	J
Sodium	20000	1860000	D	101000				158000		659000	E	809000	
Zinc	2000	9.3	J	8.9	J			17.3	J	9.4	B	98.6	N

Table 4
Second Avenue Subway Project
99th Street MGP Area - Groundwater Hits - May 6, 2004

Boring Number Sample ID Sample Date SDG	NYSDEC TOGS Groundwater Criteria	H97-2 H97-2 072803MW 07/28/03 R3531	
Volatile Organic Compounds (ug/l)			
Methyl tert-butyl Ether	10		
Benzene	1	140	
Trichloroethene	5		
Toluene	5	97	J
Ethyl Benzene	5	97	J
m/p-Xylenes	10	87	J
o-Xylene	5	120	
Semivolatile Organic Compounds (ug/l)			
2,4-Dimethylphenol	50	2.7	J
Naphthalene	10	810	D
2-Chloronaphthalene	10	1.7	J
Acenaphthene	20	5.6	J
Fluorene	50	20	
Phenanthrene	50	16	
Anthracene	50	3.6	J
Di-n-butylphthalate	50		
Fluoranthene	50	1.1	J
Pyrene	50	1.4	J
TAL Metals (ug/l)			
Antimony	3		
Arsenic	25		
Barium	1000	136	J
Beryllium	3	44	J
Chromium	50	5.5	J
Copper	200	12.4	J
Iron	300	7660	N
Lead	25	22.3	
Magnesium	35000	121000	
Manganese	300	755	
Nickel	100	4.2	J
Selenium	10	2.8	J
Sodium	20000	1300000	
Zinc	2000	31.7	

To	Derek Braithwaite, EED/CPM Emil Dul, P.E. EED/CPM		Reference number CM1188
cc	Abdallah, Thomas, P.E. Brady, Mike, P.G., P.E. Destefano, W., CHMM Musthyala, Sirish	Bradshaw, Ed Cardoni, John, P.E. Greenberg, Frankee Spronz, W., P.G.	File reference
From	Keith W. Ryan, P.G		Date June 9, 2003
Subject	CM1188 Engineering Services for Second Avenue Subway, Manhattan- Spill Notification – Boring H97-2		

At 1325 hours on June 6, 2003, the field investigation team encountered potentially contaminated soil at Boring H97-2. A reading of 75 ppm was recorded from the sample collected at 34 – 36 feet below ground surface ("bgs"). This information was forwarded to Thomas Abdallah's voice mailbox. Absent a response, Paul Kohutis of NYCT provided verbal authorization to contact NYCDEP at 1345. Per the NYCT Regulatory Notification Protocol (Appendix F – Preliminary Engineering Hazardous Materials Intrusive Investigation Work Plan), the potentially contaminated soil was reported to the NYSDEC Spill Hotline (operator 205) at 1400 hours on June 6, 2003 and a spill number was assigned.

Spill Number: #0302417

Location of Boring: 2nd Avenue, 250 feet south of 99th Street centerline, on the eastern sidewalk.

Contaminated Medium: native soil

Depth of Contamination: 34 – 38 feet bgs

Description of Suspected Contamination:

- PID reading of 75 ppm recorded in jarred sample collected at 34-36 feet bgs;
- PID reading of 150 ppm recorded in jarred sample collected at 36-38 feet bgs;
- Both samples exhibited staining, petroleum odors typical of coal tar, and an apparent free-phase;
- water table encountered between 11.5 and 12 feet bgs.

The PID readings for the soil samples were measured in the headspace of a sample jar that had been closed to the atmosphere for 10 – 15 minutes prior to the reading.

To	Derek Braithwaite, EED/CPM Balbir Sood, P.E. EED/CPM		Reference number CM1188
cc	Abdallah, Thomas, P.E. Biuso, Steve, P.E. Destefano, W., CHMM Musthyala, Sirish	Bradshaw, Ed Brady, Mike, P.G., P.E. Greenberg, Frankee Spronz, W., P.G.	File reference
From	Keith W. Ryan, P.G		Date February 10, 2004
Subject	CM1188 Engineering Services for Second Avenue Subway, Manhattan- Spill Notification – B97-1		

At 1150 hours on February 10, 2004, the field investigation team encountered field-detectable, total cyanide concentrations in soil samples from boring B97-1. A reading of 35 ppm was recorded from a soil sample collected at a depth of 25-27 feet bgs. This information was forwarded to Thomas Abdallah by telephone at 1430 hours. Per the NYCT Regulatory Notification Protocol (Appendix F – Preliminary Engineering Hazardous Materials Intrusive Investigation Work Plan), the potentially contaminated soil was reported to the New York State Department of Environmental Conservation ("NYSDEC") spill hotline (operator no. 444) at 1440 hours on February 10, 2004 and a spill number was assigned.

Spill Number: #0312504

Location of Boring: 2nd Avenue ~ 75 feet north of the 97th Street centerline on the eastern sidewalk.

Contaminated Medium: soil

Depth of Contamination: 25 – 33 feet bgs

Description of Suspected Contamination:

- total cyanides were detected at a concentration of 35 ppm in the split spoon extracted from 25-27 feet bgs (concentration in headspace 10-15 minutes later was 2 ppm);
- total cyanides were detected at a concentration of 125 ppm in split spoon extracted from 29-31 feet bgs (headspace concentration 10-15 minutes later was 3 ppm);
- total cyanides were detected at a concentration of 11 ppm in split spoon extracted from 29-31 feet bgs (headspace concentration 10-15 minutes later was 2 ppm);
- total cyanides were not detectable in the split-spoon or head space of a sample extracted from 35-37 feet bgs;
- depth to groundwater approximately 12 feet bgs;
- clay/peat stratum from 20 – 35 feet bgs.
- groundwater sample (12-14 ft bgs) and soil sample (29-31 feet bgs) submitted to laboratory for analysis of VOCs, SVOCs, metals, cyanide.

To	Derek Braithwaite, EED/CPM Balbir Sood, P.E. EED/CPM		Reference number CM1188
cc	Abdallah, Thomas, P.E. Biuso, Steve, P.E. Destefano, W., CHMM Musthyala, Sirish	Bradshaw, Ed Brady, Mike, P.G., P.E. Greenberg, Frankee Spronz, W., P.G.	File reference
From	Keith W. Ryan, P.G		Date March 25, 2004
Subject	CM1188 Engineering Services for Second Avenue Subway, Manhattan- Spill Notification – Test Pit TP-96-8&9		

At 1230 hours on March 25, 2004, the field investigation team encountered potentially contaminated soil at Test Pit TP-96-8&9. A reading of 472 ppm was recorded from a sample collected at 2 – 3 feet below ground surface ("bgs"). This information was forwarded to Brian Mclean by telephone at 1300 hours. Per the NYCT Regulatory Notification Protocol (Appendix F – Preliminary Engineering Hazardous Materials Intrusive Investigation Work Plan), the potentially contaminated soil was reported to the New York State Department of Environmental Conservation ("NYSDEC") spill hotline (operator no. 403) at 1330 hours on March 25, 2004 and a spill number was assigned.

Spill Number: #0314080

Location of Test Pit: 2nd Avenue, about 60 feet north of 96th Street, on the street (2nd and 3rd lane).

Contaminated Medium: fill material

Depth of Contamination: 2 – 3 feet bgs

Description of Suspected Contamination:

- Petroleum odor encountered during excavation from 2 – 2.5 feet bgs;
- PID reading of 472 ppm recorded in jarred sample collected at 2-3 feet bgs;
- Sample exhibited a petroleum odor. No staining was observed;
- No PID readings were recorded in breathing zone;
- Test pit was backfilled with excavated material and covered with a steel plate.

The PID readings for the soil samples were measured in the headspace of a sample jar that had been closed to the atmosphere for 10 – 15 minutes prior to the reading.

To	Derek Braithwaite, EED/CPM Emil Dul, P.E. EED/CPM		Reference number CM1188
cc	Abdallah, Thomas, P.E. Biuso, Steve, P.E. Destefano, W., CHMM Musthyala, Sirish	Bradshaw, Ed Brady, Mike, P.G., P.E. Greenberg, Frankee Spronz, W., P.G.	File reference
From	Keith W. Ryan, P.G		Date December 8, 2003
Subject	CM1188 Engineering Services for Second Avenue Subway, Manhattan- Spill Notification – Test Pit TP-96-1		

At 1330 hours on December 8, 2003, the field investigation team encountered potentially contaminated soil at Test Pit TP-96-1. A reading of 18 ppm was recorded from a sample collected at 1 – 2 feet below ground surface ("bgs"). This information was forwarded to Thomas Abdallah by telephone at 1615 hours. Per the NYCT Regulatory Notification Protocol (Appendix F – Preliminary Engineering Hazardous Materials Intrusive Investigation Work Plan), the potentially contaminated soil was reported to the New York State Department of Environmental Conservation ("NYSDEC") spill hotline (operator no. 444) at 1630 hours on December 8, 2003 and a spill number was assigned.

Spill Number: #0310389

Location of Boring: 2nd Avenue, about 30 feet north of 96th Street, on the street (first lane).

Contaminated Medium: fill material

Depth of Contamination: 1 – 2 feet bgs

Description of Suspected Contamination:

- Natural gas odor encountered during excavation from 1.5 – 2 feet bgs;
- PID reading of 18 ppm recorded in jarred sample collected at 1-2 feet bgs;
- Sample exhibited a natural gas odor. No staining was observed.
- PID readings of 2.7 and 3.2 ppm recorded in breathing zone;
- Test pit was backfilled with excavated material and covered with a steel plate.

The PID readings for the soil samples were measured in the headspace of a sample jar that had been closed to the atmosphere for 10 – 15 minutes prior to the reading.

To	Derek Braithwaite, EED/CPM Emil Dul, P.E. EED/CPM		Reference number CM1188
cc	Abdallah, Thomas, P.E. Bradshaw, Ed Destefano, W., CHMM Musthyala, Sirish	Biuso, Steve, P.E. Ryan, Keith, P.G. Greenberg, Frankee Spronz, W., P.G.	File reference
From	Michael J. Brady, P.E.		Date August 25, 2003
Subject	CM1188 Engineering Services for Second Avenue Subway, Manhattan- Spill Notification – Boring BMVP-2		

At 2315 hours on August 22, 2003, the field investigation team encountered potentially contaminated soil at Boring BMVP-2. A reading of 283 ppm was recorded from the sample collected at 10 – 11 feet below ground surface ("bgs"). This information was forwarded to Thomas Abdallah by telephone at 0010 hours. Per the NYCT Regulatory Notification Protocol (Appendix F – Preliminary Engineering Hazardous Materials Intrusive Investigation Work Plan), the potentially contaminated soil was reported to the New York State Department of Environmental Conservation ("NYSDEC") spill hotline (operator 422) at 0015 hours on August 23, 2003 and a spill number was assigned.

Spill Number: #0305498

Location of Boring: 150 feet east of the 2nd Avenue centerline and 90 feet south of the 97th Street centerline, in Manhattan Vocational Playground.

Contaminated Medium: fill material – contamination at soil (fill material)/groundwater interface.

Depth of Contamination: 10 – 15 feet bgs

Description of Suspected Contamination:

PID Readings recorded in the headspace of the sample jars:

- PID reading of 1,102 ppm recorded in jarred sample collected at 10-12 feet bgs;
- PID reading of 0.8 ppm recorded in jarred sample collected at 15-17 feet bgs;

PID Readings recorded in the 5-foot geoprobe plastic sampling sleeve:

- PID reading of 283 ppm recorded in sampling sleeve collected at 10-11 feet bgs;
- PID reading of 12.1 ppm recorded in sampling sleeve collected at 13-14 feet bgs;
- PID reading of 0.4 ppm recorded in sampling sleeve collected at 14-15 feet bgs;
- PID reading of 0.0 ppm recorded in sampling sleeve collected at 16 feet bgs;
- Samples from 10 – 15 feet exhibited a petroleum-like odor and no staining was observed;
- Water table at 10 – 12 feet bgs - fill contact.

BMVP-2 is located at Manhattan Vocational Park which is approximately 85 feet from BMVP-4 which was the subject of the same spill report (NYSDEC Spill #0305498).

The PID readings for the soil samples were measured in the headspace of a sample jar that had been closed to the atmosphere for 10 – 15 minutes prior to the reading.

To	Derek Braithwaite, EED/CPM Emil Dul, P.E. EED/CPM		Reference number CM1188
cc	Abdallah, Thomas, P.E. Bradshaw, Ed Destefano, W., CHMM Musthyala, Sirish	Biuso, Steve, P.E. Ryan, Keith, P.G. Greenberg, Frankee Spronz, W., P.G.	File reference
From	Michael J. Brady, P.E.		Date August 25, 2003
Subject	CM1188 Engineering Services for Second Avenue Subway, Manhattan- Spill Notification – Boring BMVP-4		

At 2245 hours on August 22, 2003, the field investigation team encountered potentially contaminated soil at Boring BMVP-4. A reading of 143 ppm was recorded from the sample collected at 9 – 10 feet below ground surface ("bgs"). This information was forwarded to Thomas Abdallah by telephone at 0010 hours. Per the NYCT Regulatory Notification Protocol (Appendix F – Preliminary Engineering Hazardous Materials Intrusive Investigation Work Plan), the potentially contaminated soil was reported to the New York State Department of Environmental Conservation ("NYSDEC") spill hotline (operator 422) at 0015 hours on August 23, 2003 and a spill number was assigned.

Spill Number: #0305498

Location of Boring: 66 feet east of the 2nd Avenue centerline and 90 feet south of the 97th Street centerline, in Manhattan Vocational Playground.

Contaminated Medium: fill material – contamination at soil (fill material)/groundwater interface.

Depth of Contamination: 9 – 14 feet bgs

Description of Suspected Contamination:

PID Readings recorded in the headspace of the sample jars:

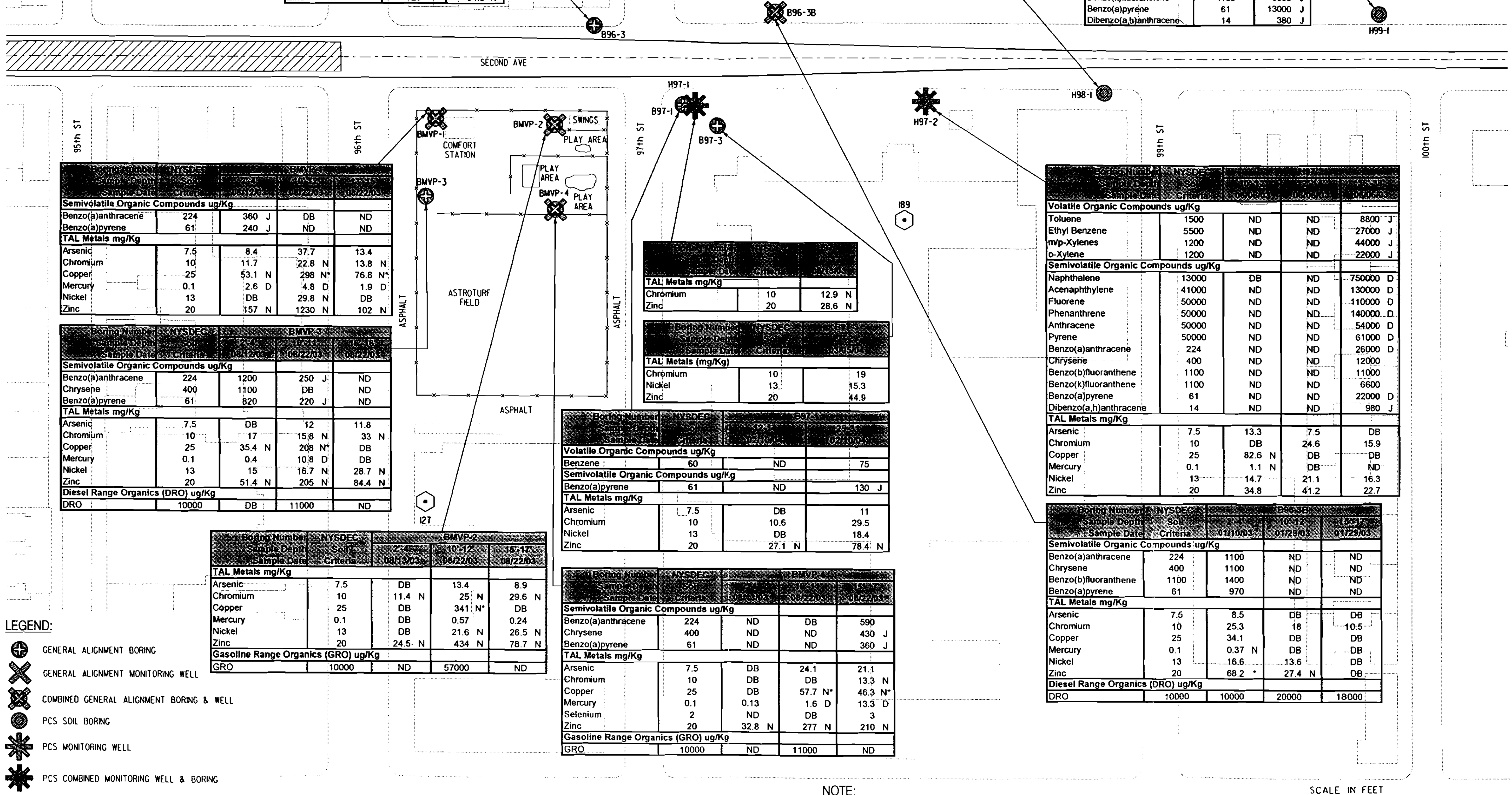
- PID reading of 715 ppm recorded in jarred sample collected at 10-11 feet bgs;
- PID reading of 0.8 ppm recorded in jarred sample collected at 15-17 feet bgs;

PID Readings recorded in the 5-foot geoprobe plastic sampling sleeve:

- PID reading of 143 ppm recorded in sampling sleeve collected at 9-10 feet bgs;
- PID reading of 404 ppm recorded in sampling sleeve collected at 10-11 feet bgs;
- PID reading of 69 ppm recorded in sampling sleeve collected at 12-13 feet bgs;
- PID reading of 1.2 ppm recorded in sampling sleeve collected at 13-14 feet bgs;
- PID reading of 0.0 ppm recorded in sampling sleeve collected at 14 feet bgs;
- Samples from 9 – 13 feet exhibited a petroleum-like odor and no staining was observed;
- Water table at 10 – 12 feet bgs - fill contact.

BMVP-4 is located at Manhattan Vocational Park which is approximately 85 feet from BMVP-2 which was the subject of the same spill report (NYSDEC Spill #0305498).

The PID readings for the soil samples were measured in the headspace of a sample jar that had been closed to the atmosphere for 10 – 15 minutes prior to the reading.



Boring Number / Sample Depth / Sample Date	NYSDEC Soil Criteria	B96-3 2'-4' 12/13/02
TAL Metals mg/Kg		
Chromium	10	35.8
Copper	25	38.2 E
Nickel	13	27.7 E
Zinc	20	94.3 N*

Boring Number / Sample Depth / Sample Date	NYSDEC Soil Criteria	H98-1 [illegible] 10/29/03
TAL Metals mg/Kg		
Chromium	10	13.8
Zinc	20	22.1

Boring Number / Sample Depth / Sample Date	NYSDEC Soil Criteria	H99-1 [illegible] 11/11/03
Semivolatile Organic Compounds ug/Kg		
Benzo(a)anthracene	224	15000 J
Chrysene	400	14000 J
Benzo(b)fluoranthene	1100	14000 DJ
Benzo(k)fluoranthene	1100	8800 J
Benzo(a)pyrene	61	13000 J
Dibenzo(a,h)anthracene	14	380 J

Boring Number / Sample Depth / Sample Date	NYSDEC Soil Criteria	BMVP-1		
		[illegible]	10'-12' 08/22/03	13'-15' 08/22/03
Semivolatile Organic Compounds ug/Kg				
Benzo(a)anthracene	224	360 J	DB	ND
Benzo(a)pyrene	61	240 J	ND	ND
TAL Metals mg/Kg				
Arsenic	7.5	8.4	37.7	13.4
Chromium	10	11.7	22.8 N	13.8 N
Copper	25	53.1 N	298 N*	76.8 N*
Mercury	0.1	2.6 D	4.8 D	1.9 D
Nickel	13	DB	29.8 N	DB
Zinc	20	157 N	1230 N	102 N

Boring Number / Sample Depth / Sample Date	NYSDEC Soil Criteria	BMVP-3		
		2'-4' 08/12/03	10'-11' 08/22/03	16'-18' 08/22/03
Semivolatile Organic Compounds ug/Kg				
Benzo(a)anthracene	224	1200	250 J	ND
Chrysene	400	1100	DB	ND
Benzo(a)pyrene	61	820	220 J	ND
TAL Metals mg/Kg				
Arsenic	7.5	DB	12	11.8
Chromium	10	17	15.8 N	33 N
Copper	25	35.4 N	208 N*	DB
Mercury	0.1	0.4	10.8 D	DB
Nickel	13	15	16.7 N	28.7 N
Zinc	20	51.4 N	205 N	84.4 N
Diesel Range Organics (DRO) ug/Kg				
DRO	10000	DB	11000	ND

Boring Number / Sample Depth / Sample Date	NYSDEC Soil Criteria	BMVP-2		
		2'-4' 08/13/03	10'-12' 08/22/03	15'-17' 08/22/03
TAL Metals mg/Kg				
Arsenic	7.5	DB	13.4	8.9
Chromium	10	11.4 N	25 N	29.6 N
Copper	25	DB	341 N*	DB
Mercury	0.1	DB	0.57	0.24
Nickel	13	DB	21.6 N	26.5 N
Zinc	20	24.5 N	434 N	78.7 N
Gasoline Range Organics (GRO) ug/Kg				
GRO	10000	ND	57000	ND

Boring Number / Sample Depth / Sample Date	NYSDEC Soil Criteria	[illegible]
TAL Metals mg/Kg		
Chromium	10	12.9 N
Zinc	20	28.6 N

Boring Number / Sample Depth / Sample Date	NYSDEC Soil Criteria	B97-3 [illegible] [illegible]
TAL Metals (mg/Kg)		
Chromium	10	19
Nickel	13	15.3
Zinc	20	44.9

Boring Number / Sample Depth / Sample Date	NYSDEC Soil Criteria	B97-1	
		12'-14' 02/10/04	29'-31' 02/10/04
Volatile Organic Compounds ug/Kg			
Benzene	60	ND	75
Semivolatile Organic Compounds ug/Kg			
Benzo(a)pyrene	61	ND	130 J
TAL Metals mg/Kg			
Arsenic	7.5	DB	11
Chromium	10	10.6	29.5
Nickel	13	DB	18.4
Zinc	20	27.1 N	78.4 N

Boring Number / Sample Depth / Sample Date	NYSDEC Soil Criteria	BMVP-4		
		[illegible]	10'-11' 08/22/03	15'-17' 08/22/03
Semivolatile Organic Compounds ug/Kg				
Benzo(a)anthracene	224	ND	DB	590
Chrysene	400	ND	ND	430 J
Benzo(a)pyrene	61	ND	ND	360 J
TAL Metals mg/Kg				
Arsenic	7.5	DB	24.1	21.1
Chromium	10	DB	DB	13.3 N
Copper	25	DB	57.7 N*	46.3 N*
Mercury	0.1	0.13	1.6 D	13.3 D
Selenium	2	ND	DB	3
Zinc	20	32.8 N	277 N	210 N
Gasoline Range Organics (GRO) ug/Kg				
GRO	10000	ND	11000	ND

Boring Number / Sample Depth / Sample Date	NYSDEC Soil Criteria	[illegible]97-2		
		10'-12' [illegible]	[illegible]	36'-38' [illegible]
Volatile Organic Compounds ug/Kg				
Toluene	1500	ND	ND	8800 J
Ethyl Benzene	5500	ND	ND	27000 J
m/p-Xylenes	1200	ND	ND	44000 J
o-Xylene	1200	ND	ND	22000 J
Semivolatile Organic Compounds ug/Kg				
Naphthalene	13000	DB	ND	750000 D
Acenaphthylene	41000	ND	ND	130000 D
Fluorene	50000	ND	ND	110000 D
Phenanthrene	50000	ND	ND	140000 D
Anthracene	50000	ND	ND	54000 D
Pyrene	50000	ND	ND	61000 D
Benzo(a)anthracene	224	ND	ND	26000 D
Chrysene	400	ND	ND	12000
Benzo(b)fluoranthene	1100	ND	ND	11000
Benzo(k)fluoranthene	1100	ND	ND	6600
Benzo(a)pyrene	61	ND	ND	22000 D
Dibenzo(a,h)anthracene	14	ND	ND	980 J
TAL Metals mg/Kg				
Arsenic	7.5	13.3	7.5	DB
Chromium	10	DB	24.6	15.9
Copper	25	82.6 N	DB	DB
Mercury	0.1	1.1 N	DB	ND
Nickel	13	14.7	21.1	16.3
Zinc	20	34.8	41.2	22.7

Boring Number / Sample Depth / Sample Date	NYSDEC Soil Criteria	B96-3B		
		2'-4' 01/10/03	10'-12' 01/29/03	15'-17' 01/29/03
Semivolatile Organic Compounds ug/Kg				
Benzo(a)anthracene	224	1100	ND	ND
Chrysene	400	1100	ND	ND
Benzo(b)fluoranthene	1100	1400	ND	ND
Benzo(a)pyrene	61	970	ND	ND
TAL Metals mg/Kg				
Arsenic	7.5	8.5	DB	DB
Chromium	10	25.3	18	10.5
Copper	25	34.1	DB	DB
Mercury	0.1	0.37 N	DB	DB
Nickel	13	16.6	13.6	DB
Zinc	20	68.2 *	27.4 N	DB
Diesel Range Organics (DRO) ug/Kg				
DRO	10000	10000	20000	18000

LEGEND:

- GENERAL ALIGNMENT BORING
- GENERAL ALIGNMENT MONITORING WELL
- COMBINED GENERAL ALIGNMENT BORING & WELL
- PCS SOIL BORING
- PCS MONITORING WELL
- PCS COMBINED MONITORING WELL & BORING
- POTENTIALLY CONTAMINATED SITE "PCS"
- (BNC) BORING NOT COMPLETED
- (NER) NO EXCEEDANCES REPORTED

NOTE:

LABORATORY DATA QUALIFIERS ARE PRESENTED IN USEPA CONTRACT LABORATORY PROGRAM (CLP) SCOPE OF WORK (SOW), LATEST VERSION

SCALE IN FEET: 50' 0 50' 100'

PRELIMINARY ENGINEERING - NOT ISSUED FOR CONSTRUCTION

MTA CAPITAL CONSTRUCTION NEW YORK CITY TRANSIT

DMJM HARRIS • ARUP *A Joint Venture* Second Avenue Subway

REV	DESCRIPTION	DATE	APPRVD

IT IS A VIOLATION OF THE PROFESSIONAL LICENSE LAW FOR ANY PERSON TO ALTER THIS DRAWING IN ANY WAY, UNLESS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER. THE ALTERING ENGINEER SHALL AFFIX HIS SEAL AND THE NOTATION "ALTERED BY" FOLLOWED BY HIS SIGNATURE AND DATE OF ALTERATION.

SEAL:

DRAWN BY: L.HARDING | SIGNATURE:
DESIGNED BY: M.BRADY | SIGNATURE:
CHECKED BY: C.BENNETT | SIGNATURE:
APPROVED BY: D.PHILLIPS | SIGNATURE:

CONTRACT CM-1188

CONSTRUCTION OF THE SECOND AVENUE SUBWAY BOROUGH OF MANHATTAN

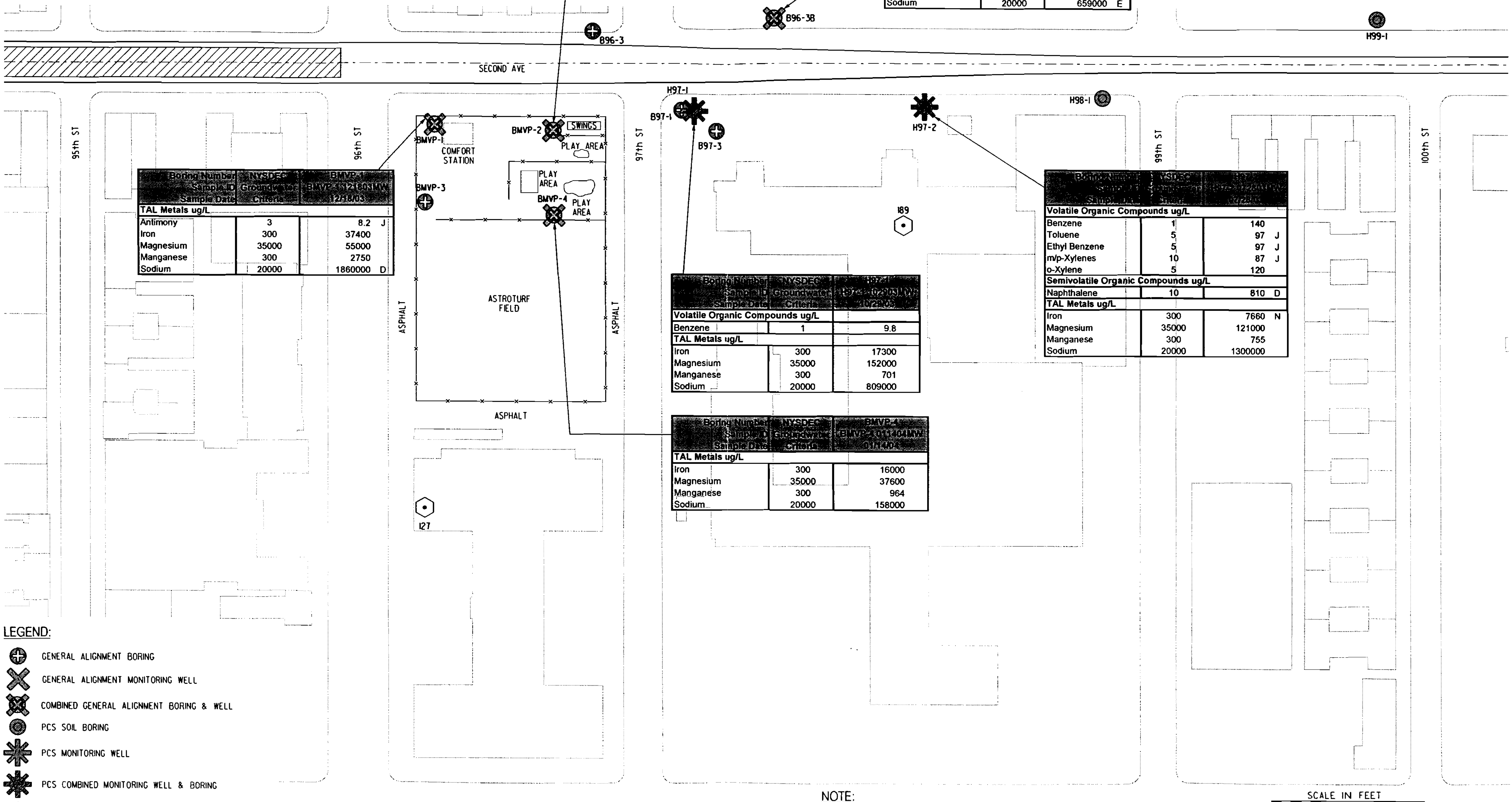
DRAWING TITLE: ENVIRONMENTAL CONTAMINANT DISTRIBUTION MAP SOIL RESULTS 99TH STREET FORMER MGP AREA

SCALE: AS SHOWN | DATE: 5/15/04
DRAWING No: PRELIMINARY ENGINEERING 00-V1187
REVISION: 0 | SHEET No: 2

CHECK PRINT BY: | BACK CHECKED: | DATE: 05/06/2004 11:34:46 AM | VERIFIED: louis.harding | DATE:

...\plotdrv\drivers\SCREENING.plt 2AV.TBL

j:\z-drawings\Production\Infrastructure\Geotech\ENVIRONMENTAL\V001B01187a.dgn



Boring Number / Sample ID / Sample Date	NYSDEC Groundwater Criteria	BMVP-2 / [illegible] / 12/19/03
TAL Metals ug/L		
Iron	300	12700
Manganese	300	1890
Sodium	20000	101000

Boring Number / Sample ID / Sample Date	NYSDEC Groundwater Criteria	B96-3B / [illegible] / [illegible]
TAL Metals ug/L		
Iron	300	1110
Magnesium	35000	112000
Manganese	300	917
Sodium	20000	659000 E

Boring Number / Sample ID / Sample Date	NYSDEC Groundwater Criteria	BMVP-1 / BMVP-1-121803MW / 12/18/03
TAL Metals ug/L		
Antimony	3	8.2 J
Iron	300	37400
Magnesium	35000	55000
Manganese	300	2750
Sodium	20000	1860000 D

Boring Number / Sample ID / Sample Date	NYSDEC Groundwater Criteria	[illegible]
Volatile Organic Compounds ug/L		
Benzene	1	140
Toluene	5	97 J
Ethyl Benzene	5	97 J
m/p-Xylenes	10	87 J
o-Xylene	5	120
Semivolatile Organic Compounds ug/L		
Naphthalene	10	810 D
TAL Metals ug/L		
Iron	300	7660 N
Magnesium	35000	121000
Manganese	300	755
Sodium	20000	1300000

Boring Number / Sample ID / Sample Date	NYSDEC Groundwater Criteria	[illegible]
Volatile Organic Compounds ug/L		
Benzene	1	9.8
TAL Metals ug/L		
Iron	300	17300
Magnesium	35000	152000
Manganese	300	701
Sodium	20000	809000

Boring Number / Sample ID / Sample Date	NYSDEC Groundwater Criteria	BMVP-4 / [illegible] / [illegible]
TAL Metals ug/L		
Iron	300	16000
Magnesium	35000	37600
Manganese	300	964
Sodium	20000	158000

LEGEND:

- GENERAL ALIGNMENT BORING
- GENERAL ALIGNMENT MONITORING WELL
- COMBINED GENERAL ALIGNMENT BORING & WELL
- PCS SOIL BORING
- PCS MONITORING WELL
- PCS COMBINED MONITORING WELL & BORING
- POTENTIALLY CONTAMINATED SITE "PCS"
- (BNC) BORING NOT COMPLETED
- (NER) NO EXCEEDANCES REPORTED

NOTE:
LABORATORY DATA QUALIFIERS ARE PRESENTED IN USEPA CONTRACT LABORATORY PROGRAM (CLP) SCOPE OF WORK (SOW), LATEST VERSION

PRELIMINARY ENGINEERING - NOT ISSUED FOR CONSTRUCTION

MTA CAPITAL CONSTRUCTION NEW YORK CITY TRANSIT

DMJM HARRIS • ARUP A Joint Venture — Second Avenue Subway

REV	DESCRIPTION	DATE	APPRVD

SEAL:

DRAWN BY: L.HARDING	SIGNATURE:
DESIGNED BY: M.BRADY	SIGNATURE:
CHECKED BY: C.BENNETT	SIGNATURE:
APPROVED BY: D.PHILLIPS	SIGNATURE:

CONTRACT CM-1188

CONSTRUCTION OF THE SECOND AVENUE SUBWAY BOROUGH OF MANHATTAN

DRAWING TITLE: ENVIRONMENTAL CONTAMINANT DISTRIBUTION MAP GROUNDWATER RESULTS 99TH STREET FORMER MGP AREA

SCALE: AS SHOWN	DATE: 5/15/04
DRAWING No: PRELIMINARY ENGINEERING 00-V1188	
REVISION: 0	SHEET No: 3

APPENDIX B

FIELD SAMPLING PLAN

APPENDIX B

FIELD SAMPLING PLAN FOR SITE CHARACTERIZATION OF THE EAST 99TH STREET WORKS SITE

Prepared For:

Consolidated Edison Company of New York, Inc.

31-01 20th Avenue
Long Island City, NY 11105

Prepared By:

PARSONS

Liverpool, New York 13088

NOVEMBER 2004

TABLE OF CONTENTS

LIST OF FIGURES

SECTION 1

INTRODUCTION

This Field Sampling Plan (FSP) is intended to define the methods and procedures to be used for conducting the Site Characterization at the Former East 99th Street Works Site.

1.1 OVERVIEW OF FIELD ACTIVITIES

The following field activities will be performed as part of the Phase I and Phase II Site Characterization:

- **Soil and Monitoring Well Borings** – 22 soil borings and six monitoring well borings will be conducted to characterize the presence of MGP residues or other constituents that could impact human health and the environment. Two soil samples will be analyzed from each soil and monitoring well boring for volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs), cyanide, and metals. Soil gas samples will also be collected from soil borings installed within the on-site building.
- **Monitoring Well Installation** - Monitoring wells will be installed at six boring locations. The objective of the monitoring wells will be to characterize groundwater quality and to determine the potential impact of MGP residuals on human health and the environment.
- **Groundwater Sampling** - Groundwater samples will be collected from the monitoring wells and will be analyzed for VOCs and SVOCs, cyanide (total and available), and metals.
- **Surveying** - The locations of the sampling points will be surveyed. The location and elevation of the well casings will be determined to support assessment of groundwater flow direction.

SECTION 2

GENERAL FIELD GUIDELINES

2.1 SITE HAZARDS

Potential on-site surface hazards, such as sharp objects, overhead power lines, energized areas, and building hazards will be identified prior to initiation of fieldwork. Generally, such hazards will be identified during a site visit prior to the first day of fieldwork.

2.2 UNDERGROUND UTILITIES

Prior to beginning the field investigation work, the New York City and Long Island One-Call Center will be contacted for a Code 753 utility mark-out. No drilling will be conducted until the following minimum requirements have been met:

- The Parsons Project Manager and/or field team leader have thoroughly inspected the drilling location and surrounding area for the Code 753 mark-out and the location is clear of marked utilities;
- All drilling locations have been M-scoped by Con Edison or a private utility locating contractor has conducted a below-ground survey (e.g., ground penetrating radar);
- All drilling locations have been cleared with a metal detector by Parsons;
- Utility plates for the site and surrounding area have been provided to Parsons by Con Edison's Construction Management staff and reviewed;
- Parsons has met with and reviewed all of the drilling locations with a facility representative, a Con Edison Construction Management representative, and/or Con Edison's Project Manager, and verified that all drilling locations have been marked; and
- Each drilling location has either been hand-augered to a minimum depth of 5 feet, or a 4-foot by 4-foot test pit has been hand-dug to a minimum depth of 5 feet, as determined by Con Edison during the site inspection.

Additional utility clearance measures may be required based on the site inspection and/or Con Edison requirements.

2.3 FIELD LOG BOOKS

All field activities will be carefully documented in field log books. Entries will be of sufficient detail that a complete daily record of significant events, observations, and measurements is obtained. The field log book will provide a legal record of the activities conducted at the site. Accordingly:

- Field books will be assigned a unique identification number.
- Field books will be bound with consecutively numbered pages.
- Field books will be controlled by the Field Team Leader while field work is in progress.
- Entries will be written with waterproof ink.
- Entries will be signed and dated at the conclusion of each day of fieldwork.
- Erroneous entries made while fieldwork is in progress will be corrected by the person that made the entries. Corrections will be made by drawing a line through the error, entering the correct information, and initialing the correction.
- Corrections made after departing the field will be made by the person who made the original entries. Corrections will be made by drawing a line through the error, entering the correct information, and initialing and dating the time of the correction.

At a minimum, daily field book entries will include the following information:

- Location of field activity;
- Date and time of entry;
- Names and titles of field team members;
- Names and titles of any site visitors and site contacts;
- Weather information, for example: temperature, cloud coverage, wind speed and direction;
- Purpose of field activity;
- A detailed description of the field work conducted;
- Sample media (soil, sediment, groundwater, etc.);
- Sample collection method(s);
- Number and volume of sample(s) taken;
- Description of sampling point(s);
- Volume of groundwater removed before sampling;
- Preservatives used;

- Analytical parameters;
- Date and time of collection;
- Sample identification number(s);
- Sample distribution (e.g., laboratory);
- Field observations;
- Any field measurements made, such as pH, temperature, conductivity, water level, etc.;
- References for all maps and photographs of the sampling site(s); and
- Information pertaining to sample documentation such as:
  - Bottle lot numbers;
  - Dates and method of sample shipments; and
  - Chain-of-Custody Record and Federal Express Air Bill numbers.

