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Prepared for:
KeySpan Corporation
175 East Old Country Road
Hicksville, New York 11801

Remedial Investigation Work Plan

Draft

Far Rockaway Former Manufactured Gas Plant Site
1200-1224 Brunswick Avenue
Far Rockaway, Queens County, New York

Order on Consent D1-0001-99-05
NYSDEC Site Number 2-41-032

The RETEC Group, Inc.
June 2007
Document No.: KED04-20370

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1.0 Introduction

This document presents the work plan for the remedial investigation (RI) of the Far Rockaway former manufactured gas plant (MGP) site (Site) located at 1200-1224 Brunswick Avenue, Far Rockaway, Queens County, New York. It has been prepared by ENSR Corporation (d/b/a, The RETEC Group, Inc. [RETEC]) on behalf of KeySpan. The Site is being investigated in accordance with Order on Consent #D1-0001-99-05 between KeySpan Corporate Service, LLC (KeySpan) and the New York State Department of Environmental Conservation (NYSDEC). The RI is designed to be an extension of the preliminary site assessment (PSA) performed on behalf of KeySpan in December 2002. The PSA was completed in accordance with the NYSDEC approved PSA work plan prepared by Vanasse Hantgen Brustlin, Inc. (VHB) and dated April 2002. Results of the PSA were presented in the PSA report (PSAR) prepared by Paulus, Sokolowski, and Sartor, Engineering, PC (PS&S, 2003).

Data collected during the PSA revealed that additional investigation is necessary at the Site due to constituent concentrations in soil in excess of the NYSDEC Recommended Soil Cleanup Objective (RSCO) concentrations, listed in the Technical and Administrative Guidance Memorandum (TAGM 4046): Determination of Soil Cleanup Objectives and Cleanup Levels (NYSDEC, 1994), and constituent concentrations in groundwater in excess of either the ambient water quality standards or guidance values (AWQSGVs) listed in NYSDEC Technical and Operations Guidance Series 1.1.1 (TOGS) (NYSDEC, 1998). The RI is required by NYSDEC due to the presence of MGP impacts observed during the PSA that require further delineation laterally at the Site and adjacent areas, particularly to the north on property owned by the Long Island Railroad (LIRR). With the exception of one sample (FRSB-8) for chromium, vertical delineation of impacts was accomplished during the PSA work. Proposed sampling in this Work Plan will address this issue.

This RI Work Plan (RIWP) presents a summary of the Site background information, RI objectives, and outlines the proposed investigation activities and the methods and guidelines for sample collection. Companion documents and guidance developed to support the RI field efforts include a Quality Assurance Project Plan (QAPP, Appendix A) a site-specific Health and Safety Plan (HASP, Appendix B), RETEC field methods and procedures (Appendix C), a Community Air Monitoring Plan (CAMP, Appendix D), and a Citizen Participation Plan (CPP, Appendix E).

The QAPP specifies procedures for data collection and quality control in the field and in the laboratory. The QAPP is designed to allow the collection of reliable and accurate data from the RI field program and laboratory. The laboratory performing the analysis of samples (Cemtech, of Mountainside, New Jersey) is certified for the specific parameter or category of parameters pursuant to New York State Department of Health ELAP Certification program. The laboratory will provide New York State Category B data deliverables for this project and the laboratory data will be validated in accordance with NYSASP protocols.

The HASP describes procedures to be followed during the RI to protect the health and safety of the field-personnel and the public in the vicinity of the Site. The HASP complies with 29 CFR 1910 and construction (29 CFR 1926). All work will be performed in accordance with all OSHA, state, and industry safety standards. All personnel performing work associated with this RI will be required to have both general and any site-specific training such as RETEC On-Track Safety and the Long Island Railroad (LIRR) training programs. The general training includes all applicable OSHA and state required training, such as the requisite 40-hour 1910.120 OSHA Hazardous Waste Operations and Emergency Response (HAZWOPER) Training and the 8-hour Refresher training. Supervisory personnel will also have Supervisory Training. All personnel will be in a medical surveillance program. RETEC will provide a qualified person to enforce the HASP during the RI field program.

The CAMP describes the methods and procedures that will be used to ensure that airborne concentrations of constituents of concern (COCs) are minimized to protect human health and the environment. The CAMP also provides an early warning system so that potential airborne emissions can be controlled at the site source and it provides the methods to measure and document the concentrations of organic vapors and dust during all ground-intrusive activities. The air monitoring proposed in the CAMP is consistent with the NYSDOH guidance.

The CPP plan outlines a variety of communication methods that, based on applicable New York State law and NYSDEC regulations and guidance, provide for constructive communication of program activities between the stakeholders and other interested parties. The attached CPP includes methods intended to inform interested parties of program developments, elicit responses and public involvement, and provide a central point of contact for inquiries regarding the remedial program for the former Far Rockaway MGP Project.

2.0 Project background and objectives

2.1 Site location and description

The Far Rockaway former MGP Site is located between B12th Street and Minton Avenue, on the north side of Brunswick Avenue. The Site address is 1200-1224 Brunswick Avenue and it occupies Section 59/Block 15529/Lots 102, 105, 110, and 115 according to the Far Rockaway Tax Department. The Site location is illustrated on Figure 2-1 and is situated at latitude 40 36' 35.78"N and longitude 74 44' 57.92"W.

The Site is approximately one-acre in size and is currently owned by individual third parties and used by three separate tenants for warehousing, shipping, and distribution operations. Figure 2-2 illustrates the current site layout as well as the location of former MGP structures. The Site contains three two-story buildings which are used for office space and warehousing and includes paved parking and landscaped areas. The buildings are serviced by public utilities including electric, water, sewer, and natural gas.

The Site is located in a mixed industrial and residential area of Far Rockaway. The Long Island RailRoad (LIRR) bounds the Site to the north. Residential housing is located to the east and south of the Site and commercial buildings are situated west of the Site.

2.2 Site history

Based on information provided in the PSAR and review of Sanborn maps, a gas works operated at the Site between the mid 1890's and 1909. Until 1902, the property was owned by Hempstead Gas and Electric Light Company. The operations were transferred to the Queensborough Gas and Electric Company in 1902 when the two entities consolidated. The Long Island Lighting Company (LILCO) acquired Queensborough Gas and Electric Company via stock purchase in 1923.

Figure 2-2 illustrates the former MGP structures that were located at the Site based on information provided on the 1901 Sanborn Fire Insurance Map provided in Appendix B of the PSAR. The former MGP included a building which housed coal bins, a purifier, and a gas generator and a 75,000 cubic foot (cf) gas holder. The PSAR also states the presence of a former gasoline tank in the southern central portion of the property near Brunswick Avenue noted on the 1933 and 1951 Sanborn Maps. No information was available whether it was an above ground or below ground tank. Brown's Directory reports indicate two MGPs in Far Rockaway including Far Rockaway (the Site) and Rockaway Beach (also known as the Rockaway Park site). Gas production was likely most pronounced in the summer given the resort nature of the area at that time with summer populations being about one order of magnitude higher than winter months. Annual production estimates, available for the period of 1900 through 1909 for both MGPs, ranged from a low of 15 million cf in 1900 to a maximum of 100 million cf from 1907 through 1909. No information on byproducts made or sold was available in the directory.

The Site was used by LILCO and the Queensborough Gas and Electric Company as office space following the cessation of MGP operations. Based on Sanborn Fire Insurance Maps, it appears that the gas holder was demolished between 1950 and 1981.

2.3 Site records review

PS&S performed a record review for the Site, the details of which are provided in the PSAR. The records review did not identify any enforcement actions, spills, discharges or releases of hazardous substances, or remedial activities at the Site. The Environmental Data Resources (EDR) database search identified 45 primary and 31 secondary sites within a one-mile radius of the Site. Specifically two sites (referenced as C8 and C9 in the EDR report) are located approximately 1/8 of a mile southeast of the site and hydraulically

upgradient. Both sites have underground storage tanks (USTs) with capacities in excess of 1,000 gallons. The tanks are for the storage of diesel and heating oil, and they represent possible sources of VOCs and SVOCs detected in the northeastern area of the Site. This area of the site is hydraulically upgradient of the former MGP footprint. The EDR results are provided in Appendix D of the PSAR.

2.4 Site geology and hydrology

The southern shores of Long Island consist of reworked glacially deposited sands of Long Island bordered by low-relief barrier islands and shallow lagoons. Long Island was deposited on Late Jurassic to Cenozoic sediments of the Long Island Platform and adjacent Baltimore Trough (USGS, 2007). Metamorphic bedrock is present at depths up to 600 meters below ground surface near Fire Island on the Southern shore of Long Island (USGS, 1999). The nearest surface water body to the site is Motts Basin, located approximately 1,270 feet to the west/northwest of the site. It is unknown whether groundwater in the site area is tidally influenced.

According to Doriski and Wilde-Katz (1983), the site area is underlain by glacial outwash deposits that contain fresh water aquifers for Nassau and Suffolk Counties. The upper portion of the glacial outwash sequence in this part of Long Island contains two confining layers, the “20-foot” clay and the Gardiners Clay, that are known to influence local groundwater flow patterns. The shallowest of these two confining units is the “20-foot” clay, which was documented in Doriski and Wilde-Katz’s 1983 study as being present at depths of 20 to 40 feet below National Geodetic Vertical Datum (NGVD) in the general site area. The “20-foot” clay, interpreted to be a marine deposit, ranges ranging in thickness from 2 to 40 feet and is discontinuous in narrow north-south channels in the study area (Doriski and Wilde-Katz, 1983).