SECTION 3

FIELD EQUIPMENT DECONTAMINATION AND MANAGEMENT OF INVESTIGATION DERIVED WASTES

3.1 DECONTAMINATION AREA

A temporary decontamination area lined with polyethylene sheeting will be constructed for steam-cleaning the drilling equipment. The location of the decontamination area will be coordinated with Con Edison and other facility representatives. Water from decontamination activities will be collected in 55-gallon drums and managed as described in Section 3.3.

3.2 EQUIPMENT DECONTAMINATION

3.2.1 Drilling Equipment Decontamination

The following procedures will be used to decontaminate drilling equipment used during the Site Characterization activities.

- All drilling equipment, including the drilling rig, augers, bits, rods, tools, split-spoon samplers and tremie pipe will be cleaned with a high-pressure steam cleaning unit before beginning work.
- Tools, drill rods, and augers will be placed on sawhorses or polyethylene plastic sheets following steam cleaning. Direct contact with the ground will be avoided.
- All augers, rods, and tools will be decontaminated between each drilling location according to the above procedures.
- The back of the drill rig and all tools, augers, and rods will be decontaminated at the completion of the work and prior to leaving the site.

3.2.2 Sampling Equipment Decontamination

Suggested Materials:

- Potable water
- Phosphate-free detergent – ***Simple Green***
- Distilled water
- Aluminum foil
- Plastic/polyethylene sheeting
- Plastic buckets and brushes

- Personal protective equipment (PPE) in accordance with the HASP (Appendix D)

Procedures:

- Prior to sampling, all non-dedicated sampling equipment (bowls, spoons, interface probes, etc.) will be either steam cleaned or washed with potable water and a phosphate-free detergent (***Simple Green***). Decontamination may take place at the sampling location as long as all liquids are contained in pails, buckets, etc.
- The sampling equipment will then be rinsed with potable water followed by a deionized water rinse.
- Between rinses, equipment will be placed on polyethylene sheets or aluminum foil if necessary. At no time will washed equipment be placed directly on the ground.
- Equipment will be wrapped in polyethylene plastic or aluminum foil for storage or transportation from the designated decontamination area to the sampling location.

3.3 MANAGEMENT OF INVESTIGATION DERIVED WASTES

3.3.1 Decontamination Fluids

Decontamination fluids will be collected in DOT approved 55-gallon drums. The drums will be labeled as investigation derived wastewater and temporarily stored in a secured area to be determined by Con Edison and facility representatives. The drums will be placed on wooden pallets in a plastic-lined containment area pending characterization and proper disposal.

3.3.2 Drill Cuttings

Drill cuttings will be contained in 55-gallon drums. The soils will be segregated by drill location as is practical. The drums will be labeled as investigation derived waste soils from the corresponding boring or source area and temporarily stored in a secured area to be determined by Con Edison and facility representatives. The drums will be placed on wooden pallets in a plastic-lined containment area pending characterization and proper disposal.

3.3.3 Development and Purge Water

All development and purge water will be contained in 55-gallon drums. The drums will be labeled as investigation derived wastewater from the corresponding well and temporarily stored in a secured area to be determined by Con Edison and facility representatives. The drums will be placed on wooden pallets in a plastic-lined containment area pending characterization and proper disposal.

3.3.4 Personal Protective Equipment

All personal protective equipment (PPE) will be placed in 55-gallon drums or roll-off containers for proper disposal.

3.3.5 Dedicated Sampling Equipment

All dedicated soil sampling equipment (Macrocore sampler liners and catchers) and groundwater sampling equipment (dedicated disposable polyethylene bailer and dedicated polypropylene line) will be placed in 55-gallon drums for disposal.

SECTION 4

DRILLING AND SOIL SAMPLING

4.1 INTRODUCTION

Investigation activities to be conducted at the Former East 99th Street Works site consist of:

- Soil boring installation;
- Monitoring well installation; and
- Collection of subsurface soil and groundwater samples.

These procedures are described in the following sections. Equipment decontamination procedures are described in Section 3.

4.2 SOIL BORINGS AND SUBSURFACE SOIL SAMPLING

The following methods will be used for conducting the soil borings.

Suggested Equipment

- Field log book
- Project plans
- PPE in accordance with the HASP (Appendix D)
- Metal detector
- Stakes and flagging
- One pint containers for lithology samples
- Tape measure
- Decontamination supplies including Simple Green
- Water level indicator
- PID
- Camera
- Clear tape and duct tape
- Aluminum foil
- Laboratory sample bottles
- Coolers and ice

- Shipping supplies

Drilling and Geologic Logging Method

- Soil borings will be advanced using direct push or hollow-stem auger drilling methods.
- Soil samples will be collected continuously to the bottom of the borings using 2-foot long, 2-inch diameter discrete samplers or Macrocore samplers advanced two feet per sampling run.
- Soil samples retrieved from the borehole will be visually described for: 1) percent recovery, 2) soil type, 3) color, 4) moisture content, 5) texture, 6) grain size and shape, 7) consistency, 8) visible evidence of staining, and 9) any other observations.
- Soil samples will be immediately screened for the evolution of organic vapors with a PID.
- A representative portion of the sample will be placed in a plastic "ziplock" bag or an eight-ounce sample jar filled approximately half full. The container will be labeled with the boring number and interval sampled. The containers will be closed tightly.
- After a minimum of 10 minutes, the tip of the PID will be inserted under the cap or into the bag to measure the headspace for organic vapors.
- Remaining soil will be disposed of in accordance with methods specified in Section 3.3.
- All borings will be sealed with bentonite or cement/bentonite grout following completion.
- All drilling equipment will be decontaminated between each boring in accordance with methods specified in Section 3.2.
- The designated field geologist will log borehole geology and headspace measurements in the field log book for later transfer to the Drilling Record shown in Figure 4.1, or similar form.

Soil Sampling

- The number and frequency of samples to be collected from each boring and the associated analytical parameters are summarized in the Site Characterization Work Plan.
- Samples for VOC analyses will be collected directly from the acetate liners, placed into appropriate containers, and compacted to minimize head space and pore space. The remaining sample volume will be homogenized and placed in appropriate containers for the other analyses.

- The sample containers will be labeled, placed in a laboratory-supplied cooler and packed on ice (to maintain a temperature of 4° C). The coolers will be shipped overnight to the laboratory for analysis.
- Chain-of-custody procedures will be followed as outlined in the QAPP (Appendix C).
- The sampling equipment will be decontaminated between samples in accordance with procedures described in Section 3.2.
- Excess soil remaining after sampling will be contained in accordance with methods specified in Section 3.3.
- The sample locations, descriptions, and depths will be recorded in the field log book.

4.3 SOIL GAS SAMPLING

The following methods will be used for collecting soil gas samples from soil borings installed inside the apartment building.

Suggested Equipment

- Field book
- Project plans
- Personal protective equipment in accordance with the HSP
- Tape measure
- Decontamination supplies including Simple Green
- Photovac PID
- Camera
- Clear tape, duct tape
- Aluminum foil
- Laboratory sample canisters
- Coolers and ice
- Shipping supplies

Soil Gas Sampling

The soil gas sampling procedures will conform to the protocols described by ASTM Method D5314-92.

- If the basement of the building is constructed of poured concrete, a hole (approximately 4 inches in diameter) will be drilled through the slab and a hand

auger will be used to reach a depth of one foot below the slab. A sample of the soil gas from beneath the slab will be collected using a 1/4 –inch OD stainless steel probe.

- The probe assembly will contain a slotted screened portion and will be connected to a length of disposal Teflon tubing. The screen will be exposed to the soil when an expendable drive point head is detached from the bottom of the probe assembly and the probe is pulled-back to a depth of two feet below the concrete floor.

- Approximately 0.5 feet of slotted screen will then be exposed for collection of the soil gas sample (2.5-2.0 feet bgs). The sample probe intake will be in communication with the slab/soil interface so that potentially intruded soil air is sampled.

- The annulus around the probe assembly at the concrete floor will be sealed with granular bentonite, which will be hydrated to form an airtight seal. Soil gas air samples will be collected in stainless steel canisters over a 30 to 60 minute period by drawing air through the slotted screen and tubing. The combined soil gas point and tubing should be purged at least one volume before collecting the soil gas samples. A vacuum gauge will be used to check both the initial and final vacuum in the canisters. The sample probe will be installed and removed the same day that the sample is collected.

If the inspection of the basement indicates that a competent slab does not exist (i.e. dirt floor, cracks in the slab, etc.) then a soil gas sample will still be collected, but from a minimum soil gas probe depth of five feet. The condition of the floor will be documented during the sampling activities.

4.4 MONITORING WELL INSTALLATION AND DEVELOPMENT

The following methods will be used for drilling, installing, and developing monitoring wells.

Suggested Equipment

- Field log book
- Project plans
- PPE in accordance with the HASP (Appendix D)
- Metal detector
- One pint containers for lithology samples
- Tape measure

- Decontamination supplies
- Water level indicator
- PID
- Camera
- Clear tape, duct tape
- Aluminum foil
- Laboratory sample bottles
- Coolers and ice
- Shipping supplies
- Polyethylene disposable bailers (development)
- Polypropylene rope (development)
- Waterra pump or other purge pump (development)
- Stainless steel or glass beakers (development)
- Turbidity meter (development)
- Temperature, conductivity, pH meter (development)

Monitoring Well Installation

Figure 4.2 shows a cross-section for a typical monitoring well. The monitoring wells will be installed in accordance with the following specifications:

- The monitoring well borings will be advanced with 4.25-inch inner diameter (ID) hollow stem augers.
- As described above for soil borings, continuous soil samples will be collected from monitoring well borings for visual description and PID screening.
- Wells will be constructed with two-inch ID, threaded, flush-joint, PVC casings and screens.
- Screens will be 10 feet long with 0.02-inch slot openings and a two-foot sump at the base. Alternatives may be used at the discretion of the field geologist and approval of Con Edison, based on site conditions.
- The annulus around the screens will be backfilled with silica sand having appropriate size (e.g., Morie No. 1) to a minimum height of two feet above the top of the screen. Auger flights will be withdrawn as sand is poured in a manner that will minimize hole collapse and bridging.

- A bentonite pellet seal or slurry seal with a minimum thickness of one-foot will be placed above the sand pack. The bentonite seal (pellets) will be allowed to hydrate before placement of grout above the seal.
- The remainder of the annular space will be filled with a cement-bentonite grout to near the ground surface. The grout will be pumped from the bottom up. The grout will be allowed to set for a minimum of 24 hours before wells are developed.
- Each monitoring well will have a sealed cap (J-plug) and will be contained in a flush-mounted vault. The J-plug will be used to keep surface water from infiltrating into the well during rain events, high water conditions, etc.
- The concrete seal or pad will be sloped slightly to channel water away from the well, and be deep enough to remain stable during freezing and thawing of the ground. Monitoring wells will be installed so that the vault and concrete pad do not pose a trip hazard when completed.
- The top of the PVC well casing will be marked and surveyed to 0.01-foot, and the elevation will be determined relative to a fixed benchmark or datum.
- The measuring point on all wells will be on the innermost PVC casing.
- Monitoring well construction details will be recorded in the field book and on the Construction Log shown in Figure 4.3, or similar form.

Monitoring Well Development

- After approximately 24 hours following completion, the monitoring wells will be developed by surging/bailing, using a centrifugal or peristaltic pump and dedicated polyethylene tubing, a Waterra positive displacement pump and dedicated polyethylene tubing, or other methods at the discretion of the field geologist.
- Water levels will be measured in each well to the nearest 0.01-foot prior to development.
- The wells will be developed until the water in the well is reasonably free of visible sediment (50 NTU if possible or until pH, temperature and specific conductivity stabilize). A portable nephelometer will be used to make this measurement.
- Development water will be contained in accordance with methods specified in Section 3.3.
- Following development, wells will be allowed to recover for at least one week before groundwater is purged and sampled. All monitoring well development will be overseen by a field geologist and recorded in the field book.

FIGURE 4.1

Contractor: _____
Driller: _____
Inspector: _____
Rig Type: _____
Method: _____

DRILLING RECORD

PROJECT NAME _____
PROJECT NUMBER _____

BORING/ WELL NO.

Sheet 1 of
Location Description:

Location Plan See Site Plan

Weather _____
Date/Time Start _____
Date/Time Finish _____

GROUNDWATER OBSERVATIONS				
Water Level				
Date				
Time				
Meas. From				

PID Reading	Sample I.D.	Sample Depth	Percent Recovery	Blow Cts	FIELD IDENTIFICATION OF MATERIAL	LITHOLOGIC SCHEMATIC	STAIN	SHEEN	FREE PRODUCT
		0							
		2							
		4							
		6							
		8							
		10							
		12							
		14							
		16							
		18							
		20							

STANDARD PENETRATION TEST

SS = SPLIT SPOON
A = AUGER CUTTINGS
C = CORED
WOR = Weight of Rod
WOH = Weight of Hammer
RB = Roller Bit

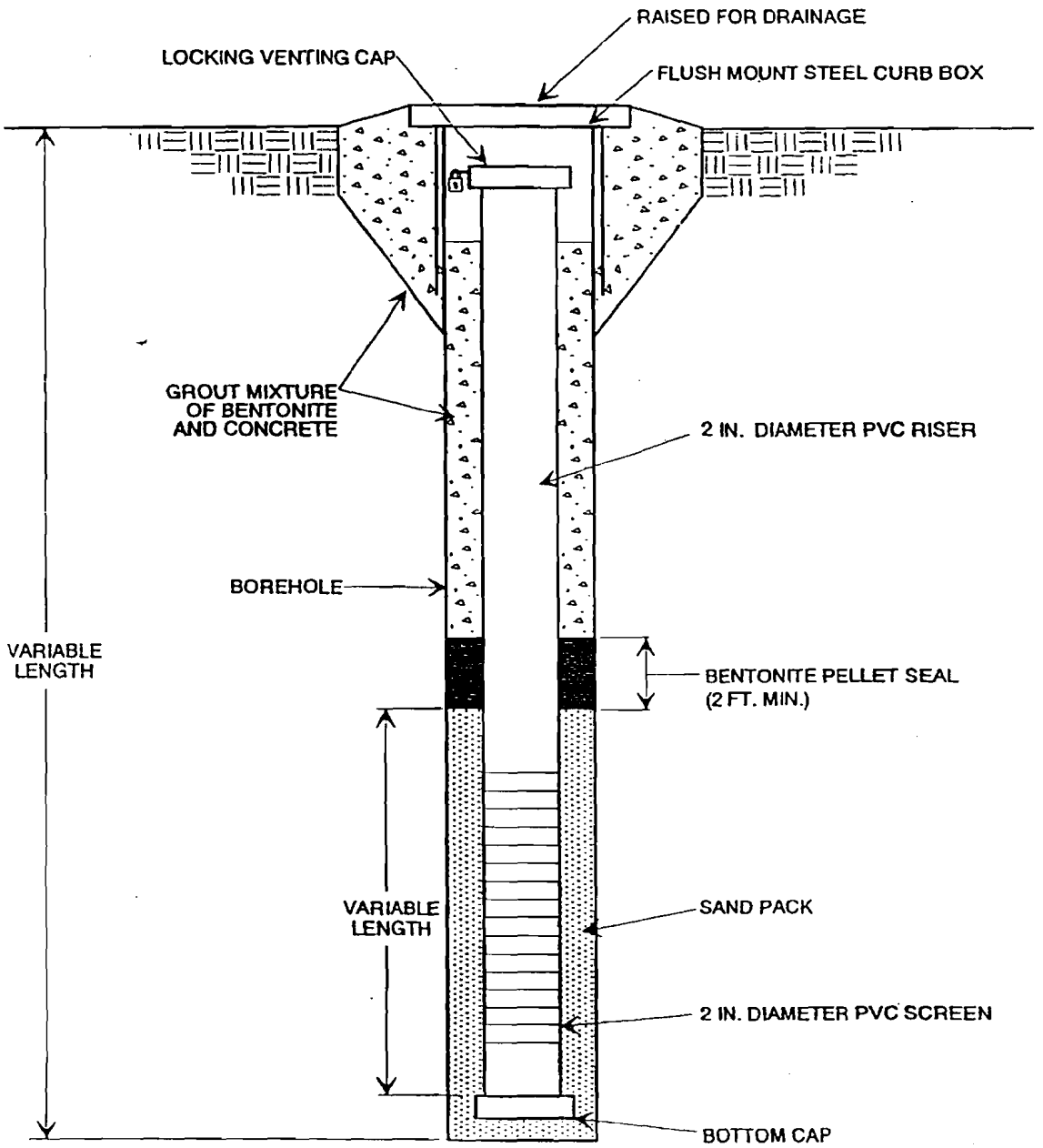
COMMENTS

::::: sand AAAA asphalt
---- silt CCCC concrete
=-=-= clay xxxxx fill

P:\736109\tech\drillog.xls

FIGURE 4.2

TYPICAL MONITORING WELL CROSS SECTION

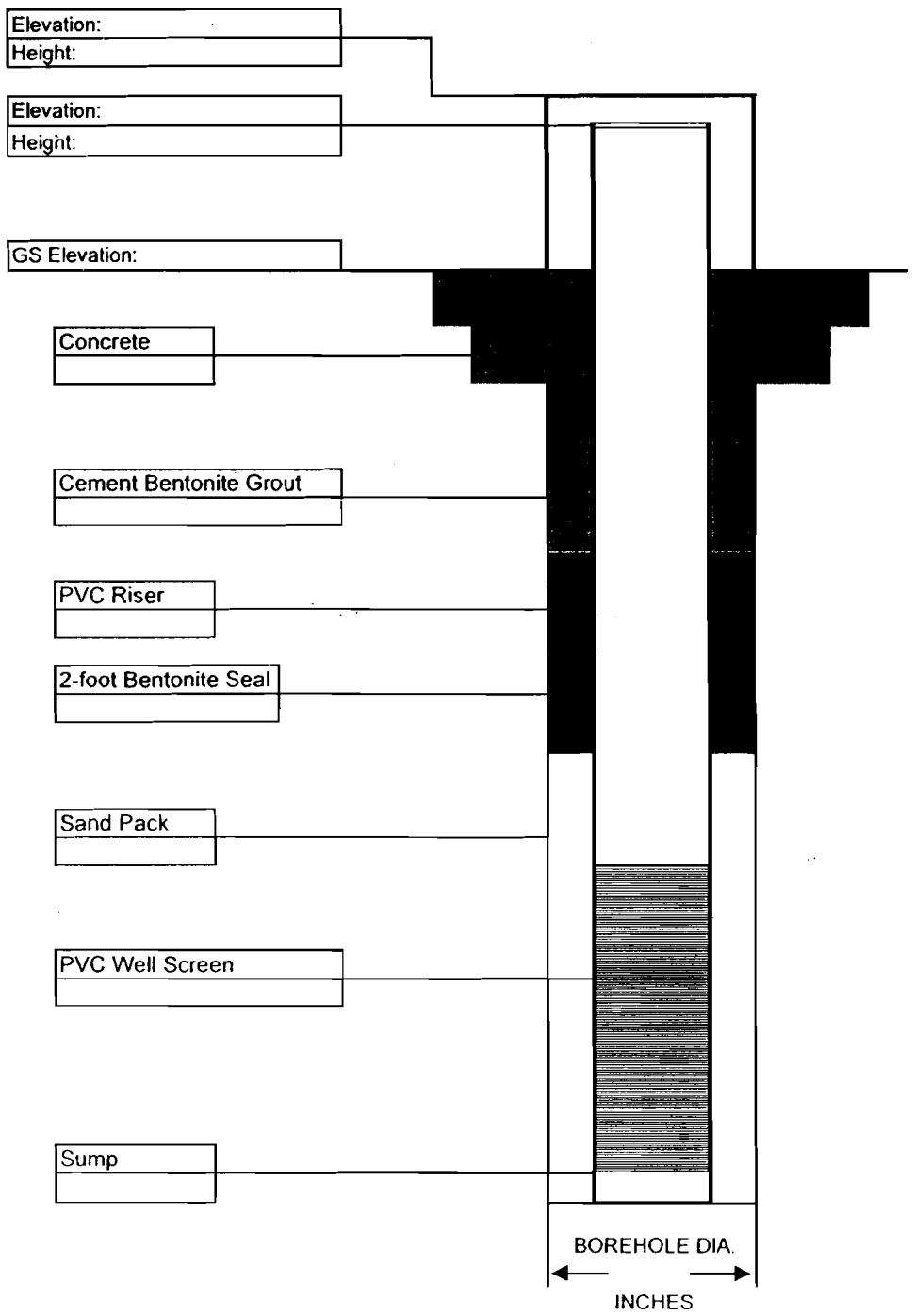


NOT TO SCALE

FIGURE 4.3

SINGLE-CASED MONITORING WELL CONSTRUCTION LOG

WELL NO.:	FACILITY/SITE NAME:
PROJ. NO.:	CLIENT:
INSPECTOR:	DRILLING CONTACTOR:
DATE START:	DATE END:
LOCATION:	DRILLING METHOD:



PROTECTIVE CASING
Material:
Diameter:
Depth BGS:
Water Tight Seal:
Flushmount:
Weep hole:
GUARD POSTS
Material:
No. & Size:
SURFACE PAD
Composition:
Size:
RISER PIPE
Material:
Schedule:
Joint Type:
O-ring:
Diameter:
GROUT
Amt cement:
Amt bentonite:
Amt water:
Tremied:
Interval:
SEAL
Material:
Type:
Amount Used:
Interval:
FILTER PACK
Material:
Brand Name:
Amount Used:
Grain Size Dist.:
Interval:
Tremied:
SCREEN
Material:
Diameter:
Slot Size & Type:
Interval BGS:
SUMP
Interval BGS:
Bottom Cap:
BACKFILL PLUG
Material:
Setup/Hydration Time:

SECTION 5

GROUNDWATER SAMPLING PROCEDURES

5.1 INTRODUCTION

Groundwater sampling will be conducted at the site. Procedures for obtaining samples are described in this section. Sample handling procedures are described in Section 8.

5.2 GROUNDWATER SAMPLING

The following method will be used to collect groundwater samples from monitoring wells.

Suggested Equipment and Supplies

- Field book
- Project plans
- Personal protective equipment in accordance with the HASP
- Oil/Water Interface Probe
- Disposable polyethylene bailers
- Polypropylene rope
- Temp, conductivity, pH meters
- Turbidity meter
- 250-mL glass beaker
- Decontamination supplies
- Waterra pump or other purge pump
- Plastic tubing
- Plastic sheeting
- Photovac PID
- Clear tape, duct tape
- Coolers and ice
- Laboratory sample bottles
- Federal Express labels

Groundwater Sampling Method

Purging

- The number and frequency of groundwater samples to be collected and the associated analytical parameters are summarized in the Site Characterization Work Plan.
- Prior to sampling, the static water level and thickness of any free product will be measured to the nearest 0.01-foot from the surveyed well elevation mark on the top of the PVC casing with a decontaminated oil/water interface probe. The measurement will be recorded in the field book.
- The probe will be decontaminated according to procedures outlined in Section 3.
- The well will be purged by removing a minimum of three well volumes of water. Purging will be conducted with either a bailer, a peristaltic pump, a Waterra positive displacement pump equipped with dedicated tubing, or a decontaminated submersible pump and dedicated tubing.
- If a well goes dry before the required volumes are removed, it will be allowed to recover, purged a second time until dry or the required volumes are removed, and sampled when it recovers sufficiently.
- Purge water will be managed and disposed of in accordance with procedures described in Section 3.3.

Sampling

- Samples will be collected with a dedicated disposable polyethylene bailer lowered with a dedicated polypropylene line, a Waterra positive displacement pump equipped with dedicated tubing, or a decontaminated submersible pump and dedicated tubing.
- Prior to filling the sample bottles, one "clean" container will be filled with water. The temperature, pH, and conductivity will be measured with a pre-calibrated probe and recorded in the field book.
- Sample containers for VOCs will be filled first. Sample containers for the other analytes will follow. If turbidity is a problem in the samples, extra water will be collected for metals and placed in unpreserved bottles provided by the laboratory. The turbidity will be allowed to settle. The water will then be decanted into a pre-preserved bottle provided by the laboratory for shipment to and analysis by the laboratory.
- The sample containers will be labeled, placed in a laboratory-supplied cooler and packed on ice (to maintain a temperature of 4°C). The cooler will be shipped overnight or delivered to the laboratory for analysis.

- Chain-of-custody procedures will be followed as outlined in the QAPP (Appendix C).

- After all samples are collected, the polypropylene rope and bailer will be disposed of in accordance with methods described in Section 3.3.

- Well sampling data will be recorded in the field logbook and on the Groundwater Sampling Record shown in Figure 5.1, or similar form.

FIGURE 5.1

GROUNDWATER SAMPLING RECORD

SITE NAME: _____
PROJECT NUMBER: _____

SAMPLE NUMBER: _____ WEATHER: _____
DATE: _____ TIME: _____

SAMPLERS: _____ of _____
_____ of _____

DESCRIPTION OF SAMPLING POINT

Sample Location: Monitoring well MW- _____
Screen/Sample Depth: _____
Sampling Method: _____

GROUNDWATER PURGING

Initial Static Water Level: _____
One Well Volume: 3 Volumes

2-Inch Casing:	_____	Feet of Water x 0.16 Gallons/Foot =	_____	Gallons	_____
3-Inch Casing:	_____	Feet of Water x 0.36 Gallons/Foot =	_____	Gallons	_____
4-Inch Casing:	_____	Feet of Water x 0.65 Gallons/Foot =	_____	Gallons	_____

Volume of groundwater purged: _____ Gallons
Purging Device: _____
Purge Water Disposition (e.g., contained): _____

SAMPLE DESCRIPTION

Color: _____
Odor: _____
Other: _____
Sample Analyzed for: _____
QC Samples at this Location: _____
QC Samples Analyzed for: _____

FIELD MEASUREMENTS

Temperature (C/F): _____ Dissolved Oxygen: _____
pH: _____ Eh (Redox Potential): _____
Conductivity (µohms/cm): _____
Turbidity (NTU): _____

SAMPLE CUSTODY

Chain of Custody Number: _____ Laboratory: _____
Shipped Via: _____ Airbill Number: _____

COMMENTS _____
_____

p:\FSPfig5-1.XLS

SECTION 6

AIR MONITORING

6.1 BREATHING ZONE AIR MONITORING DURING DRILLING AND SAMPLING

Air monitoring of the breathing zone will be conducted during all drilling and sampling activities in accordance with the Site Characterization Work Plan and HASP to assure proper health and safety protection for the team and nearby occupants and workers.

- A RaeSystems MiniRae 2000 photoionization detector (PID) or equivalent will be used to monitor for organic vapors in the breathing zone and to screen the samples.
- A MiniRAM Portable Aerosol Monitor will be used to monitor particulate dust and aerosolized vapors; and
- Cyanide color detector tubes will be used to monitor for hydrogen cyanide.

The PID readings will be recorded in the field book during drilling activities for later transferred to the boring log form. The procedure for the PID operation and calibration is included in Section 7.

SECTION 7

FIELD INSTRUMENTS AND CALIBRATION

All field analytical equipment will be calibrated immediately prior to each day's use and more frequently, if required. The calibration procedures will conform to manufacturer's standard instructions. This calibration will ensure that the equipment is functioning within the allowable tolerances established by the manufacturer and required by the project. All instrument calibrations will be documented in the project field book and in an instrument calibration log. Records of all instrument calibration will be maintained by the Field Team Leader and will be subject to audit by the Project Quality Assurance Manager (PQAM). Copies of all of the instrument manuals and/or instruction sheets will be maintained on-site by the Field Team Leader.

The following field instruments will be used during the investigation:

- PID;
- MiniRAM real-time aerosol monitor;
- pH Meter;
- Specific Conductivity Meter and Temperature Probe; and
- Turbidity Meter.

7.1 PORTABLE PHOTOIONIZATION ANALYZER

- The photoionization analyzer will be a RaeSystems MiniRae 2000 (or equivalent), equipped with a 10.6 eV lamp. The MiniRae is capable of ionizing and detecting compounds with an ionization potential of less than 10.6 eV. This accounts for up to 73% of the volatile organic compounds on the Target Compound List.
- Calibration must be performed at the beginning of each day of use with a standard calibration gas having an approximate concentration of 100 parts per million of isobutylene. If the unit experiences abnormal perturbation or erratic readings, additional calibration will be required.
- All calibration data must be recorded in the field logbook.
- A battery check must be completed at the beginning and end of each working day.

7.2 MINIRAM

- The operator shall ensure that the instruments respond properly to the substances that they are designed to monitor. Real time aerosol monitors, such as the

MiniRAM, must be zeroed at the beginning of each sampling period. Calibration and maintenance for each instrument should be performed in accordance with the manufacturer's specifications.

- All calibration data must be recorded in field log books and on calibration log sheets to be maintained on-site.
- A battery check must be completed at the beginning and end of each working day.

7.3 pH METER

- Calibration of the pH meter must be performed at the start of each day of use, and after very high or low readings as required by this plan, according to manufacturer's instructions.
- National Institute of Standards and Technology - traceable standard buffer solutions which bracket the expected pH range will be used. The standards will be pH of 4.0, 7.0 and 10.0 standard units.
- The use of the pH calibration must be used to set the meter to display the value of the standard being checked.
- The calibration data must be recorded on calibration sheets maintained on-site or with the piece of equipment.

7.4 SPECIFIC CONDUCTIVITY METER AND TEMPERATURE PROBE

- Calibration checks using the conductivity standard must be performed at the start of each day of use, after five to ten readings or after very high or low readings as required by this plan, according to manufacturer's instructions.
- The portable conductivity meter must be calibrated using a reference solution of 200 uohms/cm on a daily basis. Readings must be within five percent to be acceptable.
- The thermometer of the meter must be calibrated against the field thermometer on a weekly basis.

7.5 TURBIDITY METER

- The turbidity meter must be checked at the start of each day of use and at the end of the day according to manufacturer's instructions.

SECTION 8

FIELD SAMPLE IDENTIFICATION AND CUSTODY

8.1 SAMPLE LOCATION NUMBERING SYSTEM

Subsurface soil borings will be numbered consecutively beginning with SB-01 (soil borings) or MW-1 (monitoring well borings). Individual samples will also be designated with a depth code (see below). Monitoring wells will be numbered consecutively beginning with MW-1.

8.2 SAMPLE IDENTIFICATION

Each sample will be given a unique alphanumeric identifier in accordance with the following classification system:

SAMPLE IDENTIFICATION

LL*	NN**	N-N	LL
Sample Type	Sample Number	Depth Code	QC Identifier

	Solid	Water
Sample Type:	MW - Monitoring Well Boring SB – Soil Boring	MW - Monitoring Well
Sample Number:	Number referenced to a sample location map.	
Depth Code:	Depth in feet of sample interval (a=0-0.5, A=0-2, B=2-4, F=10-12, etc.)	
QC Identifier:	FB - Field Blank TB - Trip Blank WB - Wash or Rinse Blank	MS - Matrix Spike MD - Matrix Spike Duplicate MB - Matrix Blank

* L = Letter
** N = Number

Field duplicate samples will be assigned identifiers that do not allow the laboratory to distinguish them as field duplicates. Each sample container will be labeled prior to packing for shipment. The sample identifier, site name, date and time of sampling, and analytical parameters will be written on the label in waterproof ink and recorded in the field book.

8.3 CHAIN OF CUSTODY

- A Chain-of-Custody (COC) record (Figure 8.1 or similar) will accompany the sample containers during selection and preparation at the laboratory, during shipment to the field, and during return shipment to the laboratory.
- The COC will identify each sample container and the analytical parameters for each, and will list the field personnel that collected the samples, the project name and number, the name of the analytical laboratory that will receive the samples, and the method of sample shipment.
- If samples are split and sent to different laboratories, a copy of the COC record will be sent with each sample shipment.
- The COC will be completed by field personnel as samples are collected and packed for shipment.
- Erroneous markings will be crossed-out with a single line and initialed by the author.
- The REMARKS space will be used to indicate if the sample is a matrix spike, matrix spike duplicate, or matrix duplicate.
- Trip and field blanks will be listed on separate rows.
- After the samples have been collected and sample information has been listed on the COC form, the method of shipment, the shipping cooler identification number(s), and the shipper airbill number will be entered on the COC.
- A second member of the field team will review the COC for completeness and accuracy whenever possible.
- Finally, a member of the sampling team will write his/her signature, the date, and time on the first RELINQUISHED BY space. Duplicate copies of each COC must be completed.
- One copy of the COC will be retained by sampling personnel. Blind duplicate samples will be identified on the copy retained by the sampling crew. The other copy and the original will be sealed in a plastic bag and taped inside the lid of the shipping cooler without the additional identification of blind duplicate samples.
- Sample shipments will be refrigerated at 4°C, typically by packing with ice, to preserve the samples during shipment.
- After the shipping cooler is closed, custody seals provided by the laboratory will be affixed to the latch and across the front and back of the cooler lid, and signed by the person relinquishing the samples to the shipper.
- The seal will be covered with clear tape, and the cooler lid will be secured by wrapping with packing tape.

- The cooler will be relinquished to the shipper, typically an overnight carrier.
- The COC seal must be broken to open the container. Breakage of the seals before receipt at the laboratory may indicate tampering. If tampering is apparent, the laboratory will contact the Project Manager, and the samples will not be analyzed.
- The samples must be delivered to the laboratory within 48 hours of collection.

8.4 SAMPLE DOCUMENTATION

The field team leader will retaining a copy of the COC, and, in addition, the field team leader will ensure that the following information about each sample is recorded in the field book:

- Sample identifier;
- Identification of sampled media (e.g., soil, sediment, groundwater);
- Sample location with respect to known reference point;
- Physical description of sample location;
- Field measurements, (e.g., pH, temperature, conductivity, and water levels);
- Date and time of collection;
- Sample collection method;
- Volume of groundwater purged before sampling;
- Number of sample containers;
- Analytical parameters;
- Preservatives used; and
- Shipping information:
  - Dates and method of sample shipments;
  - Chain-of-Custody Record numbers;
  - Federal Express Air Bill numbers;
  - Sample recipient (e.g., laboratory name).

Figure 8.1 CHAIN OF CUSTODY RECORD

NO:

CLIENT:	PROJECT NO.	PROJECT MGR:	ANALYSES REQUIRED	Send results to:
				PARSONS ENGINEERING SCIENCE, INC. 290 Elwood Davis Road-Suite 312 Liverpool, NY 13088 Telephone: (315) 451-9560 Fax: (315) 451-9570
PROJECT NAME:	NOTES - (Reference QAPP and/or analytical protocols to be used):			Lab Submitted to:
SAMPLERS:				

FIELD SAMPLE ID	LOCATION DESCRIPTION	DATE	TIME	GRAB	COMP	MATRIX	Number of Bottles	REMARKS

Relinquished by: (Signature)	Date:	Time:	Shipped via:	Airbill #:	Received by: (Signature)	Date:	Time:	Cooler Temp: ___°C Samples Intact: ___Yes ___No
Relinquished by: (Signature)	Date:	Time:	Shipped via:	Airbill #:	Received by: (Signature)	Date:	Time:	Cooler Temp: ___°C Samples Intact: ___Yes ___No
Relinquished by: (Signature)	Date:	Time:	Shipped via:	Airbill #:	Received by: (Signature)	Date:	Time:	Cooler Temp: ___°C Samples Intact: ___Yes ___No

TYPE CODES:

SOLID		WATER			MATRIX	QUALITY CONTROL
SD- Sediment	TP- Test Pit/Tank Pit	MW- Monitoring Well	FD- Fuel Dispenser	ST- Storm Water	W - Water	FB- Field Blank (with date)
SS- Surface Soil	DR- Drum Waste	LC- Leachate	MH- Manhole	WW- Waste Water	S - Soil	TB- Trip Blank (with date)
SB- Subsurface Soil	WA- Solid Waste	SW- Surface Water	OW- Oil Water Separator	OL- Other Liquid (eg. Drum liquid)		WB- Wash Blank (with date)
MW- Monitoring Well Boring	OS- Other Solid	DW- Drill Water	PR- Piping Run			

NO:

APPENDIX C

QUALITY ASSURANCE PROJECT PLAN

APPENDIX C

QUALITY ASSURANCE PROJECT PLAN FOR THE SITE CHARACTERIZATION OF THE EAST 99TH STREET WORKS SITE

Prepared For:

Consolidated Edison Company of New York, Inc.

31-01 20th Avenue
Long Island City, NY 11105

Prepared By:

PARSONS

Liverpool, New York 13088

NOVEMBER 2004

TABLE OF CONTENTS

TABLE OF CONTENTS
(continued)

TABLE OF CONTENTS
(continued)

PAGE

LIST OF FIGURES

LIST OF TABLES

SECTION 1

PROJECT DESCRIPTION

1.1 INTRODUCTION

This Quality Assurance Project Plan (QAPP) specifies analytical methods to be used to ensure that data from the proposed site investigation are precise, accurate, representative, comparable, and complete.

1.2 PROJECT OBJECTIVES

The objectives of this project are as follows:

- To characterize and identify potential subsurface conditions associated with the former MGP that may pose a risk to the health and safety of workers and the public during construction;
- To identify any special precautions or procedures required to mitigate the presence of MGP-related or other constituents, and to address handling, transportation, and disposal of impacted groundwater and soils, if any; and
- To assess whether hazardous substances have been released to the environment and may be present onsite; if they may have migrated offsite; and whether they may have impacted human health or the environment.

1.3 SCOPE OF WORK

The scope of work at the Former East 99^{h} Street Works Site is described in the Site Characterization Work Plan. Samples will be collected from soil borings and groundwater monitoring wells. These samples will be analyzed using USEPA SW-846 "Test Methods for Evaluating Solid Waste," November 1986, 3rd edition (and subsequent updates).

1.4 DATA QUALITY OBJECTIVES AND PROCESSES

The quality assurance and quality control objectives for all measurement data include:

- ***Precision*** - an expression of the reproducibility of measurements of the same parameter under a given set of conditions. Field sampling precision will be determined by analyzing coded duplicate samples and analytical precision will be determined by analyzing internal QC duplicates and matrix spike duplicates.
- ***Accuracy*** - a measure of the degree of agreement of a measured value with the true or expected value of the quantity of concern. Sampling accuracy will be determined through the assessment of the analytical results of field blanks and trip blanks for each sample set. Analytical accuracy will be assessed by examining the percent recoveries of surrogate compounds that are added to each sample (organic analyses only), and the

percent recoveries of matrix spike compounds added to selected samples and laboratory blanks.

- ***Representativeness*** - expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an environmental condition. Representativeness will be determined by assessing a number of investigation procedures, including chain of custody, decontamination, and analysis of field blanks and trip blanks.
- ***Completeness*** - the percentage of measurements made which are judged to be valid. Completeness will be assessed through data validation. The QC objective for completeness is generation of valid data for at least 90 percent of the analyses requested.
- ***Comparability*** - expresses the degree of confidence with which one data set can be compared to another. The comparability of all data collected for this project will be ensured using several procedures, including standard methods for sampling and analysis, instrument calibrations, using standard reporting units and reporting formats, and data validation.

Each of the above objectives is discussed in detail in Section 3.

SECTION 2

PROJECT ORGANIZATION

This Site Characterization will be completed for Con Edison by Parsons. Parsons will arrange for the test pitting and drilling, and provide an on-site field representative to perform the soil logging and soil sampling. Parsons will also arrange for surveying and perform groundwater sampling activities. Parsons will perform the data analysis and reporting tasks. The analytical services will be performed by Chemtech.

Key contacts for this project are as follows:

Con Edison Project Manager:	Mr. Charles Leary Telephone: (718) 204-4347 Fax: (718) 932-2687
Parsons Project Manager:	Megan A. Miller, P.E. Telephone: (315) 451-9560 Fax: (315) 451-9570
Parsons QA Officer:	Maryanne Kosciewicz Telephone: (315) 469-4380 Fax: (315) 451-9570
Laboratory Representative:	Kurt Hummler - Chemtech Telephone: (908) 789 8900 Fax: (908) 789-8922

SECTION 3

QUALITY ASSURANCE/QUALITY CONTROL OBJECTIVES FOR MEASUREMENT OF DATA

3.1 INTRODUCTION

The quality assurance and quality control objectives for all measurement data include precision, accuracy, representativeness, completeness, and comparability. These objectives are defined in following subsections. They are formulated to meet the requirements of the USEPA SW-846. The analytical methods and their Contract Required Quantitation Limits (CRQLs) are provided in Section 7.

3.2 PRECISION

Precision is an expression of the reproducibility of measurements of the same parameter under a given set of conditions. Specifically, it is a quantitative measurement of the variability of a group of measurements compared to their average value (USEPA, 1987). Precision is usually stated in terms of standard deviation, but other estimates such as the coefficient of variation (relative standard deviation), range (maximum value minus minimum value), relative range, and relative percent difference (RPD) are common.

For this project, field sampling precision will be determined by analyzing coded duplicate samples (labeled so that the laboratory does not recognize them as duplicates) for the same parameters, and then during data validation (Section 8), calculating the RPD for duplicate sample results.

Analytical precision will be determined by the laboratory by calculating the RPD for the results of the analysis of internal QC duplicates and matrix spike duplicates. The formula for calculating RPD is as follows:

$$RPD = \frac{|V1 - V2|}{(V1 + V2)/2} \times 100$$

Where:

RPD	=	Relative Percent Difference.
V1, V2	=	The two values to be compared.
|V1 - V2|	=	The absolute value of the difference between the two values.
(V1 + V2)/2	=	The average of the two values.

The data quality objectives for analytical precision, calculated as the RPD between duplicate analyses, are presented in Tables 3.1 and 3.2.

TABLE 3.1
QUALITY CONTROL LIMITS FOR WATER SAMPLES

		Laboratory Accuracy and Precision					
Analytical Parameters	**Analytical Method (a)**	**Matrix Spike (MS) Compounds**	**MS/MSD (b) % Recovery**	**MS/MSD RPD (c)**	**LCS (d) % Recovery**	**Surrogate Compounds**	**Surrogate % Recovery**
VOCs (e)	8260	1,1-Dichloroethane	61-145	14	NA	Toluene-d8	88-110
		Trichloroethene	71-120	14	NA	Bromofluorobenzene	86-115
		Benzene	76-127	11	NA	1,2-Dichloroethane-d4	76-114
		Toluene	76-125	13	NA		
		Chlorobenzene	75-130	13	NA		
SVOCs (f)	8270	Phenol	12-110	42	NA	Nitrobenzene-d5	35-114
		2-Chlorophenol	27-123	40	NA	2-Fluorobiphenyl	43-116
		1,4-Dichlorobenzene	36-97	28	NA	Terphenyl-d14	33-141
		N-Nitroso-di-n-propylamine	41-116	38	NA	Phenol-d5	10-110
		1,2,4-Trichlorobenzene	39-98	28	NA	2-Fluorophenol	21-110
		4-Chloro-3-methylphenol	23-97	42	NA	2,4,6-Tribromophenol	10-123
		Acenaphthene	46-118	31	NA	2-Chlorophenol-d4	33-110 (g)
		4-Nitrophenol	10-80	50	NA	1,2-Dichlorobenzene-d4	16-110 (g)
		2,4-Dinitrotoluene	24-96	38	NA		
		Pentachlorophenol	9-103	50	NA		
		Pyrene	26-127	31	NA		
Inorganics (i)	6010,7470/7471, 7841,9010, OIA-1677	Inorganic Analyte	75-125 (j)	20 (k)	80-120	NA	NA

(a) Analytical Methods: USEPA SW-846, 3rd edition, Revision 1, November 1990; any subsequent revisions shall supersede this information
(b) Matrix Spike/Matrix Spike Duplicate
(c) Relative Percent Difference
(d) Laboratory Control Sample
(e) Target Compound List Volatile Organic Compounds
(f) Target Compound List Semivolatile Organic Compounds
(g) Limits are advisory only
(h) Polychlorinated Biphenyls
(i) Target Analyte List Inorganics (metals and cyanide)
(j) Matrix spike only
(k) Laboratory duplicate RPD
NA - Not Applicable

TABLE 3.2
QUALITY CONTROL LIMITS FOR SOIL SAMPLES

		Laboratory Accuracy and Precision					
Analytical Parameter	**Analytical Method (a)**	**Matrix Spike (MS) Compounds**	**MS/MSD (b) % Recovery**	**MS/MSD RPD (c)**	**LCS (d) % Recovery**	**Surrogate Compounds**	**Surrogate % Recovery**
VOCs (e)	8260	1,1-Dichloroethane	59-172	22	NA	Toluene-d8	84-138
		Trichloroethene	62-137	24	NA	Bromofluorobenzene	59-113
		Benzene	66-142	21	NA	1,2-Dichloroethane-d4	70-121
		Toluene	59-139	21	NA		
		Chlorobenzene	60-133	21	NA		
SVOCs (f)	8270	Phenol	26-90	35	NA	Nitrobenzene-d5	23-120
		2-Chlorophenol	25-102	50	NA	2-Fluorobiphenyl	30-115
		1,4-Dichlorobenzene	28-104	27	NA	Terphenyl-d14	18-137
		N-Nitroso-di-n-propylamine	41-126	38	NA	Phenol-d5	24-113
		1,2,4-Trichlorobenzene	38-107	23	NA	2-Fluorophenol	25-121
		4-Chloro-3-methylphenol	26-103	33	NA	2,4,6-Tribromophenol	19-122
		Acenaphthene	31-137	19	NA	2-Chlorophenol-d4	20-130 (g)
		4-Nitrophenol	11-114	50	NA	1,2-Dichlorobenzene-d4	20-130 (g)
		2,4-Dinitrotoluene	28-89	47	NA		
		Pentachlorophenol	17-109	47	NA		
		Pyrene	35-142	36	NA		
Inorganics (i)	6010, 7470/7471, 7841, 9010	Inorganic Analyte	75-125 (j)	20 (k)	80-120	NA	NA

(a) Analytical Methods: USEPA SW-846, 3rd edition, Revision 1, November 1990, any subsequent revisions shall supersede this information
(b) Matrix Spike/Matrix Spike Duplicate
(c) Relative Percent Difference
(d) Laboratory Control Sample
(e) Target Compound List Volatile Organic Compounds
(f) Target Compound List Semivolatile Organic Compounds
(g) Limits are advisory only
(h) Polychlorinated Biphenyls
(i) Target Analyte List Inorganics (metals and cyanide)
(j) Matrix spike only
(k) Laboratory duplicate RPD
NA - Not Applicable

3.3 ACCURACY

Accuracy is a measure of the degree of agreement of a measured value with the true or expected value of the quantity of concern (Taylor, 1987), or the difference between a measured value and the true or accepted reference value. The accuracy of an analytical procedure is best determined by the analysis of a sample containing a known quantity of material, and is expressed as the percent of the known quantity which is recovered or measured. The recovery of a given analyte is dependent upon the sample matrix, method of analysis, and the specific compound or element being determined. The concentration of the analyte relative to the detection limit of the analytical method is also a major factor in determining the accuracy of the measurement. Concentrations of analytes which are close to the detection limits are less accurate because they are more affected by such factors as instrument "noise". Higher concentrations will not be as affected by instrument noise or other variables and thus will be more accurate.

Sampling accuracy may be determined through the assessment of the analytical results of field blanks and trip blanks for each sample set. Analytical accuracy is typically assessed by examining the percent recoveries of surrogate compounds that are added to each sample (organic analyses only), and the percent recoveries of matrix spike compounds added to selected samples and laboratory blanks. Additionally, initial and continuing calibrations must be performed and accomplished within the established method control limits to define the instrument accuracy before analytical accuracy can be determined for any sample set.

Accuracy is normally measured as the percent recovery (%R) of a known amount of analyte, called a spike, added to a sample (matrix spike) or to a blank (blank spike). The %R is calculated as follows:

$$\%R = \frac{SSR - SR}{SA} \times 100$$

where:

%R	=	Percent recovery.
SSR	=	Spike sample result: concentration of analyte obtained by analyzing the sample with the spike added.
SR	=	Sample result: the background value, i.e., the concentration of the analyte obtained by analyzing the sample.
SA	=	Spiked analyte: concentration of the analyte spike added to the sample.

The acceptance limits for accuracy for each parameter are presented in Tables 3.1 and 3.2.

3.4 REPRESENTATIVENESS

Representativeness expresses the degree to which sample data accurately and precisely represent a characteristic of a population, parameter variations at a sampling point, or an

environmental condition. Representativeness is a qualitative parameter which is most concerned with the proper design of the sampling program (USEPA, 1987). Samples must be representative of the environmental media being sampled. Selection of sample locations and sampling procedures will incorporate consideration of obtaining the most representative sample possible.

Field and laboratory procedures will be performed in such a manner as to ensure, to the degree that is technically possible, that the data derived represents the in-place quality of the material sampled. Every effort will be made to ensure chemical compounds will not be introduced into the sample via sample containers, handling, and analysis. Decontamination of sampling devices and digging equipment will be performed between samples as outlined in the Field Sampling Plan. Analysis of field blanks, trip blanks, and method blanks will also be performed to monitor for potential sample contamination from field and laboratory procedures.

The assessment of representativeness must also consider the degree of heterogeneity in the material from which the samples are collected. Sampling heterogeneity will be evaluated during data validation through the analysis of coded field duplicate samples. The analytical laboratory will also follow acceptable procedures to assure the samples are adequately homogenized prior to taking aliquots for analysis, so the reported results are representative of the sample received.

Chain-of-custody procedures will be followed to document that contamination of samples has not occurred during container preparation, shipment, and sampling. Details of blank, duplicate and chain-of-custody procedures are presented in Sections 4 and 5.

3.5 COMPLETENESS

Completeness is defined as the percentage of measurements made which are judged to be valid (USEPA, 1987). The QC objective for completeness is generation of valid data for at least 90 percent of the analyses requested. Completeness is defined as follows for all sample measurements:

$$\%C = \frac{V}{T} \times 100$$

where:

%C = Percent completeness.

V = Number of measurements judged valid.

T = Total number of measurements.

3.6 COMPARABILITY

Comparability expresses the degree of confidence with which one data set can be compared to another (USEPA, 1987). The comparability of all data collected for this project will be ensured by:

- Using identified standard methods for both sampling and analysis phases of this project;

- Requiring traceability of all analytical standards and/or source materials to the U.S. Environmental Protection Agency (USEPA) or National Institute of Standards and Technology (NIST);
- Requiring that all calibrations be verified with an independently prepared standard from a source other than that used for calibration (if applicable);
- Using standard reporting units and reporting formats including the reporting of QC data;
- Performing a complete data validation on a representative fraction of the analytical results, including the use of data qualifiers in all cases where appropriate; and
- Requiring that all validation qualifiers be used any time an analytical result is used for any purpose.

These steps will ensure all future users of either the data or the conclusions drawn from them will be able to judge the comparability of these data and conclusions.

SECTION 4

SAMPLING PROGRAM

4.1 INTRODUCTION

Sampling program will provide data concerning the presence and the nature and extent of contamination of groundwater and soil, if any. This section presents sample container preparation procedures, sample preservation procedures, sample holding times, and field QC sample requirements. Sample locations, and the number of environmental and QC samples to be taken are given in Table 4.1. The sampling procedures are presented in the Field Sampling Plan.

4.2 SAMPLE CONTAINER PREPARATION AND SAMPLE PRESERVATION

Sample containers will be properly washed and decontaminated prior to their use by either the analytical laboratory or the container vendor to the specifications required by the USEPA. Copies of the sample container QC analyses will be provided by the laboratory for each container lot used to obtain samples. The containers will be tagged, the appropriate preservatives will be added. The types of containers are shown in Tables 4.2 and 4.3, respectively.

Samples shall be preserved according to the preservation techniques given in Tables 4.2 and 4.3. Preservatives will be added to the sample bottles by the laboratory prior to their shipment in sufficient quantities to ensure that proper sample pH is met. Following sample collection, the sample bottles should be placed on ice in the shipping cooler, cooled to 4°C with ice and delivered to the laboratory within 48 hours of collection. Chain-of-custody procedures are described in Section 7.

4.3 SAMPLE HOLDING TIMES

The sample holding times for organic and inorganic parameters are given in Tables 4.2 and 4.3 and must be in accordance with the NYSDEC ASP requirements. The NYSDEC ASP holding times must be strictly adhered to by the laboratory. Any holding time exceedances must be reported to Con Edison.

4.4 FIELD QC SAMPLES

To assess field sampling and decontamination performance, two types of "blanks" will be collected and submitted to the laboratory for analyses. In addition, the precision of field sampling procedures will be assessed by collecting coded field duplicates and matrix spike/matrix spike duplicates (MS/MSDs). The blanks will include:

a. Trip Blanks - A Trip Blank will be prepared before the sample containers are sent by the laboratory. The trip blank will consist of a 40-ml VOA vial containing distilled, deionized water, which accompanies the other water sample bottles into the field and back to the laboratory. A trip blank will be included with each shipment of water samples for target compound list (TCL) volatiles analysis. The Trip Blank will be

analyzed for TCL volatile organic compounds to assess any contamination from sampling and transport, and internal laboratory procedures.

b. Field Blanks - Field Blanks will be taken at a minimum frequency of one per 20 field samples per sample matrix. Field blanks are used to determine the effectiveness of the decontamination procedures for sampling equipment. It is a sample of deionized, distilled water provided by the laboratory that has passed through a decontaminated bailer or other sampling apparatus. It is usually collected as a last step in the decontamination procedure, prior to taking an environmental sample. The field blank may be analyzed for all or some of the parameters of interest.

The duplicates will consist of:

a. Coded Field Duplicate - To determine the representativeness of the sampling methods, coded field duplicates will be collected at a frequency of one per 20 field samples. The samples are termed "coded" because they will be labeled in such a manner that the laboratory will not be able to determine that they are a duplicate sample. This will eliminate any possible bias that could arise.

b. Matrix Spike/Matrix Spike Duplicate (MS/MSD) - MS/MSD samples (MS/MSD for organics; MS and laboratory duplicate for inorganics) will be taken at a frequency of one pair per 20 field samples. These samples are used to assess the effect of the sample matrix on the recovery of target compounds or target analytes. The percent recoveries and RPDs are given in Tables 3.1 and 3.2.

TABLE 4.1

SUMMARY OF SAMPLES AND ANALYSES

Matrix	Parameter	Analytical Method	Field Samples				QC Blanks		Total
			Field Samples	Field Duplicate	MS/MSD[a] (Total)	Sub-Total	Trip Blank	Rinse Blank[b]	
PHASE I									
Soil Samples	TCL VOCs	EPA SW 8260	20	1	1/1	23	0	8	31
	TCL SVOCs	EPA SW 8270B	20	1	1/1	23	0	8	31
	Cyanide	EPA SW 335.2	20	1	1/1	23	0	8	31
	TAL Metals	EPA SW 6010, 7470/7471, 7841, 9010	20	1	1/1	23	0	8	31
Groundwater Samples	TCL VOCs	EPA SW 8260	3	1	1/1	6	1	0	7
	TCL SVOCs	EPA SW 8270	3	1	1/1	6	-	0	6
	Cyanide (total)	EPA SW 335.2	3	1	1/1	6	-	0	6
	Cyanide (available)	EPA SW OIA-1677	3	1	1/1	6	-	0	6
	TAL Metals	EPA SW 6010, 7470/7471, 7841, 9010	3	1	1/1	6	-	0	6
Free Product Samples	Hydrocarbon Fingerprinting	Modified Method 8100	?()	-	-	-	-	-	?

TABLE 4.1 (CONTINUED)

SUMMARY OF SAMPLES AND ANALYSES

Matrix	Parameter	Analytical Method	Field Samples				QC Blanks		Total
			Field Samples	Field Duplicate	MS/MSD[a] (Total)	Sub-Total	Trip Blank	Rinse Blank[b]	
PHASE II									
Soil Samples	TCL VOCs	EPA SW 8260	36	2	1/1	40	0	10	50
	TCL SVOCs	EPA SW 8270B	36	2	1/1	40	0	10	50
	Cyanide	EPA SW 335.2	36	2	1/1	40	0	10	50
	TAL Metals	EPA SW 6010, 7470/7471, 7841, 9010	36	2	1/1	40	0	10	50
Groundwater Samples	TCL VOCs	EPA SW 8260	3	1	1/1	6	1	0	7
	TCL SVOCs	EPA SW 8270	3	1	1/1	6	-	0	6
	Cyanide (total)	EPA SW 335.2	3	1	1/1	6	-	0	6
	Cyanide (available)	EPA SW OIA-1677	3	1	1/1	6	-	0	6
	TAL Metals	EPA SW 6010, 7470/7471, 7841, 9010	3	1	1/1	6	-	0	6
Soil Gas Samples	VOCs	EPA TO-15 Modified	4	1	1/1	7	-	0	7
Free Product Samples	Hydrocarbon Fingerprinting	Modified Method 8100	?[c]	-	-	-	-	-	?

(a) Matrix spike/matrix spike duplicate for organic analyses; matrix spike and laboratory duplicate for inorganic analysis (1 each per 20 samples).
(b) Rinse blanks will be collected for each day non-disposable sampling equipment is used.
(c) Number of free product samples collected for analysis (if any) will be determined in the field.

TABLE 4.2

WATER SAMPLE CONTAINERIZATION, PRESERVATION, AND HOLDING TIMES

Analysis	Bottle Type	Preservation [a]	Holding Time [b]
Volatile Organic Compounds (VOCs)	2-40 mL glass vial w/ Teflon septum	Cool to 4°C	10 days
Semivolatile Organics Compounds (SVOCs)	1000 mL glass w/ Teflon lined cap	Cool to 4°C	5 days*
Metals	1000 mL plastic bottle	Nitric Acid to pH < 2 Cool to 4°C	6 months, except mercury (26 days)
Cyanide	500 mL plastic bottle	NaOH to pH > 12 Cool to 4°C	12 days

(a) All samples to be preserved in ice during collection and transport.

(b) Days from validated time of sample receipt (VTSR).

* Continuous liquid-liquid extraction is the required extraction for water samples for SVOCs. Continuous liquid-liquid extraction and concentration of water samples for SVOCs analysis completed within 5 days of VTSR. Extracts of water samples must be analyzed within 40 days of extraction.

TABLE 4.3

SOIL SAMPLE CONTAINERIZATION AND HOLDING TIMES

Analysis	Bottle Type	Preservation [a]	Holding Time [b]
Volatile Organic Compounds (VOCs)	Wide-mouth glass w/ teflon lined cap	Cool to 4°C	10 days
Other Organic Compounds [c]	Wide-mouth glass w/ teflon lined cap	Cool to 4°C	10 days*
Metals	Wide-mouth plastic or glass	Cool to 4°C	6 months, except mercury (26 days)
Cyanide	Wide-mouth plastic	Cool to 4°C	12 days

(a) All samples to be preserved in ice during collection and transport.
(b) Days from date of sample collection.
(c) Semivolatile organic compounds or PCBs.
* Sohxlet or sonication procedures for extraction and concentration of soil/waste samples for SVOCs must be completed within 10 days of VTSR. Sohxlet or sonication procedures for extraction and concentration of soil/sediment/waste samples for PCBs must be completed within 10 days of VTSR. Extracts of soil samples must be analyzed within 40 days of extraction.

SECTION 5

SAMPLE TRACKING AND CUSTODY

5.1 INTRODUCTION

This section presents sample custody procedures for both the field and laboratory. Implementation of proper custody procedures for samples generated in the field is the responsibility of field personnel. Both laboratory and field personnel involved in the Chain-of-custody (COC) and transfer of samples will be trained as to the purpose and procedures prior to implementation.

Evidence of sample traceability and integrity is provided by COC procedures. These procedures document the sample traceability from the selection and preparation of the sample containers by the laboratory, to sample collection, to sample shipment, to laboratory receipt and analysis. The sample custody flowchart is shown in Figure 5.1. A sample is considered to be in a person's custody if the sample is:

- In a person's possession;
- Maintained in view after possession is accepted and documented;
- Locked and tagged with Custody Seals so that no one can tamper with it after having been in physical custody; or
- In a secured area which is restricted to authorized personnel.

5.2 FIELD SAMPLE CUSTODY

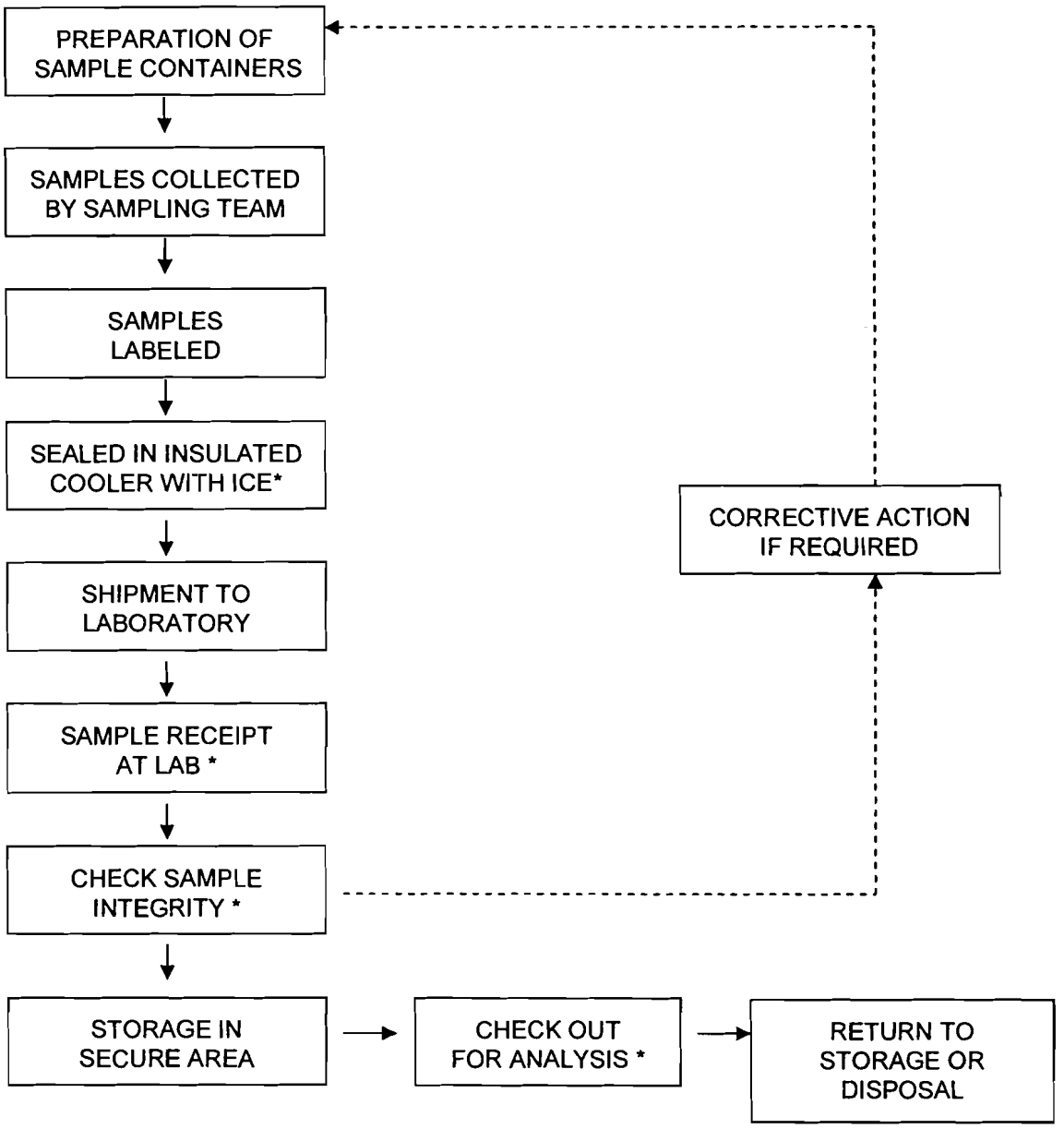
A COC record (Figure 5.2 or similar) accompanies the sample containers from selection and preparation at the laboratory, during shipment to the field for sample containment and preservation, and during return to the laboratory. Triplicate copies of the COC must be completed for each sample set collected.

The COC lists the field personnel responsible for taking samples, the project name and number, the name of the analytical laboratory to which the samples are sent, and the method of sample shipment. The COC also lists a unique description of every sample bottle in the set. If samples are split and sent to different laboratories, a copy of the COC record will be sent with each sample.

The REMARKS space on the COC is used to indicate if the sample is a matrix spike, matrix spike duplicate, or any other sample information for the laboratory. Since they are not specific to any one sample point, trip and field blanks are indicated on separate rows. Once all bottles are properly accounted for on the form, a sampler will write his or her signature and the date and time on the first RELINQUISHED BY space. The sampler will also write the method of shipment, the shipping cooler identification number, and the shipper airbill number on the top of the COC. Mistakes will be crossed out with a single line in ink and initialed by the author.

FIGURE 5.1

SAMPLE CUSTODY



* REQUIRES SIGN-OFF ON CHAIN-OF-CUSTODY FORM

Figure 5.2 CHAIN OF CUSTODY RECORD

NO:

CLIENT:	PROJECT NO.	PROJECT MGR:	ANALYSES REQUIRED	Send results to: PARSONS ENGINEERING SCIENCE, INC. 290 Elwood Davis Road-Suite 312 Liverpool, NY 13088 Telephone: (315) 451-9560 Fax: (315) 451-9570
PROJECT NAME:	NOTES - (Reference QAPP and/or analytical protocols to be used):			Lab Submitted to:
SAMPLERS:				

FIELD SAMPLE ID	LOCATION DESCRIPTION	DATE	TIME	GRAB	COMP	MATRIX	Number of Bottles	REMARKS

Relinquished by: (Signature)	Date:	Time:	Shipped via:	Airbill #:	Received by:(Signature)	Date:	Time:	Cooler Temp: ___°C Samples Intact: ___Yes ___No
Relinquished by: (Signature)	Date:	Time:	Shipped via:	Airbill #:	Received by:(Signature)	Date:	Time:	Cooler Temp: ___°C Samples Intact: ___Yes ___No
Relinquished by: (Signature)	Date:	Time:	Shipped via:	Airbill #:	Received by:(Signature)	Date:	Time:	Cooler Temp: ___°C Samples Intact: ___Yes ___No

TYPE CODES:

SOLID
- SD- Sediment
- SS- Surface Soil
- SB- Subsurface Soil
- MW- Monitoring Well Boring
- TP- Test Pit/Tank Pit
- DR- Drum Waste
- WA- Solid Waste
- OS- Other Solid

WATER
- MW- Monitoring Well
- LC- Leachate
- SW- Surface Water
- DW- Drill Water
- FD- Fuel Dispenser
- MH- Manhole
- OW- Oil Water Separator
- PR- Piping Run
- ST- Storm Water
- WW- Waste Water
- OL- Other Liquid (eg. Drum liquid)

MATRIX
- W - Water
- S - Soil

QUALITY CONTROL
- FB- Field Blank (with date)
- TB- Trip Blank (with date)
- WB- Wash Blank (with date)

NO:

One copy of the COC is retained by sampling personnel (notations identifying blind duplicate samples will be added to this copy of the COC but not the others that will go to the laboratory) and the other two copies are put into a sealable plastic bag and taped inside the lid of the shipping cooler. The cooler lid is closed, custody seals provided by the laboratory are affixed to the latch and across the back and front lids of the cooler, and the person relinquishing the samples signs their name across the seal. The seal is taped, and the cooler is wrapped tightly with clear packing tape. It is then relinquished by field personnel to personnel responsible for shipment, typically an overnight carrier. The COC seal must be broken to open the container. Breakage of the seals before receipt at the laboratory may indicate tampering. If tampering is apparent, the laboratory will contact the Project Manager, and the sample will not be analyzed.

5.3 LABORATORY SAMPLE CUSTODY

The Project Manager or Field Team Leader will notify the laboratory of upcoming field sampling activities, and the subsequent shipment of samples to the laboratory. This notification will include information concerning the number and type of samples to be shipped as well as the anticipated date of arrival.

The following laboratory sample custody procedures will be used:

- The laboratory will designate a sample custodian who will be responsible for maintaining custody of the samples, and for maintaining all associated records documenting that custody.
- Upon receipt of the samples, the custodian will check cooler temperature, and check the original COC documents and compare them with the labeled contents of each sample container for correctness and traceability. The sample custodian will sign the COC record and record the date and time received.
- Care will be exercised to annotate any labeling or descriptive errors. In the event of discrepant documentation, the laboratory will immediately contact the Project Manager or Field Team Leader as part of the corrective action process. A qualitative assessment of each sample container will be performed to note any anomalies, such as broken or leaking bottles. This assessment will be recorded as part of the incoming chain-of-custody procedure.
- The samples will be stored in a secured area at a temperature of approximately 4° C until analyses commence.
- A laboratory tracking record will accompany the sample or sample fraction through final analysis for control.
- A copy of the tracking record will accompany the laboratory report and will become a permanent part of the project records.

SECTION 6

CALIBRATION PROCEDURES

6.1 FIELD INSTRUMENTS

All field analytical equipment will be calibrated immediately prior to each day's use. The calibration procedures will conform to manufacturer's standard instructions and are described in the Field Sampling Plan. This calibration will ensure that the equipment is functioning within the allowable tolerances established by the manufacturer and required by the project. Records of all instrument calibration will be maintained by the Field Team Leader. Copies of all the instrument manuals will be maintained on-site by the Field Team Leader.

Calibration procedures for instruments used for monitoring health and safety hazards (e.g., photoionization detector and explosimeter) are provided in the Health and Safety Plan.

6.2 LABORATORY INSTRUMENTS

The laboratory will follow all calibration procedures and schedules as specified in the sections of the USEPA SW-846 and subsequent updates that apply to the instruments used for the analytical methods given in Section 7.

SECTION 7

ANALYTICAL PROCEDURES

7.1 INTRODUCTION

Samples will be analyzed according to the USEPA SW-846 "Test Methods for Evaluating Solid Waste," November 1986, 3rd edition and subsequent updates. The methods to be used for the laboratory analysis of water and soil samples are presented in Tables 7.1 and 7.2. These methods were selected because they attain the quantitation limits which are compiled on Tables 7.1.

TABLE 7.1
PROJECT QUANTITATION LIMITS

	Analysis/Compound	Method	Quantitation Limits Water (ug/L)	Quantitation Limits Soil (ug/kg)	State of New York Standards Water (ug/L) [a]	State of New York Standards Soil (ug/kg) [b]
	Volatile Organics					
1	1,1,1-Trichloroethane	SW8260B	1	5	5	800
2	1,1,2,2-Tetrachloroethane	SW8260B	1	5	5	600
3	1,1,2-Trichloroethane	SW8260B	1	5	1	
4	1,1-Dichloroethane	SW8260B	1	5	5	200
5	1,1-Dichloroethene	SW8260B	1	5	5	400
6	1,2-Dichloroethane	SW8260B	1	5	0.6	100
7	1,2-Dichloroethene(total)	SW8260B	1	5	5	300
8	1,2-Dichloropropane	SW8260B	1	5	1	
9	2-Butanone (MEK)	SW8260B	10	20		300
10	2-Hexanone	SW8260B	10	20		
11	4-Methyl-2-pentanone(MIBK)	SW8260B	5	20		1000
12	Acetone	SW8260B	10	20		200
13	Benzene	SW8260B	1	5	1	60
14	Bromodichloromethane	SW8260B	1	5		
15	Bromoform	SW8260B	1	5		
16	Bromomethane	SW8260B	2	10	5	
17	Carbon Disulfide	SW8260B	1	5		2700
18	Carbon Tetrachloride	SW8260B	1	5	5	600
19	Chlorobenzene	SW8260B	1	5	5	1700
20	Chloroethane	SW8260B	2	10	5	1900
21	Chloroform	SW8260B	1	5	7	300
22	Chloromethane	SW8260B	2	10	5	
23	cis-1,3-Dichloropropene	SW8260B	1	5	0.4	
24	Dibromochloromethane	SW8260B	1	5	5	
25	Ethyl Benzene	SW8260B	1	5	5	5500
26	Methylene Chloride	SW8260B	1	5	5	100
27	Styrene	SW8260B	1	5	5	
28	Tetrachloroethene	SW8260B	1	5	5	1400
29	Toluene	SW8260B	1	5	5	1500
30	trans-1,3-Dichloropropene	SW8260B	1	5	0.4	
31	Trichloroethene	SW8260B	1	5	5	700
32	Vinyl Chloride	SW8260B	2	10	2	200
33	Xylenes (total)	SW8260B	1	5	5	1200

TABLE 7.1 (Continued)
PROJECT QUANTITATION LIMITS

	Analysis/Compound	Method	Quantitation Limits Water (ug/L)	Quantitation Limits Soil (ug/kg)	State of New York Standards Water (ug/L)	State of New York Standards Soil (ug/kg)
	Semivolatile Organics					
1	1,2,4-Trichlorobenzene	SW8270C	10	330	5	3400
2	1,2-Dichlorobenzene	SW8270C	10	330	3	7900
3	1,3-Dichlorobenzene	SW8270C	10	330	3	1600
4	1,4-Dichlorobenzene	SW8270C	10	330	3	8500
5	2,2'-oxybis(1-chloropropane)*	SW8270C	10	330	5	
6	2,4,5-Trichlorophenol	SW8270C	25	330	1	100
7	2,4,6-Trichlorophenol	SW8270C	10	330	1	
8	2,4-Dichlorophenol	SW8270C	10	330	1	400
9	2,4-Dimethylphenol	SW8270C	10	330	1	
10	2,4-Dinitrophenol	SW8270C	25	330	1	200
11	2,4-Dinitrotoluene	SW8270C	10	330	5	
12	2,6-Dinitrotoluene	SW8270C	10	330	5	1000
13	2-Chloronaphthalene	SW8270C	10	330		
14	2-Chlorophenol	SW8270C	10	330	1	800
15	2-methyl-4,6-Dinitrophenol	SW8270C	25	330		
16	2-Methylnaphthalene	SW8270C	10	330		36400
17	2-Methylphenol	SW8270C	10	330	1	100
18	2-Nitrolaniline	SW8270C	25	330	5	430
19	2-Nitrophenol	SW8270C	10	330	1	330
20	3,3'-Dichlorobenzidine	SW8270C	10	330	5	
21	3-Nitroaniline	SW8270C	25	330	5	500
22	4-Bromophenyl-phenyl ether	SW8270C	10	330		
23	4-Chloro-3-methylphenol	SW8270C	10	330		240
24	4-Chloroaniline	SW8270C	10	330	5	220
25	4-Chlorophenyl-phenyl ether	SW8270C	10	330		
26	4-Methylphenol	SW8270C	10	330	1	900
27	4-Nitroaniline	SW8270C	25	330	5	
28	4-Nitrophenol	SW8270C	25	330	1	100
29	Acenaphthene	SW8270C	10	330		50000
30	Acenaphthylene	SW8270C	10	330		41000
31	Anthracene	SW8270C	10	330		50000
32	Benzo(a)anthracene	SW8270C	10	330		224
33	Benzo(a)pyrene	SW8270C	10	330		61
34	Benzo(b)fluoranthene	SW8270C	10	330		1100

TABLE 7.1 (Continued)
PROJECT QUANTITATION LIMITS

	Analysis/Compound	Method	Quantitation Limits Water (ug/L)	Quantitation Limits Soil (ug/kg)	State of New York Standards Water (ug/L)	State of New York Standards Soil (ug/kg)
	Semivolatile Organics, cont.					
35	Benzo(g,h,i)perylene	SW8270C	10	330		50000
36	Benzo(k)fluoranthene	SW8270C	10	330		1100
37	bis(2-Chloroethoxy) methane	SW8270C	10	330	5	
38	bis(2-Chloroethyl) ether	SW8270C	10	330	1	
39	bis(2-ethylhexyl)phthalate	SW8270C	10	330	5	50000
40	Butylbenzylphthalate	SW8270C	10	330		50000
41	Carbazole	SW8270C	10	330		
42	Chrysene	SW8270C	10	330		400
43	Di-n-butylphthalate	SW8270C	10	330	50	8100
44	Di-n-octylphthalate	SW8270C	10	330		50000
45	Dibenz(a,h)anthracene	SW8270C	10	330		14
46	Dibenzofuran	SW8270C	10	330		6200
47	Diethylphthalate	SW8270C	10	330		7100
48	Dimethylphthalate	SW8270C	10	330		2000
49	Fluoranthene	SW8270C	10	330		50000
50	Fluorene	SW8270C	10	330		50000
51	Hexachlorobenzene	SW8270C	NA (8081A)	330		410
52	Hexachlorobutadiene	SW8270C	10	330	0.5	
53	Hexachlorocyclopentadiene	SW8270C	10	330	5	
54	Hexachloroethane	SW8270C	10	330	5	
55	Indeno(1,2,3-cd)pyrene	SW8270C	10	330		3200
56	Isophorone	SW8270C	10	330		4400
57	N-Nitroso-di-n-propylamine	SW8270C	10	330		
58	N-nitrosodiphenylamine	SW8270C	10	330		
59	Naphthalene	SW8270C	10	330		13000
60	Nitrobenzene	SW8270C	10	330	0.4	200
61	Pentachlorophenol	SW8270C	25	330	1	1000
62	Phenanthrene	SW8270C	10	330		50000
63	Phenol	SW8270C	10	330	1	30
64	Pyrene	SW8270C	10	330		50000

TABLE 7.1 (Continued)
PROJECT QUANTITATION LIMITS

Analysis/Compound	Method	Estimated Quantitation Limits		State of New York Standards	
		Water (ug/L)	Soil (ug/kg)	Water (ug/L)	Soil (ug/kg)
PCBs					
1 Aroclor-1016	SW8082	1.0	33	0.09	1000
2 Aroclor-1221	SW8082	2.0	33	0.09	1000
3 Aroclor-1232	SW8082	1.0	33	0.09	1000
4 Aroclor-1242	SW8082	1.0	33	0.09	1000
5 Aroclor-1248	SW8082	1.0	33	0.09	1000
6 Aroclor-1254	SW8082	1.0	33	0.09	1000
7 Aroclor-1260	SW8082	1.0	33	0.09	1000
Metals		(mg/L)	(mg/kg)	(mg/L)	(mg/kg)
1 Antimony	SW6010B	0.006	5.0	0.003	
2 Arsenic	SW6010B	0.01	1	0.025	7.5
3 Barium	SW6010B	0.01	1	1	300
4 Beryllium	SW6010B	0.005	0.5	0.003	0.16
5 Cadmium	SW6010B	0.005	0.5	0.005	1
6 Chromium	SW6010B	0.01	1	0.05	10
7 Copper	SW6010B	0.03	2.5	0.2	25
8 Lead	SW6010B	0.01	0.5	0.025	400[(c)]
9 Mercury	SW7470A/7471A	0.0002	0.01	0.0007	0.1
10 Nickel	SW6010B	0.04	4	0.1	13
11 Selenium	SW6010B	0.01	1	0.01	2
12 Silver	SW6010B	0.01	1	0.05	
13 Thallium	SW7841	0.002	1	0.0005	
14 Zinc	SW6010B	0.02	2	2	20
*15 Vanadium	SW6010B	0.05	1	0.0005	150
*16 Cobalt	SW6010B	0.05	1		30
*17 Aluminum	SW6010B	0.2	20		
*18 Calcium	SW6010B	5	500		
*19 Iron	SW6010B	0.1	10	0.3	2000

TABLE 7.1 (Continued)
PROJECT QUANTITATION LIMITS

Analysis/Compound	Method	Estimated Quantitation Limits		State of New York Standards	
		Water (mg/L)	Soil (mg/kg)	Water (mg/L)	Soil (mg/kg)
Metals, cont.					
*20 Magnesium	SW6010B	5	500	35	
*21 Manganese	SW6010B	0.015	1.5	0.3	
*22 Potassium	SW6010B	5	500		
*23 Sodium	SW6010B	5	500	20	
*24 Cyanide	SW9010A	0.01	0.01	200	

Notes:
N/A - Not Applicable
(a) - Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations, NYSDEC, October 1993
(b) - Determination of Soil Cleanup Objectives and Cleanup Levels, NYSDEC, January 24, 1994
(c) - EPA Guidance on Residential Lead-Based Paint, Lead Contaminated Dust, and Lead Contaminated Soil, July 14, 1994

SECTION 8

DATA REDUCTION, VALIDATION, AND REPORTING

8.1 INTRODUCTION

Data collected during the field investigation will be reduced and reviewed by the laboratory QA personnel, and a report on the findings will be tabulated in a standard format. The criteria used to identify and quantify the analytes will be those specified for the applicable methods in the USEPA SW-846 and subsequent updates. The data package provided by the laboratory will contain all items specified in the USEPA SW-846 appropriate for the analyses to be performed, and be reported in standard format.