According to the PSAR, the general area of the Site appears to contain historic fill placed at some point within the last 75+ years to raise the elevation of the land to a usable level. During the PSAR, several borings were drilled at the Site to a depth of 16 feet (ft) below ground surface (bgs). Based on the boring logs provided in Appendix E of the PSAR, the Site is underlain by at least 16 ft of fill material which consists predominantly of fine to medium sand with little silt and fine gravel. At some locations, the fill also contained brick, concrete, ash, cinders, glass, and wire. RETEC’s review of the boring logs for evidence of obvious fill materials and the depth to groundwater in the site area suggests that the fill thickness may actually be in the four to five foot range. Despite this potential inconsistency, the boring depths (16 feet bgs) were determined to be sufficient to characterize site impacts.

Groundwater was encountered in the borings at depths ranging between approximately 4 and 8 ft bgs. The groundwater flow direction was determined to be northwest. Figure 2-3 illustrates the groundwater elevations and flow direction at the Site developed during the PSA.

2.5 Previous investigations

The PSA performed by PS&S in 2002 is the only investigation previously performed at the Site. The PSA was performed in accordance with the NYSDEC approved PSA work plan prepared by VHB and dated April 2002. The PSA included historical site data and records review, and a field investigation, the results of which are presented in the PSAR developed by PS&S and dated March 2003. The field investigation consisted of soil, groundwater, and soil vapor sampling and analysis to investigate the potential for the presence of contaminants.

The sampling program was initiated the week of December 2002 and included the collection of 14 surface soil samples, 16 subsurface soil samples from 8 soil borings, 3 subsurface soil samples from 1 test trench, 6 groundwater samples from temporary monitoring wells, and 4 soil vapor samples. Additionally, duplicate samples consisted of one surface soil, one subsurface soil from the test trench, and one groundwater sample.

The surface and subsurface soil analytical results indicated the presence of volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs), particularly polycyclic aromatic hydrocarbons (PAHs),

and metals at concentrations exceeding the NYSDEC RSCOs. Detections of the compounds were concentrated in the area of the former gas holder. A summary of the surface soil and subsurface soil analytical results is provided on Figures 2-4 through and 2-6 and Tables 2-1 through 2-3, respectively.

The groundwater analytical results also indicated the presence of VOCs (benzene, toluene, ethylbenzene, and xylenes [BTEX]), PAHs, and metals at concentrations exceeding NYSDEC AWQSGVs. These compounds were concentrated in the area of the former gas holder. Groundwater exceedances beneath the northeast area of the Site and upgradient of the former MGP operations area were limited to concentrations of toluene. A summary of the groundwater analytical results is presented on Figure 2-7 and in Table 2-4.

The soil vapor samples indicated the presence of various VOCs and naphthalene at low level to moderate concentrations. Again, the compounds were reported to be concentrated in the area of the former gas holder. The soil vapor analytical results are provided in Table 2-5 and sample locations are illustrated on Figure 2-8.

2.6 Site conceptual model

The area formerly occupied by the MGP operations area and gas holder is currently being used as commercial property owned by three different property owners. Commercial property bounds the Site to the west and the Long Island Railroad maintains an active rail yard adjacent to the entire northern boundary of the Site. Private residential properties are located across B12th Street to the east and across Brunswick Avenue to the south of the Site.

The Site is underlain by approximately four to five feet of sandy fill identified by anthropogenic material (brick, glass, asphalt, etc.). A fine to medium sand with little silt and gravel is encountered below the fill. None of the borings were advanced below this stratigraphic unit. Groundwater is encountered beneath the site at depths of five to eight feet below ground surface (bgs), and it flows towards the northwest. The nearest water body in the direction of groundwater flow is Motts Basin located approximately 1,270 feet to the northwest of the Site. A preliminary review of aerial photographs of the Site indicates that the Site is located in a completely urbanized area with no apparent ecological habitats at or in close proximity to the Site.

The observations from the PSA appear consistent with the operating duration (approximately 20 years with seasonal gas production peaks in the summer) of this former MGP, in that only a relatively limited area of the Site around the former gas holder foundation contained visible impacts consisting of black staining. This area of the Site also contained the highest concentrations of PAHs and VOCs in subsurface soils and groundwater. Based on test pit observations, the gas holder bottom was encountered approximately four feet bgs and was less than four inches thick with no evidence of a subsurface foundation, suggesting that the holder was surface mounted structure.

Existing surface soil analytical results are summarized on Figure 2-4. All but one surface soil sample contained concentrations of one or more constituents above the RSCOs. At most locations these compounds consisted of a select group of PAHs and metals. The highest concentrations were detected at FRSS-09 along the northern property boundary adjacent to the active rail yard and at FRSS-04 adjacent to the former gas holder. The remaining onsite samples contained concentrations similar to those detected at adjacent properties to the east and south (FRSS-11 through FRSS-14). Further delineation of PAHs and metals in surface soils is required to the west of the former gas holder and to the north on the Long Island Railroad property (north of the gas holder and north of the former MGP operations area). In addition, samples are required for the development of site specific background values (SSBVs) of these compounds to evaluate whether the detected concentrations of PAHs and metals in surface soils at the Site are consistent with urban background.

Subsurface soil analytical results are summarized on Figures 2-5 for samples collected above ten feet bgs and Figure 2-6 for samples collected below ten feet bgs. With only one exception (FRSB-8) no samples collected below ten feet contained concentrations of one or more constituents above the RSCOs. Based on these findings, the vertical extent of soil impacts has been delineated during the PSA work. A regional clay confining

unit identified as the “20-foot” clay unit is suspected to be present beneath the site at depths of approximately 35 to 40 feet bgs. Despite the PSA findings indicating delineation of vertical impacts at shallower depths, the “20-foot” clay unit will be targeted for investigation at select boring locations during the RI, as outlined in Section 4. The majority of the RSCO exceedances in shallower soils included typical MGP related PAHs including benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, indeno(1,2,3-cd)pyrene, isophorone, naphthalene, and 2-methylnaphthalene. The highest concentrations were detected adjacent to the former gas holder location. Concentrations of VOCs detected above the RSCOs were limited to north of the gas holder at FRSB-04 (ethylbenzene, toluene, and xylene) and west of the holder at FRSB-03 (ethylbenzene and xylenes). Metals detected above the RSCOs consisted of chromium (the most commonly detected metal at the Site, it was detected at three locations) iron, and zinc. The only constituent detected above the RSCOs below ten feet bgs consisted of chromium in the northeast corner of the Site at FRSB-08.

Further delineation of PAHs in the upper ten feet of subsurface soils is required to the north, east, south, and west of the former gas holder. Delineation of VOCs is required to the north and west of the gas holder. In addition, subsurface soil samples are required beneath the Long Island Railroad paved access road to evaluate subsurface conditions north of the former MGP operations area (gas generator and purifier) which was not addressed during the PSA.

Groundwater results collected during the PSA (Figure 2-7) showed that concentrations of constituents above the AWQSGVs were detected hydraulically upgradient of the former MGP operations area and downgradient of the former gas holder. Upgradient of the MGP operations area, exceedances were limited to one VOC (toluene) at wells FRGW-05 and FRGW-06. Exceedances downgradient of the former gas holder consisted of one PAH (naphthalene), and four VOCs, benzene, ethylbenzene, toluene, and xylenes. Delineation of VOCs and SVOCs is required to the north and west of the Site, hydraulically downgradient of the gas holder and the MGP operations area. In addition, evaluation of groundwater quality is required to the south and east, upgradient of the former MGP area to establish background conditions and to evaluate possible off-site sources of VOCs.

Soil vapor results from the PSA indicate fairly low to moderate VOCs in soil vapor. The PSA report states that the highest VOC detected was isopropyl alcohol at 59 ppb (however, Table 5 of the PSA shows this compound at 5.9 ppb). In addition, toluene was detected in this sample (FRSV-01), at 22 ppb (82.9 µg/m^3) and benzene was detected in FRSV-03 at 18 ppb (57.5 µg/m^3). Consistent with Section 2.1 of the NYSDOH guidance, a soil vapor intrusion (SVI) evaluation is required for the buildings which are built on top of or nearby sources of volatile contaminants (such as former MGP structures), including sampling beneath building slabs and sampling of indoor air and ambient air.

In summary, while the gas holder appears to be the primary source of impacts at the Site, the former MGP operations area (gas generator and purifier) were not fully evaluated during the PSA and require investigation. While the impacts detected during the PSA are not suggestive of extensive remedial requirements for the Site, data gaps are present at the constituent level that require additional delineation in all media (surface soil, subsurface soil, groundwater, and soil vapor) to satisfy NYSDEC RI requirements

2.7 Remedial investigation objectives

Based on the operation of a MGP at the Site between the mid-1890’s and 1909 and the results of the PSA, the goals for the RI are to:

- Fill data gaps to determine the nature and extent of MGP impacts at the Site and offsite in accordance with NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation. Specifically, delineate the area and vertical extent of MGP impacts, determine the surface and subsurface characteristics of the Site, identify sources of contamination, migration pathways and potential human or ecological receptors at the Site and offsite.

- Perform a soil vapor survey in accordance with New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion in the State of New York.
- Conduct a Qualitative Human Health Exposure Assessment (QHEA) and Fish and Wildlife Impact Analysis (FWIA).
- Further develop the dataset necessary to allow preparation of a Feasibility Study to evaluate alternative remedies that will eliminate the threat to public health or the environment posed by the site. The Feasibility Study shall be prepared in accordance in a manner consistent with CERCLA, the NCP, the USEPA guidance document entitled "Guidance for Conducting Remedial Investigations and Feasibility Studies under CERCLA (USEPA, 1998) and appropriate USEPA and NYSDEC technical and administrative guidance documents.

3.0 Scope of work

The additional investigative work outlined in this RIWP includes the following field tasks:

- Pre-investigation coordination/meetings to facilitate implementation of the RI
- Locating underground utilities in the investigation areas
- Community air monitoring during invasive drilling activities
- Surface soil sampling and analysis
- Advancement of soil borings and collection of subsurface soil samples for analysis
- Monitoring well installation
- Monitoring well development
- Groundwater sampling
- Aquifer slug testing at select well locations
- Collection and analysis of sub-slab soil vapor samples and indoor air samples from each of the three buildings occupying the former MGP site
- Surveying of all new sampling points, wells, and borings
- Investigation residuals management
- Private Well Survey (may be performed pending results of groundwater investigation)

All field work will follow methods and guidelines provided in this RIWP, the QAPP (Appendix A), HASP (Appendix B), and Field Sampling Procedures (Appendix C).

A summary of the proposed RI Field Investigation activities is included in the following section.

4.0 Remedial investigation field activities

The proposed sampling locations for this RI are illustrated on Figure 4-1, with the sample collection and analyses rationale provided on Table 4-1. The proposed investigation locations were selected to target areas most likely to contain MGP residuals and to define the extent of MGP residuals identified during the PSA investigations. Access agreements will be required with various site and adjacent property owners to execute all sampling locations. If soil observations and photoionization detection (PID) screening results indicate that the proposed soil borings and monitoring wells do not adequately define the extent of MGP residuals, additional investigation locations will be selected in the field in consultation with NYSDEC and KeySpan. Depending on their location, some of these locations will be performed during the mobilization of the proposed RI work and others may require subsequent mobilizations based on access issues. All additional work, whether performed at on-Site or off-Site locations, will be coordinated under the direction of NYSDEC and NYSDOH oversight.

4.1 Pre-investigation coordination

Given current ownership of the property by third parties, meetings will be performed to outline the elements of the RI prior to implementation of the investigation. It is envisioned that this process will include:

- A meeting or meetings with the LIRR and owners and/or current occupants of the site to discuss the implications of the site history and identify any short term concerns about potential risks.
- Discussion and eventual implementation of a soil vapor intrusion survey to collect data on indoor air and soil gas beneath each site building at the former MGP.
- Discussion and communication about the remedial investigation activities prior to and on a routine basis during the project.

4.2 Underground utility clearance

Prior to the initiation of intrusive field work, RETEC will contact Dig Safely New York to arrange for the location and marking of all underground utilities in the vicinity of the proposed soil boring and monitoring well locations. Copies of available city sewer and water maps from the Site vicinity will also be obtained and reviewed during underground utility clearance procedures. Following review of the utilities in the Site area, all sampling locations will be scanned using ground penetrating radar (GPR) and electromagnetic (EM) survey methods by NAEVA Geophysics, Inc. to confirm the location of marked utilities or to identify other unmarked utilities. This work will also provide information regarding the location of the former gas holder. Prior to advancing soil borings, each boring/well location will be hand or vacuum excavated to a depth of 5 feet to check for any utilities not located by Dig Safely prior to deeper investigative drilling/sampling. RETEC will provide written confirmation to KeySpan that subsurface utility markouts have been completed at least three days in advance of initiating the RI Field program.

4.3 Community air monitoring

Community air monitoring requires real-time monitoring for VOCs, particulates (i.e., dust), and MGP related odors at the downwind perimeter of each designated work area when certain activities are in progress at the Site. The community air monitoring is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative work activities. The Community Air Monitoring Plan provided in Appendix D specifies action levels which require increased monitoring, corrective actions to abate emissions, and/or work shutdown for the RI. Perimeter air monitoring

shall be conducted in accordance with the New York State Department of Health Generic Community Air Monitoring Plan (CAMP). In addition, worker zone air monitoring shall be conducted and shall include, at a minimum, use of hand held equipment to monitor for VOCs and particulates as specified in Section 4.3 of the HASP.

4.4 Surface soil sampling and analysis

Surface soil samples will be collected from locations adjacent to the northern and western limits of the MGP operations. Surface soil samples will be collected from the ground surface to 2-inches (0.17 feet) bgs. A total of five surface soil samples are proposed to better delineate constituents detected at the site during the PSA, and shown on Figure 4-1. Rationale for the sample locations is provided on Table 4-1.

In addition, a total of ten surface soil samples are proposed to calculate site-specific background values (SSBVs) for SVOCs and metals using the methods listed below (Table 4-1). These samples will be collected from public space areas within the site area with an emphasis on areas topographically upgradient of the site. All samples will be collected at the same depth interval as the site surface soil samples and will be collected away from parking lots and roadside areas, known waste disposal areas, areas containing known historic fill, low lying depositional areas, and storm drains or ditches receiving site runoff. Once site access issues are resolved, KeySpan will send a letter Work Plan to NYSDEC for final review and approval of all background surface soil locations prior to initiation of the RI.

Samples will be collected using manual methods with a Teflon® or stainless steel spatula or trowel. Soils will be described and field screened using a PID. Soil samples for VOC analysis will be placed directly into appropriate containers and compacted to minimize head space and pore space. The remaining sample volume will be placed into a stainless steel bowl, homogenized, and placed in appropriate containers for the other analyses. The samples will be labeled, placed in laboratory supplied coolers and packed on ice (to maintain a temperature of 4 degrees Celsius). Sampling equipment decontamination and chain of custody (COC) procedures presented in Appendix C will be followed. All sample locations will be flagged for inclusion in the site survey.

The samples will be analyzed for VOCs by United States Environmental Protection Agency (USEPA) Method 8260B, SVOCs by USEPA Method 8270C, RCRA 8 metals plus iron, copper, and zinc using USEPA Methods 6010 and 7000-series, and total cyanide by USEPA Method 9012. Based on the results of the PSA work, tentatively identified compounds (TICs) analysis did not provide additional information beyond typical MGP-related impacts and are therefore not included in the proposed analyses.

4.5 Soil boring and subsurface soil sampling and analysis

A total of 15 soil borings will be drilled during the RI. The boring locations are shown on Figure 4-1. Three of the 15 borings (SB-111, SB-113, and SB-116) are deep borings proposed to determine whether the “20-foot” clay unit is present beneath the site. Soil sampling rationale and proposed sample depths are outlined on Table 4-1. Actual sample intervals and the number of samples chosen for laboratory analysis will be selected in the field based on field conditions and biased to provide required delineation. In general, at least two samples will be collected from each boring location; one at the depth interval with the greatest observed impact based on olfactory and visual observations and PID readings, and one below the deepest impacts or at the base of the boring to provide vertical delineation information. In the event that olfactory and visual observations and PID readings do not indicate impacts at a location, a sample will be collected at the water table.

At deep boring locations, soil borings will be advanced a minimum of five feet into the top of the “20-foot” clay surface to evaluate whether impacts are present. Since this unit is anticipated to be present at depths of approximately 35 to 40 feet bgs in the site area, a maximum anticipated boring depth of 45 feet below ground surface (bgs) is proposed. If the clay is detected as shallower depths, deep boring completion depths will be

shallower. If the “20-foot” clay unit is not present, soil borings will be terminated at a depth of 45 feet bgs. Soil samples will also be collected just above the clay interface (if present), as outlined in Table 4-1.

Soil borings will be advanced using either hollow stem augers (HSA) or geoprobe direct push methods. Continuous samples will be collected from five feet until the base of each borehole and the soils will be field screened with a PID and visually described for textural composition and any contaminant characteristics. Drilling, subsurface soil sampling and decontamination procedures provided in Appendix C will be followed during this task.

The subsurface soil samples will be analyzed for VOCs, SVOCs, metals and cyanide using the same laboratory methods presented in Section 4.4.

Upon completion, borings will either be filled with cuttings if the soil is not impacted or sealed with grout or bentonite. Select soil borings will be converted to monitoring wells, as discussed in Section 4.6. Investigative derived waste (IDW) will be managed in accordance with Appendix C.

4.6 Groundwater investigation

Additional groundwater investigation will be performed through the installation of 12 monitoring wells. Nine of the wells will be screened across the shallow water table and three wells (MW-111D, MW-113D, and MW-116D) will be screened at depth either above the “20-foot” clay interface or at a depth consistent with this unit in nearby areas (35 to 45 feet bgs). The locations of the monitoring wells are shown on Figure 4-1. Rationale for the monitoring wells is provided on Table 4-1.

All wells will be installed using either HSAs or direct-push methods in accordance with monitoring well installation and development procedures provided in Appendix C. All wells will be constructed of two inch schedule 40 PVC with 10-foot, 20-slot (0.02-inch) well screens with a two-foot sump at the base of the well to collect any denser than water non-aqueous phase liquid (DNAPL) that may be present. If DNAPL is not detected during the investigation, the appropriateness of using the two-foot sump at the base of the wells will be discussed and negotiated with the NYSDEC. If screened above the “20-foot” clay, deep well borings SB-111, SB-113, and SB-116 will be sealed with bentonite or grout to allow completion of the well with the base of the screen set at the clay interface with the sump extending two feet into the top of the clay. Quartz sand appropriately sized for the screen slot size will be emplaced to a minimum of one-foot above the screened interval of the well and a two-foot bentonite seal will be emplaced above the sand pack. Grout will be emplaced above the bentonite seal to grade. Expandable locking caps will be emplaced at the top pf each monitoring well. Flush-mounted, limited access road boxes will be used at the ground surface to complete the wells and the surface will be restored to pre-existing conditions. A diagram outlining the typical well construction details is shown on Figure 4-2.

Following installation, all monitoring wells will be developed to evacuate silts and other fine-grained sediments which may have accumulated within the well during its installation. Well development will not be performed for a minimum of 24 hours after well installation. A number of techniques may be used, including surging using a plunger, bailing or pumping until the turbidity has stabilized (less than 50 NTU if possible). Special care will be taken to develop the wells properly in order to ensure adequate hydraulic connection between the monitor well and the aquifer and to obtain representative groundwater samples for chemical analysis.

Following development, wells will be allowed to stabilize for two weeks or more prior to groundwater sampling. The wells will be sampled in accordance with the groundwater sampling procedures provided in Appendix C.