The completed copies of the Chain-of-custody records (both external and internal) accompanying each sample from time of initial bottle preparation to completion of analysis shall be attached to the analytical reports.

8.2 DATA REDUCTION

One copy of the analytical data packages and an electronic disk deliverable will be provided by the laboratory approximately 30 days after receipt of a complete sample delivery group. The hard copy and the disk deliverable will be used to generate summary tables. These tables will form the database for assessment of the site contamination condition.

The electronic deliverable format required is an ASCII comma delimited file with the fields and character lengths summarized in Table 8.1.

Each diskette deliverable must be formatted and copied using an MS-DOS operating system. To avoid transcription errors, data will be loaded directly into the ASCII format from the laboratory information management system (LIMS). If this cannot be accomplished, the consultant should be notified via letter of transmittal indicating that manual entry of data is required for a particular method of analysis. All diskette deliverables must also undergo a QC check by the laboratory before delivery. The original data, tabulations, and electronic media are stored in a secure and retrievable fashion.

The Project Manager or Task Manager will maintain close contact with the QA reviewer to ensure all non-conformance issues are acted upon prior to data manipulation and assessment routines. Once the QA review has been completed, the Project Manager may direct the Team Leaders or others to initiate and finalize the analytical data assessment.

8.3 DATA VALIDATION

Data validation will be performed in accordance with the USEPA validation guidelines for organic and inorganic data review. Validation will include the following:

- Verification of 100% of all QC sample results (both qualitative and quantitative),

Table 8.1

Field and Character Lengths for Disk Deliverable

Description	Length	Format
Field Sample ID (as shown on COC)	15	Character
Cas. No. (including -'s)	10	Character
Parameter Name	31	Character
Concentration	13	Numeric
Qualifier	4	Character
Units	8	Character
SDG	8	Character
Lab Sample ID	15	Character
Date Sampled (from COC)	D	Date
Matrix (soil/water/air)	5	Character
Method Detection Limit	13	Numeric
Method Code	8	Character
Lab Code	6	Character

- Verification of the identification of 100% of all sample results (both positive hits and non-detects),
- Recalculation of 10% of all investigative sample results, and
- Data Usability Summary Report (DUSR).

A DUSR will be prepared and reviewed by the QAO before issuance. The DUSR will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and COC procedures, and a summary assessment of precision, accuracy, representativeness, comparability, and completeness for each analytical method. A detailed assessment of each SDG will follow. For each of the organic analytical methods, the following will be assessed:

- Holding times;
- Instrument tuning;
- Instrument calibrations;
- Blank results;
- System monitoring compounds or surrogate recovery compounds (as applicable);
- Internal standard recovery results;
- MS and MSD results;
- Target compound identification;
- Chromatogram quality;
- Pesticide cleanup (if applicable);
- Compound quantitation and reported detection limits;
- System performance; and
- Results verification.

For each of the inorganic compounds, the following will be assessed:

- Holding times;
- Calibrations;
- Blank results;
- Interference check sample;
- Laboratory check samples;
- Duplicates;
- Matrix Spike;
- Furnace atomic absorption analysis QC;

- ICP serial dilutions; and
- Results verification and reported detection limits.

Based on the results of data validation, the validated analytical results reported by the laboratory will be assigned one of the following usability flags:

- "U" - Not detected at given value;
- "UJ" - Estimated not detected at given value;
- "J" - Estimated value;
- "N" – Presumptive evidence at the value given;
- "R" - Result not useable; and
- No Flag - Result accepted without qualification.

SECTION 9

INTERNAL QUALITY CONTROL CHECKS AND FREQUENCY

9.1 QUALITY ASSURANCE BATCHING

Each set of samples will be analyzed concurrently with calibration standards, method blanks, matrix spikes (MS), matrix spike duplicates (MSD) or laboratory duplicates, and QC check samples (if required by the protocol). The MS/MSD samples will be designated by the field personnel. If no MS/MSD samples have been designated, the laboratory will contact the Con Edison Project Manager for corrective action.

9.2 CALIBRATION STANDARDS AND SURROGATES

All organic standard and surrogate compounds are checked by the method of mass spectrometry for correct identification and gas chromatography for degree of purity and concentration. All standards are traceable to a source of known quality certified by the USEPA or NIST, or other similar program. When the compounds pass the identity and purity tests, they are certified for use in standard and surrogate solutions. Concentrations of the solutions are checked for accuracy before release for laboratory use. Standard solutions are replaced monthly or more frequently, based upon data indicating deterioration.

9.3 ORGANIC BLANKS AND MATRIX SPIKE

Analysis of blank samples verifies that the analytical method does not introduce contaminants or detect "false positives". The blank water can be generated by reverse osmosis and Super-Q filtration systems, or distillation of water containing $KMnO_4$. The matrix spike is generated by addition of surrogate standard to each sample.

9.4 TRIP AND FIELD BLANKS

Trip blanks and field blanks will be utilized in accordance with the specifications in Section 4. These blanks will be analyzed to provide a check on sample bottle preparation and to evaluate the possibility of atmospheric or cross contamination of the samples.

SECTION 10

QUALITY ASSURANCE PERFORMANCE AUDITS AND SYSTEM AUDITS

10.1 INTRODUCTION

Quality assurance audits may be performed by the project quality assurance group under the direction and approval of the project Quality Assurance Officer (QAO). These audits will be implemented to evaluate the capability and performance of project and subcontractor personnel, items, activities, and documentation of the measurement system(s). Functioning as an independent body and reporting directly to corporate quality assurance management, the QAO may plan, schedule, and approve system and performance audits based upon procedures customized to the project requirements. At times, the QAO may request additional personnel with specific expertise from company and/or project groups to assist in conducting performance audits. However, these personnel will not have responsibility for the project work associated with the performance audit.

10.2 SYSTEM AUDITS

System audits may be performed by the QAO or designated auditors, and encompass a qualitative evaluation of measurement system components to ascertain their appropriate selection and application. In addition, field and laboratory quality control procedures and associated documentation may be system audited. These audits may be performed once during the performance of the project. However, if conditions adverse to quality are detected or if the Project Manager requests, additional audits may occur.

10.3 PERFORMANCE AUDITS

The laboratory may be required to conduct an analysis of Performance Evaluation (PE) samples or provide proof that Performance Evaluation samples submitted by USEPA or a state agency have been analyzed within the past twelve months.

10.4 FORMAL AUDITS

Formal audits refer to any system or performance audit that is documented and implemented by the QA group. These audits encompass documented activities performed by qualified lead auditors to a written procedure or checklists to objectively verify that quality assurance requirements have been developed, documented, and instituted in accordance with contractual and project criteria. Formal audits may be performed on project and subcontractor work at various locations.

Audit reports will be written by auditors who have performed the site audit after gathering and evaluating all data. Items, activities, and documents determined by lead auditors to be in noncompliance shall be identified at exit interviews conducted with the involved management.

Noncompliances will be logged, and documented through audit findings which are attached to and are a part of the integral audit report. These audit finding forms are directed to management to satisfactorily resolve the noncompliance in a specified and timely manner.

The Project Manager has overall responsibility to ensure that all corrective actions necessary to resolve audit findings are acted upon promptly and satisfactorily. Audit reports must be submitted to the Project Manager within fifteen days of completion of the audit. Serious deficiencies will be reported to the Project Manager within 24 hours. All audit checklists, audit reports, audit findings, and acceptable resolutions are approved by the QAO prior to issue. Verification of acceptable resolutions may be determined by re-audit or documented surveillance of the item or activity. Upon verification acceptance, the QAO will close out the audit report and findings.

SECTION 11

PREVENTIVE MAINTENANCE PROCEDURES AND SCHEDULES

11.1 PREVENTIVE MAINTENANCE PROCEDURES

Equipment, instruments, tools, gauges, and other items requiring preventive maintenance will be serviced in accordance with the manufacturer's specified recommendations and written procedure developed by the operators.

A list of critical spare parts will be established by the operator. These spare parts will be available for use in order to reduce the downtime. A service contract for rapid instrument repair or backup instruments may be substituted for the spare part inventory.

11.2 SCHEDULES

Written procedures will establish the schedule for servicing critical items in order to minimize the downtime of the measurement system. The laboratory will adhere to the maintenance schedule, and arrange any necessary and prompt service. Required service will be performed by qualified personnel.

11.3 RECORDS

Logs shall be established to record and control maintenance and service procedures and schedules. All maintenance records will be documented and traceable to the specific equipment, instruments, tools, and gauges. Records produced shall be reviewed, maintained, and filed by the operators at the laboratories. The QAO may audit these records to verify complete adherence to these procedures.

SECTION 12

CORRECTIVE ACTION

12.1 INTRODUCTION

The following procedures have been established to ensure that conditions adverse to quality, such as malfunctions, deficiencies, deviations, and errors, are promptly investigated, documented, evaluated, and corrected.

12.2 PROCEDURE DESCRIPTION

When a significant condition adverse to quality is noted at site, laboratory, or subcontractor location, the cause of the condition will be determined and corrective action will be taken to preclude repetition. Condition identification, cause, reference documents, and corrective action planned to be taken will be documented and reported to the QAO, Project Manager, Field Team Leader and involved contractor management, at a minimum. Implementation of corrective action is verified by documented follow-up action.

All project personnel have the responsibility, as part of the normal work duties, to promptly identify, solicit approved correction, and report conditions adverse to quality. Corrective actions will be initiated as follows:

- When predetermined acceptance standards are not attained;
- When procedure or data compiled are determined to be deficient;
- When equipment or instrumentation is found to be faulty;
- When samples and analytical test results are not clearly traceable;
- When quality assurance requirements have been violated;
- When designated approvals have been circumvented;
- As a result of system and performance audits;
- As a result of a management assessment;
- As a result of laboratory/field comparison studies; and
- As required by USEPA SW-846, and subsequent updates, or by the NYSDEC ASP.

Project management and staff, such as field investigation teams, remedial response planning personnel, and laboratory groups, monitor on-going work performance in the normal course of daily responsibilities. Work may be audited at the sites, laboratories, or contractor locations. Activities, or documents ascertained to be noncompliant with quality assurance requirements will be documented. Corrective actions will be mandated through audit finding sheets attached to the audit report. Audit findings are logged, maintained, and controlled by the Task Manager.

Personnel assigned to quality assurance functions will have the responsibility to issue and control Corrective Action Request (CAR) Forms (Figure 12.1 or similar). The CAR identifies the out-of-compliance condition, reference document(s), and recommended corrective action(s) to be administered. The CAR is issued to the personnel responsible for the affected item or activity. A copy is also submitted to the Project Manager. The individual to whom the CAR is addressed returns the requested response promptly to the QA personnel, affixing his/her signature and date to the corrective action block, after stating the cause of the conditions and corrective action to be taken. The QA personnel maintain the log for status of CARs, confirms the adequacy of the intended corrective action, and verifies its implementation. CARs will be retained in the project file for the records.

Any project personnel may identify noncompliance issues; however, the designated QA personnel are responsible for documenting, numbering, logging, and verifying the close out action. The Project Manager will be responsible for ensuring that all recommended corrective actions are implemented, documented, and approved.

FIGURE 12.1

CORRECTIVE ACTION REQUEST

Number: _____ Date: _____

TO: _____

You are hereby requested to take corrective actions indicated below and as otherwise determined by you to (a) resolve the noted condition and (b) to prevent it from recurring. Your written response is to be returned to the project quality assurance manager by _____

CONDITION:

REFERENCE DOCUMENTS:

RECOMMENDED CORRECTIVE ACTIONS:

_____	_____	_____	_____	_____	_____
Originator	Date	Approval	Date	Approval	Date

RESPONSE

CAUSE OF CONDITION

CORRECTIVE ACTION

(A) RESOLUTION

(B) PREVENTION

(C) AFFECTED DOCUMENTS

C.A. FOLLOWUP:

CORRECTIVE ACTION VERIFIED BY: _____ DATE:_____

SECTION 13

REFERENCES

USEPA, 1986. SW-846 "Test Method for Evaluating Solid Waste," dated November 1986. U.S. Environmental Protection Agency, Washington, D.C.

Taylor, J. K., 1987. Quality Assurance of Chemical Measurements. Lewis Publishers, Inc., Chelsea, Michigan

USEPA, 1987. Data Quality Objectives for Remedial Response Actions Activities: Development Process, EPA/540/G-87/003, OSWER Directive 9355.0-7- U.S. Environmental Protection Agency, Washington, D.C.

USEPA, 1992a. CLP Organics Data Review and Preliminary Review. SOP No. HW-6, Revision #8, dated January 1992. USEPA Region II.

USEPA, 1992b. Evaluation of Metals Data for the Contract Laboratory Program (CLP) based on SOW 3/90. SOP No. HW-2, Revision XI, dated January 1992. USEPA Region II.

APPENDIX D

HEALTH AND SAFETY PLAN

APPENDIX D

HEALTH AND SAFETY PLAN FOR THE SITE CHARACTERIZATION OF THE EAST 99TH STREET WORKS SITE

Prepared For:

Consolidated Edison Company of New York, Inc.

31-01 20th Avenue
Long Island City, NY 11105

Prepared By:

PARSONS

Liverpool, New York 13088

NOVEMBER 2004

LIST OF TABLES

LIST OF APPENDICES

HEALTH AND SAFETY PLAN SUMMARY

EMERGENCY CONTACTS

Emergency contacts are listed on Table 1.

EMERGENCY PROCEDURES

Emergency procedures are described in Section 6.

SITE SPECIFIC HAZARDS AND TRAINING

Site Specific Hazards are described in Section 2.

The Site Safety Officer will be responsible for providing site-specific training to all personnel that work at the site. This training will cover the following topics:

- Names of personnel responsible for site safety and health.
- Safety, health, and other hazards at the site.
- Proper use of personal protective equipment.
- Work practices by which the employee can minimize risk from hazards.
- Acute effects of compounds at the site.
- Decontamination procedures.

Personnel will be required to sign and date the Site-Specific Training Form provided in Attachment B prior to working on-site.

GENERAL HEALTH AND SAFETY REQUIREMENTS

Personnel will be required to sign and date the Plan Acceptance Form provided in Attachment B prior to working on-site.

Personnel Protective Equipment

Level D protection will be worn for initial entry on-site and for all activities except as noted in Section 3. Level D protection will consist of:

- Standard work clothes
- Steel-toe safety boots
- Safety glasses or goggles must be worn when splash hazard is present
- Disposable PVC or nitrile gloves must be worn during all sampling activities and fresh gloves will be donned before the collection of each new sample

TABLE 1

EMERGENCY CONTACTS
EAST 99TH STREET WORKS SITE

In the event of any situation or unplanned occurrence requiring assistance, the appropriate contact(s) should be made from the list below. For emergency situations, contact should first be made with the field team leader (or designee) who will notify emergency personnel who will then contact the appropriate response teams. This emergency contacts list must be in an easily accessible location at the site.

Emergency Contacts	**Phone Number**
Mr. Charles Leary (Con Edison)	(718) 204-4347 – office
	(917) 380-6302 - pager
Mr. Eddy Louie (Con Edison)	(718) 204-4262 – office
	(917) 616-1529 - pager
Contingency Contacts	
Fire Department:	911
Police:	911
New York City/Long Island One Call Center (3 day notice required for utility markouts)	(800) 272-4480
Poison Control Center:	(800) 222-1222
Consultant's Contract Physician:	TBD
Pollution Toxic Chemical Oil Spills:	(800) 424-8802
Medical Emergency	
Ambulance Service:	911
Hospital Name:	Metropolitan Hospital

TABLE 1 cont.

EMERGENCY CONTACTS
EAST 99TH STREET WORKS SITE

Hospital Phone Number:	212-230-6262
Hospital Address:	1901 1st Ave, New York, NY
Route to Hospital:	Entrance to Metropolitan Hospital is on East 97th Street
Travel Time From Site:	1 minute
Parsons Project Contacts	
Project Manager: Megan Miller	(315) 451-9560 - office
	(315) 569-1020 - mobile
Office H& S Officer: William Bradford	(315) 451-9560 - office

TABLE 2

SUMMARY OF ACTION LEVELS AND RESTRICTIONS

Conditions for Level D:

All areas

- PID readings <1 ppm, and
- Cyanide readings < 5 mg/m^3

Conditions for Level C (with full-face mask respirator):

All areas

- Benzene > 5 ppm and < 25 ppm.

Conditions for Level B (or retreat):

All areas

- Benzene > 25 ppm, or
- Cyanide readings > 5 mg/m^3

SECTION 1

INTRODUCTION

1.1 PURPOSE AND POLICY

The purpose of this safety plan is to establish personnel protection standards and mandatory safety practices and procedures. This plan assigns responsibilities, establishes standard operating procedures, and provides for contingencies that may arise while operations are being conducted at known or suspected hazardous waste sites.

The provisions of the plan are mandatory for all on-site personnel. Any supplemental plans used by subcontractors shall conform to this plan as a minimum. All personnel who engage in project activities must be familiar with this plan, comply with its requirements, and sign the Plan Acceptance Form (Attachment B) prior to working on the site. The Plan Acceptance Form must be submitted to the consultant's Health and Safety Officer.

1.2 SITE DESCRIPTION

The Former East 99th Street Works was located between 99th and 98th Street extending eastward from Second Avenue to the Harlem River. The site previously occupied former Tax Block 1692 Lots 1 & 17 and Block 1670 Lot 1. The MGP Site previously contained four gasholders (capacities of 105,000, 500,000, 210,000, and 300,000 cubic feet), a purifying house, condenser house, retort house, meter house, engine room, office, and a coal house. Sanborn Insurance Maps of 1896 also indicate that a coal yard existed between First Avenue and Harlem River. By 1960, the property had been purchased by the City of New York, and combined to current Tax Blocks 1669 Lot 1 and Block 1691 Lot 1, at which point, the Metropolitan Hospital was built. The main hospital building encompasses the area between 99th Street and 97th Street between First and Second Avenue, and the associated Nurses Residence building currently occupies the area between 99th and 97th between First Avenue and FDR Drive. 98th Street between First and Second Avenue was removed during the construction of the hospital. No remnants of the former facility are evident at the site.

1.3 SCOPE OF WORK

The scope of work for the Site Characterization may include the following activities:

- Soil Borings/Soil Gas Sampling;
- Monitoring Well Installation; and
- Groundwater Sampling.

1.4 PROJECT TEAM ORGANIZATION

Table 1.1 describes the responsibilities of all on-site personnel associated with this project. The names of principal personnel associated with this project are:

Project Manager:	Megan A. Miller, P.E.
Consultant's H&S Officer:	Gregory Beck
Field Team Leader:	TBD
Site Safety Officer:	TBD

All personnel shall be appropriately trained in first aid and hazardous waste safety procedures, including the operating and fitting of personal protective equipment, and are experienced with the field operations planned for this site.

TABLE 1.1
ON-SITE PERSONNEL
AND RESPONSIBILITIES

PROJECT MANAGER - Assumes total control over site activities. Reports to upper-level management. Has authority to direct response operations.

Responsibilities:

- Prepares and organizes the background review of the situation, the Work Plan, the Site Safety Plan, and the field team.
- Obtains permission for site access and coordinates activities with appropriate officials.
- Ensures that the Work Plan is completed and on schedule.
- Briefs the field team on their specific assignments.
- Coordinates with the site health and safety officer to ensure that health and safety requirements are met.
- Prepares the final report and support files on the response activities.
- Serves as the liaison with public officials.

SITE SAFETY OFFICER - Advises the Project Manager on all aspects of health and safety on site. Stops work if any operation threatens worker or public health or safety.

Responsibilities:

- Ensures that all necessary Health and Safety Equipment is available on-site. Ensures that all equipment is functional.
- Periodically inspects protective clothing and equipment.
- Ensures that protective clothing and equipment are properly stored and maintained.
- Controls entry and exit at the Access Control Points.
- Coordinates health and safety program activities with the Project Safety Officer.
- Confirms each team member's suitability for work based on a physician's recommendation.
- Monitors the work parties for signs of stress, such as cold exposure, heat stress, and fatigue.
- Implements the Site Safety Plan.
- Conducts periodic inspections to determine if the Site Safety Plan is being followed.
- Enforces the "buddy" system.

TABLE 1.1 - CONTINUED
ON-SITE PERSONNEL
AND RESPONSIBILITIES

Site Safety Officer Responsibilities (continued)

- Knows emergency procedures, evacuation routes, and the telephone numbers of the ambulance, local hospital, poison control center, fire department, and police department.
- Notifies, when necessary, local public emergency officials.
- Coordinates emergency medical care.
- Sets up decontamination lines and the decontamination solutions appropriate for the type of chemical contamination on the site.
- Controls the decontamination of all equipment, personnel, and samples from the contaminated areas.
- Assures proper disposal of contaminated clothing and materials.
- Ensures that all required equipment is available.
- Advises medical personnel of potential exposures and consequences.
- Notifies emergency response personnel by telephone or radio in the event of an emergency.

FIELD TEAM LEADER - Advises the Project Manager on all aspects of health and safety on site. Stops work if any operation threatens worker or public health or safety. Is directly responsible for the field team and the safety of site operations.

Responsibilities:

- Manages field operations.
- Executes the Work Plan and schedule.
- Enforces safety procedures.
- Coordinates with the Site Safety Officer in determining protection level.
- Enforces site control.
- Documents field activities and sample collection.
- Serves as a liaison with public officials.

WORK TEAM - Drillers, samplers. The work party must consist of at least two people.

Responsibilities:

- Safely completes the on-site tasks required to fulfill the Work Plan.
- Complies with Site Safety Plan.

- Notifies Site Safety Officer or supervisor of suspected unsafe conditions.

SECTION 2

RISK ANALYSIS

2.1 CHEMICAL HAZARDS

Potential contaminants which may be encountered while conducting intrusive activities at the Site include volatile organic compounds (VOCs), polycyclic aromatic hydrocarbons (PAHs), PCBs, cyanide, and metals. Some relevant properties of these compounds are shown in Table 2.1.

Of the listed volatile chemicals, benzene has the lowest Permissible Exposure Limit (PEL) as set by OSHA and hence sets the action limit for monitoring with a Photoionization Detector (PID). PAHs could pose significant health threats if ingested or inhaled as a dust. Onsite personnel will make efforts to avoid activities that could generate potentially contaminated dust, and work upwind of soils and groundwater during excavation activities. The metals potentially present in the site soils are unlikely to become airborne because of their low vapor pressures and moist conditions under which they are expected to be encountered.

In addition to the compounds detected onsite, some of the solvents used in decontamination of equipment are potentially hazardous to human health if they are not used properly. Material Safety Data Sheets for substances that will be used on site and a select number of site contaminants are included in Attachment C.

2.2 RADIATION HAZARDS

No radiation hazards are known or expected at the site.

2.3 PHYSICAL HAZARDS

2.3.1 Explosion

No explosion hazards are expected for the scope of work at this site.

2.3.2 Flora and Fauna

The flora and fauna of the site may present hazards of poison ivy, poison oak, ticks, fleas, mosquitos, wasps, spiders, and sakes. Personnel shall avoid contact with poisonous plants, cover arms and hands, and frequently wash potentially exposed skin. Mosquito and tick repellant should be used in infested areas, and pant legs should be tucked into boots.

2.3.3 Slips, Trips, and Falls

The wok area presents slip, trip, and fall hazards from scattered debris and irregular walking surfaces. Freezing weather hazards include frozen, slick, and irregular walking surfaces. Rainy weather may cause wet, muddy, slick walking surfaces and unstable soil.

2.3.4 Electrocution

All drilling equipment will be kept a safe distance from live sources of electricity. Drill rods and other metal objects will not be raised above the height of the rig. The length of drill rods will be less than the distance to the nearest live electrical source so if the drill string is dropped it cannot fall across electrified equipment. All subsurface and overhead electrical sources and lines will be identified before digging, drilling, or sampling activities commence. Where possible and/or practical, electric lines and sources will be deactivated or insulated before digging, drilling, or sampling activities are commenced.

2.3.5 Poor Ventilation

Some drilling and sampling may be conducted in basement areas. Engineering controls (fans or blowers) will be employed to assure the circulation of fresh air.

2.3.6 Heat Stress

The use of Level C protective equipment, or greater, may create heat stress. Monitoring of personnel wearing personal protective clothing should commence when the ambient temperature is 72°F or above. Table 2.2 presents the suggested frequency for such monitoring. Monitoring frequency should increase as ambient temperature increases or as slow recovery rates are observed. Refer to the Table 2.3 below to assist in assessing when the risk for heat related illness is likely. To use this table, the ambient temperature and relative humidity must be obtained (a regional weather report should suffice). Heat stress monitoring should be performed by the Site Health and Safety Officer, who shall be able to recognize symptoms related to heat stress.

To monitor the workers, be familiar with the following heat-related disorders and their symptoms:

- **Prickly Heat** (Heat rash)
  - Painful, itchy red rash. Occurs during sweating, on skin covered by clothing.
- Heat Cramps
  - Painful spasm of arm, leg or abdominal muscles, during or after work.
- Heat Exhaustion

- Headache, nausea, dizziness. Cool, clammy, moist skin. Heavy sweating. Weak, fast pulse. Shallow respiration, normal temperature.

- Heat Fatigue
  - Weariness, irritability, loss of skill for fine or precision work. Decreased ability to concentrate. No loss of temperature control.
- **Heat Syncope** (Heat Collapse)
  - Fainting while standing in a hot environment.
- Heat Stroke
  - Headache, nausea, weakness, hot dry skin, fever, rapid strong pulse, rapid deep respirations, loss of consciousness, convulsions, coma. **This is a life threatening condition.**
  - Do not permit a worker to wear a semi-permeable or impermeable garment when they are showing signs or symptoms of heat-related illness.

To monitor the worker, measure:

- Heart rate. Count the radial pulse during a 30-second period as early as possible in the rest period.
  - If the heart rate exceeds 100 beats per minute at the beginning of the rest period, shorten the next work cycle by one-third and keep the rest period the same.
  - If the heart rate still exceeds 100 beats per minute at the next rest period, shorten the following work cycle by one-third. A worker cannot return to work after a rest period until their heart rate is below 100 beats per minute.
- Oral temperature. Use a clinical thermometer (3 minutes under the tongue) or similar device to measure the oral temperature at the end of the work period (before drinking).
  - If oral temperature exceeds 99.6°F (37.6°C), shorten the next work cycle by one-third without changing the rest period. A worker cannot return to work after a rest period until their oral temperature is below 99.6°F.
  - If oral temperature still exceeds 99.6°F (37.6°C) at the beginning of the next rest period, shorten the following cycle by one-third.
  - Do not permit a worker to wear a semi-permeable or impermeable garment when oral temperature exceeds 100.6°F (38.1°C).

Prevention of Heat Stress - Proper training and preventative measures will aid in averting loss of worker productivity and serious illness. Heat stress prevention is particularly important because once a person suffers from heat stroke or heat exhaustion,

that person may be predisposed to additional heat related illness. To avoid heat stress the following steps should be taken:

- Adjust work schedules.
- Mandate work slowdowns as needed.
- Perform work during cooler hours of the day if possible or at night if adequate lighting can be provided.
- Provide shelter (air-conditioned, if possible) or shaded areas to protect personnel during rest periods.
- Maintain worker's body fluids at normal levels. This is necessary to ensure that the cardiovascular system functions adequately. Daily fluid intake must approximately equal the amount of water lost in sweat, id., eight fluid ounces (0.23 liters) of water must be ingested for approximately every eight ounces (0.23 kg) of weight lost. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drunk to replace lost sweat. When heavy sweating occurs, encourage the worker to drink more. The following strategies may be useful:
  - Maintain water temperature 50° to 60°F (10° to 16.6°C).
  - Provide small disposal cups that hold about four ounces (0.1 liter).
  - Have workers drink 16 ounces (0.5 liters) of fluid (preferably water or dilute drinks) before beginning work.
  - Urge workers to drink a cup or two every 15 to 20 minutes, or at each monitoring break. A total of 1 to 1.6 gallons (4 to 6 liters) of fluid per day are recommended, but more may be necessary to maintain body weight.
- Train workers to recognize the symptoms of heat related illness.

2.3.7 Cold-Related Illness

If work on this project begins in the winter months, thermal injury due to cold exposure can become a problem for field personnel. Systemic cold exposure is referred to as hypothermia. Local cold exposure is generally called frostbite.

Hypothermia - Hypothermia is defined as a decrease in the patient core temperature below 96°F. The body temperature is normally maintained by a combination of central (brain and spinal cord) and peripheral (skin and muscle) activity. Interference with any of these mechanisms can result in hypothermia, even in the absence of what normally is considered a "cold" ambient temperature. Symptoms of hypothermia include: shivering, apathy, listlessness, sleepiness, and unconsciousness.

Frostbite - Frostbite is both a general and medical term given to areas of local cold injury. Unlike systemic hypothermia, frostbite rarely occurs unless the ambient

temperatures are less than freezing and usually less than 20°F. Symptoms of frostbite are: a sudden blanching or whitening of the skin; the skin has a waxy or white appearance and is firm to the touch; tissues are cold, pale, and solid.

Prevention of Cold-Related Illness - To prevent cold-related illness:

- Educate workers to recognize the symptoms of frostbite and hypothermia
- Identify and limit known risk factors:
- Assure the availability of enclosed, heated environment on or adjacent to the site.
- Assure the availability of dry changes of clothing.
- Assure the availability of warm drinks.
- Start (oral) temperature recording at the job site:
  - At the Field Team Leader's discretion when suspicion is based on changes in a worker's performance or mental status.
  - At a worker's request.
  - As a screening measure, two times per shift, under unusually hazardous conditions (e.g., wind-chill less than 20°F, or wind-chill less than 30°F with precipitation).
  - As a screening measure whenever any one worker on the site develops hypothermia.

Any person developing moderate hypothermia (a core temperature of 92°F) cannot return to work for 48 hours.

2.4 TASK HAZARD ANALYSIS

2.4.1 Soil Borings and Monitoring Well Installation

Excavation and drilling activities associated with these tasks are inherently dangerous. Prior to beginning the field investigation work, Dig Safely New York (800-272-4480) will be contacted for a utility mark-out as required by New York State Code 753. No drilling will be conducted until the following minimum requirements have been met:

- The Parsons Project Manager and/or field team leader have thoroughly inspected the drilling location and surrounding area for the Code 753 mark-out and the location is clear of marked utilities;
- All drilling locations have been M-scoped by Con Edison, or a private utility locating contractor has performed a below ground survey (e.g., ground penetrating radar);

- All drilling locations have been cleared with a metal detector by Parsons;
- Utility plates for the site and surrounding area have been provided to Parsons by Con Edison's Construction Management staff and reviewed;
- Parsons has met with and reviewed all of the drilling locations with a facility representative, a Con Edison Construction Management representative, and Con Edison's Project Manager, and verified that all drilling locations have been M-scoped and marked; and
- Each drilling location has either been hand-augered to a minimum depth of 5 feet, or a 4-foot by 4-foot test pit has been conducted to a minimum depth of 5 feet, as determined by Con Edison during the site inspection.

A utility clearance checklist (Attachment D) will be completed for each drilling program. Additional utility clearance measures may be required based on the site inspection and/or Con Edison requirements.

Chemical exposure may also occur as drill cuttings are handled, split spoon samples are taken, or CO levels increase in poor ventilation areas. Activities will be conducted in Level D, but personnel should be prepared to upgrade to Level C when pockets of contaminants are brought to the surface and breathing zone air becomes contaminated.

If evidence of historic contamination is encountered during test boring installation or drilling (such as oily materials, high PID readings, etc.), work will be stopped and the Con Edison emergency contacts listed in Table 1 of this HASP will be immediately notified.

2.4.2 Groundwater Sampling

Sampling monitoring wells involves the transfer of potentially contaminated water to sample vials. Care shall be taken to avoid contact of sample water with skin. Sampling shall be performed with latex gloves and standard Level D protection. Gloves will be changed between sample locations and if the gloves become soiled.

TABLE 2.1
RELEVANT PROPERTIES OF VOLATILES AND SEMIVOLATILES KNOWN OR SUSPECTED AT THE FORMER EAST 99TH STREET WORKS SITE

Compound (Synonym)	OSHA PEL(1) (ppm)	IDLH (ppm)	LEL (%)	Odor Threshold(2) (ppm)	Odor Character	Vapor Pressure (mm Hg)	Physical State	Detectable w/ 10.6 eV lamp PID (I.P. eV)
Benzene	1 5 [STEL]	500 [Ca]	1.2	119	Aromatic, sweet	75	Flammable Liquid	Yes (9.24)
o-,m-, p- Xylenes	100 150 [STEL]	900	0.9	20	Aromatic	7,9,9	Flammable Liquid vapor	Yes (8.4-8.6)
Toluene	200 300 [CEIL]	500	1.1	37	Sweet, pungent Benzene-like	20	Flammable Liquid vapor	Yes (8.82)
Ethyl Benzene	100 125 [TLV-STEL]	800	0.8	0.6	Oily Solvent	10	Flammable Liquid	Yes (8.76)

(1) 29 CFR 1910, June 30, 1993 (8-hour Time weighted average unless otherwise specified.)

(2) ACGIH 1989 Highest reported value of acceptable odor threshold range.

[IDLH] Immediately dangerous to life or health.
[CA] Suspect carcinogen - Minimize all possible exposures.
[STEL] 15 minute Short Term Exposure Limit
[SKIN] Designates that skin is an important possible route of exposure.
[CEIL] Ceiling Limit - not to de exceeded at any time during a work day.
[TLV] Threshold Limit Value.

TABLE 2.1 (CONTINUED)
RELEVANT PROPERTIES OF VOLATILES AND SEMIVOLATILES KNOWN OR SUSPECTED AT THE FORMER EAST 99TH STREET WORKS SITE

Compound (Synonym)	OSHA PEL(1) (ppm)	IDLH (ppm)	LEL (%)	Odor Threshold(2) (ppm)	Odor Character	Vapor Pressure (mm Hg)	Physical State	Detectable w/ 10.6 eV lamp PID (I.P.)
Naphthalene	10 15 [TLV-STEL]	250	0.9	0.64	Mothballs/ Tar/ Creosote	0.08	Combustible Solid	Yes (8.12)
Polynuclear Aromatic Hydrocarbons (PAH's)	0.2 mg/m^3	80 mg/m^3 [Ca]	varies	varies	varies	very low	Combustible Solid	No (?)
Cyanide	5.0 mg/m^3 [STEL] [SKIN]	50	5.6	5	Bitter almond	630	Flammable Liquid	No (13.6) (Draeger Tube)

(1) 29 CFR 1910, June 30, 1993 (8-hour Time weighted average unless otherwise specified.)
(2) ACGIH 1989 Highest reported value of acceptable odor threshold range.
[IDLH] Immediately dangerous to life or health.
[CA] Suspect carcinogen - Minimize all possible exposures.
[STEL] 15 minute Short Term Exposure Limit
[SKIN] Designates that skin is an important possible route of exposure.
[TLV] Threshold Limit Value

Table 2.2
Suggested Frequency of Physiological Monitoring
For Fit and Acclimated Workers[A]

Adjusted Temperature[b]	Normal Work Ensemble[c]	Impermeable Ensemble
90°F or above (32.2°C) or above	After each 45 min. of work	After each 15 min. of work
87.5°F (30.8°-32.2°C)	After each 60 min. of work	After each 30 min. of work
82.5°-87.5°F (28.1°-30.8°C)	After each 90 min. of work	After each 60 min. of work
77.5°-82.5°F (25.3°-28.1°C)	After each 120 min. of work	After each 90 min. of work
72.5°-77.5°F (22.5°-25.3°C)	After each 150 min. of work	After each 120 min. of work

a For work levels of 250 kilocalories/hour.

b Calculate the adjusted air temperature (ta adj) by using this equation: ta adj ^{o}F = ta ^{o}F + (13 x % sunshine). Measure air temperature (ta) with a standard mercury-in-glass thermometer, with the bulb shielded from radiant heat. Estimate percent sunshine by judging what percent time the sun is not covered by clouds that are thick enough to produce a shadow. (100 percent sunshine = no cloud cover and a sharp, distinct shadow; 0 percent sunshine = no shadows.)

c A normal work ensemble consists of cotton coveralls or other cotton clothing with long sleeves and pants.

Table 2.3 - HEAT INDEX

ENVIRONMENTAL TEMPERATURE (Fahrenheit)

RELATIVE HUMIDITY	70	75	80	85	90	95	100	105	110	115	120
	APPARENT TEMPERATURE*										
0%	64	69	73	78	83	87	91	95	99	103	107
10%	65	70	75	80	85	90	95	100	105	111	116
20%	66	72	77	82	87	93	99	105	112	120	130
30%	67	73	78	84	90	96	104	113	123	135	148
40%	68	74	79	86	93	101	110	123	137	151	
50%	69	75	81	88	96	107	120	135	150		
60%	70	76	82	90	100	114	132	149			
70%	70	77	85	93	106	124	144				
80%	71	78	86	97	113	136					
90%	71	79	88	102	122						
100%	72	80	91	108							

*Combined Index of Heat and Humidity...what it "feels like" to the body
Source: National Oceanic and Atmospheric Administration

How to use Heat Index:
1. Across top locate Environmental Temperature
2. Down left side locate Relative Humidity
3. Follow across and down to find Apparent Temperature
4. Determine Heat Stress Risk on chart at right

Note: Exposure to full sunshine can increase Heat Index values by up to 15 degrees F.

Apparent Temperature	Heat Stress Risk with Physical Activity and/or Prolonged Exposure
90-105	Heat Cramps or Heat Exhaustion Possible
105-130	Heat Cramps or Heat Exhaustion Likely, Heat Stroke Possible
>130	Heatstroke Highly Likely

SECTION 3

PERSONNEL PROTECTION AND MONITORING

3.1 MEDICAL SURVEILLANCE

Parsons will use the services of a licensed occupational health physician who is familiar with the hazards associated with the project to provide the medical examinations and surveillance specified herein.

Personnel involved in this operation have undergone medical surveillance prior to employment, and thereafter at 12-month intervals. The 12 month medical examination includes a complete medical and work history and a standard occupational physical, examination of all major organ systems, complete blood count with differential (CBC), and a SMAC/23 blood chemistry screen which includes calcium, phosphorous, glucose, uric acid, BUN, creatinine, albumin, SGPT, SGOT, LDH, globulin, A/G ratio, alkaline phosphatase, total protein, total bilirubin, triglyceride, cholesterol, and a creatinine/BUN ratio. Additionally a pulmonary function test will be performed by trained personnel to record Forced Vital Capacity (FVC) and Forced Expiratory Volume in second ($FEV_{1.0}$). An audiogram and visual acuity measurement, including color perception, is provided. The medical exam is performed under the direction of a licensed Occupational Health Physician. A medical certification as to the fitness or unfitness for employment on hazardous waste projects, or any restrictions on his/her utilization that may be indicated, is provided by the physician. This evaluation will be repeated as indicated by substandard performance or evidence of particular stress that is evident by injury or time loss illness on the part of any worker.

3.2 OSHA TRAINING

All on-site personnel who will be actively involved in the field investigation activities must have completed hazardous waste operations-related training, as required by OSHA Regulations 29 CFR 1910.120. Personnel who completed this training more than 12 months prior to the start of the project must have completed an 8-hour refresher course within the past 12 months. Documentation of OSHA training for project personnel must be provided to Con Edison prior to starting work.

3.3 SITE-SPECIFIC TRAINING

The Site Safety Officer will be responsible for developing a site-specific occupational hazard training program and providing training to all personnel that are to work at the site. This training will be conducted prior to starting fieldwork and will consist of the following topics:

- Names of personnel responsible for site safety and health.
- Safety, health, and other hazards at the site.
- Proper use of personal protective equipment.
- Requirements of this HASP.
- Work practices by which the employee can minimize risk from hazards. This may include a specific review of heavy equipment safety, safety during inclement weather, changes in common escape rendezvous point, site security measures, or other site-specific issues that need to be addressed before work begins.
- Safe use of engineering controls and equipment on the site.
- Acute effects of compounds at the site.
- Decontamination procedures.

Upon completion of site-specific training, workers will sign the Site-Specific-Training Form provided in Attachment B. A representative from Con Edison will be present during the site-specific training. A copy of the completed Site-Specific Training Form will be provided to Con Edison.

3.4 MONITORING REQUIREMENTS

Air monitoring of the worker breathing zone will be conducted continuously during all intrusive activities. Organic vapors will be monitored with a photoionization detector (PID) such as the RaeSystems MiniRae 2000, equipped with a 10.6 eV lamp. Background PID levels will be taken initially upwind from planned site activities. If, during site activities, sustained PID readings reach 1 ppm above background levels (and are sustained for 15 minutes), the field technician will then call up the correction factor for benzene from the instruments memory and measure for benzene. If benzene is present between 1 and 5 ppm, then all personnel will upgrade to Level C personal protective gear with a half mask respirator. In addition, if sustained readings for total VOCs reach 25 ppm, then all personnel will upgrade to Level C personal protective gear with a half-mask respirator. If Benzene levels are greater than 5 ppm and less than 25 ppm, all personnel will upgrade to the use of a full mask respirator. If Benzene is greater than 25 ppm, personnel will immediately retreat to an up-wind location and consult with the Site Safety Officer to discuss whether to (1) don Level B protection and continue work or (2) wait until the concentration of volatile organics falls below the established action levels for Level B work.

In addition, monitoring during intrusive activities will incorporate the use of cyanide color detector tubes taken at least once every hour. Cyanide color detector tube readings of 5 mg/m^3 or greater shall be cause for employee retreat and/or upgrade to Level B personal protective equipment as determined by the Site Safety Officer.

For soil borings to be advanced within the on-site building, measures will be taken to mitigate dust, odors, and vapor generation. Adequate ventilation will be provided as necessary to reduce potential exposure via inhalation of dust and/or vapors from the subsurface and exhaust from the drilling equipment. Drilling equipment used within the building will be electric-powered. No gasoline-powered equipment will be used within the building. If possible, indoor drilling activities will be conducted at times of minimal occupancy to reduce the disturbance to building operations and the building's HVAC system will be shut down during drilling activities as the system could rapidly spread dust and vapors throughout the building. If necessary, screening, logging, and sampling of soils will be conducted outside the building.

The area around each drilling location will be isolated to the extent possible by closing doors to other rooms while leaving open all windows and doors to the outside (if any) during work within the isolated work zone. Where simple ventilation measures are inadequate, the work area will be directly ventilated to the outside via a blower and flexible ductwork. The blower will be placed immediately adjacent to the boring to maximize intake of dust and vapors, and the ductwork will run to the nearest (or most suitable) discharge point (window, door, or other opening to the outside). Polyethylene tarps or other covers may be used to protect the materials stored in the vicinity of the work area.

The boring may be temporarily covered while active drilling is not taking place. Each boring advanced within the building will be abandoned as quickly as possible upon completion. Indoor borings will be completed and grouted in the same day. Fugitive dust migration from the ventilation activities will be monitored in conjunction with the community air monitoring activities.

Air monitoring will be performed during all work within the on-site building. VOCs will be monitored with a PID with an action level of 1 ppm, based on the potential presence of benzene in the subsurface. If the action level is exceeded work will cease and the borehole will be grouted immediately with bentonite.

Should visible dust emissions occur in potentially impacted areas, real time aerosol monitoring or upgrading to Level C may be warranted for affected personnel.

3.5 SUMMARY OF ACTION LEVELS AND RESTRICTIONS

Conditions for Level D:

All areas

- PID readings < 1 ppm, and
- Cyanide readings < 5 mg/m^3

Conditions for Level C (with full-face mask respirator):

All areas

- Benzene > 5 ppm and < 25 ppm.

Conditions for Level B (or retreat):

All areas

- Benzene > 25 ppm, or
- Cyanide readings > 5 mg/m^3

3.5.1 Level D

Level D protection will be worn for initial entry on-site and initially for all activities. Level D protection will consist of:

- Standard work clothes
- Steel-toe safety boots
- Safety glasses (goggles must be worn when splash hazard is present)
- Nitrile outer gloves and PVC inner gloves must be worn during all activities requiring contact with soils.
- Hard hat (must be worn during all site activities)

3.5.2 Level C

The level of personal protection will be upgraded to Level C if the concentration of volatile organic compounds which can be detected with a photoionization detector (PID) in the breathing zone equals or exceeds the specified action limits and the contaminants of concern have characteristic warning properties appropriate for air purifying respirators (e.g. taste, odor). Level C protection will consist of the following equipment:

- Full-face mask air-purifying respirator
- Combination HEPA filter/organic vapor cartridges
- Tyvek coveralls if particulate hazards only are present, poly-coated Tyvek coveralls if liquid hazards are present.
- Steel-toe safety boots
- Nitrile outer gloves and PVC inner gloves must be worn during all activities requiring contact with soils.
- Hard hat (must be worn during all site activities)

Cartridges will be disposed at the end of each day's use.

3.5.3 Level B (Retreat)

If the concentration of volatile organics or cyanide equals or exceeds the specified action levels, all field personnel associated with the project will immediately retreat to a location up-wind of the source of contamination. At this point the Site Safety Officer must consult with Con Edison to discuss appropriate actions.

3.5.4 OSHA Requirements for Personal Protective Equipment

All personal protective equipment used during the course of this field investigation must meet the following OSHA standards:

Type of Protection	Regulation	Source
Eye and Face	29 CFR 1910.133 29 CFR 1926.102	ANSI Z87.1-1968
Respiratory	29 CFR 1910.134 29 CFR 1926.103	ANSI Z88.1-1980
Head	29 CFR 1910.135 29 CFR 1926.100	ANSI Z89.1-1969
Type of Protection	**Regulation**	**Source**
Foot	29 CFR 1910.136 29 CFR 1926.96	ANSI Z41.1-1967

ANSI = American National Standards Institute

Both the respirator and cartridges specified for use in Level C protection must be fit-tested prior to use in accordance with OSHA regulations (29 CFR 1910.1025; 29 CFR 1910.134).

Based on performance criteria of Air purifying respirators, they cannot be worn under the following conditions:

- Oxygen deficiency;
- IDLH concentrations;
- High relative humidity; and
- If contaminant levels exceed designated use concentrations.

In addition to the PPE described above, Cyanide antidote kits will be available for each person working within the hot zone.

SECTION 4

WORK ZONES AND DECONTAMINATION

4.1 SITE WORK ZONES

To reduce the spread of hazardous materials by workers from the contaminated areas to the clean areas, work zones will be delineated at the site. The flow of personnel between the zones should be controlled. The establishment of the work zones will help ensure that personnel are properly protected against the hazards present where they are working, work activities and contamination are confined to the appropriate areas, and personnel can be located and evacuated in an emergency.

4.1.1 Hot Zone

Hot zones will be established at the site for all drilling activities; unprotected onlookers should be located 50 feet upwind of drilling or soil sampling activities. In the event that volatile organics are detected in the breathing zone as discussed in Section 3, all personnel within the hot zone must don Level C protection. Hot zones will also be established during any activity when Level C protection is established as a result of conditions discussed in Section 3.

All personnel within the hot zone will be required to use the specified level of protection. No food, drink, or smoking will be allowed in the hot or warm zones. Contact lenses and cosmetics are not permitted on-site.

4.1.2 Warm Zone

A warm zone will be established and utilized during the field activities. This zone will be established between the hot zone and the cold zone, and will include the personnel and equipment necessary for decontamination of equipment and personnel (discussed below). Personnel and equipment in the hot zone must pass through this zone before entering the cold zone. This zone should always be located upwind of the hot zone. No food or drink will be permitted in the warm zone.

4.1.3 Cold Zone

The cold zone will include the remaining areas of the job site. Break areas, operational direction and support facilities (to include supplies, equipment storage and maintenance areas) will be located in this zone. No equipment or personnel will be permitted to enter the cold zone from the hot zone without passing through the personnel or equipment decontamination station. Eating, smoking, and drinking will be allowed only in this area.

4.2 DECONTAMINATION

Generally, any water used in decontamination procedures will be placed in containers and stored on-site. Disposal procedures that may be required by site-specific conditions are described in the Field Sampling Plan.

4.2.1 Decontamination of Personnel

Decontamination of personnel will be necessary if Level C or Level B protection is used. Decontamination will not be necessary if only Level D protection is used. However, disposable gloves used during sampling activities should be removed and bagged; personnel should be encouraged to remove clothing and shower as soon as is practicable at the end of the day. All clothing should be machine-washed. All personnel will wash hands and face prior to eating and before and after using the restroom.

The following OSHA-specified procedures include steps necessary for complete decontamination prior to entry into the cold zone, and steps necessary if a worker only needs to change a respirator or respirator canister. Modification can be made to the twelve station decontamination process by the site health and safety officer depending upon the extent of contamination.

Station 1 - Segregated Equipment Drop

Deposit equipment used on the site (tools, sampling devices and containers, monitoring instruments, clipboards, etc.) on plastic drop cloths or in different containers with plastic liners. Each will be contaminated to a different degree. Segregation at the drop reduces the probability of cross-contamination.

Station 2 - Suit, Safety Boots, and Outer Glove Wash

Thoroughly wash chemically resistant suit, safety boots and outer-gloves. Scrub with long-handle, soft-bristle scrub brush and copious amounts of Simple Green/water solution. Necessary equipment includes:

- Wash tub (30 gallon or large enough for person to stand in);
- Simple Green/water solution; and
- Long-handle soft-bristle scrub brushes.

Station 3 - Suit, Safety Boots, and Outer Glove Rinse

Rinse off Simple Green/water solution using copious amounts of water. Repeat as many times as necessary. Necessary equipment includes:

- Wash tub (30 gallon or large enough for person to stand in);
- Spray unit;
- Water; and

Station 9 - Respirator Removal

Remove face-piece. Avoid touching face. Wash respirator in clean, sanitized solution, allow to dry and deposit face-piece in plastic bag. Store in clean area. Necessary equipment includes:

- Plastic bags;
- Sanitizing solution; and
- Cotton.

Station 10 - Inner-Glove Removal

Remove inner gloves and deposit in container with plastic liner. Necessary equipment includes:

- Container with plastic liner.

Station 11 - Field Wash

Wash hands and face. Necessary equipment includes:

- Water;
- Soap;
- Tables;
- Wash basins or buckets; and
- Clean towels.

Station 12 - Redress

If re-entering Hot Zone put on clean field clothes (e.g., Tyvek, gloves, etc.). Necessary equipment includes:

- Table; and
- Clothing.

4.2.2 Decontamination of Field Equipment

Field equipment decontamination procedures are described in the project Field Sampling Plan. All sampling equipment will be decontaminated with a "Simple Green" solution.

4.3 INVESTIGATION-DERIVED WASTE

All investigation-derived waste materials (PPE, decontamination waste, excess drill cuttings, and well purge/development water) will be placed in 55-gallon drums and

- Long-handle, soft-bristle scrub brushes.

Station 4 - Outer Gloves Removal

Remove the outer gloves and deposit in individually marked plastic bags. Necessary equipment includes:

- Plastic bag.

Station 5 - Canister, Air Tank, or Mask Change

If a worker leaves the hot zone to change a canister, mask or air tank, this is the last step in the decontamination procedures. The worker's canisters or tank are exchanged, new outer glove donned, and joints taped. Worker returns to duty. Otherwise the worker proceeds to Station 6. Necessary equipment includes:

- Canisters, air tanks, or mask;
- Tape; and
- Gloves.

Station 6 - Removal of Chemically Resistant Suit

With assistance of helper, remove suit. Deposit in container with plastic liner. Necessary equipment includes:

- Container with plastic liner.

Station 7 - Inner-Glove Wash

Wash inner gloves with Simple Green/water solution that will not harm skin. Repeat as many times as necessary. Necessary equipment includes:

- Simple Green/water solution;
- Wash tub; and
- Long-handle, soft-bristle brushes.

Station 8 - Inner-Glove Rinse

Rinse inner-gloves with water. Repeat as many times as necessary. Necessary equipment includes:

- Water; and
- Wash tub.

labeled appropriately. The drums will be temporarily stored as described in the Field Sampling Plan (FSP) in a secured area to be determined during the site inspection.

SECTION 5

SAMPLE SHIPMENT

5.1 ENVIRONMENTAL SAMPLES

Samples collected will be classified as environmental samples. In general, environmental samples are collected from soils or wells and are not expected to be grossly contaminated with high levels of hazardous materials.

Sample containers must have a completed sample identification tag and the outside container must be marked "Environmental Sample". The sample tag will be legibly written and completed with an indelible pencil or waterproof ink. The information will also be recorded in a log book. As a minimum, it will include:

- Exact location of sample;
- Time and date sample was collected;
- Name of sampler witnesses (if necessary);
- Project codes, sample station number, and identifying code (if applicable);
- Type of sample (if known);
- Laboratory number (if applicable); and
- Any other pertinent information.

Environmental samples will be packaged and shipped according to the following procedure:

1. Place sample container, properly identified and with a sealed lid, in a polyethylene bag, and seal bag;
2. Place sample in a fiberboard container or picnic cooler which has been lined with a large polyethylene bag;
3. Pack cooler with ice (double bagged) to maintain temperature of 4 degrees C;
4. Pack with enough noncombustible, absorbent, cushioning material to minimize the possibility of the container breaking;
5. Seal large bag; and
6. Seal or close outside container.

The appropriate side of the container must be marked "This End Up" and arrows should be drawn accordingly. No DOT marking labeling is required. No DOT shipping papers are required. There are no DOT restrictions on mode of transportation.

5.2 HAZARDOUS SAMPLES

Personnel who must complete a Hazardous Goods Airway Bill must first be DOT trained and certified every two years. Drum samples, tank samples, sludge samples, and grossly contaminated soil samples will be shipped as DOT Hazardous Materials. The shipping of samples will comply with Air Transport Association's Dangerous Goods Regulations. The designation "Flammable Liquid" or "Flammable Solid" will be used. The samples will be transported as follows:

1. Collect sample in a 16-ounce or smaller glass or polyethylene container with nonmetallic Teflon-lined screw cap. Allow sufficient air space (approximately 10% by volume) so container is not liquid full at 54 °C (130 °F). If collecting a solid material, the container plus contents should not exceed 1-pound net weight. if sampling for volatile organic analysis, fill VOA container to septum but place the VOA container inside a 16-ounce or smaller container so the required air space may be provided. large quantities, up to 3.786 liters (1 gallon), may be collected if the sample's flash point is 23 °C (75 °F) or higher. In this case, the flash point must be marked on the outside container (e.g., carton, cooler), and shipping papers should state that "Flash point is 73 °F or higher."
2. Seal sample and place in a 4-mil thick polyethylene bag, one sample per bag.
3. Place sealed bag inside a metal can with noncombustible, absorbent cushioning material (e.g., vermiculite or earth) to prevent breakage, one bag per can. Pressure-close the can and use clips, tape or other positive means to hold the lid securely.
4. Mark the can with:
    - Name and address of originator
    - "Flammable Liquid N.O.S. UN 1993"
    - (or "Flammable Solid N.O.S. UN 1325)
    - NOTE: UN numbers are now required in proper shipping names.
5. Place one or more metal cans in a strong outside container such as a picnic cooler or fiberboard box. Preservatives are not used for hazardous waste site samples.
6. Prepare for shipping:

    "Flammable Liquid, N.O.S. UN 1993" or "Flammable Solid, N.O.S. UN 1325"; "Cargo Aircraft Only (if more than 1 quart net per outside package); "Limited Quantity" or "Ltd. Qty."; "Laboratory Samples"; "Net Weight ___" or "Net Volume ___" (of hazardous contents) should be indicated on shipping papers and on outside of shipping container. "This Side Up" or "This End Up" should also be on container. Sign shipper certification.
7. Stand by for possible carrier requests to open outside containers for inspection or modify packaging. It is wise to contact carrier before packing to ascertain local

packaging requirements and not to leave area before the carrier vehicle (aircraft, truck) is on its way.

5.3 Shipping Papers

A blank shipping paper should be filled out and maintained within the driver's reach, whenever an employee carries hazardous materials in a vehicle in quantities above those allowed for Materials of Trade (MOTs). Such materials may include more than 8 gallons of the following:

- Gasoline (for use in a generator) UN1203, Guide #27;
- Methanol (for use in decontamination procedures) UN 1230, Guide #28;
- Nitric Acid (for use in decontamination procedures) UN 1760, Guide #60; and
- Hydrochloric Acid (for use in decontamination procedures) UN 1789, Guide #60.

Other materials may include the following:

- > 220 pounds of compressed Gas [Air, Compressed] (calibration gas for the PID, or Grade D breathing air for Level B work) UN 1002, Class 2.2; and
- Other hazardous materials as defined by the DOT.

Appropriate MSDSs should be maintained with the shipping papers and/or the pocket DOT Emergency Response Guidebook.

SECTION 6

ACCIDENT PREVENTION AND CONTINGENCY PLAN

6.1 ACCIDENT PREVENTION

6.1.1 Site-Specific Training

All field personnel will receive health and safety training prior to the initiation of any site activities. The site-specific training form provided in Attachment B must be signed, dated, and returned to the Site Safety Officer. On a day-to-day basis, individual personnel should be constantly alert for indicators of potentially hazardous situations and for signs and symptoms in themselves and others that warn of hazardous conditions and exposures. Rapid recognition of dangerous situations can avert an emergency. Before daily work assignments, regular meeting should be held. Discussion should include:

- Tasks to be performed;
- Time constraints (e.g., rest breaks, cartridge changes);
- Hazards that may be encountered, including their effects, how to recognize symptoms or monitor them, concentration limits, or other danger signals; and
- Emergency procedures.

6.1.2 Vehicles and Heavy Equipment

Working with large motor vehicles and heavy equipment could be a major hazard at this site. Injuries can result from equipment hitting or running over personnel, impacts from flying objects, or overturning of vehicles. Vehicle and heavy equipment design and operation will be in accordance with 29 CFR, Subpart O, 1926.600 through 1926.602. In particular, the following precautions will be utilized to help prevent injuries/accidents.

- Brakes, hydraulic lines, light signals, fire extinguishers, fluid levels, steering, tires, horn, and other safety devices will be checked at the beginning of each shift.
- Large construction motor vehicles will not be backed up unless:
  - The vehicle has a reverse signal alarm audible above the surrounding noise level; or
  - The vehicle is backed up only when an observer signals that it is safe to do so.
- Heavy equipment or motor vehicle cable will be kept free of all nonessential items, and all loose items will be secured.

- Large construction motor vehicles and heavy equipment will be provided with necessary safety equipment (such as seat belts, roll-over protection, emergency shut-off in case of roll-over, backup warning lights and audible alarms).
- Blades and buckets will be lowered to the ground and parking brakes will be set before shutting off any heavy equipment or vehicles.

6.2 SPILL CONTROL PLAN

All personnel must take every precaution to minimize the potential for spills during site operations. Any spill shall be reported immediately to the Con Edison emergency contacts listed in Table 1 of this HASP. Spill control apparatus (sorbent materials) will be located on-site. All materials used for the clean up of spills will be containerized and labeled separately from other wastes, unless otherwise directed by Con Edison.

6.3 CONTINGENCY PLAN

6.3.1 Emergency Procedures

In the event that an emergency develops on site, the procedures delineated herein are to be immediately followed. Emergency conditions are considered to exist if:

- Any member of the field crew is involved in an accident or experiences any adverse effects or symptoms of exposure while on site.
- A condition is discovered that suggests the existence of a situation more hazardous than anticipated.

General emergency procedures, and specific procedures for personal injury, chemical exposure and radiation exposure, are described below.

6.3.2 Chemical Exposure

If a member of the field crew demonstrates symptoms of chemical exposure the procedures outlined below should be followed:

- Another team member (buddy) should remove the individual from the immediate area of contamination. The buddy should communicate to the Field Team Leader (via voice and hand signals) of the chemical exposure. The Field Team Leader should contact the appropriate emergency response agency.
- Precautions should be taken to avoid exposure of other individuals to the chemical.
- If the chemical is on the individual's clothing, the chemical should be neutralized or removed if it is safe to do so.
- If the chemical has contacted the skin, the skin should be washed with copious amounts of water.
- In case of eye contact, an emergency eyewash should be used. Eyes should be washed for at least 15 minutes.

- All chemical exposure incidents must be reported in writing to the Office Health and Safety Representative. The Site Safety Officer or Field Team Leader is responsible for completing the accident report.

6.3.3 Personal Injury

In case of personal injury at the site, the following procedures should be followed:

- Another team member (buddy) should signal the Field Team Leader that an injury has occurred.
- A field team member trained in first aid can administer treatment to an injured worker.
- The victim should then be transported to the nearest hospital or medical center. If necessary, an ambulance should be called to transport the victim.
- For less severe cases, the individual can be taken to the site dispensary.
- The Field Team Leader or Site Safety Officer is responsible for making certain that an Accident Report Form is completed. This form is to be submitted to the Office Health and Safety Representative. Follow-up action should be taken to correct the situation that caused the accident.
- Any incident (near miss, property damage, first aid, medical treatment, etc.) must be reported.

A first-aid kit and blood-born pathogens kit will be kept on-site during the field activities.

6.3.4 Evacuation Procedures

- The Field Team Leader will initiate evacuation procedure by signaling to leave the site.
- All personnel in the work area should evacuate the area and meet in the common designated area.
- All personnel suspected to be in or near the contract work area should be accounted for and the whereabouts or missing persons determined immediately.
- Further instruction will then be given by the Field Team Leader.

6.3.5 Procedures Implemented in the Event of a Major Fire, Explosion, or On-Site Health Emergency Crisis

- Notify the paramedics and/or fire department, as necessary;
- Signal the evacuation procedure previously outlined and implement the entire procedure;
- Isolate the area;
- Stay upwind of any fire;

- Keep the area surrounding the problem source clear after the incident occurs;
- Complete accident report for and distribute to appropriate personnel.

6.4 COMMUNITY AIR MONITORING PLAN

Community air monitoring will be conducted in compliance with the NYSDOH's Generic Community Air Monitoring Plan (CAMP). Real-time air monitoring for volatile compounds and particulates at the perimeter of the hot zone will be performed as described below.

VOC Monitoring

Periodic monitoring for VOCs will be conducted during non-intrusive activities such as the collection of soil, sediment, and groundwater samples. Periodic monitoring may include obtaining measurements upon arrival at a location, while opening a monitoring well cap, when overturning soil, when bailing/purging a well, and upon leaving the location. In some instances, depending on the proximity of exposed individuals, continuous monitoring may be conducted during these activities.

Continuous monitoring for VOCs will be conducted during all ground intrusive activities (i.e., soil boring and monitoring well installation). Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background concentrations. VOCs will be monitored continuously at the downwind perimeter of the hot zone. Monitoring will be conducted with a PID equipped with a 10.6 eV lamp capable of calculating 15-minute running average concentrations.

- If total organic vapor levels exceed 5 ppm above background for the 15-minute average at the perimeter, work activities will be temporarily halted and monitoring continued. If levels readily decrease (per instantaneous readings) below 5 ppm above background, work activities will resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the hot zone persist at levels in excess of 5 ppm above background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps work activities will resume provided that the total organic vapor level 200 feet downwind of the hot zone or half the distance to the nearest potential receptor or residential /commercial structure, whichever is less – but in no case less than 20 feet, is below 5 ppm above background for the 15-minute average.
- If the total organic vapor level is above 25 ppm at the perimeter of the hot zone, activities will be shutdown.

All 15-minute readings will be recorded and available for NYSDEC and NYSDOH personnel to review. Instantaneous readings, if any, will also be recorded.

Particulate Monitoring

Particulate concentrations will be monitored continuously at the downwind perimeter of the hot zone with a portable real-time particulate monitor capable of measuring particulate

matter less than 10 micrometers in size and capable of integrating over a period of 15 minutes (or less). The equipment will include an audible alarm to indicate exceedence of the action level. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background concentrations.

- If the downwind particulate level is 100 micrograms per cubic meter ($\mu g/m^3$) above background for the 15-minute period or if dust is observed leaving the work area, then dust suppression techniques will be employed. Work will continue with dust suppression provided that the downwind particulate level does not exceed 150 $\mu g/m^3$ above background and no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, the downwind particulate level is greater than 150 $\mu g/m^3$ above background, work will be stopped and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind particulate level to within 150 $\mu g/m^3$ of the background (upwind) level and in preventing visible dust migration.

All readings will be recorded and be available for NYSDEC and NYSDOH personnel to review.

ATTACHMENT A

AIR MONITORING EQUIPMENT CALIBRATION AND MAINTENANCE

AIR MONITORING EQUIPMENT CALIBRATION AND MAINTENANCE

All monitoring instruments must be calibrated and maintained periodically. Calibration and on-site maintenance records will be kept in the field log book. The limitations and possible sources of errors for each instrument must be understood by the operator. It is important that the operator ensures that the instrument responds properly to the substances it was designed to monitor. Portable air quality monitoring equipment that measures total ionizables present such as the Photovac MicroTip HL-2000 (or equivalent) photoionization detector (PID) must be calibrated at least once each day. Combustible gas/oxygen meters (explosimeters) such as the MSA Model 360 monitor must be calibrated at least once a week. The specific instructions for calibration and maintenance provided for each instrument should be followed.

ATTACHMENT B

FORMS FOR HEALTH AND SAFETY-RELATED ACTIVITIES

Note: The OSHA Job Safety and Health Protection Poster must be posted prominently during field activities. The following page is an example of the poster to be used in the field. The actual poster must be an 11-inch by 17-inch size version of this page. The OSHA 300 Log of injuries and illnesses is maintained in the home office of each employee.

You Have a Right to a Safe and Healthful Workplace.

IT'S THE LAW!

- You have the right to notify your employer or OSHA about workplace hazards. You may ask OSHA to keep your name confidential.
- You have the right to request an OSHA inspection if you believe that there are unsafe and unhealthful conditions in your workplace. You or your representative may participate in the inspection.
- You can file a complaint with OSHA within 30 days of discrimination by your employer for making safety and health complaints or for exercising your rights under the *OSH Act*.
- You have a right to see OSHA citations issued to your employer. Your employer must post the citations at or near the place of the alleged violation.
- Your employer must correct workplace hazards by the date indicated on the citation and must certify that these hazards have been reduced or eliminated.
- You have the right to copies of your medical records or records of your exposure to toxic and harmful substances or conditions.
- Your employer must post this notice in your workplace.

The *Occupational Safety and Health Act of 1970 (OSH Act)*, P.L. 91-596, assures safe and healthful working conditions for working men and women throughout the Nation. The Occupational Safety and Health Administration, in the U.S. Department of Labor, has the primary responsibility for administering the *OSH Act*. The rights listed here may vary depending on the particular circumstances. To file a complaint, report an emergency, or seek OSHA advice, assistance, or products, call 1-800-321-OSHA or your nearest OSHA office: • Atlanta (404) 562-2300 • Boston (617) 565-9860 • Chicago (312) 353-2220 • Dallas (214) 767-4731 • Denver (303) 844-1600 • Kansas City (816) 426-5861 • New York (212) 337-2378 • Philadelphia (215) 861-4900 • San Francisco (415) 975-4310 • Seattle (206) 553-5930. Teletypewriter (TTY) number is 1-877-889-5627. To file a complaint online or obtain more information on OSHA federal and state programs, visit OSHA's website at **www.osha.gov**. If your workplace is in a state operating under an OSHA-approved plan, your employer must post the required state equivalent of this poster.

1-800-321-OSHA

www.osha.gov

U.S. Department of Labor • Occupational Safety and Health Administration • OSHA 3165

ACCIDENT REPORT FORM

Project Name:_____

INJURED OR ILL EMPLOYEE

1. Name _____ Social Security #_____
   (First) (Middle) (Last)
2. Home Address _____
   (No. and Street) (City or Town) (State and Zip)
3. Age _____ 4. Sex: Male ( ) Female ( )
5. Occupation _____
   (Specific job title, not the specific activity employee was performing at time of injury)
6. Department _____
   (Enter name of department in which injured person is employed, even though they may have been temporarily working in another department at the time of injury)

EMPLOYER

7. Name _____
8. Mailing Address _____
   (No. and Street) (City or Town) (State and Zip)
9. Location (if different from mailing address):_____

THE ACCIDENT OR EXPOSURE TO OCCUPATIONAL ILLNESS

10. Place of accident or exposure _____
    (No. and Street) (City or Town) (State and Zip)
11. Was place of accident or exposure on employer's premises? _(Yes/No)
12. What was the employee doing when injured?_____

(Be specific - was employee using tools or equipment or handling material?)

13. How did the accident occur? _____
    (Describe fully the events that resulted in the injury or

occupational illness. Tell what happened and how. Name objects and substances involved.

Give details on all factors that led to accident. Use separate sheet if needed)

14. Time of accident: _____
15. Date of injury or initial diagnosis of occupational illness _____
    (Date)

ACCIDENT REPORT FORM

16. WITNESS TO ACCIDENT

(Name)	(Affiliation)	(Phone No.)
(Name)	(Affiliation)	(Phone No.)
(Name)	(Affiliation)	(Phone No.)

OCCUPATIONAL INJURY OR OCCUPATIONAL ILLNESS

17. Describe the injury or illness in detail; indicate part of body affected.

18. Name the object or substance which directly injured the employee. (For example, object that struck employee; the vapor or poison inhaled or swallowed; the chemical or radiation that irritated the skin; or in cases of strains, hernias, etc., the object the employee was lifting, pulling, etc.)

19. Did the accident result in employee fatality? _____ (Yes or No)
20. Number of lost workdays ____/restricted workdays _____ resulting from injury or illness?

OTHER

21. Did you see a physician for treatment? _____ (Yes or No) _____ (Date)
22. Name and address of physician _____

(No. and Street) (City or Town) (State and Zip)

23. If hospitalized, name and address of hospital _____

(No. and Street) (City or Town) (State and Zip)

Date of report _____ Prepared by _____

Official position _____

PROJECT HEALTH AND SAFETY PLAN

AND WORK PLAN ACCEPTANCE FORM

(For _____employees only)

I have read and agree to abide by the contents of the Work Plan and Health and Safety Plan for the following project:

_____	_____
(Project Title)	(Project Number)

Furthermore, I have read and am familiar with the work plan or proposal which describes the fieldwork to be conducted and the procedures to be utilized in the conduct of this work.

Name (print)	Signature	Date

Place in project Health and Safety File as soon as possible

SITE-SPECIFIC HEALTH AND SAFETY TRAINING

(For All _____ and subcontract employees on site)

I hereby confirm that site-specific health and safety training has been conducted by the site health and safety officer which included:

- Names of personnel responsible for site safety and health
- Safety, health, and other hazards at the site
- Proper use of personal protective equipment
- Work practices by which the employee can minimize risk from hazards
- Safe use of engineering controls and equipment on the site
- Acute effects of compounds at the site
- Decontamination procedures

For the following project:

_____ _____

(Project Title) (Project Number)

Name (print)	Signature	Date

Place in project Health and Safety File as soon as possible

ATTACHMENT C

MATERIAL SAFETY DATA SHEETS

MSDS - Bentonite Granular

January 15, 2001

A. Product Information
Trade Name: Bentonite Granular
Product Use: Feed Ingredients
Emmergency Phone No: (613) 996-6666 (Canutec)

B. Preparation Information
Date Prepared: January 1996

C. Toxicological Properties
Inhalation: Lung irritation
Ingestion: Not Identified
Eyes: Eye irritation
Acute Toxicity: Not Identified
Chronic Toxicity: Not Identified
Exposure Limits: No Data
Other: Not Identified

D. Physical Data
Material: Solid *Appearance/Color:* Odorless, buff to gray powder, granules or nuggets
Odor Threshold: N/A *Boiling Point:* N/A *Freezing Point:* N/A *Melting Point:* N/I
Solubility in Water: N/I *Evaporation Rate:* N/A *Vapor Density:* N/A *Vapor Pressure:* N/A
Specific Gravity: (H20=1): 2-3 *pH:* 9 *%Volatiles by Volume:* N/I

E. Reactivity Data
Stability: Stable Incompatibility: N/A Hazardous Decomposition: N/A

F. Fire or Explosion Hazard
Conditions of Flammability: Not Flammable Hazardous Combustion Products: N/A
Upper Flammability Limit: N/A Lower Flammability: N/A Sensitivity to Mechanical Impact: N/A
Sensitivity to Static Discharge: N/A Flashpoint Method: N/A Explosion Hazard: N/A

G. Hazardous Ingredients (Mixtures Only)
Free Silica/14808-60-7 2-4.5% Concentration
Hazard Data: TLV/TWA=<0.1 mg/m3 LD50: No Data LC50: No Data

H. Preventive Measures
Personal Protective Equipment
Prespiratory Protective Equipment: Mask or approved respirator rated for free silica
Eyes/Face: High dust conditions use monogoggle. Low dust conditions use safety glasses with side and top shields
Hands/Arms/Body: Dust resistant gloves, footwear and clothing
Storage: Store in dry place
Normal Handling: Personal protective equipment as above. Keep dust minimal

Engineering Controls
Ventilation and filtration systems to keep dust to a minimum
Environmental
Degradability: Not identified Aquatic Toxicity: Not identified
Spill or Leak (Always wear personal protective equipment) - shovel into containers with WHMIS workplace label; hose away residual dust. Caution: Slippery when wet.
Waste Disposal: Bury in landfill

I. First Aid Measures
Inhalation: Remove personnel from dusty area to area with clean air. Give artificial respiration if not

breathing. Seek medical attention
Ingestion: Not identified
Skin: Wash skin with soap and water. Seek medical attention
Eyes: Remove personnel from dusty area with clean air. Immediately flush eyes with gently flowing lukewarm water for 15 minutes (timed) holding eyelids open. Seek medical attention

Disclaimer:

This information contained herein is accurate to the best of our knowledge. We do not suggest or guarantee that any hazards listed herein are the only ones which exist. Pestell Minerals & Ingredients makes no warranty of any kind, expressed or implied, concerning the safe use of this material in your process or combination with any other substances. Effects can be aggravated by other materials and/or this material may aggravate or add to the effects of other materials. This material my be released from gas, liquid or solid materials made directly or indirectly from it. user has the sole responsibility to determine the suitability of the materials for any use and the manner of use contemplated. User must meet all applicable safety and health standards.

ALDRICH CHEMICAL -- ACENAPHTHENE, 99%, 21537-6 - ACENAPHTHENE, 1,2-DIHYDRO-
MATERIAL SAFETY DATA SHEET
NSN: 681000N040297
Manufacturer's CAGE: 60928
Part No. Indicator: A
Part Number/Trade Name: ACENAPHTHENE, 99%, 21537-6

General Information

Item Name: ACENAPHTHENE, 1,2-DIHYDRO-
Company's Name: ALDRICH CHEMICAL CO
Company's P. O. Box: 355
Company's City: MILWAUKEE
Company's State: WI
Company's Country: US
Company's Zip Code: 53201
Company's Emerg Ph #: 414-273-3850
Company's Info Ph #: 414-273-3850
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 23JUL92
Safety Data Review Date: 03MAR93
MSDS Serial Number: BRZJQ
Hazard Characteristic Code: NK

Ingredients/Identity Information

Proprietary: NO
Ingredient: ACENAPHTHENE
Ingredient Sequence Number: 01
Percent: 99
NIOSH (RTECS) Number: AB1000000
CAS Number: 83-32-9

Physical/Chemical Characteristics

Appearance And Odor: PALE-YELLOW NEEDLES.
Boiling Point: 534F,279C
Melting Point: 199F,93C
Vapor Pressure (MM Hg/70 F): 10@131C
Vapor Density (Air=1): 5.32

Fire and Explosion Hazard Data

Extinguishing Media: WATER SPRAY. CARBON DIOXIDE, DRY CHEMICAL POWDER OR APPROPRIATE FOAM.
Special Fire Fighting Proc: WEAR NIOSH/MSHA APPROVED SCBA AND FULL PROTECTIVE EQUIPMENT (FP N).
Unusual Fire And Expl Hazrds: NONE SPECIFIED BY MANUFACTURER.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): NONE SPECIFIED BY MANUFACTURER.
Materials To Avoid: STRONG OXIDIZING AGENTS.
Hazardous Decomp Products: TOXIC FUMES OF: CARBON MONOXIDE, CARBON DIOXIDE.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT

Health Hazard Data

LD50-LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: ACUTE: MAY BE HARMFUL BY INHALATION, INGESTION OR SKIN ABSORPTION. CAUSES EYE AND SKIN IRRITATION. MATERIAL IS IRRITATING TO MUCOUS MEMBRANES AND UPPER RESPIRATORY TRACT. TO THE BEST OF MFR KNOWLEDGE, THE CHEMICAL, PHYSICAL, AND TOXICOLOGICAL PROPERTIES HAVE NOT BEEN THOROUGHLY INVESTIGATED.
Carcinogenicity - NTP: NO
Carcinogenicity - IARC: NO
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: NOT RELEVANT
Signs/Symptoms Of Overexp: SEE HEALTH HAZARDS.
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: EYES: IMMED FLUSH WITH COPIOUS AMOUNTS OF WATER FOR AT LEAST 15 MINUTES & SEEK MED ADVICE. SKIN: IMMED WASH SKIN WITH SOAP AND COPIOUS AMOUNTS OF WATER. WASH CONTAMINATED CLOTHING BEFORE REUSE. INHAL: REMOVE TO FRESH AIR. IF NOT BREATHING GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN. INGEST: WASH OUT MOUTH WITH WATER PROVIDED PERSON IS CONSCIOUS. CALL A PHYSICIAN.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: WEAR NIOSH/MSHA APPROVED SCBA, RUBBER BOOTS AND HEAVY RUBBER GLOVES. SWEEP UP, PLACE IN A BAG AND HOLD FOR WASTE DISPOSAL. AVOID RAISING DUST. VENTILATE AREA AND WASH SPILL SITE AFTER MATERIAL PICKUP IS COMPLETE.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: DISSOLVE/MIX MATERIAL WITH A COMBUSTIBLE SOLVENT AND BURN IN A CHEMICAL INCINERATOR EQUIPPED WITH AN AFTERBURNER AND SCRUBBER. DISPOSE OF I/A/W FEDERAL, STATE AND LOCAL REGULATIONS (FP N).
Precautions-Handling/Storing: KEEP TIGHTLY CLOSED. STORE IN A COOL DRY PLACE. AVOID CONTACT AND INHALATION. DO NOT GET IN EYES, ON SKIN/CLTHG. IRRITANT.
Other Precautions: NONE SPECIFIED BY MANUFACTURER.

Control Measures

Respiratory Protection: NIOSH/MSHA APPROVED RESPIRATOR.
Ventilation: MECHANICAL EXHAUST REQUIRED.
Protective Gloves: RUBBER GLOVES.
Eye Protection: CHEMICAL SAFETY GOGGLES.
Other Protective Equipment: SAFETY SHOWER AND EYE BATH. WEAR SUITABLE PROTECTIVE CLOTHING.
Work Hygienic Practices: WASH THOROUGHLY AFTER HANDLING.
Suppl. Safety & Health Data: NONE SPECIFIED BY MANUFACTURER.