The wells will be sampled with either a peristaltic pump or submersible pump using low-flow sampling methods with the tubing or pump placed at the approximate midpoint of the screened interval. At the ground surface, the water will pass through a sealed chamber containing probes which will measure the water temperature, pH, specific conductivity, oxidation-reduction potential, and dissolved oxygen. Samples of water discharging from

the chamber will be collected at regular intervals and analyzed for turbidity using a hand-held field meter. After passing through this chamber, the water will be discharged to a calibrated five-gallon bucket where the pumping rate will be calculated. When this bucket is full, the water will be transferred into a fifty-five gallon drum where it will be stored for future disposal. Pumping rates will be set below the maximum sustainable flow rate so as not to significantly lower the water level in the well. Groundwater analytical samples will be collected when water quality parameters have stabilized.

Samples will be analyzed for VOCs, SVOCs, metals, and cyanide using the same laboratory methods presented in earlier sections.

All development and purge water will be managed in accordance with Appendix C.

4.7 Aquifer hydraulic conductivity testing

Assuming that soil conditions at the Site are conducive to slug testing (i.e. they do not recover too rapidly), conductivity tests (slug tests) will be performed at three well locations providing good lateral coverage at the Site. These data will be used to calculate the hydraulic conductivity of the aquifer which will be used to evaluate the fate and transport of Site impacts and for evaluation of potential remedial alternatives. Prior to any slug testing, "trial" slug tests will be performed to evaluate probable groundwater recovery characteristics at the wells. In addition, a background continuous water level survey (at least 24 hours) will be performed at these wells to evaluate potential tidal or other influences including train traffic on water levels.

If the pre-screening evaluations show that slug tests are a viable method to evaluate aquifer conductivity at the site, the slug tests will be performed by pneumatic testing methods and timing the equilibration to the static water level. The general steps to be performed during slug testing are as follows:

- Static water level will be measured to the nearest 0.01 foot.
- A pressure transducer, attached to a data logger, will be placed into the well and the water level allowed to equilibrate to static conditions.
- The water column in the well will be pressurized while simultaneously measuring and recording water levels with the pressure transducer and data logger until the water level has equilibrated ("falling head test").
- The pressure in the well will then be rapidly removed and the water level will be measured and recorded ("rising head test").

The data from these tests will be analyzed by AQTESOLV® according to the Bouwer and Rice method (1989) or equivalent methods to calculate average hydraulic conductivity values for the aquifer.

4.8 Soil vapor intrusion survey

A soil vapor intrusion survey will be performed at the Site since MGP-related compounds have been detected in soil vapor, soil and groundwater samples collected from the Site. The work will be performed in accordance with Guidance for Evaluating Soil Vapor Intrusion in the State of New York (NYSDOH, 2006). The sampling event will be conducted in a one-time event during the heating season between November 1 and March 31 and will require two days to complete. The proposed sampling plan consists of the collection of a total of eight samples, with one sub-slab vapor sample and matching indoor air sample collected in each of three buildings (six total) plus one ambient outdoor air sample and one sample duplicate. The approximate sampling locations are shown on the attached Figure 4-1. Rationale for their placement is included on Table 4-1.

The indoor air and sub-slab vapor sampling will require two days to complete. On the first day, a chemical inventory check will be performed within each of the three site buildings to document current conditions with

the regard to the storage of chemicals at each facility. On the second day, ambient air sample, indoor air samples and sub-slab vapor samples will be collected concurrently.

Following utility clearance processes, sub-slab soil vapor samples will be collected from immediately below the concrete floor slabs of each building. The sub-slab sampling implants will be installed by drilling a ¾-inch diameter hole through the concrete slab and placing Teflon tubing in the hole. An air-tight seal will be created by filling the space between the tubing and the concrete with hydrated bentonite clay or modeling clay. The tubing used for sampling will be attached to the sampling canister with Swagelok™ fittings. The integrity of the seals around the implants will be confirmed by placing a helium-filled "shroud" around the insertion points. One to three volumes of air will be purged with a helium meter at a rate not to exceed 0.2 liters per minute. Detections of helium will indicate a leak in the seal, requiring that the seal be repaired or replaced. All samples will be collected in batch certified, 6-liter Summa canisters through regulators set for a one-hour collection time (6 liter / 60 minutes = 0.1 L/min), which conforms to the NYSDOH Guidance. Following the sub-slab vapor sample collection, all concrete coring holes will be sealed and patched to match the existing grade. These procedures are further outlined in Appendix C.

Indoor air samples will be collected at the same location as the sub-slab samples. All samples will be collected in batch certified, 6-liter Summa canisters through regulators set for an eight-hour sample duration, which conforms to the NYSDOH Guidance. The ambient air sample will be collected at a location determined to be upwind of the buildings at time of sampling. The air and soil gas samples will be shipped overnight to a NY ELAP-certified laboratory (Air Toxics, Ltd.) for analysis.

The laboratory samples will be analyzed for VOCs (including naphthalene) by U.S. EPA SW846 Method TO-15, with an extended analyte list. The minimum reporting limit for the analysis will be at most one part per billion (1 to 7 micrograms per cubic meter depending on the molecular weight for each compound). The helium analysis will be performed using modified method ASTM D1945. The laboratory turn-around-time will be 14 days from the date the samples are received by the laboratory. The analytical results will be provided by the laboratory in a summary table, which will also include NYSDOH background concentrations for the respective target compounds.

The results of the indoor air and ambient air results will be evaluated by first comparing the VOC concentrations to typical background values published by NYSDOH. If compounds are detected above the typical range, the data will be evaluated to determine the sources of these compounds. For example, benzene may be associated with MGP residuals but is also widely found in urban soil gas and indoor air due to gasoline. To distinguish between these sources, and prevent the false attribution of the benzene to MGP residuals, compound ratios and the presence or absence of indicator compounds will be examined. In addition to the standard TO-15 list of compounds, several additional compounds will be analyzed for, including: indan, indene, thiophene, 2-methyl pentane, isopentane, 2,3-dimethyl pentane, isooctane, and methyl tert butyl ether (MTBE). This list of additional compounds was developed specifically for use in evaluation of soil vapor intrusion at MGP sites. Indan, indene, and thiophene are usually associated with MGP residuals. The presence or absence of these indicator compounds will be used as a line of evidence to distinguish between MGP and non-MGP sources in the soil vapor and indoor air. Similarly, inclusion of the pentane compounds and MTBE will allow the presence of gasoline sources to be identified. In some cases, statistical analysis of the data may be used to distinguish among the sources.

4.9 Site survey

A site survey of the investigation sampling points and other features of interest will be conducted at the end of the fieldwork by a New York State-licensed surveyor under the direct supervision of RETEC. The surveyor will use survey techniques that follow commonly accepted professional surveying practices which are appropriate for the task. All locations will be tied into the existing base map developed for the site during the PSA.

After the monitoring wells are installed, a notch or mark will be made at the top of each inner casing. The vertical location of this point will be surveyed to an accuracy of 0.01 of a foot. The horizontal locations of each point will be established from directly measuring from site features with an accuracy of 0.1 foot. Elevations will be referenced to the North American Vertical Datum of 1988 (NAVD88) and horizontal locations will be based upon the North American Datum of 1983 Long Island Grid of the New York State Coordinate System (NAD83 N.Y.L.I. – 3104).

4.10 Investigation residuals management

All investigation waste generated during the RI will be collected in properly labeled USDOT approved storage containers (55-gallon drums) and grouped by environmental matrix (soil, water, PPE/plastic, construction debris). As drums are filled, they will be tracked and given unique identification codes based on the following:

- A prefix indicating the site where the drum was generated and the drum's contents: i.e., FR – Far Rockaway plus S – Soil, W – Water, P – PPE/Plastic, and C&D – Construction Debris.
- Following the prefix and a hyphen will be the drum's chronological number of generation. For example, drum FRS-1 is the first drum of the project at Far Rockaway generated and is filled with soil. Drum FRW-8 is the eighth drum generated and contains water.
- As drums are generated, their identification code, date of generation, contents, source (i.e., drill cuttings from location x, purge water from well y), and date sampled will be entered on Table 4-2. The final two columns on this table are the date each drum is shipped off-site and the waste hauler.

The drums will be stored at a locked, temporary fenced location to be decided during the preliminary site visit, which will be completed prior to the start of the field investigation. Subsequently, the drums will be characterized with laboratory analyses including full TCLP, corrosivity, ignitability, reactivity, TPH, and PCBs. Waste transportation and disposal of all contaminated wastes will be managed by KeySpan.

4.11 Private Well Survey

Pending the results of the groundwater investigation at the site and consultation with the NYSDEC, a private well survey may be conducted in the site area following RI sampling activities. Groundwater flow data developed during the PSA indicated shallow groundwater flow towards the northwest towards the LIRR property and railroad tracks. The private well and basement survey would be performed if groundwater impacts from the former MGP are documented outside of the immediate site area (beyond the downgradient LIRR property) or if groundwater impacts are detected in the deep well pairs proposed during the RI. This survey will include a private well and basement questionnaire mailed to residences in the site area and a file search of state, county, and local records for information on wells identified within the established search area. Information about each identified well including construction details and current status (active, inactive or properly abandoned) will be collected. Wells identified in the survey will evaluated to determine if they could be affected by site conditions. Actions will be performed in accordance with Section 3.7.2 of NYSDEC's DER-10 technical guidance.