Transportation Data

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 03MAR93
Label Date: 03MAR93
Label Status: G
Common Name: ACENAPHTHENE, 99%, 21537-6
Chronic Hazard: NO
Signal Word: CAUTION!
Acute Health Hazard-Slight: X

Contact Hazard-Slight: X
Fire Hazard-None: X
Reactivity Hazard-None: X
Special Hazard Precautions: STORE IN A COOL DRY PLACE. AVOID CONTACT AND INHALATION. DO NOT GET IN EYES, ON SKIN/CLTHG. IRRITANT. ACUTE: MAY BE HARMFUL BY INHALATION, INGESTION OR SKIN ABSORPTION. CAUSES EYE AND SKIN IRRITATION. MATERIAL IS IRRITATING TO MUCOUS MEMBRANES AND UPPER RESPIRATORY TRACT. TO THE BEST OF MFR KNOWLEDGE, THE CHEMICAL, PHYSICAL, AND TOXICOLOGICAL PROPERTIES HAVE NOT BEEN THOROUGHLY INVESTIGATED.
CHRONIC: NONE LISTED BY MANUFACTURER.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: ALDRICH CHEMICAL CO
Label P.O. Box: 355
Label City: MILWAUKEE
Label State: WI
Label Zip Code: 53201
Label Country: US
Label Emergency Number: 414-273-3850

HIGH-PURITY STANDARDS -- ARSENIC
MATERIAL SAFETY DATA SHEET
NSN: 681000N065017
Manufacturer's CAGE: 0YZE5
Part No. Indicator: A
Part Number/Trade Name: ARSENIC

General Information

Company's Name: HIGH-PURITY STANDARDS
Company's P. O. Box: 30188
Company's City: CHARLESTON
Company's State: SC
Company's Country: US
Company's Zip Code: 29417
Company's Emerg Ph #: 803-556-3411
Company's Info Ph #: 803-556-3411
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 01MAR95
Safety Data Review Date: 16OCT95
MSDS Serial Number: BZRFZ

Ingredients/Identity Information

Proprietary: NO
Ingredient: ARSENIC; (AS) (SARA 313) (CERCLA)
Ingredient Sequence Number: 01
Percent: 0.1
NIOSH (RTECS) Number: CG0525000
CAS Number: 7440-38-2
OSHA PEL: SEE 1910.1018
ACGIH TLV: 0.01 MG/M3, A1

Proprietary: NO
Ingredient: NITRIC ACID;(HNO*3) (SARA 302/313) (CERCLA)
Ingredient Sequence Number: 02
Percent: 2
NIOSH (RTECS) Number: QU5775000
CAS Number: 7697-37-2
OSHA PEL: 2 PPM
ACGIH TLV: 2 PPM/4 STEL

Proprietary: NO
Ingredient: SUP DAT: SUFFICIENT CONC CAUSES CYANOSIS. ONSET OF THIS CNDTN MAY BE DELAYED 2-4 HRS/EVEN LONGER. ARSENIC & ITS(ING 4)
Ingredient Sequence Number: 03
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 3: CMPDS CAUSE SYMP CHARACT BY CONSTRICTION OF THROAT FOLLOWED BY DYSPHAGIA, EPIGASTRIC PAIN, VOMIT & WATERY (ING 5)
Ingredient Sequence Number: 04
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 4: DIARR. BLOOD MAY APPEAR IN VOMITUS & STOOL. IF AMT INGESTED IS SUFFICIENTLY HIGH, SHOCK MAY DEVELOP DUE (ING 6)

Ingredient Sequence Number: 05
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 5: TO SEV FLUID LOSS. CONTINUED POIS BY INGEST CAN CAUSE WT LOSS, NAUS, DIARR ALTERNATING W/CONSTIPATION, (ING 7)
Ingredient Sequence Number: 06
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 6: PIGMENTATION & ERUPTION OF SKIN, LOSS OF HAIR, & PERIPHERAL NEURITIS. POLYNEURITIS MAY ALSO RESULT. (ING 8)
Ingredient Sequence Number: 07
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 7: HORIZONTAL WHITE LINES (STRIATIONS) ON FINGERNAILS & TOENAILS ARE COMMONLY SEEN W/CHRONIC EXPOS & ARE (ING 9)
Ingredient Sequence Number: 08
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 8: CONSIDERED TO BE DIAGNOSTIC ACCOMPANIMENT OF ARSENICAL POLYNEURITIS. IF ARSENIC POIS OCCURS DUE TO (ING 10)
Ingredient Sequence Number: 09
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 9: INHAL, COUGH, CHEST PAIN, DYSPNEA, HDCH & EXTREME GEN WEAK PRECEDE GI SYMP. ACUTE POIS DUE TO INHAL IS (ING 11)
Ingredient Sequence Number: 10
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 10: RARE IN INDUS, BUT CHRONIC BRTHG OF INORG ARSENIC CMPDS IS THE MOST COMMON CAUSE OF HAZ IN WORK PLACE. (ING 12)
Ingredient Sequence Number: 11
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 11: THIS CNDTN IS DIVIDED INTO 3 PHASES BASED ON DISTRESS SIGNS & SYMP: PHASE I: VICTIM DEVELOPS WEAK, LOSS (ING 13)
Ingredient Sequence Number: 12
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 12: OF APPETITE, NAUS, OCCAS VOMIT, STOM DISCOMFORT & SOME DIARR. PHASE II: CONJUNC & CATARRHAL STATE OF (ING 14)

Ingredient Sequence Number: 13
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 13: MUC MEMB OF NOSE, LARYNX & RESP PASSAGES DEVELOPS. CORYZA, HOARSENESS, & MILD TRACHEOBRONCHITIS MAY (ING 15)
Ingredient Sequence Number: 14
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 14: OCCUR. PERFORATION OF NASAL SEPTUM IS COMMON, & PROBABLY THE MOST TYPICAL LESION OF UPPER RESP TRACT IN (ING 16)
Ingredient Sequence Number: 15
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 15: OCCUP EXPOS TO ARSENIC DUST. SKIN LESIONS, ECZEMATOID & ALLERGIC IN TYPE, ARE COMMON. PHASE III: SYMPS (ING 17)
Ingredient Sequence Number: 16
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 16: OF PERIPHERAL NEURITIS, INITIALLY IN HANDS & FEET, WHICH IS ESSENTIALLY SENSORY, WILL DEVELOP. IN MORE (ING 18)
Ingredient Sequence Number: 17
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 17: SEV CASES, MOTOR PARAL WILL OCCUR. FIRST MUSCLES AFFECTED BY THIS ARE USUALLY TOE EXTENSORS & PERONEI. (ING 19)
Ingredient Sequence Number: 18
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 18: IN ONLY MOST SEV CASES WILL PARAL OF FLEXOR MUSCLES OF FEET/OF EXTENSOR MUSCLES OF HANDS OCCUR. (ING 20)
Ingredient Sequence Number: 19
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE

Proprietary: NO
Ingredient: ING 19: ARSENIC IS ALSO CONSIDERED TO BE A MUTAGEN.
Ingredient Sequence Number: 20
NIOSH (RTECS) Number: 9999999ZZ
OSHA PEL: NOT APPLICABLE
ACGIH TLV: NOT APPLICABLE
==========

Physical/Chemical Characteristics

==========
Appearance And Odor: CLEAR, COLORLESS ODORLESS SOLUTION
Boiling Point: 212F,100C

Vapor Pressure (MM Hg/70 F): N/A
Vapor Density (Air=1): N/A
Specific Gravity: 1 (H*2O=1)
Solubility In Water: COMPLETE

Fire and Explosion Hazard Data

Flash Point: N/A
Lower Explosive Limit: N/A
Upper Explosive Limit: N/A
Extinguishing Media: USE MEDIA SUITABLE FOR SURROUNDING FIRE (FP N).
Special Fire Fighting Proc: WEAR NIOSH/MSHA APPROVED SCBA & FULL PROTECTIVE EQUIPMENT (FP N).
Unusual Fire And Expl Hazrds: TOXIC GASES PRODUCED: NO, NO*2.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): METALS, HYDROXIDES, CARBONATES, CYANIDES.
Materials To Avoid: STRONG REDUCING AGENTS.
Hazardous Decomp Products: NO, NO*2.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT.

Health Hazard Data

LD50-LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES
Route Of Entry - Ingestion: NO
Health Haz Acute And Chronic: ACUTE: ARSENIC & ITS CMPDS CAN BE FATAL IF INHALED, SWALLOWED/ABSORBED THRU SKIN. PRLNG CONT RSLTS IN LOC HYPEREMIA & LATER VESICULAR/PUSTULAR ERUPTION. MOIST MUC MEMB ARE MOST SENSITIVE TO IRRITANT ACTION. CONJUNCTIVA, MOIST & MACERATED AREAS OF SKIN, EYELIDS, ANGLES OF EARS, NOSE, MOUTH & RESP (EFTS OF OVEREXP)
Carcinogenicity - NTP: YES
Carcinogenicity - IARC: YES
Carcinogenicity - OSHA: YES
Explanation Carcinogenicity: ARSENIC: IARC MONO, SUPP, VOL 7, PG 100, 1987: GROUP 1. NTP 7TH ANNUAL REPORT ON CARCINS, 1994: KNOWN TO BE (SUP DAT)
Signs/Symptoms Of Overexp: HLTH HAZ: MUCOSA ARE ALSO VULNERABLE TO IRRITANT EFTS. WRISTS ARE COMMON SITE OF DERM. ARSENIC IS ALSO CAPABLE OF PRODUCING KERATOSES, ESPECIALLY TO PALMS & SOLES. THERE IS SUFFICIENT EVIDENCE THAT SUPPORTS FACT THAT SKIN CANCER IN HUMANS IS ASSOC W/EXPOS TO INORG ARSENIC CMPDS IN DRUGS, DRINKING WATER & IN (SUP DAT)
Med Cond Aggravated By Exp: BURNS, DERMATITIS, LARYNGEAL SPASM, PULMONARY EDEMA CAN BE AGGRAVATED BY HNO*3.
Emergency/First Aid Proc: CALL MD. INGESTION: DO NOT INDUCE VOMITING. IF CONSCIOUS, GIVE WATER, MILK. EYES/SKIN: FLUSH WITH PLENTY OF WATER FOR AT LEAST 15 MINUTES. INHALATION: REMOVE TO FRESH AIR. SUPPORT BREATHING (GIVE OXYGEN OR ARTIFICIAL RESPIRATION) (FP N).

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: REMOVE SOURCE OF IGNITION IF HYDROGEN IS A HAZARD. PROVIDE OPTIMUM VENTILATION. FLUSH TO HOLDING AREA FOR NEUTRALIZATION.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: FOLLOW FEDERAL, STATE, AND LOCAL REGULATIONS FOR ACID WASTE. EPA HAZARDOUS WASTE #: P010.
Precautions-Handling/Storing: KEEP CONTAINER TIGHTLY CLOSED.
Other Precautions: NONE SPECIFIED BY MANUFACTURER.

Control Measures

Respiratory Protection: USE NIOSH/MSHA APPROVED RESPIRATOR.
Ventilation: LOCAL EXHAUST.
Protective Gloves: IMPERVIOUS GLOVES (FP N).
Eye Protection: ANSI APPRVD CHEM WORKERS GOGGS (FP N).
Other Protective Equipment: LAB COAT/APRON: VENT HOOD. EMERGENCY EYEWASH & DELUGE SHOWER MEETING ANSI DESIGN CRITERIA (FP N).
Work Hygienic Practices: NONE SPECIFIED BY MANUFACTURER.
Suppl. Safety & Health Data: CARCIN EXPLAN: CARCIN. OSHA REGULATED: CFR 29 1910.1018. EFTS OF OVEREXP: OCCUP ENVIRON. THERE ARE ALSO CASE REPORTS THAT SUGGEST THAT THERE IS AN ASSOC BETWEEN EXPOS TO ARSENIC CMPDS & BLOOD DYSCRASIAS & LIVER TUMORS. IT MAY CAUSE IRRIT & ABSORPTION INTO BODY WHICH LEADS TO FORMATION OF METHEMOGLOBIN WHICH IN (ING 3)

Transportation Data

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 16OCT95
Label Date: 16OCT95
Label Status: G
Common Name: ARSENIC
Chronic Hazard: YES
Signal Word: DANGER!
Acute Health Hazard-Severe: X
Contact Hazard-Severe: X
Fire Hazard-None: X
Reactivity Hazard-None: X
Special Hazard Precautions: POISON. ACUTE: ARSENIC & ITS COMPOUNDS CAN BE FATAL IF INHALED, SWALLOWED OR ABSORBED THROUGH SKIN. PROLONGED CONTACT RESULTS IN LOC HYPEREMIA AND LATER VESICULAR OR PUSTULAR ERUPTION. MOIST MUCOUS MEMBRANES ARE MOST SENSITIVE TO IRRITANT ACTION. CONJUNCTIVA, MOIST AND MACERATED AREAS OF SKIN, EYELIDS, ANGLES OF EARS, NOSE, MOUTH & RESP MUCOSA ARE ALSO VULNERABLE TO THE IRRITANT EFFECTS. DERMATITIS MAY OCCUR ON WRISTS. CHRONIC: CANCER HAZARD. ARSENIC IS LISTED AS A HUMAN SKIN AND LIVER CARCINGEN(FP N).
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: HIGH-PURITY STANDARDS
Label P.O. Box: 30188
Label City: CHARLESTON
Label State: SC
Label Zip Code: 29417
Label Country: US
Label Emergency Number: 803-556-3411

Material Safety Data Sheet

From Genium's Reference Collection
Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8855

GENIUM PUBLISHING CORP.

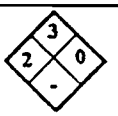
No. 316

BENZENE
(Revision D)
Issued: November 1978
Revised: April 1988

SECTION 1. MATERIAL IDENTIFICATION

25

Material Name: BENZENE



Description (Origin/Uses): Used in the manufacture of medicinal chemicals, dyes, linoleum, airplane dopes, varnishes, and lacquers; and as a solvent for waxes, resins, and oils.

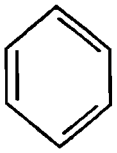
Other Designations: Benzol; Phene; Phenylhydride; C_6H_6; NIOSH *RTECS* No. CY1400000; CAS No. 0071-43-2

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyers' Guide* (Genium ref. 73) for a list of suppliers.

HMIS	
H 2	
F 3	R 1
R 0	I 4
PPG*	S 2
*See sect. 8	K 4

SECTION 2. INGREDIENTS AND HAZARDS

	%	EXPOSURE LIMITS
Benzene, CAS No. 0071-43-2	Ca 100	**OSHA PEL** 8-Hr TWA: 1 ppm 15-Min Ceiling: 5 ppm Action Level: 0.5 ppm **ACGIH TLV, 1987-88** TLV-TWA: 10 ppm, 30 mg/m³ **Toxicity Data*** Human, Inhalation, LC_{Lo}: 2000 ppm/5 Min Human, Oral, TD_{Lo}: 130 mg/kg Human, Inhalation, TC_{Lo}: 210 ppm



*See NIOSH, *RTECS*, for additional data with references to irritative, mutagenic, tumorigenic, and reproductive effects.

SECTION 3. PHYSICAL DATA

Boiling Point: 176°F (80°C)
Melting Point: 42°F (5.5°C)
Vapor Pressure: 75 Torrs at 68°F (20°C)
Vapor Density (Air = 1): >1

Water Solubility (%): Slight
% Volatile by Volume: 100
Molecular Weight: 78 Grams/Mole
Specific Gravity (H_2O = 1): 0.87865 at 68°F (20°C)

Appearance and Odor: A colorless liquid; characteristic aromatic odor.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temperature	Flammability Limits in Air	LOWER	UPPER
12°F (-11.1°C) CC	928°F (498°C)	% by Volume	1.3%	7.1%

Extinguishing Media: Use dry chemical, foam, or carbon dioxide to put out benzene fires. Water may be ineffective as an extinguishing agent because it can scatter and spread the fire. Use water to cool fire-exposed containers, flush spills away from exposures, disperse benzene vapor, and protect personnel attempting to stop an unignited benzene leak.
Unusual Fire or Explosion Hazards: Benzene vapor is heavier than air and can collect in low-lying areas such as sumps or wells. Eliminate all sources of ignition there to prevent a dangerous flashback to the original liquid benzene. **Danger:** Explosive and flammable benzene vapor-air mixtures can easily form at room temperature; always use this material in a way that minimizes dispersion of its vapor into general work areas.
Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

SECTION 5. REACTIVITY DATA

Benzene is stable in closed containers during routine operations. It does not undergo hazardous polymerization.

Chemical Incompatibilities: Hazardous chemical reactions involving benzene and the following materials are reported in Genium reference 84: bromine pentafluoride, chlorine, chlorine trifluoride, chromic anhydride, nitryl perchlorate, oxygen, ozone, perchlorates, perchloryl fluoride and aluminum chloride, permanganates and sulfuric acid, potassium peroxide, silver perchlorate, and sodium peroxide.

Conditions to Avoid: Avoid all exposure to sources of ignition and to incompatible chemicals.

Hazardous Products of Decomposition: Toxic gases like carbon monoxide (CO) may be produced during benzene fires.

SECTION 6. HEALTH HAZARD INFORMATION

Benzene is listed as a suspected human carcinogen by the ACGIH.

Summary of Risks: Prolonged skin contact with benzene or excessive inhalation of its vapor may cause headache, weakness, loss of appetite, and lassitude. Continued exposure can cause collapse, bronchitis, and pneumonia. The most important health hazards are cancer (leukemia), bone marrow effects, and injuries to the blood-forming tissue from chronic low-level exposure.

Medical Conditions Aggravated by Long-Term Exposure: Ailments of the heart, lungs, liver, kidneys, blood, and central nervous system (CNS) may be worsened by exposure. Administer preplacement and periodic medical exams emphasizing these organs' functions and reassign workers who test positive. **Target Organs:** Blood, CNS, bone marrow, eyes, and upper respiratory tract (URT). **Primary Entry:** Skin contact, inhalation. **Acute Effects:** Dizziness, mental dullness, nausea, headache, fatigue, and giddiness. **Chronic Effects:** Possible cancer (leukemia).

FIRST AID

Eyes: Immediately flush eyes, including under the eyelids, gently but thoroughly with plenty of running water for at least 15 minutes.

Skin: Immediately wash the affected area with soap and water.

Inhalation: Remove the exposed person to fresh air; restore and/or support his or her breathing as needed.

Ingestion: Never give anything by mouth to someone who is unconscious or convulsing. Do not induce vomiting because of the possibility of aspiration.

GET MEDICAL HELP (IN PLANT, PARAMEDIC, COMMUNITY) FOR ALL EXPOSURES. **Seek prompt medical assistance for further treatment, observation, and support after first aid.**

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Notify safety personnel, provide ventilation, and eliminate all sources of ignition immediately. Cleanup personnel need protection against contact with and inhalation of vapor (see sect. 8). Contain large spills and collect waste or absorb it with an inert material such as sand, earth, or vermiculite. Use nonsparking tools to place waste liquid or absorbent into closable containers for disposal. Keep waste out of sewers, watersheds, and waterways.

Waste Disposal: Contact your supplier or a licensed contractor for detailed recommendations for disposal. Follow Federal, state, and local regulations.

OSHA Designations

Air Contaminant (29 CFR 1910.1000 Subpart Z)

EPA Designations (40 CFR 302.4)

RCRA Hazardous Waste, No. U019

CERCLA Hazardous Substance, Reportable Quantity: 1000 lbs (454 kg)

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Where splashing is possible, wear a full face shield. Follow the eye- and face-protection guidelines in 29 CFR 1910.133. **Respirator:** Wear a NIOSH-approved respirator per the *NIOSH Pocket Guide to Chemical Hazards* for the maximum-use concentrations and/or the exposure limits cited in section 2. Follow the respirator guidelines in 29 CFR 1910.134. For emergency or nonroutine use (e.g., cleaning reactor vessels or storage tanks), wear an SCBA with a full facepiece operated in the pressure-demand or positive-pressure mode. **Warning:** Air-purifying respirators will *not* protect workers in oxygen-deficient atmospheres. **Other:** Wear impervious gloves, boots, aprons, gauntlets, etc., to prevent any possibility of skin contact with this suspected human carcinogen. **Ventilation:** Install and operate general and local ventilation systems powerful enough to maintain airborne levels of benzene below the OSHA PEL standard cited in section 2.

Safety Stations: Make eyewash stations, washing facilities, and safety showers available in use and handling areas. **Contaminated Equipment:** Contact lenses pose a special hazard; soft lenses may absorb irritants and all lenses concentrate them. Do *not* wear contact lenses in any work area. Remove contaminated clothing and launder it before wearing it again; clean this material from shoes and equipment. **Comments:** Practice good personal hygiene; always wash thoroughly after using this material. Keep it off of your clothing and equipment. Avoid transferring it from your hands to your mouth while eating, drinking, or smoking. Do *not* eat, drink, or smoke in any work area. Do not inhale benzene vapor!

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage/Segregation: Store benzene in a cool, dry, well-ventilated area away from sources of ignition and incompatible chemicals.

Special Handling/Storage: Protect containers from physical damage. Electrically ground and bond all metal containers used in shipping or transferring operations. Follow all parts of 29 CFR 1910.1028.

Engineering Controls: All engineering systems (production, transportation, etc.) must be of maximum explosion-proof design (non-sparking, electrically grounded and bonded, etc.)

Comments: If possible, substinite less toxic solvents for benzene; use this material with extreme caution and only if it is absolutely essential.

Transportation Data (49 CFR 172.101-2)

DOT Shipping Name: Benzene	DOT Label: Flammable Liquid	IMO Label: Flammable Liquid
DOT Class: Flammable Liquid	DOT ID No. UN1114	IMO Class: 3.2

References: 1, 2, 12, 73, 84-94, 100, 103.

Prepared by PJ Igoe, BS

Industrial Hygiene Review: DJ Wilson, CIH

Medical Review: MJ Hardies, MD

New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **BENZ(a)ANTHRACENE**

CAS Number: 56-55-3
DOT Number: None

RTK Substance number: 0193
Date: September 1998

HAZARD SUMMARY

* **Benz(a)Anthracene** can affect you when breathed in.
* **Benz(a)Anthracene** should be handled as a CARCINOGEN--WITH EXTREME CAUTION.
* *CONSULT THE NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES HAZARDOUS SUBSTANCE FACT SHEET ON COAL TAR.*

IDENTIFICATION

Benz(a)Anthracene is a colorless plate-like material which is recrystallized from glacial *Acetic Acid* or a light yellow to tan powder. It is not produced commercially but occurs as an intermediate during chemical manufacturing. It is also found in *Coal Tar* .

REASON FOR CITATION

* **Benz(a)Anthracene** is on the Hazardous Substance List because it is cited by ACGIH, NTP, IARC, HHAG and EPA.
* This chemical is on the Special Health Hazard Substance List because it is a **CARCINOGEN** and **MUTAGEN**.
* Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

* Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.20.
* If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

No occupational exposure limits have been established for **Benz(a)Anthracene**. This does not mean that this substance is not harmful. Safe work practices should always be followed.

ACGIH: Recommends that exposure by all routes be controlled to levels as low as possible.

* **Benz(a)Anthracene** may be a CARCINOGEN in humans. There may be no safe level of exposure to a carcinogen, so all contact should be reduced to the lowest possible level.

WAYS OF REDUCING EXPOSURE

* Enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
* A regulated, marked area should be established where **Benz(a)Anthracene** is handled, used, or stored.
* Wear protective work clothing.
* When using small quantities of **Benz(a)Anthracene** use in a glove box.
* Wash thoroughly immediately after exposure to **Benz(a) Anthracene** and at the end of the workshift.
* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Benz(a)Anthracene** to potentially exposed workers.

ALDRICH CHEMICAL -- BENZO (A) PYRENE, 98%, B1008-0
MATERIAL SAFETY DATA SHEET
NSN: 681000N065303
Manufacturer's CAGE: 60928
Part No. Indicator: A
Part Number/Trade Name: BENZO (A) PYRENE, 98%, B1008-0

General Information

Company's Name: ALDRICH CHEMICAL CO INC
Company's P. O. Box: 355
Company's City: MILWAUKEE
Company's State: WI
Company's Country: US
Company's Zip Code: 53201
Company's Emerg Ph #: 414-273-3850
Company's Info Ph #: 414-273-3850
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 001
Status: SMJ
Date MSDS Prepared: 05JAN95
Safety Data Review Date: 23OCT95
MSDS Serial Number: BZRGR

Ingredients/Identity Information

Proprietary: NO
Ingredient: BENZO(A)PYRENE (CERCLA)
Ingredient Sequence Number: 01
Percent: 98
NIOSH (RTECS) Number: DJ3675000
CAS Number: 50-32-8
OSHA PEL: 0.2 MG/M3
ACGIH TLV: A2

Physical/Chemical Characteristics

Appearance And Odor: YELLOW GREEN POWDER.
Boiling Point: 923F,495C
Melting Point: >351F,>177C

Fire and Explosion Hazard Data

Extinguishing Media: WATER SPRAY, CARBON DIOXIDE, DRY CHEMICAL POWDER OR APPROPRIATE FOAM.
Special Fire Fighting Proc: WEAR NIOSH/MSHA APPROVED SCBA & FULL PROTECTIVE EQUIPMENT (FP N).
Unusual Fire And Expl Hazrds: NONE SPECIFIED BY MANUFACTURER.

Reactivity Data

Stability: YES
Cond To Avoid (Stability): NONE SPECIFIED BY MANUFACTURER.
Materials To Avoid: OXIDIZING AGENTS.
Hazardous Decomp Products: CARBON MONOXIDE, CARBON DIOXIDE.
Hazardous Poly Occur: NO
Conditions To Avoid (Poly): NOT RELEVANT

Health Hazard Data

LD50-LC50 Mixture: NONE SPECIFIED BY MANUFACTURER.
Route Of Entry - Inhalation: YES
Route Of Entry - Skin: YES

Route Of Entry - Ingestion: YES
Health Haz Acute And Chronic: ACUTE:HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. MAY CAUSE EYE IRRITATION. MAY CAUSE SKIN IRRITATION. SKIN LUNGS. TO THE BEST OF MANUFACTURER'S KNOWLEDGE, THE CHEMICAL, PHYSICAL & TOX PROPERTIES HAVE NOT BEEN THORO INVESTIGATED.
Carcinogenicity - NTP: YES
Carcinogenicity - IARC: YES
Carcinogenicity - OSHA: NO
Explanation Carcinogenicity: BENZO (A) PYRENE:IARC MONO, SUPP, VOL 7, PG 56, 1987:GROUP 2A. NTP 7TH ANNUAL RPT ON CARCINS. 1994:ANTIC TO BE (SUP DAT)
Signs/Symptoms Of Overexp: SEE HEALTH HAZARDS.
Med Cond Aggravated By Exp: NONE SPECIFIED BY MANUFACTURER.
Emergency/First Aid Proc: EYES:FLUSH WITH COPIOUS AMOUNTS OF WATER FOR AT LEAST 15 MINUTES. SKIN:FLUSH WITH COPIOUS AMOUNTS OF WATER FOR AT LEAST 15 MINUTES WHILE REMOVING CONTAMINATED CLOTHING AND SHOES. INHALATION: REMOVE TO FRESH AIR. IF NOT BREATHING GIVE ARTIFICIAL RESPIRATION. IF BREATHING IS DIFFICULT, GIVE OXYGEN. INGESTION:WASH OUT MOUTH WITH WATER PROVIDED PERSON IS CONSCIOUS. CALL A PHYSICIAN IMMEDIATELY.

Precautions for Safe Handling and Use

Steps If Matl Released/Spill: EVACUTE AREA. WEAR NIOSH/MSHA APPROVED SCBA, RUBBER BOOTS AND HEAVY RUBBER GLOVES. WEAR DISPOSABLE COVERALLS AND DISCARD THEM AFTER USE. SWEEP UP, PLACE IN BAG & HOLD FOR WASTE DISP. VENT AREA & WASH SPILL SITE AFTER MATERIAL PICKUP IS COMPLETE.
Neutralizing Agent: NONE SPECIFIED BY MANUFACTURER.
Waste Disposal Method: DISSOLVE OR MIX THE MATERIAL WITH A COMBUSTIBLE SOLVENT AND BURN IN A CHEMICAL INCINERATOR EQUIPPED WITH AN AFTERBURNER AND SCRUBBER. OBSERVE ALL FEDERAL, STATE AND LOCAL ENVIRONMENTAL REGULATIONS.
Precautions-Handling/Storing: DO NOT BREATHE DUST. DO NOT GET IN EYES, ON SKIN, ON CLOTHING. CARCINOGEN. MUTAGEN. TERATOGEN. KEEP TIGHTLY CLOSED. STORE IN A COOL, DRY PLACE.
Other Precautions: NONE SPECIFIED BY MANUFACTURER.

Control Measures

Respiratory Protection: WEAR APPROPRIATE NIOSH/MSHA APPROVED RESPIRATOR.
Ventilation: USE ONLY IN A CHEMICAL FUME HOOD.
Protective Gloves: CHEMICAL-RESISTANT GLOVES.
Eye Protection: ANSI APPROVED CHEM WORKERS GOGGS (FP N).
Other Protective Equipment: ANSI APPROVED EMERGENCY EYE WASH AND DELUGE SHOWER (FP N). OTHER PROTECTIVE CLOTHING.
Work Hygienic Practices: WASH THOROUGHLY AFTER HANDLING.
Suppl. Safety & Health Data: EXPLAN OF CARCIN: CARCINOGEN. ANIMAL:SKIN, LUNG, LIVER.

Transportation Data

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 23OCT95
Label Status: G
Common Name: BENZO (A) PYRENE, 98%, B1008-0
Chronic Hazard: YES
Signal Word: WARNING!
Acute Health Hazard-Moderate: X
Contact Hazard-Moderate: X
Fire Hazard-Slight: X

Reactivity Hazard-None: X
Special Hazard Precautions: TOXIC. ACUTE:HARMFUL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. MAY CAUSE EYE IRRITATION. MAY CAUSE SKIN IRRITATION. CHRONIC:CANCER HAZARD. CONTAINS BENZO(A)PYRENE WHICH IS LISTED AS AN ANIMAL LUNG, SKIN AND LIVER CARCINOGEN (FP N). MAY ALTER GENETIC MATERIAL. TERATOGEN. TARGET ORGAN(S):SKIN, LUNGS. TO THE BEST OF MANUFACTURER'S KNOWLEDGE, THE CHEMICAL, PHYSICAL & TOX PROPERTIES HAVE NOT BEEN THOROUGHLY INVESTIGATED.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: ALDRICH CHEMICAL CO INC
Label P.O. Box: 355
Label City: MILWAUKEE
Label State: WI
Label Zip Code: 53201
Label Country: US
Label Emergency Number: 414-273-3850

New Jersey Department of Health and Senior Services

HAZARDOUS SUBSTANCE FACT SHEET

Common Name: **CHRYSENE**

CAS Number: 218-01-9
DOT Number: None

RTK Substance number: 0441
Date: April 1994 Revision: December 1999

HAZARD SUMMARY

* **Chrysene** can affect you when breathed in and by passing through your skin.
* If skin contaminated with **Chrysene** is exposed to sunlight, a rash or sunburn effect and permanent changes in skin pigment can occur.
* **Chrysene** is almost always found in *Coal Tar Pitch, Coal Tar Creosote*, or other coal tar products. If you work with coal, tar, soot, pitch, asphalt, etc., you may be exposed to **Chrysene**.
* *CONSULT THE NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES HAZARDOUS SUBSTANCE FACT SHEETS ON COAL TAR PITCH AND COAL TAR CREOSOTE.*

IDENTIFICATION

Pure **Chrysene** is a colorless to off-white flake which is used in laboratories and dye manufacturing. **Chrysene** is most often found in black or brown tars and pitches.

REASON FOR CITATION

* **Chrysene** is on the Hazardous Substance List because it is regulated by OSHA and cited by ACGIH, DOT, NIOSH, HHAG and EPA.
* Definitions are provided on page 5.

HOW TO DETERMINE IF YOU ARE BEING EXPOSED

The New Jersey Right to Know Act requires most employers to label chemicals in the workplace and requires public employers to provide their employees with information and training concerning chemical hazards and controls. The federal OSHA Hazard Communication Standard, 1910.1200, requires private employers to provide similar training and information to their employees.

* Exposure to hazardous substances should be routinely evaluated. This may include collecting personal and area air samples. You can obtain copies of sampling results from your employer. You have a legal right to this information under OSHA 1910.1020.
* If you think you are experiencing any work-related health problems, see a doctor trained to recognize occupational diseases. Take this Fact Sheet with you.

WORKPLACE EXPOSURE LIMITS

The following exposure limits are for *Coal Tar Pitch Volatiles*:

OSHA: The legal airborne permissible exposure limit (PEL) is **0.2 mg/m^3** averaged over an 8-hour workshift.

NIOSH: The recommended airborne exposure limit is **0.1 mg/m^3** averaged over a 10-hour workshift.

ACGIH: An exposure limit has not been determined for this suspected carcinogen. Worker exposure by all routes should be carefully controlled to the lowest possible level.

* The above exposure limits are for air levels only. When skin contact also occurs, you may be overexposed, even though air levels are less than the limits listed above.

WAYS OF REDUCING EXPOSURE

* Where possible, enclose operations and use local exhaust ventilation at the site of chemical release. If local exhaust ventilation or enclosure is not used, respirators should be worn.
* Wear protective work clothing.
* Wash thoroughly immediately after exposure to **Chrysene** and at the end of the workshift.
* Post hazard and warning information in the work area. In addition, as part of an ongoing education and training effort, communicate all information on the health and safety hazards of **Chrysene** to potentially exposed workers.

This Fact Sheet is a summary source of information of all potential and most severe health hazards that may result from exposure. Duration of exposure, concentration of the substance and other factors will affect your susceptibility to any of the potential effects described below.

HEALTH HAZARD INFORMATION

Acute Health Effects

The following acute (short-term) health effects may occur immediately or shortly after exposure to **Chrysene**:

* If skin contaminated with **Chrysene** is exposed to sunlight, a rash or sunburn effect can occur, sometimes with blisters.

Chronic Health Effects

The following chronic (long-term) health effects can occur at some time after exposure to **Chrysene** and can last for months or years:

Cancer Hazard

* There is limited evidence that **Chrysene** causes cancer in animals. It may cause skin cancer.
* Many scientists believe there is no safe level of exposure to a carcinogen. Such substances may also have the potential for causing reproductive damage in humans.

Reproductive Hazard

* According to the information presently available to the New Jersey Department of Health and Senior Services, **Chrysene** has not been tested for its ability to affect reproduction.

Other Long-Term Effects

* Permanent changes in skin pigment can occur if contaminated skin is exposed to sunlight.

MEDICAL

Medical Testing

* There is no special test for this chemical. However, monthly, carefully look at any skin areas that have been exposed. Any growth (like a mole) that increases in size or shows changes in color should be examined by a physician. Skin cancer is curable when detected early.

Any evaluation should include a careful history of past and present symptoms with an exam. Medical tests that look for damage already done are not a substitute for controlling exposure.

Request copies of your medical testing. You have a legal right to this information under OSHA 1910.1020.

Mixed Exposures

* Sunlight exposure on skin contaminated with *Coal Tar* chemicals can cause rash and later, pigment changes. Persons who smoke cigarettes may be at increased risk for lung cancer with his chemical. This can be significantly reduced by stopping smoking as well as by reducing exposures.

WORKPLACE CONTROLS AND PRACTICES

Unless a less toxic chemical can be substituted for a hazardous substance, **ENGINEERING CONTROLS** are the most effective way of reducing exposure. The best protection is to enclose operations and/or provide local exhaust ventilation at the site of chemical release. Isolating operations can also reduce exposure. Using respirators or protective equipment is less effective than the controls mentioned above, but is sometimes necessary.

In evaluating the controls present in your workplace, consider: (1) how hazardous the substance is, (2) how much of the substance is released into the workplace and (3) whether harmful skin or eye contact could occur. Special controls should be in place for highly toxic chemicals or when significant skin, eye, or breathing exposures are possible.

In addition, the following control is recommended:

* Where possible, automatically transfer pure **Chrysene** from drums or other storage containers to process containers.

Good **WORK PRACTICES** can help to reduce hazardous exposures. The following work practices are recommended:

* Workers whose clothing has been contaminated by **Chrysene** should change into clean clothing promptly.
* Do not take contaminated work clothes home. Family members could be exposed.
* Contaminated work clothes should be laundered by individuals who have been informed of the hazards of exposure to **Chrysene**.
* Eye wash fountains should be provided in the immediate work area for emergency use.
* If there is the possibility of skin exposure, emergency shower facilities should be provided.
* On skin contact with **Chrysene**, immediately wash or shower to remove the chemical. At the end of the workshift, wash any areas of the body that may have contacted **Chrysene**, whether or not known skin contact has occurred.
* Do not eat, smoke, or drink where **Chrysene** is handled, processed, or stored, since the chemical can be swallowed. Wash hands carefully before eating, drinking, smoking, or using the toilet.
* For pure **Chrysene** use a vacuum or a wet method to reduce dust during clean-up. DO NOT DRY SWEEP.

PERSONAL PROTECTIVE EQUIPMENT

WORKPLACE CONTROLS ARE BETTER THAN PERSONAL PROTECTIVE EQUIPMENT. However, for some jobs (such as outside work, confined space entry, jobs done only once in a while, or jobs done while workplace controls are being installed), personal protective equipment may be appropriate.

OSHA 1910.132 requires employers to determine the appropriate personal protective equipment for each hazard and to train employees on how and when to use protective equipment.

The following recommendations are only guidelines and may not apply to every situation.

Clothing

* Avoid skin contact with **Chrysene**. Wear protective gloves and clothing. Safety equipment suppliers/ manufacturers can provide recommendations on the most protective glove/clothing material for your operation.
* All protective clothing (suits, gloves, footwear, headgear) should be clean, available each day, and put on before work.

Eye Protection

* For pure **Chrysene** wear impact resistant eye protection with side shields or goggles.
* Wear a face shield along with goggles when working with corrosive, highly irritating or toxic substances.

Respiratory Protection

IMPROPER USE OF RESPIRATORS IS DANGEROUS. Such equipment should only be used if the employer has a written program that takes into account workplace conditions, requirements for worker training, respirator fit testing and medical exams, as described in OSHA 1910.134.

* Where the potential exists for exposure over **0.1 mg/m^3**, (as *Coal Tar Pitch Volatiles*) use a MSHA/NIOSH approved supplied-air respirator with a full facepiece operated in a pressure-demand or other positive-pressure mode. For increased protection use in combination with an auxiliary self-contained breathing apparatus operated in a pressure-demand or other positive-pressure mode.
* Exposure to **80 mg/m^3** (as *Coal Tar Pitch Volatiles*) is immediately dangerous to life and health. If the possibility of exposure above **80 mg/m^3** (as *Coal Tar Pitch Volatiles*) exists, use a MSHA/NIOSH approved self-contained breathing apparatus with a full facepiece operated in a pressure-demand or other positive-pressure mode.

QUESTIONS AND ANSWERS

Q: If I have acute health effects, will I later get chronic health effects?
A: Not always. Most chronic (long-term) effects result from repeated exposures to a chemical.

Q: Can I get long-term effects without ever having short-term effects?
A: Yes, because long-term effects can occur from repeated exposures to a chemical at levels not high enough to make you immediately sick.

Q: What are my chances of getting sick when I have been exposed to chemicals?
A: The likelihood of becoming sick from chemicals is increased as the amount of exposure increases. This is determined by the length of time and the amount of material to which someone is exposed.

Q: When are higher exposures more likely?
A: Conditions which increase risk of exposure include dust releasing operations (grinding, mixing, blasting, dumping, etc.), other physical and mechanical processes (heating, pouring, spraying, spills and evaporation from large surface areas such as open containers), and "confined space" exposures (working inside vats, reactors, boilers, small rooms, etc.).

Q: Is the risk of getting sick higher for workers than for community residents?
A: Yes. Exposures in the community, except possibly in cases of fires or spills, are usually much lower than those found in the workplace. However, people in the community may be exposed to contaminated water as well as to chemicals in the air over long periods. This may be a problem for children or people who are already ill.