5.0 Remedial investigation report

At the completion of the field investigation, the results of both the PSA and RI investigations will be combined into a RI report. Comprehensive data packages (ASP Category B) will be submitted by the laboratory for validation by a qualified chemist. The methods and data package provided by the laboratory will be consistent with the specifications of the most current version of the ASP (July 2005). The laboratory performing the analyses will have current NYSDOH Environmental Laboratory Approval Program (ELAP) certification for all analyses performed. Data Usability Summary Reports (DUSRs) will be prepared by RETEC for the analytical samples. The DUSRs will be included as an appendix to the RI report. Data will be validated according to method specifications and the USEPA Contract Laboratory Program National Functional Guidelines for Organic Data Review, EPA540/R-99/008, October 1999 and USEPA Contract Laboratory Program National Functional Guidelines for Inorganic Data Review, EPA540-R-04-004, October 2004, as they apply to the analytical methods employed. Soil, groundwater, and soil vapor data will be managed in a database and compared to applicable NYSDEC and NYSDOH criteria and standards.

As stated previously, RI work may require additional phases of work not outlined in this RIWP or in the project schedule outlined in this RIWP. When sufficient data have been collected to characterize the Site, the RI report will be prepared and will include:

- Executive summary
- Site description and history
- Descriptions of field activities performed
- Field observations, field measurements, and laboratory analytical data summarized in tabular format. Data will be managed in a database. Soil and groundwater analytical results will be compared to appropriate NYSDEC guidance and standards. The results of the indoor air and ambient air results will be evaluated by first comparing the VOC concentrations to typical background values published by NYSDOH.
- Plan-view and cross-section figures presenting laboratory analytical data and/or field observations of soil vapor, surface and subsurface soil, and groundwater.
- Geologic profiles summarizing both field observation and laboratory results. A minimum of two profiles will be developed, one perpendicular to and one parallel with groundwater flow direction at the Site.
- Integration of field observations and measurements with laboratory analytical data to evaluate the nature and extent of contamination, and develop a site conceptual model of potential contaminant migration
- Qualitative Human Health Exposure Assessment (QHEA) and Fish and Wildlife Impact Assessment (FWIA)

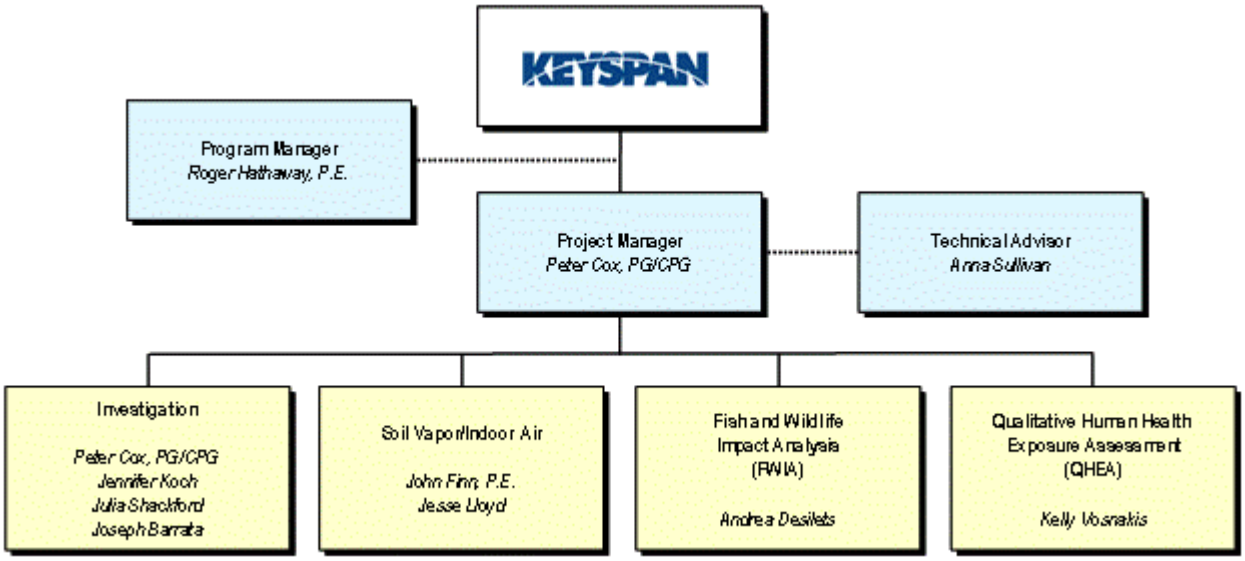
Appendices to the report will include all pertinent data used to support the RI effort, including validated laboratory analytical results (Form 1s), data usability reports, stratigraphic boring and monitoring well construction logs, and all field sampling sheets (monitoring well development forms, aquifer testing results, groundwater sampling sheets, etc.).

6.0 Project schedule

The RI mobilization is anticipated to be initiated in early October 2007, following the acceptance of the RIWP and following completion of necessary right-of-way permits or property access agreements. The anticipated schedule for the RI is outlined on Figure 6-1. Assumptions have been made in the schedule regarding turnaround times for document review and for duration of various field tasks. If during the execution of the RI it is found that impacts extend to areas beyond those for which access agreements have been obtained, additional RI phases will be required to allow time for investigation planning and to secure additional access agreements. Anticipated schedules for any additional investigation work will be prepared at a later date.

7.0 Project organization

The internal project organization for this investigation is presented below. The RETEC members listed on this organizational chart will be available to perform their assigned tasks within the dates listed on the project schedule.



8.0 References

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PS&S, 2003, Preliminary Site Assessment Report, Far Rockaway Former MGP Site, 1200-1224 Brunswick Avenue, Far Rockaway, New York.

USGS, 2007, http://woodshole.er.usgs.gov/project-pages/newyork/geologicbkgrnd.html.

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Tables

Table 2-1
PSA Subsurface Soil Analytical Results Summary - December 2002
Former MGP, Far Rockaway, New York

Sample Number	NYSDEC	FRSB - 01A	FRSB - 01B	FRSB - 02A	FRSB - 02B	FRSB - 03A	FRSB - 03B	FRSB - 04A	FRSB - 04B
Lab Sample ID No.	Recommended	AB74446	AB74447	AB74154	AB74155	AB74143	AB74144	AB74441	AB74442
Depth (ft)	Soil	2' - 4'	6' - 7'	4' - 5'	13' - 14'	6.5' - 7.5'	12.5' - 13.5'	9' - 10'	15' - 16'
SampleType	Cleanup	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Date	Objective	12/4/2002	12/4/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/4/2002	12/4/2002
Units	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
SEMI-VOLATILE ORGANIC COMPOUNDS									
1,2,4-Trichlorobenzene	N/A	ND @ 1.8	ND @ 3.9	ND @ 0.38	ND @ 0.42	ND @ 0.46	ND @ 0.41	ND @ 0.38	ND @ 0.41
1,4-Dichlorobenzene	N/A	ND @ 1.8	ND @ 3.9	ND @ 0.38	ND @ 0.42	ND @ 0.46	ND @ 0.41	ND @ 0.38	ND @ 0.41
2,4-Dinitrotoluene	N/A	ND @ 1.8	ND @ 3.9	ND @ 0.38	ND @ 0.42	ND @ 0.46	ND @ 0.41	ND @ 0.38	ND @ 0.41
2-Chlorophenol	0.8	ND @ 1.8	ND @ 3.9	ND @ 0.38	ND @ 0.42	ND @ 0.46	ND @ 0.41	ND @ 0.38	ND @ 0.41
4-Chloro-3-methylphenol	36.4	ND @ 1.8	ND @ 3.9	ND @ 0.38	ND @ 0.42	ND @ 0.46	ND @ 0.41	ND @ 0.38	ND @ 0.41
4-Nitrophenol	0.240 or MDL	ND @ 1.8	ND @ 3.9	ND @ 0.38	ND @ 0.42	ND @ 0.46	ND @ 0.41	ND @ 0.38	ND @ 0.41
2-Methylnaphthalene	0.330 or MDL	**7**	**53**	ND @ 0.38	ND @ 0.42	**85**	ND @ 0.41	**1.6 J**	ND @ 0.41
Acenaphthene	50	1.5 J	9	ND @ 0.38	ND @ 0.42	ND @ 0.46	ND @ 0.41	0.23 J	ND @ 0.41
Acenaphthylene	41	ND @ 1.8	**52**	ND @ 0.38	ND @ 0.42	ND @ 0.46	ND @ 0.41	1.1 J	ND @ 0.41
Anthracene	50	1.59 J	16	ND @ 0.38	ND @ 0.42	ND @ 0.46	ND @ 0.41	0.55 J	ND @ 0.41
Benzo[a]anthracene	0.224 or MDL	**0.43 J**	**9.3**	0.073 J	ND @ 0.42	ND @ 0.46	ND @ 0.41	**0.55 J**	ND @ 0.41
Benzo[a]pyrene	0.061 or MDL	**0.41 J**	**8.8**	0.095 J	ND @ 0.42	ND @ 0.46	ND @ 0.41	**0.34 J**	ND @ 0.41
Benzo[b]fluoranthene	1.1	0.86 J	**8.4**	0.15 J	ND @ 0.42	ND @ 0.46	ND @ 0.41	0.56 J	ND @ 0.41
Benzo[g,h,I]perylene	50	0.29 J	6	0.055 J	ND @ 0.42	ND @ 0.46	ND @ 0.41	0.23 J	ND @ 0.41
Benzo[k]fluoranthene	1.1	0.37 J	**2.2 J**	0.047 J	ND @ 0.42	ND @ 0.46	ND @ 0.41	0.26 J	ND @ 0.41
Butylbenzylphalate	50	ND @ 1.8	ND @ 3.9	ND @ 0.38	ND @ 0.42	ND @ 0.46	ND @ 0.41	ND @ 0.38	ND @ 0.41
Bis(2-Ethylhexyl)phthalate	50	6.5 B	0.43 JB	0.22 JB	0.23 J	ND @ 0.46	0.061 JB	0.18 J	0.015 JB
Carbazole	N/A	ND @ 1.8	ND @ 3.9	ND @ 0.38	ND @ 0.42	ND @ 0.46	ND @ 0.41	ND @ 0.38	ND @ 0.41
Chrysene	0.4	**0.46** J	**9.5**	0.11 J	ND @ 0.42	ND @ 0.46	ND @ 0.41	**0.66 J**	ND @ 0.41
Dibenzo[a,h]Anthracene	0.014 or MDL	ND @ 1.8	**0.88 J**	ND @ 0.38	ND @ 0.42	ND @ 0.46	ND @ 0.41	**0.042 J**	ND @ 0.41
Dibenzofuran	6.2	0.72 J	0.47 J	ND @ 0.38	ND @ 0.42	ND @ 0.46	ND @ 0.41	ND @ 0.38	ND @ 0.41
Di-n-butylphalate	8.1	ND @ 1.8	ND @ 3.9	0.11 J	0.097 J	ND @ 0.46	0.082 J	0.049 J	ND @ 0.41
Di-n-octylphthalate	50	7.4	ND @ 3.9	ND @ 0.38	ND @ 0.42	ND @ 0.46	ND @ 0.41	ND @ 0.38	ND @ 0.41
Fluoranthene	50	0.85 J	27	0.23 J	ND @ 0.42	7.2 J	ND @ 0.41	1.9 J	ND @ 0.41
Fluorene	50	2.7	25	ND @ 0.38	ND @ 0.42	4.9 J	ND @ 0.41	0.75 J	ND @ 0.41
Indeno[1,2,3-cd]pyrene	3.2	0.29 J	**3.9 J**	0.056 J	ND @ 0.42	ND @ 0.46	ND @ 0.41	0.19 J	ND @ 0.41
Isophorone	4.4	ND @ 1.8	**34**	ND @ 0.38	ND @ 0.42	ND @ 0.46	ND @ 0.41	ND @ 0.38	ND @ 0.41
Naphthalene	13	2.3	**34**	ND @ 0.38	ND @ 0.42	**520**	0.16 J	4.7 J	ND @ 0.41
N-Nitro-Di-N-Propylamine	N/A	ND @ 1.8	ND @ 3.9	ND @ 0.38	ND @ 0.42	ND @ 0.46	ND @ 0.41	ND @ 0.38	ND @ 0.41
Pentachlorophenol	1.0 or MDL	ND @ 1.8	ND @ 3.9	ND @ 0.38	ND @ 0.42	ND @ 0.46	ND @ 0.41	ND @ 0.38	ND @ 0.41
Phenanthrene	50	3.6	62	0.18 J	ND @ 0.42	16 J	ND @ 0.41	2.9 J	0.052 J
Phenol	0.03 or MDL	ND @ 1.8	ND @ 3.9	ND @ 0.38	ND @ 0.42	ND @ 0.46	ND @ 0.41	ND @ 0.38	ND @ 0.41
Pyrene	50	2	39	0.18 J	ND @ 0.42	6.4 J	ND @ 0.41	2.2 J	0.047 J
Total Non-Targeted BN's	N/A	122 J	266.4 J	34.68 J	34.13 J	562 J	29.28 J	35.8 J	43.31 J

Notes

NA - Not Analyzed

ND - Non Detected at Method Detection Limit

N/A - Indicates no Soil Cleanup Objective number established for that compound.

B - Compound Found in Associated Lab Blank

J - Estimated Value

Table 2-1
PSA Subsurface Soil Analytical Results Summary - December 2002
Former MGP, Far Rockaway, New York

Sample Number	NYSDEC	FRSB - 08A	FRSB - 08B	FRSB - 09A	FRSB - 09B	FRSB - 09B(MS)	FRSB - 09B(MSD)	FRSB - 10A	FRSB - 10B	FRSB - 11A	FRSB - 11B
Lab Sample ID No.	Recommended	AB74136	AB74137	AB74448	AB74449	AB74450	AB74451	AB74156	AB74157	AB74404	AB74405
Depth (ft)	Soil	3.5' - 4.5'	14' - 15'	6' - 7'	13' - 14'	13' - 14'	13' - 14'	4' - 5'	12' - 13'	5' - 6'	13' - 14'
SampleType	Cleanup	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Date	Objective	12/2/2002	12/2/2002	12/4/2002	12/4/2002	12/4/2002	12/4/2002	12/2/2002	12/2/2002	12/5/2002	12/5/2002
Units	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
SEMI-VOLATILE ORGANIC COMPOUNDS											
1,2,4-Trichlorobenzene	N/A	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	3.8	3.3	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
1,4-Dichlorobenzene	N/A	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	3.4	3.1	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
2,4-Dinitrotoluene	N/A	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	3.5	3.2	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
2-Chlorophenol	0.8	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	5.3	5	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
4-Chloro-3-methylphenol	36.4	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	6.3	5.6	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
4-Nitrophenol	0.240 or MDL	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	6.5	6.3	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
2-Methylnaphthalene	0.330 or MDL	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	ND @ 0.39	ND @ 0.39	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
Acenaphthene	50	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	3.4	3	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
Acenaphthylene	41	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	ND @ 0.39	ND @ 0.39	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
Anthracene	50	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	ND @ 0.39	ND @ 0.39	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
Benzo[a]anthracene	0.224 or MDL	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	ND @ 0.39	ND @ 0.39	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
Benzo[a]pyrene	0.061 or MDL	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	ND @ 0.39	ND @ 0.39	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
Benzo[b]fluoranthene	1.1	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	ND @ 0.39	ND @ 0.39	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
Benzo[g,h,I]perylene	50	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	ND @ 0.39	ND @ 0.39	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
Benzo[k]fluoranthene	1.1	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	ND @ 0.39	ND @ 0.39	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
Butylbenzylphalate	50	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	ND @ 0.39	ND @ 0.39	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
Bis(2-Ethylhexyl)phthalate	50	0.062 JB	0.13 JB	0.13 JB	0.46 B	0.33 JB	ND @ 0.39	0.14 JB	0.13 JB	0.29 J	0.21 JB
Carbazole	N/A	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	ND @ 0.39	ND @ 0.39	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
Chrysene	0.4	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	ND @ 0.39	ND @ 0.39	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
Dibenzo[a,h]Anthracene	0.014 or MDL	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	ND @ 0.39	ND @ 0.39	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
Dibenzofuran	6.2	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	ND @ 0.39	ND @ 0.39	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
Di-n-butylphalate	8.1	ND @ 0.38	0.081 J	0.075 J	0.14 J	0.13 J	ND @ 0.39	0.041 J	ND @ 0.42	0.11 J	0.059 J
Di-n-octylphthalate	50	ND @ 0.38	ND @ 0.4	ND @ 0.38	0.063 J	0.047 J	ND @ 0.39	ND @ 0.4	ND @ 0.42	0.041 J	ND @ 0.42
Fluoranthene	50	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	ND @ 0.39	ND @ 0.39	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
Fluorene	50	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	ND @ 0.39	ND @ 0.39	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
Indeno[1,2,3-cd]pyrene	3.2	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	ND @ 0.39	ND @ 0.39	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
Isophorone	4.4	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	ND @ 0.39	ND @ 0.39	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
Naphthalene	13	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	ND @ 0.39	ND @ 0.39	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
N-Nitro-Di-N-Propylamine	N/A	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	ND @ 0.39	3.9	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
Pentachlorophenol	1.0 or MDL	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	ND @ 0.39	5.3	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
Phenanthrene	50	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	ND @ 0.39	ND @ 0.39	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
Phenol	0.03 or MDL	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	ND @ 0.39	5.2	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
Pyrene	50	ND @ 0.38	ND @ 0.4	ND @ 0.38	ND @ 0.42	3.5	ND @ 0.39	ND @ 0.4	ND @ 0.42	ND @ 0.39	ND @ 0.42
Total Non-Targeted BN's	N/A	28.62 J	31.47 J	49.23 J	34.40 J	13.69 J	13.49 J	29.97 J	34.87 J	34.92 J	55.12 J

Notes

NA - Not Analyzed

ND - Non Detected at Method Detection Limit

N/A - Indicates no Soil Cleanup Objective number established for that compound.

B - Compound Found in Associated Lab Blank

J - Estimated Value

Table 2-1
PSA Subsurface Soil Analytical Results Summary - December 2002
Former MGP, Far Rockaway, New York