Q: Don't all chemicals cause cancer?
A: No. Most chemicals tested by scientists are not cancer-causing.

Q: Should I be concerned if a chemical causes cancer in animals?
A: Yes. Most scientists agree that a chemical that causes cancer in animals should be treated as a suspected human carcinogen unless proven otherwise.

Q: But don't they test animals using much higher levels of a chemical than people usually are exposed to?
A: Yes. That's so effects can be seen more clearly using fewer animals. But high doses alone don't cause cancer unless it's a cancer agent. In fact, a chemical that causes cancer in animals at high doses could cause cancer in humans exposed to low doses.

The following information is available from:

New Jersey Department of Health and Senior Services
Occupational Health Service
PO Box 360
Trenton, NJ 08625-0360
(609) 984-1863
(609) 292-5677 (fax)

Web address: http://www.state.nj.us/health/eoh/odisweb/

Industrial Hygiene Information

Industrial hygienists are available to answer your questions regarding the control of chemical exposures using exhaust ventilation, special work practices, good housekeeping, good hygiene practices, and personal protective equipment including respirators. In addition, they can help to interpret the results of industrial hygiene survey data.

Medical Evaluation

If you think you are becoming sick because of exposure to chemicals at your workplace, you may call personnel at the Department of Health and Senior Services, Occupational Health Service, who can help you find the information you need.

Public Presentations

Presentations and educational programs on occupational health or the Right to Know Act can be organized for labor unions, trade associations and other groups.

Right to Know Information Resources

The Right to Know Infoline (609) 984-2202 can answer questions about the identity and potential health effects of chemicals, list of educational materials in occupational health, references used to prepare the Fact Sheets, preparation of the Right to Know survey, education and training programs, labeling requirements, and general information regarding the Right to Know Act. Violations of the law should be reported to (609) 984-2202.

DEFINITIONS

ACGIH is the American Conference of Governmental Industrial Hygienists. It recommends upper limits (called TLVs) for exposure to workplace chemicals.

A **carcinogen** is a substance that causes cancer.

The **CAS number** is assigned by the Chemical Abstracts Service to identify a specific chemical.

A **combustible** substance is a solid, liquid or gas that will burn.

A **corrosive** substance is a gas, liquid or solid that causes irreversible damage to human tissue or containers.

DEP is the New Jersey Department of Environmental Protection.

DOT is the Department of Transportation, the federal agency that regulates the transportation of chemicals.

EPA is the Environmental Protection Agency, the federal agency responsible for regulating environmental hazards.

A **fetus** is an unborn human or animal.

A **flammable** substance is a solid, liquid, vapor or gas that will ignite easily and burn rapidly.

The **flash point** is the temperature at which a liquid or solid gives off vapor that can form a flammable mixture with air.

HHAG is the Human Health Assessment Group of the federal EPA.

IARC is the International Agency for Research on Cancer, a scientific group that classifies chemicals according to their cancer-causing potential.

A **miscible** substance is a liquid or gas that will evenly dissolve in another.

mg/m^3 means milligrams of a chemical in a cubic meter of air. It is a measure of concentration (weight/volume).

MSHA is the Mine Safety and Health Administration, the federal agency that regulates mining. It also evaluates and approves respirators.

A **mutagen** is a substance that causes mutations. A **mutation** is a change in the genetic material in a body cell. Mutations can lead to birth defects, miscarriages, or cancer.

NAERG is the North American Emergency Response Guidebook. It was jointly developed by Transport Canada, the United States Department of Transportation and the Secretariat of Communications and Transportation of Mexico. It is a guide for first responders to quickly identify the specific or generic hazards of material involved in a transportation incident, and to protect themselves and the general public during the initial response phase of the incident.

NCI is the National Cancer Institute, a federal agency that determines the cancer-causing potential of chemicals.

NFPA is the National Fire Protection Association. It classifies substances according to their fire and explosion hazard.

NIOSH is the National Institute for Occupational Safety and Health. It tests equipment, evaluates and approves respirators, conducts studies of workplace hazards, and proposes standards to OSHA.

NTP is the National Toxicology Program which tests chemicals and reviews evidence for cancer.

OSHA is the Occupational Safety and Health Administration, which adopts and enforces health and safety standards.

PEOSHA is the Public Employees Occupational Safety and Health Act, a state law which sets PELs for New Jersey public employees.

ppm means parts of a substance per million parts of air. It is a measure of concentration by volume in air.

A **reactive** substance is a solid, liquid or gas that releases energy under certain conditions.

A **teratogen** is a substance that causes birth defects by damaging the fetus.

TLV is the Threshold Limit Value, the workplace exposure limit recommended by ACGIH.

The **vapor pressure** is a measure of how readily a liquid or a solid mixes with air at its surface. A higher vapor pressure indicates a higher concentration of the substance in air and therefore increases the likelihood of breathing it in.

>>>>>>>>>>>>>>>>> EMERGENCY INFORMATION <<<<<<<<<<<<<<<<<

Common Name: **CHRYSENE**
DOT Number: **None**
NAERG Code: **No Citation**
CAS Number: **218-01-9**

Hazard rating	NJDHSS	NFPA
FLAMMABILITY	0	Not Rated
REACTIVITY	Not Found	Not Rated
POISONOUS GASES ARE PRODUCED IN FIRE		

Hazard Rating Key: 0=minimal; 1=slight; 2=moderate; 3=serious; 4=severe

FIRE HAZARDS

* **Chrysene** is a noncombustible solid.
* Use dry chemical, CO_2, water spray, alcohol or polymer foam extinguishers.
* POISONOUS GASES ARE PRODUCED IN FIRE.
* If employees are expected to fight fires, they must be trained and equipped as stated in OSHA 1910.156.

SPILLS AND EMERGENCIES

If pure **Chrysene** is spilled, take the following steps:

* Evacuate persons not wearing protective equipment from area of spill until clean-up is complete.
* Collect powdered material in the most convenient and safe manner and deposit in sealed containers.
* Ventilate and wash area after clean-up is complete.
* It may be necessary to contain and dispose of **Chrysene** as a HAZARDOUS WASTE. Contact your Department of Environmental Protection (DEP) or your regional office of the federal Environmental Protection Agency (EPA) for specific recommendations.
* If employees are required to clean-up spills, they must be properly trained and equipped. OSHA 1910.120(q) may be applicable.

==========

FOR LARGE SPILLS AND FIRES immediately call your fire department. You can request emergency information from the following:

CHEMTREC: (800) 424-9300
NJDEP HOTLINE: (609) 292-7172

==========

HANDLING AND STORAGE

* Prior to working with **Chrysene** you should be trained on its proper handling and storage.
* **Chrysene** is not compatible with OXIDIZING AGENTS (such as PERCHLORATES, PEROXIDES, PERMANGANATES, CHLORATES, NITRATES, CHLORINE, BROMINE and FLUORINE).
* Store in tightly closed containers in a cool, well-ventilated area.

FIRST AID

In NJ, for POISON INFORMATION call 1-800-764-7661

Eye Contact

* Immediately flush with large amounts of water for at least 15 minutes, occasionally lifting upper and lower lids.

Skin Contact

* Remove contaminated clothing. Wash contaminated skin with soap and water.

Breathing

* Remove the person from exposure.

PHYSICAL DATA

Water Solubility: Insoluble

OTHER COMMONLY USED NAMES

Chemical Name:
1,2,5,6-Dibenzonaphthalene
Other Names:
1,2-Benzophenanthrene; Benzo[a]phenanthrene

NEW JERSEY DEPARTMENT OF HEALTH AND SENIOR SERVICES
Right to Know Program
PO Box 368, Trenton, NJ 08625-0368
(609) 984-2202

HIGH-PURITY STANDARDS -- CYANIDE
MATERIAL SAFETY DATA SHEET
NSN: 681000N063132
Manufacturer's CAGE: 0YZE4
Part No. Indicator: A
Part Number/Trade Name: CYANIDE

General Information

Company's Name: HIGH-PURITY STANDARDS
Company's P. O. Box: 30188
Company's City: CHARLESTON
Company's State: SC
Company's Country: US
Company's Zip Code: 29417
Company's Emerg Ph #: 803-556-3411
Company's Info Ph #: 803-556-3411
Record No. For Safety Entry: 001
Tot Safety Entries This Stk#: 002
Status: SMJ
Date MSDS Prepared: 16SEP92
Safety Data Review Date: 08SEP95
MSDS Serial Number: BYWMT

Ingredients/Identity Information

Proprietary: NO
Ingredient: CYANIDE
Ingredient Sequence Number: 01
NIOSH (RTECS) Number: GS7175000
CAS Number: 57-12-5
OSHA PEL: 5 MG/M3 (MFR)
ACGIH TLV: 5 MG/M3 (MFR)

Proprietary: NO
Ingredient: POTASSIUM CYANIDE; (KCN)
Ingredient Sequence Number: 02
Percent: 0.1
NIOSH (RTECS) Number: TS8750000
CAS Number: 151-50-8
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)

Proprietary: NO
Ingredient: POTASSIUM HYDROXIDE; (KOH)
Ingredient Sequence Number: 03
Percent: 0.5
NIOSH (RTECS) Number: TT2100000
CAS Number: 1310-58-3
OSHA PEL: N/K (FP N)
ACGIH TLV: N/K (FP N)

Physical/Chemical Characteristics

Appearance And Odor: CLEAR, COLORLESS, ODORLESS SOLUTION.
Boiling Point: 212F,100C
Melting Point: N/A
Vapor Pressure (MM Hg/70 F): N/A
Vapor Density (Air=1): N/A
Specific Gravity: 1 (H*2O=1)
Decomposition Temperature: N/A
Solubility In Water: COMPLETE

Fire and Explosion Hazard Data

Flash Point: NOT APPLICABLE
Lower Explosive Limit: N/A
Extinguishing Media: USE APPROPRIATE: DO NOT USE CARBON DIOXIDE EXTINGUISHER.
Special Fire Fighting Proc: USE NIOSH/MSHA APPROVED SCBA & FULL PROTECTIVE EQUIPMENT (FP N).
Unusual Fire And Expl Hazrds: NOT APPLICABLE

Reactivity Data

Stability: YES
Cond To Avoid (Stability): THERMAL DECOMPOSITION INCOMPATIBLE.
Materials To Avoid: ACIDS, OXIDIZING AGENTS, ALKALOIDS, IODINE, AMMONIA, CO*2, CHLORAL HYDRATE.

Health Hazard Data

Precautions for Safe Handling and Use

Control Measures

Transportation Data

Disposal Data

Label Data

Label Required: YES
Technical Review Date: 08SEP95
Label Date: 31AUG95
Label Status: G
Common Name: CYANIDE
Chronic Hazard: YES
Signal Word: DANGER!
Acute Health Hazard-Severe: X
Contact Hazard-Severe: X
Fire Hazard-None: X
Reactivity Hazard-None: X
Special Hazard Precautions: CORROSIVE POISON. ACUTE:INGESTION:CORROSIVE TO GASTROINTESTINAL TRACT. IN ADDITION TO PAINFUL SWALLOWING, SYMPTOMS ARE SIMILAR TO THOSE OF ACUTE INHALATION. SKIN CONTACT:CORROSIVE. READILY ABSORBED THROUGH SKIN. ABSORPTION MAY CAUSE SYMPTOMS SIMILAR TO THOSE OF ACUTE INHALATION. EYE CONTACT:CORROSIVE. REDNESS, PAIN AND BLURRED VISON MAY OCCUR. INHALATION:CORROSIVE TO RESPIRATORY TRACT. INHIBITS CELLULAR RESPIRATION. OVEREXPOSURE MAY CAUSE HEADACHE, WEAKNESS, DIZZINESS, LABORED BREATHING AND NAUSEA FOLLOWED BY WEAK AND IRREGULAR HEARTBEAT, UNCONSCIOUSNESS, CONVULSIONS, COMA & DEATH. CHRONIC:REPEATED MINOR SKIN CONTACT CAUSES A "CYANIDE" RASH.
Protect Eye: Y
Protect Skin: Y
Protect Respiratory: Y
Label Name: HIGH-PURITY STANDARDS
Label P.O. Box: 30188
Label City: CHARLESTON
Label State: SC
Label Zip Code: 29417
Label Country: US

Label Emergency Number: 803-556-3411

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

MALLINCKRODT

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response In Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

ETHYL BENZENE

MSDS Number: OR155 --- *Effective Date: 12/08/96*

1. Product Identification

Synonyms: Benzene, ethyl; ethylbenzen 99%; ethyl benzol
CAS No.: 100-41-4
Molecular Weight: 106.17
Chemical Formula: C8H10
Product Codes: 2427

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Ethyl Benzene	100-41-4	100%	Yes

3. Hazards Identification

Emergency Overview

WARNING! FLAMMABLE LIQUID. HARMFUL IF SWALLOWED OR INHALED. VAPOR OR MIST IS IRRITATING TO THE EYES AND UPPER RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM.

Potential Health Effects

Inhalation:
Vapors irritate the mucous membranes and respiratory tract. May cause coughing, headache, Labored breathing, dizziness and unconsciousness. May affect blood circulation.

Ingestion:
Harmful if swallowed. Aspiration into the lungs may cause pneumonia. Abdominal pain, nausea, vomiting may occur. May affect central nervous system.

Skin Contact:
Causes irritation with redness and pain. Prolonged contact may cause dermatitis.

Eye Contact:
Vapors irritate the eyes, causing redness, pain, blurred vision.

Chronic Exposure:
No information found.

Aggravation of Pre-existing Conditions:
Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney or respiratory function may be more susceptible to the effects of the substance.

---

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:
If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately.

Skin Contact:
Remove any contaminated clothing. Wash skin with soap or mild detergent and water for at least 15 minutes. Get medical attention if irritation develops or persists.

Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Flash point: 15C (59F) CC Autoignition temperature: 432C (810F) Flammable limits in air % by volume: lel: 1.0; uel: 7.8

Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above.

Fire Extinguishing Media:
Dry chemical, alcohol foam or carbon dioxide. Water may be ineffective. Water spray may be used to keep fire exposed containers cool.

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Vapors can flow along surfaces to distant ignition source and flash back.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer!

7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL): 100 ppm (TWA), 125 ppm (STEL) -ACGIH Threshold Limit Value (TLV): 100 ppm (TWA), 125 ppm (STEL)

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices* , most recent edition, for details.

Personal Respirators (NIOSH Approved):
If the TLV is exceeded a full facepiece chemical cartridge respirator may be worn up to the maximum use concentration specified by the respirator supplier. Alternatively, a supplied air full facepiece respirator or airlined hood may be worn.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.

Odor:
Aromatic odor.

Solubility:
Insoluble in water.

Specific Gravity:
0.867

pH:
No information found.

% Volatiles by volume @ 21C (70F):
No information found.

Boiling Point:
136C (277F)

Melting Point:
-95C (-139F)

Vapor Density (Air=1):
3.66

Vapor Pressure (mm Hg):
7.1 @ 20C (68F)

Evaporation Rate (BuAc=1):
< 1

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.

Hazardous Polymerization:
Will not occur.

Incompatibilities:
Contact with strong oxidizing agents may cause fires and explosions. Attacks many plastics.

Conditions to Avoid:
No information found.

11. Toxicological Information

Oral rat LD50: 3500 mg/Kg Skin rabbit LD50: 17800 mg/Kg Mutation reference cited reproduction effect cited.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category

Ethyl Benzene (100-41-4)	No	No	None

12. Ecological Information

Environmental Fate:
No information found.

Environmental Toxicity:
No information found.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: ETHYLBENZENE
Hazard Class: 3
UN/NA: UN1175
Packing Group: II
Information reported for product/size: 3KG

International (Water, I.M.O.)

Proper Shipping Name: ETHYLBENZENE
Hazard Class: 3.2
UN/NA: UN1175
Packing Group: II
Information reported for product/size: 3KG

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Ethyl Benzene (100-41-4)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Ethyl Benzene (100-41-4)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313----- List	Chemical Catg
Ethyl Benzene (100-41-4)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\----------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Ethyl Benzene (100-41-4)	1000	No	Yes

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Pure / Liquid)

Australian Hazchem Code: 3[Y]E
Poison Schedule: No information found.

WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 2 **Flammability:** 3 **Reactivity:** 0

Label Hazard Warning:
WARNING! FLAMMABLE LIQUID. HARMFUL IF SWALLOWED OR INHALED. VAPOR OR MIST IS IRRITATING TO THE EYES AND UPPER RESPIRATORY TRACT. AFFECTS CENTRAL NERVOUS SYSTEM.

Label Precautions:
Do not breathe vapor. Avoid contact with eyes, skin and clothing. Keep container closed. Use with adequate ventilation. Wash thoroughly after handling. Keep away from heat, sparks and flame.

Label First Aid:
In all cases call a physician immediately. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes.

Product Use:
Laboratory Reagent.

Revision Information:
Pure. New 16 section MSDS format, all sections have been revised.

Disclaimer:

****

Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

****

Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

Alfa Aesar/Avocado Organics - Material Safety Data Sheet A17230

1. IDENTIFICATION OF SUBSTANCE AND SUPPLIER

Name On Label : Fluoranthene
Product Number : A17230
Supplier :
Johnson Matthey Catalog Company Inc.
30 Bond Street, Ward Hill, Massachusetts, 01835-8099
Emergency Telephone Number: (978) 521-6300; CHEMTREC: (800) 424-9300
Alternative Names : None in common use.

2. COMPOSITION AND INFORMATION ON COMPONENTS

Name : Fluoranthene
MinorImpurities : Not determined
CAS Number : 206-44-0
EINECS Number : 2059124
EEC Number :

3. HAZARDS IDENTIFICATION

Designation :
HARMFUL
Risk Phrases
R20/21/22 Harmful by inhalation, in contact with skin and if swallowed.
R40 Possible risk of irreversible effects.

4. FIRST AID MEASURES

Inhalation
Remove to fresh air. Seek medical advice if symptoms persist.

Eye Contact
Flush with copious amounts of water for at least 15 minutes. If symptoms arise, seek medical advice.

Skin Contact

Remove contaminated clothing. Wash affected area with soap and water. Rinse thoroughly. If unusual symptoms are observed, seek medical advice. Show the physician the container details.

Ingestion
Rinse out mouth and drink lots of water. In case of unusual symptoms, seek medical attention and show physician the container details.

---

5. FIRE FIGHTING MEASURES

Extiguishing Medium
Use fire fighting measures which suit the environment and take into account other materials which may be involved. In general, water-based extinguishers should not be used for fires involving organic materials. Use carbon dioxide or dry powder.

Protective Equipment
Wear self-contained breathing apparatus and protective clothing.

Hazardous Products of Combustion May Include:
carbon monoxide, carbon dioxide.

---

6. ACCIDENTAL RELEASE MEASURES

Personal Protection
Avoid inhalation or contact of spilled material with skin or clothing. Wear protective equipment including rubber gloves, and eye protection. Keep unprotected persons away.

Environmental Protection
Take precautions to ensure product does not contaminate the ground or enter the drainage system.

Collection
Mix with vermiculite or proprietary absorbent material and transfer to sealed containers for disposal.

---

7. HANDLING AND STORAGE

Handling
Chemicals should be used only by those trained in handling potentially hazardous materials. Rubber gloves, eye protection and protective clothing should be worn. Operations should be carried out in an efficient fume hood or equivalent system.

Storage
Store in tightly sealed containers in a cool place.
Protect from moisture.

---

8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Respiratory
Avoid inhalation of product. Handle in an efficient fume hood or equivalent system.

Eye
Avoid eye contact. Wear safety spectacles or goggles.

Hands and Body
Avoid skin contact. Wear rubber gloves and protective clothing.

---

9. PHYSICAL AND CHEMICAL PROPERTIES

Appearance : Yellow crystals
Physical Constants: m.p. 107-110Ê
Molecular Formula : C16H10
Formula Weight : 202.26
Water Solubility : Insol
Density : Not available
Flash Point : Not available

---

10. STABILITY AND REACTIVITY

Specific Hazard
Incompatibilities
Strong oxidising agents.

Decomposition
Hazardous products of decomposition may include:
carbon monoxide, carbon dioxide.

---

11. TOXICOLOGICAL INFORMATION

RTECS Number : LL4025000
Acute Toxicity
LD50 : ORL-RAT 2000mg/kg; SKN-RBT 3180mg/kg
Harmful by inhalation, in contact with skin and if swallowed. Possible risk of irreversible effects.

Chronic Toxicity
Possible mutagen.

---

12. ECOLOGICAL EFFECTS

General
Take care to prevent chemicals from entering the ground, water courses or drainage systems.

---

13. DISPOSAL CONSIDERATIONS

Disposal
Disposal should be via an approved contractor and should take full account of local regulations.

---

14. TRANSPORT INFORMATION

UN Number : 2811
Land Transport
ADR/RIC Code/Class: 6.1 /Packing Group III
Maritime Transport IMDG Code/Class : 6.1 /Packing Group III
Air Transport IATA Code/Class : 6.1 /Packing Group III

---

15. REGULATORY INFORMATION

CAS Number : 206-44-0
EINECS Number : 2059124
EEC Number :
UN Number : 2811
RTECS Number : LL4025000
Hazard Indication :

HARMFUL

Risk and Safety Phrases
Harmful by inhalation, in contact with skin and if swallowed.
Possible risk of irreversible effects.
Keep container tightly closed.
Do not breathe dust.
Wear suitable protective clothing.
If you feel unwell, seek medical advice (show the label where possible).

TSCA: Listed substance.

---

16. OTHER INFORMATION

It must be recognised that the physical and chemical properties of any product may not be fully understood and that new, possibly hazardous products may arise from reactions between chemicals. The information given in this data sheet is based on our present knowledge and shall not constitute a guarantee for any specific product features and shall not establish a legally valid contractual relationship.

Date of Last Review: 3rd August 1998
Date Printed : 18th September 1998

Material Safety Data Sheet

From Genium's Reference Collection
Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8855

GENIUM PUBLISHING CORP.

No. 624

NAPHTHALENE

Issued: November 1987

SECTION 1. MATERIAL IDENTIFICATION

24

Material Name: NAPHTHALENE

Description (Origin/Uses): Used as a moth repellant and in many industrial processes.

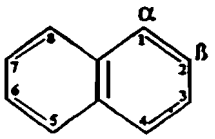
Other Designations: Naphthalin; Naphthene; Tar Camphor; $C_{10}H_8$; NIOSH *RTECS* No. QJ0525000; CAS No. 0091-20-3

Manufacturer: Contact your supplier or distributor. Consult the latest edition of the *Chemicalweek Buyer's Guide* (Genium ref. 73) for a list of suppliers.

HMIS	
H 2	
F 2	R 1
R 0	I 4
PPG*	S 1
*See sect. 8	K 2

SECTION 2. INGREDIENTS AND HAZARDS

	%	EXPOSURE LIMITS
Naphthalene, CAS No. 0091-20-3	ca 100	IDLH* Level: 500 ppm



ACGIH TLVs, 1987-88
TLV-TWA: 10 ppm, 50 mg/m³
OSHA PEL
8-Hr TWA: 10 ppm, 50 mg/m³
Toxicity Data**
Child, Oral, LD_{Lo}: 100 mg/kg
Man, Unknown, LD_{Lo}: 74 mg/kg
Rat, Oral, LD_{50}: 1250 mg/kg

*Immediately dangerous to life and health
**See NIOSH *RTECS* for additional data with references to irritative, mutagenic, reproductive, and tumorigenic effects.

SECTION 3. PHYSICAL DATA

Boiling Point: 424°F (218°C)
Vapor Density (Air = 1): 4.4
Vapor Pressure: 0.087 Torr at 77°F (25°C)
Water Solubility: Insoluble
Specific Gravity (H_20 = 1): 1.162 at 68°F (20°C)
Melting Point: 176°F (80°C)
Molecular Weight: 128 Grams/Mole
% Volatile by Volume: ca 100

Appearance and Odor: White crystalline flakes; strong coal tar odor.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temperature	Flammability Limits in Air	LOWER	UPPER
174°F (79°C) OC; 190°F (88°C) CC	979°F (526°C)	% by Volume	0.9	5.9

Extinguishing Media: Use water spray, dry chemical, or carbon dioxide to fight fires involving naphthalene. Caution: Foam or direct water spray applied to molten naphthalene may cause extensive foaming.

Unusual Fire or Explosion Hazards: Naphthalene is a volatile solid that gives off flammable vapor when heated (as in fire situations). This vapor is much denser than air and will collect in enclosed or low-lying areas like sumps. In these areas an explosive air-vapor mixture may form, and extra caution is required to prevent any ignition sources from starting an explosion or fire.

Special Fire-fighting Procedures: Wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode.

SECTION 5. REACTIVITY DATA

Naphthalene is stable in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization.

Chemical Incompatibilities: Naphthalene is incompatible with strong oxidizing agents, chromic anhydride, and mixtures of aluminum trichloride and benzoyl chloride.

Conditions to Avoid: Ignition sources like open flame, unprotected heaters, excessive heat, lighted tobacco products, and electric sparks must not occur in work areas where naphthalene vapor may become concentrated.

Hazardous Products of Decomposition: Toxic gases like carbon monoxide are produced during fire conditions. Irritating, flammable vapor forms below the melting point because even solid naphthalene has a significant vapor pressure.

SECTION 6. HEALTH HAZARD INFORMATION

Naphthalene is not listed as a carcinogen by the NTP, IARC, or OSHA.
Summary of Risks: Renal shutdown (kidney failure), hemolytic effects (breakdown of red blood cells), hematuria (blood in the urine), oliguria (low volume of urine), jaundice, eye damage, and depression of the central nervous system (CNS) are the primary health concerns associated with exposure to naphthalene. The ACGIH TLVs in section 2 are set to prevent eye damage. These recommended exposure limits may not be low enough to prevent blood changes in genetically hypersensitive individuals.
Medical Conditions Aggravated by Long-Term Exposure: Diseases of the blood, liver, and kidneys. Administer medical exams emphasizing these organs. **Target Organs:** Eyes, skin, kidneys, liver, blood (red blood cell effects), and CNS.
Primary Entry: Inhalation, skin contact. **Acute Effects:** Inhalation of naphthalene vapor causes excitement, confusion, headache, nausea, and loss of appetite. **Chronic Effects:** Increased incidence of cataracts.
FIRST AID
Eye Contact: Immediately flush eyes, including under the eyelids, gently but thoroughly with plenty of running water for at least 15 minutes to remove particles.
Skin Contact: Immediately wash the affected area with soap and water.
Inhalation: Remove victim to fresh air; restore and/or support his breathing as needed.
Ingestion: Call a poison control center. Never give anything by mouth to someone who is unconscious or convulsing. Administer a gastric lavage followed by saline catharsis. Monitor blood and electrolytic balance. Other sources recommend giving the victim several glasses of water to drink.

GET MEDICAL HELP (IN PLANT, PARAMEDIC, COMMUNITY) FOR ALL EXPOSURES. Seek prompt medical assistance for further treatment, observation, and support after first aid.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

Spill/Leak: Notify safety personnel, provide ventilation, and eliminate all ignition sources immediately. Cleanup personnel need protection against contact and inhalation of vapor (see sect. 8). Contain large spills and collect waste. Use nonsparking tools to place naphthalene into closable containers for disposal. Keep waste out of sewers, watersheds, and waterways.
Waste Disposal: Consider reclamation, recycling, or destruction rather than disposal in a landfill. Contact your supplier or a licensed contractor for detailed recommendations. Follow Federal, state, and local regulations.

OSHA Designations
Air Contaminant (29 CFR 1910.1000, Subpart Z)
EPA Designations (40 CFR 302.4)
RCRA Hazardous Waste, No. U165
CERCLA Hazardous Substance, Reportable Quantity: 100 lbs (45.4 kg)

SECTION 8. SPECIAL PROTECTION INFORMATION

Goggles: Always wear protective eyeglasses or chemical safety goggles. Follow the eye- and face-protection guidelines of 29 CFR 1910.133. **Respirator:** Use a NIOSH-approved respirator per the *NIOSH Pocket Guide to Chemical Hazards* (Genium ref. 88) for the maximum-use concentrations and/or the exposure limits cited in section 2. Respirator usage must be in accordance with the OSHA regulations of 29 CFR 1910.134. IDLH or unknown concentrations require an SCBA with a full facepiece operated in the pressure-demand or positive-pressure mode. **Warning:** Air-purifying respirators will *not* protect workers in oxygen-deficient atmospheres.
Other Equipment: Wear impervious gloves, boots, aprons, gauntlets, etc., as required by the specific work environment to prevent skin contact. **Ventilation:** Install and operate general and local maximum explosion-proof ventilation systems of sufficient power to maintain airborne levels of naphthalene below the OSHA PEL standard cited in section 2. **Safety Stations:** Make eyewash stations, washing facilities, and safety showers available in areas of use and handling. **Contaminated Equipment:** Contact lenses pose a special hazard; soft lenses may absorb irritants, and all lenses concentrate them. Do *not* wear contact lenses in any work area. Remove and launder contaminated clothing before wearing it again; clean this material from shoes and equipment.
Comments: Practice good personal hygiene; always wash thoroughly after using this material. Keep this material off of your clothing and equipment. Avoid transferring this material from hands to mouth while eating, drinking, or smoking. Do *not* smoke, eat, or drink in any immediate work area. Avoid inhalation of vapor!

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

Storage Segregation: Store naphthalene in a cool, dry, well-ventilated area away from chemical incompatibles (see sect. 5).
Special Handling/Storage: Protect containers from physical damage. All bulk storage facilities must be built with an explosion-proof design. All containers used in shipping/transferring operations must be electrically grounded to prevent static sparks. Use monitoring equipment to measure the extent of vapor present in any storage facility containing naphthalene because of potential fire and explosion hazards.
Comments: All operations with naphthalene must be done carefully to prevent accidental ignition of its flammable/explosive vapor. If the weather is warm, more naphthalene vapor forms and the potential for explosion increases. Do *not* smoke in any use or storage area!
Transportation Data (49 CFR 172.101-2)
DOT Shipping Name: Naphthalene
DOT Hazard Class: ORM-A
IMO Class: 4.1
DOT ID No. UN1334
IMO Label: Flammable Solid
DOT Label: None

References: 1, 2, 12, 73, 84-94, 103. PJI

Approvals
Indust. Hygiene/Safety
Medical Review

MONSANTO PRODUCT NAME

Polychlorinated Biphenyls (PCBs)

MONSANTO COMPANY
800 N. LINDBERGH BLVD.
ST. LOUIS, MO 63167

Emergency Phone No.
(Call Collect)
314-694-1000

Date: 10/88

PRODUCT IDENTIFICATION

Synonyms:
PCBs
Chlorodiphenyl (__% Cl)
Chlorinated biphenyl
Polychlorinated biphenyl
Chlorinated biphenyls
(approx. __% Cl)

Trade Names/ Common Names:
Aroclor®[1] Series 1016, 1221, 1232, 1242, 1248, 1254, 1260
Therminol®[1] FR Series

PYRANOL®[2] and INERTEEN®[3] are trademarks for commonly used dielectric fluids that may have contained varying amounts of PCBs as well as other components including chlorinated benzenes.

ASKAREL - Generic name for a broad class of fire-resistant synthetic chlorinated hydrocarbons and mixtures used as dielectric fluids that commonly contained about 30-70% PCBs. Some ASKAREL fluids contained 99% or greater PCBs and some contained no PCBs.

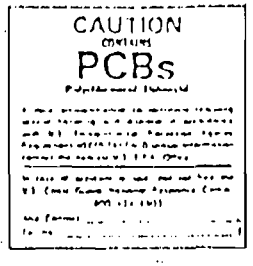
This list of trade names is representative of several commonly used Monsanto products (or products formulated with Monsanto products). Other trademarked PCB products were marketed by Monsanto and other manufacturers. PCBs were also manufactured and sold by several European and Japanese companies. Contact the manufacturer of the trademarked product, if not in this listing, to determine if the formulation contained PCBs.

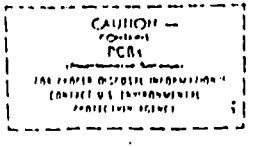
[1] Registered trademark of Monsanto Company
[2] Registered trademark of General Electric Company
[3] Registered trademark of Westinghouse Electric Corporation

CAS No.'s: 001336363, 053469219, 021672296, 01109769, 011096825 and others

WARNING STATEMENTS

Federal regulations under the Toxic Substances Control Act require PCBs, PCB items, storage areas, transformer vaults, and transport vehicles to be marked. (check regulations, 40 CFR 761, for details)





PRECAUTIONARY MEASURES

Care should be taken to prevent entry into the environment through spills, leakage, use, vaporization, or disposal of liquid or containers. Avoid prolonged breathing of vapors or mists. Avoid contact with eyes or prolonged contact with skin. If skin contact occurs, remove by washing with soap and water. Following eye contact, flush with water. In case of spillage onto clothing, the clothing should be removed as soon as practical, skin washed, and clothing laundered. Comply with all federal, state, and local regulations.

EMERGENCY AND FIRST AID PROCEDURES

Ingestion: Consult a physician. Do not induce vomiting or give any oily laxatives. NOTE TO PHYSICIAN—If large amounts are ingested, gastric lavage is suggested.

Skin: If liquid or solid PCBs are splashed or spilled on skin, contaminated clothing should be removed and the skin washed thoroughly with soap and water. NOTE TO PHYSICIAN—Hot PCBs may cause thermal burns.

Eyes: Eyes should be irrigated immediately with copious quantities of running water for at least 15 minutes if liquid or solid PCBs get into them. A petrolatum-based opthalmic ointment may be applied to the eye to relieve the irritating effects of PCBs.

Inhalation: Remove to fresh air. If skin rash or respiratory irritation persists, consult a physician. NOTE TO PHYSICIAN—If electrical equipment arcs over, PCBs or other chlorinated hydrocarbon dielectric fluids may decompose to produce HCl, hydrochloric acid, a respiratory irritant.

OCCUPATIONAL CONTROL PROCEDURES

Eye Protection: Wear chemical splash goggles and have eye baths available where there is significant potential for eye contact.

Skin Protection: Wear appropriate protective clothing and chemical resistant gloves to prevent skin contact. Consult glove manufacturer to determine appropriate type glove for given application. Wear chemical goggles, face shield, and chemical resistant clothing such as a rubber apron when splashing is likely. Wash immediately if skin is contaminated. Remove contaminated clothing promptly and launder before reuse. Clean protective equipment before reuse. Provide a safety shower at any location where skin contact can occur. Wash thoroughly after handling.

ATTENTION! Repeated or prolonged contact may cause chloracne in some people.

Respiratory Protection: Avoid breathing vapor or mist. Use NIOSH/MSHA approved equipment when airborne exposure limits are exceeded. Full facepiece equipment is recommended and, if used, replaces need for face shield and/or chemical splash goggles. Consult respirator manufacturer to determine the type of equipment for a given application. The respirator use limitations specified by NIOSH/MSHA or the manufacturer must be observed. High airborne concentrations may require use of self-contained breathing apparatus or supplied air respirator. Respiratory protection programs must be in compliance with 29 CFR Part 1910.134.

Ventilation: Provide natural or mechanical ventilation to control exposure levels below airborne exposure limits (see below). If practical, use local mechanical exhaust ventilation at sources of air contamination such as open process equipment.

Airborne Exposure Limits: Chlorinated biphenyl (approximately 42% chlorine)

OSHA PEL: 1 mg/m³ 8-hour time-weighted average - Skin*
ACGIH TLV: 1 mg/m³ 8-hour time-weighted average - Skin*
2 mg/m³ short-term exposure limit - Skin*

*Skin notation means that skin absorption of this material may add to the overall exposure. Avoid skin contact.

(OCCUPATIONAL CONTROL PROCEDURES continued on page 3)

MATERIAL SAFETY DATA Polychlorinated Biphenyls (PCBs)

OCCUPATIONAL CONTROL PROCEDURES *(continued)*

Airborne Exposure Limits (Continued):

Chlorinated biphenyl (approximately 54% chlorine)

OSHA PEL: 0.5 mg/m³ 8-hour time-weighted average - Skin*

ACGIH TLV: 0.5 mg/m³ 8-hour time-weighted average - Skin*

1 mg/m³ short-term exposure limit - Skin*

**Skin notation means that skin absorption of this material may add to the overall exposure. Avoid skin contact.*

FIRE PROTECTION INFORMATION

Fire and Explosion: PCBs are fire-resistant compounds. They may decompose to form CO, CO_2, HCl, phenolics, aldehydes and other toxic combustion products under severe conditions such as exposure to flame or hot surfaces.

At temperatures in the range of 600-650°C in the presence of excess of oxygen PCBs may form polychlorinated dibenzofurans (PCDFs). Laboratory studies under similar conditions have demonstrated that PCBs do not produce polychlorinated dibenzo-p-dioxins (PCDDs).

PCBs in electrical equipment have been reported to produce both chlorinated dioxins (PCDDs) and furans (PCDFs) during fire situations. These combustion products may result all, or in part, from non-PCB components of the dielectric fluids or other combusted materials. Consult the equipment manufacturer for information regarding composition of the dielectric fluids in electrical apparatus.

Standard fire fighting wearing apparel and self-contained breathing apparatus should be worn when fighting fires that involve possible exposure to chemical combustion products. Fire fighting equipment should be thoroughly cleaned and decontaminated after use.

Federal regulations require all PCB transformers to be registered with fire response personnel.

If a PCB transformer is involved in a fire-related incident, the owner of the transformer may be required to report the incident. Consult and follow appropriate federal, state, and local regulations.

REACTIVITY DATA

PCBs are very stable, fire-resistant compounds.

HEALTH EFFECTS SUMMARY

Skin Contact: PCBs can be absorbed through intact skin. Local action on skin is similar to that of common organic solvents where contact leads to removal of natural fats and oils with subsequent drying and cracking of the skin. A potential exists for contracting chloracne.

Eye Contact: The liquid products and their vapors are moderately irritating to eye tissues.

Ingestion: The acute oral toxicities of the undiluted compounds are: LD_{50} rats—8.65 gm/kg for 42% chlorinated, and 11.9 gm/kg for 54% chlorinated—"slightly toxic."

Inhalation: Animal experiments of varying duration and at different air concentrations show that for similar exposure conditions, the 54% chlorinated material produces more liver injury than the 42% chlorinated material.

(HEALTH EFFECTS SUMMARY continued on page 4)

MATERIAL SAFETY DATA Polychlorinated Biphenyls (PCBs)

HEALTH EFFECTS SUMMARY *(continued)*

Other: There are literature reports that PCBs can impair reproductive functions in monkeys. The National Cancer Institute performed a study in 1977 using Aroclor 1254 with both sexes of rats. NCI stated that the PCB, Aroclor 1254, was not carcinogenic under the conditions of their bioassay. There is sufficient evidence in the scientific literature to conclude that Aroclor 1260 can cause liver cancer when fed to rodents at high doses. Similar experiments with less chlorinated PCB products have produced negative or equivocal results.

The consistent finding in animal studies is that PCBs produce liver injury following prolonged and repeated exposure by any route, if the exposure is of sufficient degree and duration. Liver injury is produced first, and by exposures that are less than those reported to cause cancer in rodents. Therefore, exposure by all routes should be kept sufficiently low to prevent liver injury.

Numerous epidemiological studies of humans, both occupationally exposed and non-worker environmentally exposed populations, have not demonstrated any causal relationship between PCB exposures and chronic human illnesses such as cancer or neurological or cardiovascular effects. PCBs can cause dermatological symptoms; however, these are reversible upon removal of exposure source.

PCBs are identified as hazardous chemicals under criteria of the OSHA Hazard Communication Standard (29 CFR Part 1910.1200). PCBs have been listed in the International Agency for Research on Cancer (IARC) Monographs (1987)-Group 2A and in the National Toxicology Program (NTP) Annual Report on Carcinogens (Fourth).

PHYSICAL DATA

PROPERTIES OF SELECTED AROCLORS*

PROPERTY	1016	1221	1232	1242	1248	1254	1260
Color (APHA)	40	100	100	100	100	100	150
Physical state	mobile oil	mobile oil	mobile oil	mobile oil	mobile oil	viscous liquid	sticky resin
Stability	Inert	Inert	Inert	Inert	Inert	Inert	Inert
Density (lb/gal 25°C)	11.40	9.85	10.55	11.50	12.04	12.82	13.50
Specific gravity x/15.5°C	1.36-1.37 x-25°	1.18-1.19 x-25°	1.27-1.28 x-25°	1.30-1.39 x-25°	1.40-1.41 x-65°	1.49-1.50 x-65°	1.55-1.56 x-90°
Distillation range (°C)	323-356	275-320	290-325	325-366	340-375	365-390	385-420
Acidity mg KOH/g, maximum	.010	.014	.014	.015	.010	.010	.014
Fire point (°C)	none to boiling point	178	238	none to boiling point	none to boiling point	none to boiling point	none to boiling point
Flash point (°C)	170	141-150	152-154	176-180	193-198	none	none
Vapor pressure (mm Hg @ 100°F)	NA	NA	0.005	0.001	0.00037	0.00006	NA
Viscosity (Saybolt Univ. Sec. @ 100°F) (centistokes)	71-81 13-16	38-41 3.6-4.6	44-51 5.5-7.7	82-92 16-19	185-240 42-52	1800-2500 390-540	— —

NA—Not Available

SPILL, LEAK & DISPOSAL INFORMATION

Cleanup and disposal of liquid PCBs and other PCB items are strictly regulated by the federal government. The regulations are found at 40 CFR Part 761. Consult these regulations as well as applicable state and local regulations prior to any disposal of PCBs, PCB items, or PCB-contaminated items.

If PCBs leak or are spilled, the following steps should be taken immediately:

All non-essential personnel should leave the leak or spill area.

The area should be adequately ventilated to prevent the accumulation of vapors.

The spill/leak should be contained. Loss to sewer systems, navigable waterways and streams should be prevented. Spills/leaks should be removed promptly by means of absorptive material, such as sawdust, vermiculite, dry sand, clay, dirt or other similar materials, or trapped and removed by pumping or other suitable means (traps, drip-pans, trays, etc.).

Personnel entering the spill or leak area should be furnished with appropriate personal protective equipment and clothing as needed. See Occupational Control Procedures section of this MSDS.

Personnel trained in the emergency procedures and protected against the attendant hazards should shut off sources of PCBs, clean up spills, control and repair leaks and fight fires in PCB areas.

All wastes and residues containing PCBs (e.g., wiping cloths, absorbent material, used disposable protective gloves, clothing, etc.) should be collected, placed in proper containers, marked and disposed of in the manner prescribed by EPA regulations (40 CFR Part 761) and applicable state and local regulations.

Various federal, state and local regulations may require immediate reporting of PCB spills and may also define spill clean-up levels. Consult your attorney or appropriate regulatory officials for information relating to spill reporting and spill clean-up.

ENVIRONMENTAL INFORMATION

Care should be taken to prevent entry of PCBs into the environment through spills, leakage, use, vaporization or disposal of liquids or solids. PCBs can accumulate in the environment and can adversely affect some animals and aquatic life. In general, PCBs have low solubility in water, are strongly bound to soils and sediments, and are slowly degraded by natural processes in the environment.

ADDITIONAL COMMENTS

Polychlorinated Biphenyls

For regulatory purposes, under the Toxic Substances Control Act the term "PCBs" refers to a chemical substance limited to the biphenyl molecule that has been chlorinated to varying degrees or any combination of substances which contain such substance (40 CFR Part 761).

Chemically, commercial PCBs are defined as a series of technical mixtures, consisting of many isomers and compounds that vary from mobile oily liquids to white crystalline solids and hard non-crystalline resins. Technical products vary in composition, in the degree of chlorination and possibly according to batch.

The mixtures generally used contain an average of 3 atoms of chlorine per molecule (42% chlorine) to 5 atoms of chlorine per molecule (54% chlorine). They are used as components of dielectric fluids in transformers and capacitors. Prior to 1972, PCB applications included heat transfer media, hydraulic and other industrial fluids, plasticizers, carbonless paper, paints, inks and adhesives.

In 1972 Monsanto restricted sales of PCBs to applications involving only closed electrical systems (transformers and capacitors). In 1977 all manufacturing and sales were voluntarily terminated. In 1979 EPA restricted the manufacture, processing, use, and distribution of PCBs to specifically exempted and authorized activities.

MATERIAL SAFETY DATA *Polychlorinated Biphenyls (PCBs)*

DATE: 10/1/88 SUPERSEDES: All prior to 10/1/88

FOR ADDITIONAL NON-EMERGENCY INFORMATION, CONTACT:

John H. Craddock
Product & Environmental Safety Director

Paul R. Michael
Product & Environmental Safety Manager

Environmental Policy Staff
Monsanto Company
800 North Lindbergh Boulevard
St. Louis, Missouri 63167
(314) 694-4764

Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8854

Material Safety Data Sheets Collection:

Sheet No. 711
Pyrene

Issued: 4/90

Section 1. Material Identification

Pyrene Description: A condensed ring, polyaromatic hydrocarbon compound derived from coal tar. Also synthesized from o,o'-ditolyl. Used in biochemical research and as starting material for synthesizing benzo(a)pyrene. An ingredient of smoked and broiled meat, tobacco smoke, and air pollution.
Other Designations: CAS No. 0129-00-0; $C_{16}H_{10}$; beta-pyrene; benzo(d,e,f)phenanthrene; benzo(d,e,f)phenathrene.
Manufacturer: Contact your supplier or distributor. Consult the latest *Chemicalweek Buyers' Guide*(TM) for a suppliers list.

R 1
I 3
S 2*
K -
* Skin absorption

Genium

HMIS
H 2
F 1
R 0
PPG†
† Sec. 8

Section 2. Ingredients and Occupational Exposure Limits

Pyrene, ca 100%

OSHA PEL	ACGIH TLV, 1989-90	NIOSH REL, 1987	Toxicity Data*
8-hr TWA: 0.2 mg/m³	None established	None established	Rat, oral, LD_{50}: 2700 mg/kg ingested produces conjunctiva irritation, excitement, and muscle contraction Rat, inhalation, LC_{50}: 170 mg/m³ inhaled produces conjunctiva irritation, excitement, and muscle contraction Gene mutation in mammalian cells; human cell types: 12 µmol/l

* See NIOSH, *RTECS* (UR2450000), for additional mutative, tumorigenic, and toxicity data.

Section 3. Physical Data

Boiling Point: 759 °F/404 °C
Melting Point: 313 °F/156 °C
Vapor Pressure: 6.85 x 10^{-7} torr at 68 °F/20 °C
Molecular Weight: 202.26 g/mol
Specific Gravity (H_2O = 1 at 39 °F/4 °C): 1.271 at 73 °F/23 °C
Water Solubility: Insoluble (0.135 mg/l)

Appearance and Odor: Colorless solid or a slight blue florescent solution. Tetracene impurities give pyrene a yellow color.

Section 4. Fire and Explosion Data

Flash Point: None reported	Autoignition Temperature: None reported	LEL: None reported	UEL: None reported

Extinguishing Media: Use foam, dry chemical, and CO_2 to extinguish fire.
Unusual Fire or Explosion Hazards: Pyrene is a flammable and combustible material that heat and ignition sources may ignite. It burns rapidly with a flare-like effect.
Special Fire-fighting Procedures: Since fire may produce toxic fumes, wear a self-contained breathing apparatus (SCBA) with a full facepiece operated in the pressure-demand or positive-pressure mode. Avoid skin contact. Be aware of runoff from fire control methods. Do not release to sewers or waterways.

Section 5. Reactivity Data

Stability/Polymerization: Pyrene is stable at room temperature in closed containers under normal storage and handling conditions. Hazardous polymerization cannot occur.
Hazardous Products of Decomposition: Thermal oxidative decomposition of pyrene can emit irritating fumes and acrid smoke.

Section 6. Health Hazard Data

Carcinogenicity: Neither the NTP, IARC, nor OSHA lists pyrene as a carcinogen.
Summary of Risks: Pyrene is irritating to exposed skin and eyes, moderately toxic by ingestion and intraperitoneal routes, and a poison by inhalation. Experimental studies show pyrene is a tumorigen in animals and a mutagen in humans. Workers exposed to concentrations between 3 and 5 mg/m^3 showed some unspecified teratogenic effects. In general, human exposure occurs mainly through inhalation of tobacco smoke and polluted air. Although ingesting smoked and broiled meats may expose humans to pyrene, there is little indication of serious health effects.
Medical Conditions Aggravated by Long-Term Exposure: None reported.
Target Organs: Skin, eyes, respiratory tract.
Primary Entry Routes: Inhalation, ingestion, skin contact.
Acute Effects: Vapor inhalation may irritate the nose mucosa and respiratory tract. Vapors may also cause conjunctival irritation. Pyrene is absorbed through intact skin and causes dermal irritation. Ingestion may irritate and burn the esophagus and gastrointestinal tract.
Chronic Effects: None reported.
FIRST AID
Eyes: Flush immediately, including under the eyelids, gently but thoroughly with flooding amounts of running water for at least 15 min.
Skin: *Quickly* remove contaminated clothing. After rinsing affected skin with flooding amounts of water, wash it with soap and water.
Inhalation: Remove exposed person to fresh air and support breathing as needed.
Ingestion: Never give anything by mouth to an unconscious or convulsing person. If ingested, have a *conscious* person drink 1 to 2 glasses of milk or water. Do not induce vomiting.
After first aid, get appropriate in-plant, paramedic, or community medical support.
Physician's Note: Observe patients with dermal exposure for systemic poisoning since pyrene is absorbed through intact skin.

Section 7. Spill, Leak, and Disposal Procedures

Spill/Leak: Notify safety personnel, evacuate all unnecessary personnel, and remove all heat and ignition sources. Cleanup personnel should protect against vapor inhalation and skin and eye contact. Scoop spilled material into appropriate disposal containers. Absorb liquid with inert, noncombustible material and place waste in appropriate disposal containers. Follow applicable OSHA regulations (29 CFR 1910.120).
Disposal: Contact your supplier or a licensed contractor for detailed recommendations. Follow applicable Federal, state, and local regulations.
EPA Designations
RCRA Hazardous Waste (40 CFR 261.33): Not listed
Listed as a CERCLA Hazardous Substance* (40 CFR 302.4), Reportable Quantity (RQ): 5000 lb (2270 kg) [* per Clean Water Act, Sec. 307(a)]
Listed as SARA Extremely Hazardous Substance (40 CFR 355), Reportable Quantity: 5000 lb, Threshold Planning Quantity (TPQ): 1000/10,000 lb
SARA Toxic Chemical (40 CFR 372.65): Not listed
OSHA Designations
Air Contaminant (29 CFR 1910.1000, Subpart Z): Not listed

Section 8. Special Protection Data

Goggles: Wear protective eyeglasses or chemical safety goggles, per OSHA eye- and face-protection regulations (29 CFR 1910.133).
Respirator: Follow OSHA respirator regulations (29 CFR 1910.134) and, if necessary, wear a NIOSH-approved respirator. For emergency or nonroutine operations (cleaning spills, reactor vessels, or storage tanks), wear an SCBA.
Warning: Air-purifying respirators do *not* protect workers in oxygen-deficient atmospheres.
Other: Wear impervious gloves, boots, aprons, and gauntlets to prevent skin contact.
Ventilation: Provide general and local explosion-proof ventilation systems to maintain airborne concentrations below the OSHA PEL (Sec. 2). Local exhaust ventilation is preferred since it prevents contaminant dispersion into the work area by controlling it at its source.[107]
Safety Stations: Make available in the work area emergency eyewash stations, safety/quick-drench showers, and washing facilities.
Contaminated Equipment: Never wear contact lenses in the work area: soft lenses may absorb, and all lenses concentrate, irritants. Remove this material from your shoes and equipment. Launder contaminated clothing before wearing.
Comments: Never eat, drink, or smoke in work areas. Practice good personal hygiene after using this material, especially before eating, drinking, smoking, using the toilet, or applying cosmetics.

Section 9. Special Precautions and Comments

Storage Requirements: Store in closed containers in a cool, well-ventilated area. Protect containers from physical damage.
Engineering Controls: Avoid vapor inhalation and skin contact. Practice good personal hygiene and housekeeping procedures. To prevent static sparks, electrically ground and bond all containers and equipment used in shipping, receiving, or transferring operations in production and storage areas. Provide preplacement and periodic medical examinations, including comprehensive medical histories with emphasis on the oral cavity, respiratory tract, bladder, and kidneys. Examine the skin for premalignant and malignant lesions.
Transportation Data (49 CFR 172.101, .102): Not listed

MSDS Collection **References:** 7, 73, 87, 103, 123, 124, 126, 127, 136
Prepared by: MJ Allison, BS; **Industrial Hygiene Review:** DJ Wilson, CIH; **Medical Review:** MJ Hardies, MD

Material Safety Data Sheet

Genium Publishing Corporation
1145 Catalyn Street
Schenectady, NY 12303-1836 USA
(518) 377-8855

GENIUM PUBLISHING CORP.

No. 317
TOLUENE
(Revision D)

Issued: August 1979
Revised: April 1986

SECTION 1. MATERIAL IDENTIFICATION

20

MATERIAL NAME: TOLUENE

OTHER DESIGNATIONS: Methyl Benzene, Methyl Benzol, Phenylmethane, Toluol, C_7H_8, CAS #0108-88-3

MANUFACTURER/SUPPLIER: Available from many suppliers, including:
Allied Corp., PO Box 2064R, Morristown, NJ 07960; Telephone: (201) 455-4400
Ashland Chemical Co., Industrial Chemicals & Solvents Div., PO Box 2219, Columbus, OH; Telephone: (614) 889-3844

HMIS
H: 2
F: 3
R: 0
PPE*
*See sect. 8

R 1
I 3
S 2
K 4

SECTION 2. INGREDIENTS AND HAZARDS

	%	HAZARD DATA
Toluene 	ca 100	8-hr TLV: 100 ppm, or 375 mg/m^3* (Skin)** --- Man, Inhalation, TCLo: 100 ppm: Psychotropic*** --- Rat, Oral, LD_{50}: 5000 mg/kg Rat, Inhalation, LCLo: 4000 ppm/4 hrs. Rabbit, Skin, LD_{50}: 14 gm/kg --- Human, Eye: 300 ppm

* Current (1985-86) ACGIH TLV. The OSHA PEL is 200 ppm with an acceptable ceiling concentration of 300 ppm and an acceptable maximum peak of 500 ppm/10 minutes.

** Skin designation indicates that toluene can be absorbed through intact skin and contribute to overall exposure.

*** Affects the mind.

SECTION 3. PHYSICAL DATA

Boiling Point ... 231°F (111°C)
Vapor Pressure @ 20°C, mm Hg ... 22
Water Solubility @ 20°C, wt. % ... 0.05
Vapor Density (Air = 1) ... 3.14
Evaporation Rate (BuAc = 1) ... 2.24
Specific Gravity (H_2O = 1) ... 0.866
Melting Point ... -139°F (-95°C)
Percent Volatile by Volume ... ca 100
Molecular Weight ... 92.15

Appearance and odor: Clear, colorless liquid with a characteristic aromatic odor. The odor is detectable to most individuals in the range of 10 to 15 ppm. Because olfactory fatigue occurs rapidly upon exposure to toluene, odor is not a good warning property.

SECTION 4. FIRE AND EXPLOSION DATA

Flash Point and Method	Autoignition Temp.	Flammability Limits In Air	LOWER	UPPER
40°F (4°C) CC	896°F (480°C)	% by Volume	1.27	7.1

EXTINGUISHING MEDIA: Carbon dioxide, dry chemical, alcohol foam. Do not use a solid stream of water because the stream will scatter and spread the fire. Use water spray to cool tanks/containers that are exposed to fire and to disperse vapors.

UNUSUAL FIRE/EXPLOSION HAZARDS: This OSHA class IB flammable liquid is a dangerous fire hazard. It is a moderate fire hazard when exposed to oxidizers, heat, sparks, or open flame. Vapors are heavier than air and may travel a considerable distance to an ignition source and flash back.

SPECIAL FIRE-FIGHTING PROCEDURES: Fire fighters should wear self-contained breathing apparatus with full facepiece operated in a positive-pressure mode when fighting fires involving toluene.

SECTION 5. REACTIVITY DATA

CHEMICAL INCOMPATIBILITIES: Toluene is stable in closed containers at room temperature under normal storage and handling conditions. It does not undergo hazardous polymerization. This material is incompatible with strong oxidizing agents, dinitrogen tetraoxide, silver perchlorate, tetranitromethane, and uranium hexafluoride. Contact with these materials may cause fire or explosion. Nitric acid and toluene, especially in the presence of sulfuric acid, will produce nitrated compounds that are dangerously explosive.

CONDITIONS TO AVOID: Avoid exposure to sparks, open flame, hot surfaces, and all sources of heat and ignition. Toluene will attack some forms of plastics, rubber, and coatings. Thermal decomposition or burning produces carbon dioxide and/or carbon monoxide.

SECTION 6. HEALTH HAZARD INFORMATION | TLV

Toluene is not considered a carcinogen by the NTP, IARC, or OSHA. SUMMARY OF RISKS: Vapors of toluene may cause irritation of the eyes, nose, upper respiratory tract, and skin. Exposure to 200 ppm for 8 hours causes mild fatigue, weakness, confusion, lacrimation (tearing) and paresthesia (a sensation of prickling, tingling, or creeping on the skin that has no objective cause). Exposure to higher concentrations may cause headache, nausea, dizziness, dilated pupils, and euphoria, and, in severe cases, may cause unconsciousness and death. The liquid is irritating to the eyes and skin. Contact with the eyes may cause transient corneal damage, conjunctival irritation, and burns if not promptly removed. Repeated and/or prolonged contact with the skin may cause drying and cracking. It may be absorbed through the skin in toxic amounts. Ingestion causes irritation of the gastrointestinal tract. It may cause effects resembling those from inhalation of the vapor. Chronic overexposure to toluene may cause reversible kidney and liver injury. FIRST AID: EYE CONTACT: Immediately flush eyes, including under eyelids, with running water for at least 15 minutes. Get medical attention if irritation persists.* SKIN CONTACT: Immediately flush skin (for at least 15 minutes) while removing contaminated shoes and clothing. Wash exposed area with soap and water. Get medical attention if irritation persists or if a large area has been exposed.* INHALATION: Remove victim to fresh air. Restore and/or support breathing as required. Keep victim warm and quiet. Get medical help.* INGESTION: Give victim 1 to 2 glasses of water or milk. Contact a poison control center. Do not induce vomiting unless directed to do so. Transport victim to a medical facility. Never give anything by mouth to a person who is unconscious or convulsing. * GET MEDICAL ASSISTANCE = In plant, paramedic, community. Get medical help for further treatment, observation, and support after first aid, if indicated.

SECTION 7. SPILL, LEAK, AND DISPOSAL PROCEDURES

SPILL/LEAK: Notify safety personnel of large spills or leaks. Remove all sources of heat and ignition. Provide maximum explosion-proof ventilation. Limit access to spill area to necessary personnel only. Remove leaking containers to safe place if feasible. Cleanup personnel need protection against contact with liquid and inhalation of vapor (see sect. 8). WASTE DISPOSAL: Absorb small spills with paper towel or vermiculite. Contain large spills and collect if feasible, or absorb with vermiculite or sand. Place waste solvent or absorbent into closed containers for disposal using nonsparking tools. Liquid can be flushed with water to an open holding area for handling. Do not flush to sewer, watershed, or waterway. COMMENTS: Place in suitable container for disposal by a licensed contractor or burn in an approved incinerator. Consider reclaiming by distillation. Contaminated absorbent can be buried in a sanitary landfill. Follow all Federal, state, and local regulations. TLm 96: 100-10 ppm. Toluene is designated as a hazardous waste by the EPA. The EPA (RCRA) HW No. is U220 (40 CFR 261). The reportable quantity (RQ) is 1000 lbs/454 kg (40 CFR 117).

SECTION 8. SPECIAL PROTECTION INFORMATION

Provide general and local exhaust ventilation to meet TLV requirements. Ventilation fans and other electrical service must be nonsparking and have an explosion-proof design. Exhaust hoods should have a face velocity of at least 100 lfm (linear feet per minute) and be designed to capture heavy vapor. For emergency or nonroutine exposures where the TLV may be exceeded, use an organic chemical cartridge respirator if concentration is less than 200 ppm and an approved canister gas mask or self-contained breathing apparatus with full facepiece if concentration is greater than 200 ppm.

Safety glasses or splash goggles should be worn in all work areas. Neoprene gloves, apron, face shield, boots, and other appropriate protective clothing and equipment should be available and worn as necessary to prevent skin and eye contact. Remove contaminated clothing immediately and do not wear it until it has been properly laundered.

Eyewash stations and safety showers should be readily available in use and handling areas.

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

SECTION 9. SPECIAL PRECAUTIONS AND COMMENTS

STORAGE SEGREGATION: Store in a cool, dry, well-ventilated area away from oxidizing agents, heat, sparks, or open flame. Storage areas must meet OSHA requirements for class IB flammable liquids. Use approved safety cans for handling small amounts. Protect containers from physical damage. Use only with adequate ventilation. Avoid contact with eyes, skin, or clothing. Do not inhale or ingest. Use caution when handling this compound because it can be absorbed through intact skin in toxic amounts. SPECIAL HANDLING/STORAGE: Ground and bond metal containers and equipment to prevent static sparks when making transfers. Do not smoke in use or storage areas. Use nonsparking tools. ENGINEERING CONTROL: Preplacement and periodic medical exams emphasizing the liver, kidneys, nervous system, lungs, heart, and blood should be provided. Workers exposed to concentrations greater than the action level (50 ppm) should be examined at least once a year. Use of alcohol can aggravate the toxic effects of toluene.

COMMENTS: Emptied containers contain product residues. Handle accordingly!

Toluene is designated as a hazardous substance by the EPA (40 CFR 116). DOT Classification: Flammable liquid. UN1294.

Data Source(s) Code: 1-9, 12, 16, 20, 21, 24, 26 [illegible] 31, 82. CR

Approvals J.O. Peterson, 11/86.

Indust. Hygiene/Safety 10-86

Medical Review Oct 86

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

MALLINCKRODT J.T.Baker

24 Hour Emergency Telephone: 908-859-2151
CHEMTREC: 1-800-424-9300

National Response In Canada
CANUTEC: 613-996-6666

Outside U.S. and Canada
Chemtrec: 202-483-7616

NOTE: CHEMTREC, CANUTEC and National Response Center emergency numbers to be used only in the event of chemical emergencies involving a spill, leak, fire, exposure or accident involving chemicals.

All non-emergency questions should be directed to Customer Service (1-800-582-2537) for assistance.

XYLENES

MSDS Number: X2000 --- *Effective Date: 03/05/97*

1. Product Identification

Synonyms: Dimethyl benzene, xylol, methyltoluene
CAS No.: 1330-20-7
Molecular Weight: 106.17
Chemical Formula: C6H4(CH3)2
Product Codes: J.T. Baker: 5377, 5810, 5813, 9483, 9489, 9490, 9493, 9494, 9499, 9516, X516 Mallinckrodt: 8664, 8668, 8671, 8672, 8685, 8802

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
p-Xylene	106-42-3	< 20%	No
Ethyl Benzene	100-41-4	15 - 25%	Yes
m-Xylene	108-38-3	40 - 65%	No
o-Xylene	95-47-6	15 - 20%	No

3. Hazards Identification

Emergency Overview

DANGER! HARMFUL OR FATAL IF SWALLOWED. VAPOR HARMFUL. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES SEVERE EYE IRRITATION. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. CHRONIC EXPOSURE CAN CAUSE ADVERSE LIVER, KIDNEY, AND BLOOD EFFECTS. FLAMMABLE LIQUID AND VAPOR.

J.T. Baker SAF-T-DATA (tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate
Flammability Rating: 3 - Severe (Flammable)
Reactivity Rating: 0 - None
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT; VENT HOOD; PROPER GLOVES; CLASS
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation of vapors may be irritating to the nose and throat. Inhalation of high concentrations may result in nausea, vomiting, headache, ringing in the ears, and severe breathing difficulties which may be delayed in onset. Substernal pain, cough, and hoarseness are also reported. High vapor concentrations are anesthetic and central nervous system depressants.

Ingestion:
Ingestion causes burning sensation in mouth and stomach, nausea, vomiting and salivation. Minute amounts aspirated into the lungs can produce a severe hemorrhagic pneumonitis with severe pulmonary injury or death.

Skin Contact:
Skin contact results in loss of natural oils and often results in a characteristic dermatitis. May be absorbed through the skin.

Eye Contact:
Vapors cause eye irritation. Splashes cause severe irritation, possible corneal burns and eye damage.

Chronic Exposure:
Chronic inhalation can cause headache, loss of appetite, nervousness and pale skin. Repeated or prolonged skin contact may cause a skin rash. Repeated exposure of the eyes to high concentrations of vapor may cause reversible eye damage. Repeated exposure can damage bone marrow, causing low blood cell count. May damage the liver and kidneys.

Aggravation of Pre-existing Conditions:

Persons with pre-existing skin disorders or eye problems, or impaired liver, kidney, blood, or respiratory function may be more susceptible to the effects of the substance.

4. First Aid Measures

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician immediately.

Ingestion:
Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately.

Skin Contact:
Immediately flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention. Wash clothing before reuse. Thoroughly clean shoes before reuse.

Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

5. Fire Fighting Measures

Fire:
Flash point: 29C (84F) CC Autoignition temperature: 464C (867F) Flammable limits in air % by volume: lel: 1.0; uel: 7.0

Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with strong oxidizers may cause fire. Sealed containers may rupture when heated. Sensitive to static discharge.

Fire Extinguishing Media:
Dry chemical, foam or carbon dioxide. Water spray may be used to keep fire exposed containers cool, dilute spills to nonflammable mixtures, protect personnel attempting to stop leak and disperse vapors.

Special Information:
In the event of a fire, wear full protective clothing and NIOSH-approved self-contained breathing apparatus with full facepiece operated in the pressure demand or other positive pressure mode. Vapors can flow along surfaces to distant ignition source and flash back.

6. Accidental Release Measures

Ventilate area of leak or spill. Remove all sources of ignition. Wear appropriate personal protective equipment as specified in Section 8. Isolate hazard area. Keep unnecessary and unprotected personnel from entering. Contain and recover liquid when possible. Use non-sparking tools and equipment. Collect liquid in an appropriate container or absorb with an inert material (e. g., vermiculite, dry sand, earth), and place in a chemical waste container. Do not use combustible materials, such as saw dust. Do not flush to sewer! If a leak or spill has not ignited, use water spray to disperse the vapors, to protect personnel attempting to stop leak, and to flush spills away from exposures. US Regulations (CERCLA) require reporting spills and releases to soil, water and air in excess of reportable quantities. The toll free number for the US Coast Guard National Response Center is (800) 424-8802. J. T. Baker SOLUSORB(tm) solvent adsorbent is recommended for spills of this product.

7. Handling and Storage

Protect against physical damage. Store in a cool, dry well-ventilated location, away from any area where the fire hazard may be acute. Outside or detached storage is preferred. Separate from incompatibles. Containers should be bonded and grounded for transfers to avoid static sparks. Storage and use areas should be No Smoking areas. Use non-sparking type tools and equipment, including explosion proof ventilation. Containers of this material may be hazardous when empty since they retain product residues (vapors, liquid); observe all warnings and precautions listed for the product. Do Not attempt to clean empty containers since residue is difficult to remove. Do not pressurize, cut, weld, braze, solder, drill, grind or expose such containers to heat, sparks, flame, static electricity or other sources of ignition: they may explode and cause injury or death.

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit (PEL): 100 ppm (TWA) xylene 100 ppm (TWA) ethylbenzene -ACGIH Threshold Limit Value (TLV): 100 ppm (TWA) 150 ppm (STEL) xylene Carcinogen Category (xylene): A4 100 ppm (TWA) 125 ppm (STEL) ethyl benzene

Ventilation System:
A system of local and/or general exhaust is recommended to keep employee exposures below the Airborne Exposure Limits. Local exhaust ventilation is generally preferred because it can control the emissions of the contaminant at its source, preventing dispersion of it

into the general work area. Please refer to the ACGIH document, *Industrial Ventilation, A Manual of Recommended Practices* , most recent edition, for details. Use explosion-proof equipment.

Personal Respirators (NIOSH Approved):
If the exposure limit is exceeded, a half-face organic vapor respirator may be worn for up to ten times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. A full-face piece organic vapor respirator may be worn up to 50 times the exposure limit or the maximum use concentration specified by the appropriate regulatory agency or respirator supplier, whichever is lowest. For emergencies or instances where the exposure levels are not known, use a full-face piece positive-pressure, air-supplied respirator. WARNING: Air-purifying respirators do not protect workers in oxygen-deficient atmospheres.

Skin Protection:
Wear impervious protective clothing, including boots, gloves, lab coat, apron or coveralls, as appropriate, to prevent skin contact.

Eye Protection:
Use chemical safety goggles and/or a full face shield where splashing is possible. Maintain eye wash fountain and quick-drench facilities in work area.

9. Physical and Chemical Properties

The following physical data is for xylene.
Appearance:
Clear, colorless liquid.

Odor:
Characteristic odor.

Solubility:
Insoluble in water.

Specific Gravity:
0.86 @ 20C/4C

pH:
Not applicable.

% Volatiles by volume @ 21C (70F):
100

Boiling Point:
137 - 140C (279 - 284F)

Melting Point:
-25C (-13F)

Vapor Density (Air=1):
3.7

Vapor Pressure (mm Hg):
8 @ 20C (68F)

Evaporation Rate (BuAc=1):
0.7

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage.

Hazardous Decomposition Products:
Involvement in a fire causes formation of carbon monoxide and unidentified organic components.

Hazardous Polymerization:
Will. not occur.

Incompatibilities:
Strong oxidizing agents and strong acids.

Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

11. Toxicological Information

Toxicological Data:
Xylene: oral rat LD50: 4300 mg/kg; inhalation rat LC50: 5000 ppm/4H; skin rabbit LD50: > 1700 mg/kg; Irritation eye rabbit: 87 mg mild (Std. Draize); irritation skin rabbit 500 mg/24 moderate (Std. Draize); investigated as a tumorigen, mutagen, reproductive effector. Ethyl benzene: oral rat LD50: 3500 mg/kg; skin rabbit LD50: 17800 uL/kg; investigated as a tumorigen, mutagen, reproductive effector.

Reproductive Toxicity:
May cause teratogenic effects.

--------\Cancer Lists\----------
---NTP Carcinogen---

Ingredient	Known	Anticipated	IARC Category
Ethyl Benzene (100-41-4)	No	No	None
p-Xylene (106-42-3)	No	No	3
m-Xylene (108-38-3)	No	No	3
o-Xylene (95-47-6)	No	No	3

12. Ecological Information

Environmental Fate:
Following data for xylene: When released into the soil, this material may evaporate to a moderate extent. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material may biodegrade to a moderate extent. When released into water, this material may evaporate to a moderate extent. When released into water, this material may biodegrade to a moderate extent. When released into the air, this material may be moderately degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material is expected to have a half-life of less than 1 day. This material is not expected to significantly bioaccumulate. (mixed xylenes: octanol / water partition coefficient 3.1 - 3.2; bioconcentration factor = 1.3, eels)

Environmental Toxicity:
For xylene: This material is expected to be slightly toxic to aquatic life. The LC50/96-hour values for fish are between 10 and 100 mg/l.

13. Disposal Considerations

Whatever cannot be saved for recovery or recycling should be handled as hazardous waste and sent to a RCRA approved incinerator or disposed in a RCRA approved waste facility. Processing, use or contamination of this product may change the waste management options. State and local disposal regulations may differ from federal disposal regulations. Dispose of container and unused contents in accordance with federal, state and local requirements.

14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: XYLENES
Hazard Class: 3
UN/NA: UN1307
Packing Group: III
Information reported for product/size: 398LB

International (Water, I.M.O.)

Proper Shipping Name: XYLENES
Hazard Class: 3.3
UN/NA: UN1307
Packing Group: III
Information reported for product/size: 398LB

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\----------

Ingredient	TSCA	EC	Japan	Australia
Ethyl Benzene (100-41-4)	Yes	Yes	Yes	Yes
p-Xylene (106-42-3)	Yes	Yes	Yes	Yes
m-Xylene (108-38-3)	Yes	Yes	Yes	Yes
o-Xylene (95-47-6)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\----------

--Canada--

Ingredient	Korea	DSL	NDSL	Phil.
Ethyl Benzene (100-41-4)	Yes	Yes	No	Yes
p-Xylene (106-42-3)	Yes	Yes	No	Yes
m-Xylene (108-38-3)	Yes	Yes	No	Yes
o-Xylene (95-47-6)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\----------

-SARA 302- ------SARA 313------

Ingredient	RQ	TPQ	List	Chemical Catg.
Ethyl Benzene (100-41-4)	No	No	Yes	No
p-Xylene (106-42-3)	No	No	Yes	No
m-Xylene (108-38-3)	No	No	Yes	No
o-Xylene (95-47-6)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\----------

-RCRA- -TSCA-

Ingredient	CERCLA	261.33	8(d)
Ethyl Benzene (100-41-4)	1000	No	Yes
p-Xylene (106-42-3)	100	No	Yes
m-Xylene (108-38-3)	1000	No	No
o-Xylene (95-47-6)	1000	No	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Mixture / Liquid)

Australian Hazchem Code: 3[Y]
Poison Schedule: No information found.

WHMIS:
This MSDS has been prepared according to the hazard criteria of the Controlled Products Regulations (CPR) and the MSDS contains all of the information required by the CPR.

16. Other Information

NFPA Ratings: Health: 2 Flammability: 3 Reactivity: 0

Label Hazard Warning:
DANGER! HARMFUL OR FATAL IF SWALLOWED. VAPOR HARMFUL. AFFECTS CENTRAL NERVOUS SYSTEM. CAUSES SEVERE EYE IRRITATION. CAUSES IRRITATION TO SKIN AND RESPIRATORY TRACT. MAY BE HARMFUL IF ABSORBED THROUGH SKIN. CHRONIC EXPOSURE CAN CAUSE ADVERSE LIVER, KIDNEY, AND BLOOD EFFECTS. FLAMMABLE LIQUID AND VAPOR.

Label Precautions:
Keep away from heat, sparks and flame. Avoid contact with eyes, skin and clothing. Keep container closed. Use only with adequate ventilation. Avoid breathing vapor. Wash thoroughly after handling.

Label First Aid:
Aspiration hazard. If swallowed, vomiting may occur spontaneously, but DO NOT INDUCE. If vomiting occurs, keep head below hips to prevent aspiration into lungs. Never give anything by mouth to an unconscious person. Call a physician immediately. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. In all cases get medical attention immediately.

Product Use:

Laboratory Reagent.

Revision Information:
Mixture. New 16 section MSDS format, all sections have been revised.

Disclaimer:

****

Mallinckrodt Baker, Inc. provides the information contained herein in good faith but makes no representation as to its comprehensiveness or accuracy. This document is intended only as a guide to the appropriate precautionary handling of the material by a properly trained person using this product. Individuals receiving the information must exercise their independent judgment in determining its appropriateness for a particular purpose. MALLINCKRODT BAKER, INC. MAKES NO REPRESENTATIONS OR WARRANTIES, EITHER EXPRESS OR IMPLIED, INCLUDING WITHOUT LIMITATION ANY WARRANTIES OF MERCHANTABILITY, FITNESS FOR A PARTICULAR PURPOSE WITH RESPECT TO THE INFORMATION SET FORTH HEREIN OR THE PRODUCT TO WHICH THE INFORMATION REFERS. ACCORDINGLY, MALLINCKRODT BAKER, INC. WILL NOT BE RESPONSIBLE FOR DAMAGES RESULTING FROM USE OF OR RELIANCE UPON THIS INFORMATION.

****

Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

ATTACHMENT D

UTILITY CLEARANCE CHECKLIST

CHECKLIST FOR INTRUSIVE FIELDWORK

Site Name: _____ Job # _____

Site Address: _____

Con Edison Project Manager: _____ Phone: _____

Con Edison Site Manager: _____ _____

Parsons Project Manager: _____ Phone: _____

Parsons Site Manager: _____ Phone: _____

Subcontractor (driller, excavation, etc): _____

Subcontractor's Contact Person: _____ Phone _____

Meeting / Start Date _____ Time _____

1) Health and Safety Plan Reviewed by: Signature: _____

Health and Safety Form Completed: _____ Date _____

Site Drawings (yes/no/NA): _____ (Attach site figure with proposed boring locations)

2) Dig Safely New York Contacted for Utility Mark-Out: Y / N

NYC/Long Island One Call Center required by Code 753: 1-800 272-4480) 72 Hr. Advanced Notice

Called: Date _____ Time _____ Initials _____

Reference # _____

Utility Drawings Received: _____ (Attach copy of utility maps)

Utility Mark-Outs Inspected/Confirmed: Y / N By (initials): _____

Utility Inventory:

Utility	Name	Depth (ft)	Phone	Notified - Date	Marked
Above Ground Services:					
Electric		NA		Y / N	Y / N
Telephone		NA		Y / N	Y / N
Cable		NA		Y / N	Y / N
Overhead Supports		NA		Y / N	Y / N
Traffic light cables		NA		Y / N	Y / N
Below Ground Services:					
Electric				Y / N	Y / N
Telephone				Y / N	Y / N
Cable				Y / N	Y / N
Gas				Y / N	Y / N
Water				Y / N	Y / N
UST System				Y / N	Y / N
Storm				Y / N	Y / N
Sanitary				Y / N	Y / N
Steam				Y / N	Y / N
Pipeline Companies				Y / N	Y / N

3) Private Utility Locating Service Retained? Y / N

Called: Date _____ Time _____ Initials _____

Name of Locating Service: _____

Telephone #/ contact: _____

Type of sensing equipment used: _____

CHECKLIST FOR INTRUSIVE FIELDWORK

4) Metal Detector Survey

Drilling location cleared by Parsons with a metal detector: By (initials): _____ Date: _____

5) Drilling Locations Marked, M-Scoped and Cleared by Con Edison Construction Management

Con Edison Construction Manager: _____ Phone: _____

Site Walkover Conducted to Mark all Locations: _____ Date: _____

M-Scoping Conducted by Con Edison: _____ Date: _____

Con Edison Construction Management Approval of all Locations: Y / N

6) Hand Excavations: (test pits or hand auger borings to a minimum of 5 feet required)

4' X 4' x 5' test pits required for all sidewalk locations

Date Completed: _____ Depth: _____

7) Signature of Parsons Project Mgr. (required to begin fieldwork):

NAME OF PROJ. MGR. (PRINTED OR TYPED)	SIGNATURE OF PROJ. MGR.	Date

ADDITIONAL COMMENTS / NOTES:

ATTACHMENT E

STANDARD SAFE WORK PRACTICES

STANDARD SAFE WORK PRACTICES

1) Eating, drinking, chewing tobacco, smoking and carrying matches or lighters is prohibited in a contaminated or potentially contaminated area or where the possibility for the transfer of contamination exists.

2) Avoid contact with potentially contaminated substances. Do not walk through puddles, pools, mud, etc. Avoid, whenever possible, kneeling on the ground, leaning or sitting on equipment or ground. Do not place monitoring equipment on potentially contaminated surfaces (i.e., ground, etc.).

3) All field crew members should make use of their senses to alert them to potentially dangerous situations in which they should not become involved; i.e., presence of strong and irritating or nauseating odors.

4) Prevent, to the extent possible, spills. In the event that a spillage occurs, contain liquid if possible.

5) Field crew members shall be familiar with the physical characteristics of investigations, including:

   - Wind direction
   - Accessibility to associates, equipment, vehicles
   - Communication
   - Hot zone (areas of known or suspected contamination)
   - Site access
   - Nearest water sources

6) All wastes generated during activities on-site should be disposed of as directed by the project manager or his on-site representative.

7) Protective equipment as specified in the section on personnel protection will be utilized by workers during the initial site reconnaissance, and other activities.

8) Employees shall follow procedures to avoid at-risk behaviors that could result in an incident.