Sample Number	NYSDEC	FRSB - 01A	FRSB - 01B	FRSB - 02A	FRSB - 02B	FRSB - 03A	FRSB - 03B	FRSB - 04A	FRSB - 04B
Lab Sample ID No.	Recommended	AB74446	AB74447	AB74154	AB74155	AB74143	AB74144	AB74441	AB74442
Depth (ft)	Soil	2' - 4'	6' - 7'	4' - 5'	13' - 14'	6.5' - 7.5'	12.5' - 13.5'	9' - 10'	15' - 16'
SampleType	Cleanup	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Date	Objective	12/4/2002	12/4/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/4/2002	12/4/2002
Units	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
VOLATILE ORGANIC COMPOUNDS									
1,1,1-Trichloroethane	0.8	ND @ 0.68	ND @ 0.74	ND @ 0.0057	ND @ 0.0062	ND @ 1.4	ND @ 0.0061	ND @ 0.71	ND @ 0.0062
1,1,2,2-Tetrachloroethane	0.6	ND @ 0.68	ND @ 0.74	ND @ 0.0057	ND @ 0.0062	ND @ 1.4	ND @ 0.0061	ND @ 0.71	ND @ 0.0062
1,1,2-Trichloroethane	N/A	ND @ 0.68	ND @ 0.74	ND @ 0.0057	ND @ 0.0062	ND @ 1.4	ND @ 0.0061	ND @ 0.71	ND @ 0.0062
1,1-Dichloroethane	0.2	ND @ 0.68	ND @ 0.74	ND @ 0.0057	ND @ 0.0062	ND @ 1.4	ND @ 0.0061	ND @ 0.71	ND @ 0.0062
1,1-Dichloroethene	0.4	ND @ 0.68	ND @ 0.74	ND @ 0.0057	ND @ 0.0062	ND @ 1.4	ND @ 0.0061	ND @ 0.71	ND @ 0.0062
1,2-Dichloroethane	0.1	ND @ 0.68	ND @ 0.74	ND @ 0.0057	ND @ 0.0062	ND @ 1.4	ND @ 0.0061	ND @ 0.71	ND @ 0.0062
1,2-Dichloropropane	N/A	ND @ 0.68	ND @ 0.74	ND @ 0.0057	ND @ 0.0062	ND @ 1.4	ND @ 0.0061	ND @ 0.71	ND @ 0.0062
2-Butanone	0.3	ND @ 3.4	ND @ 3.7	ND @ 0.028	ND @ 0.031	ND @ 7.2	ND @ 0.03	ND @ 3.6	ND @ 0.031
2-Chloroethylvinylether	N/A	ND @ 0.68	ND @ 0.74	ND @ 0.0057	ND @ 0.0062	ND @ 1.4	ND @ 0.0061	ND @ 0.71	ND @ 0.0062
2-Hexanone	N/A	ND @ 2.7	ND @ 2.9	ND @ 0.023	ND @ 0.025	ND @ 5.7	ND @ 0.24	ND @ 2.8	ND @ 0.025
4-Methyl-2-Pentanone	1	ND @ 2.7	ND @ 2.9	ND @ 0.023	ND @ 0.025	ND @ 5.7	ND @ 0.24	ND @ 2.8	ND @ 0.025
Acetone	0.2	ND @ 2.7	ND @ 2.9	ND @ 0.023	ND @ 0.025	ND @ 5.7	ND @ 0.24	ND @ 2.8	0.03
Acrolein	N/A	ND @ 2	ND @ 2.2	ND @ 0.017	ND @ 0.019	ND @ 4.3	ND @ 0.018	ND @ 0.21	ND @ 0.019
Acrylonitrile	N/A	ND @ 0.94	ND @ 1	ND @ 0.0079	ND @ 0.0087	ND @ 2	ND @ 0.0085	ND @ 0.98	ND @ 0.0086
Benzene	0.06	ND @ 0.14	ND @ 0.15	ND @ 0.0011	ND @ 0.0012	ND @ 0.29	ND @ 0.0012	ND @ 0.14	ND @ 0.0012
Bromodichloromethane	N/A	ND @ 0.68	ND @ 0.74	ND @ 0.0057	ND @ 0.0062	ND @ 1.4	ND @ 0.0061	ND @ 0.71	ND @ 0.0062
Bromoform	N/A	ND @ 0.68	ND @ 0.74	ND @ 0.0057	ND @ 0.0062	ND @ 1.4	ND @ 0.0061	ND @ 0.71	ND @ 0.0062
Bromomethane	N/A	ND @ 0.68	ND @ 0.74	ND @ 0.0057	ND @ 0.0062	ND @ 1.4	ND @ 0.0061	ND @ 0.71	ND @ 0.0062
Carbon Disulfide	2.7	ND @ 0.68	ND @ 0.74	ND @ 0.0057	ND @ 0.0062	ND @ 1.4	ND @ 0.0061	ND @ 0.71	ND @ 0.0062
Carbon tetrachloride	0.6	ND @ 0.68	ND @ 0.74	ND @ 0.0057	ND @ 0.0062	ND @ 1.4	ND @ 0.0061	ND @ 0.71	ND @ 0.0062
Chlorobenzene	1.7	ND @ 0.68	ND @ 0.74	ND @ 0.0057	ND @ 0.0062	ND @ 1.4	ND @ 0.0061	ND @ 0.71	ND @ 0.0062
Chloroethane	1.9	ND @ 0.68	ND @ 0.74	ND @ 0.0057	ND @ 0.0062	ND @ 1.4	ND @ 0.0061	ND @ 0.71	ND @ 0.0062
Chloroform	0.3	ND @ 0.68	ND @ 0.74	ND @ 0.0057	ND @ 0.0062	ND @ 1.4	ND @ 0.0061	ND @ 0.71	ND @ 0.0062
Chloromethane	N/A	ND @ 0.68	ND @ 0.74	ND @ 0.0057	ND @ 0.0062	ND @ 1.4	ND @ 0.0061	ND @ 0.71	ND @ 0.0062
Cis-1,2-Dichloroethene	N/A	ND @ 0.68	ND @ 0.74	ND @ 0.0057	ND @ 0.0062	ND @ 1.4	ND @ 0.0061	ND @ 0.71	ND @ 0.0062
Cis-1,3-Dichloropropene	0.3	ND @ 0.68	ND @ 0.74	ND @ 0.0057	ND @ 0.0062	ND @ 1.4	ND @ 0.0061	ND @ 0.71	ND @ 0.0062
Dibromochlormethane	N/A	ND @ 0.68	ND @ 0.74	ND @ 0.0057	ND @ 0.0062	ND @ 1.4	ND @ 0.0061	ND @ 0.71	ND @ 0.0062
Ethylbenzene	5.5	0.25	ND @ 0.15	ND @ 0.011	ND @ 0.0012	**33**	ND @ 0.0012	**32**	0.0026
Methylene Chloride	0.1	ND @ 0.68	ND @ 0.74	0.005 JB	0.011 B	ND @ 1.4	0.0061 JB	ND @ 0.71	0.012 B
Styrene	N/A	ND @ 0.14	ND @ 0.15	ND @ 0.011	ND @ 0.0012	ND @ 0.029	ND @ 0.0012	ND @ 0.14	ND @ 0.0012
Tetrachloroethene	1.4	ND @ 0.68	ND @ 0.74	ND @ 0.0057	ND @ 0.0062	ND @ 1.4	ND @ 0.0061	ND @ 0.71	ND @ 0.0062
Toluene	1.5	0.16	ND @ 0.15	0.0015	0.0017	0.53	0.0025	**2.9**	0.0023
Trans-1,2-Dichloroethene	0.3	ND @ 0.68	ND @ 0.74	ND @ 0.0057	ND @ 0.0062	ND @ 1.4	ND @ 0.0061	ND @ 0.71	ND @ 0.0062
Trans-1,3-Dichloropropene	N/A	ND @ 0.68	ND @ 0.74	ND @ 0.0057	ND @ 0.0062	ND @ 1.4	ND @ 0.0061	ND @ 0.71	ND @ 0.0062
Trichloroethene	0.7	ND @ 0.68	ND @ 0.74	ND @ 0.0057	ND @ 0.0062	ND @ 1.4	ND @ 0.0061	ND @ 0.71	ND @ 0.0062
Vinyl Chloride	0.2	ND @ 0.68	ND @ 0.74	ND @ 0.0057	ND @ 0.0062	ND @ 1.4	ND @ 0.0061	ND @ 0.71	ND @ 0.0062
Xylenes	1.2	0.37	ND @ 0.74	ND @ 0.0057	ND @ 0.0062	**60**	ND @ 0.0061	23	0.0039 J
Total Non-Targeted VOC's	N/A	395 J	580 J	0.015 J	ND	170.2 J	ND	194.1 J	0.011 J

Notes

NA - Not Analyzed

ND - Non Detected at Method Detection Limit

N/A - Indicates no Soil Cleanup Objective number established for that compound.

B - Compound Found in Associated Lab Blank

J - Estimated Value

Table 2-1
PSA Subsurface Soil Analytical Results Summary - December 2002
Former MGP, Far Rockaway, New York

Sample Number	NYSDEC	FRSB - 08A	FRSB - 08B	FRSB - 09A	FRSB - 09B	FRSB - 09B(MS)	FRSB - 09B(MSD)	FRSB - 10A	FRSB - 10B	FRSB - 11A	FRSB - 11B
Lab Sample ID No.	Recommended	AB74136	AB74137	AB74448	AB74449	AB74450	AB74451	AB74156	AB74157	AB74404	AB74405
Depth (ft)	Soil	3.5' - 4.5'	14' - 15'	6' - 7'	13' - 14'	13' - 14'	13' - 14'	4' - 5'	12' - 13'	5' - 6'	13' - 14'
SampleType	Cleanup	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Date	Objective	12/2/2002	12/2/2002	12/4/2002	12/4/2002	12/4/2002	12/4/2002	12/2/2002	12/2/2002	12/5/2002	12/5/2002
Units	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
VOLATILE ORGANIC COMPOUNDS											
1,1,1-Trichloroethane	0.8	ND @ 0.0057	ND @ 0.006	ND @ 0.0057	ND @ 0.0062	0.067	0.063	ND @ 0.006	ND @ 0.0062	ND @ 0.0059	ND @ 0.0063
1,1,2,2-Tetrachloroethane	0.6	ND @ 0.0057	ND @ 0.006	ND @ 0.0057	ND @ 0.0062	0.057	0.054	ND @ 0.006	ND @ 0.0062	ND @ 0.0059	ND @ 0.0063
1,1,2-Trichloroethane	N/A	ND @ 0.0057	ND @ 0.006	ND @ 0.0057	ND @ 0.0062	0.06	0.055	ND @ 0.006	ND @ 0.0062	ND @ 0.0059	ND @ 0.0063
1,1-Dichloroethane	0.2	ND @ 0.0057	ND @ 0.006	ND @ 0.0057	ND @ 0.0062	0.062	0.057	ND @ 0.006	ND @ 0.0062	ND @ 0.0059	ND @ 0.0063
1,1-Dichloroethene	0.4	ND @ 0.0057	ND @ 0.006	ND @ 0.0057	ND @ 0.0062	0.076	0.07	ND @ 0.006	ND @ 0.0062	ND @ 0.0059	ND @ 0.0063
1,2-Dichloroethane	0.1	ND @ 0.0057	ND @ 0.006	ND @ 0.0057	ND @ 0.0062	0.064	0.061	ND @ 0.006	ND @ 0.0062	ND @ 0.0059	ND @ 0.0063
1,2-Dichloropropane	N/A	ND @ 0.0057	ND @ 0.006	ND @ 0.0057	ND @ 0.0062	0.055	0.052	ND @ 0.006	ND @ 0.0062	ND @ 0.0059	ND @ 0.0063
2-Butanone	0.3	ND @ 0.028	ND @ 0.03	ND @ 0.028	ND @ 0.031	0.082	0.073	ND @ 0.03	ND @ 0.031	ND @ 0.029	ND @ 0.032
2-Chloroethylvinylether	N/A	ND @ 0.0057	ND @ 0.006	ND @ 0.0057	ND @ 0.0062	0.04	0.04	ND @ 0.006	ND @ 0.0062	ND @ 0.0059	ND @ 0.0063
2-Hexanone	N/A	ND @ 0.023	ND @ 0.024	ND @ 0.023	ND @ 0.025	0.07	0.065	ND @ 0.024	ND @ 0.024	ND @ 0.024	ND @ 0.025
4-Methyl-2-Pentanone	1	ND @ 0.023	ND @ 0.024	ND @ 0.023	ND @ 0.025	0.059	0.054	ND @ 0.024	ND @ 0.024	ND @ 0.024	ND @ 0.025
Acetone	0.2	ND @ 0.023	ND @ 0.024	ND @ 0.023	ND @ 0.025	0.61	0.58	ND @ 0.024	ND @ 0.024	ND @ 0.024	ND @ 0.025
Acrolein	N/A	ND @ 0.017	ND @ 0.018	ND @ 0.017	ND @ 0.019	0.4	0.36	ND @ 0.018	ND @ 0.019	ND @ 0.018	ND @ 0.019
Acrylonitrile	N/A	ND @ 0.0079	ND @ 0.0083	ND @ 0.0079	ND @ 0.0087	0.31	0.28	ND @ 0.0083	ND @ 0.0087	ND @ 0.0082	ND @ 0.0088
Benzene	0.06	ND @ 0.0011	ND @ 0.0012	ND @ 0.0011	ND @ 0.0012	0.056	0.054	ND @ 0.0012	ND @ 0.0012	ND @ 0.0012	ND @ 0.0013
Bromodichloromethane	N/A	ND @ 0.0057	ND @ 0.006	ND @ 0.0057	ND @ 0.0062	0.063	0.063	ND @ 0.006	ND @ 0.0062	ND @ 0.0059	ND @ 0.0063
Bromoform	N/A	ND @ 0.0057	ND @ 0.006	ND @ 0.0057	ND @ 0.0062	0.062	0.058	ND @ 0.006	ND @ 0.0062	ND @ 0.0059	ND @ 0.0063
Bromomethane	N/A	ND @ 0.0057	ND @ 0.006	ND @ 0.0057	ND @ 0.0062	0.07	0.067	ND @ 0.006	ND @ 0.0062	ND @ 0.0059	ND @ 0.0063
Carbon Disulfide	2.7	ND @ 0.0057	ND @ 0.006	ND @ 0.0057	ND @ 0.0062	0.064	0.059	ND @ 0.006	ND @ 0.0062	ND @ 0.0059	ND @ 0.0063
Carbon tetrachloride	0.6	ND @ 0.0057	ND @ 0.006	ND @ 0.0057	ND @ 0.0062	0.07	0.066	ND @ 0.006	ND @ 0.0062	ND @ 0.0059	ND @ 0.0063
Chlorobenzene	1.7	ND @ 0.0057	ND @ 0.006	ND @ 0.0057	ND @ 0.0062	0.058	0.055	ND @ 0.006	ND @ 0.0062	ND @ 0.0059	ND @ 0.0063
Chloroethane	1.9	ND @ 0.0057	ND @ 0.006	ND @ 0.0057	ND @ 0.0062	0.06	0.055	ND @ 0.006	ND @ 0.0062	ND @ 0.0059	ND @ 0.0063
Chloroform	0.3	ND @ 0.0057	ND @ 0.006	ND @ 0.0057	ND @ 0.0062	0.064	0.06	ND @ 0.006	ND @ 0.0062	ND @ 0.0059	ND @ 0.0063
Chloromethane	N/A	ND @ 0.0057	ND @ 0.006	ND @ 0.0057	ND @ 0.0062	0.049	0.046	ND @ 0.006	ND @ 0.0062	ND @ 0.0059	ND @ 0.0063
Cis-1,2-Dichloroethene	N/A	ND @ 0.0057	ND @ 0.006	ND @ 0.0057	ND @ 0.0062	0.057	0.058	ND @ 0.006	ND @ 0.0062	ND @ 0.0059	ND @ 0.0063
Cis-1,3-Dichloropropene	0.3	ND @ 0.0057	ND @ 0.006	ND @ 0.0057	ND @ 0.0062	0.058	0.055	ND @ 0.006	ND @ 0.0062	ND @ 0.0059	ND @ 0.0063
Dibromochlormethane	N/A	ND @ 0.0057	ND @ 0.006	ND @ 0.0057	ND @ 0.0062	0.066	0.062	ND @ 0.006	ND @ 0.0062	ND @ 0.0059	ND @ 0.0063
Ethylbenzene	5.5	ND @ 0.0011	ND @ 0.0012	ND @ 0.0011	ND @ 0.0012	0.055	0.052	ND @ 0.0012	ND @ 0.0012	ND @ 0.0012	ND @ 0.0013
Methylene Chloride	0.1	0.0054 JB	0.0056 JB	0.0048 JB	0.0058 JB	0.059 B	0.055 B	0.009 B	0.0059 JB	0.012 B	0.011 B
Styrene	N/A	ND @ 0.0011	ND @ 0.0012	ND @ 0.0011	ND @ 0.0012	0.058	0.055	ND @ 0.0012	ND @ 0.0012	ND @ 0.0012	ND @ 0.0013
Tetrachloroethene	1.4	ND @ 0.0057	ND @ 0.006	ND @ 0.0057	ND @ 0.0062	0.059	0.058	ND @ 0.006	ND @ 0.0062	ND @ 0.0059	ND @ 0.0063
Toluene	1.5	0.002	0.0038	ND @ 0.0011	ND @ 0.0012	0.061	0.055	ND @ 0.0012	0.0028	0.0016	0.002
Trans-1,2-Dichloroethene	0.3	ND @ 0.0057	ND @ 0.006	ND @ 0.0057	ND @ 0.0062	0.066	0.061	ND @ 0.006	ND @ 0.0062	ND @ 0.0059	ND @ 0.0063
Trans-1,3-Dichloropropene	N/A	ND @ 0.0057	ND @ 0.006	ND @ 0.0057	ND @ 0.0062	0.06	0.057	ND @ 0.006	ND @ 0.0062	ND @ 0.0059	ND @ 0.0063
Trichloroethene	0.7	ND @ 0.0057	ND @ 0.006	ND @ 0.0057	ND @ 0.0062	0.06	0.057	ND @ 0.006	ND @ 0.0062	ND @ 0.0059	ND @ 0.0063
Vinyl Chloride	0.2	ND @ 0.0057	ND @ 0.006	ND @ 0.0057	ND @ 0.0062	0.053	0.051	ND @ 0.006	ND @ 0.0062	ND @ 0.0059	ND @ 0.0063
Xylenes	1.2	ND @ 0.0057	ND @ 0.006	ND @ 0.0057	ND @ 0.0062	0.167	0.165	ND @ 0.006	ND @ 0.0062	ND @ 0.0059	ND @ 0.0063
Total Non-Targeted VOC's	N/A	0.0059 JB	0.0062 JB	ND	0.0041 J	0.023 J	0.021 J	ND	0.0086 J	0.0049 J	ND

Notes

NA - Not Analyzed
ND - Non Detected at Method Detection Limit
N/A - Indicates no Soil Cleanup Objective number established for that compound.

B - Compound Found in Associated Lab Blank
J - Estimated Value

Table 2-1
PSA Subsurface Soil Analytical Results Summary - December 2002
Former MGP, Far Rockaway, New York

Sample Number	NYSDEC	FRSB - 01A	FRSB - 01B	FRSB - 02A	FRSB - 02B	FRSB - 03A	FRSB - 03B	FRSB - 04A	FRSB - 04B
Lab Sample ID No.	Recommended	AB74446	AB74447	AB74154	AB74155	AB74143	AB74144	AB74441	AB74442
Depth (ft)	Soil	2' - 4'	6' - 7'	4' - 5'	13' - 14'	6.5' - 7.5'	12.5' - 13.5'	9' - 10'	15' - 16'
SampleType	Cleanup	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Date	Objective	12/4/2002	12/4/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/4/2002	12/4/2002
Units	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
PCB'S									
Aroclor - 1016	1/10	NA	ND @ 0.29	NA	NA	NA	NA	NA	NA
Aroclor - 1221	1/10	NA	ND @ 0.29	NA	NA	NA	NA	NA	NA
Aroclor - 1232	1/10	NA	ND @ 0.29	NA	NA	NA	NA	NA	NA
Aroclor - 1242	1/10	NA	ND @ 0.29	NA	NA	NA	NA	NA	NA
Aroclor - 1248	1/10	NA	ND @ 0.29	NA	NA	NA	NA	NA	NA
Aroclor - 1254	1/10	NA	ND @ 0.29	NA	NA	NA	NA	NA	NA
Aroclor - 1260	1/10	NA	ND @ 0.29	NA	NA	NA	NA	NA	NA
PESTICIDES									
Aldrin	0.041	NA	ND @ 0.0059	NA	NA	NA	NA	NA	NA
Aplha-BHC	0.11	NA	ND @ 0.0059	NA	NA	NA	NA	NA	NA
Beta-BHC	0.2	NA	ND @ 0.0059	NA	NA	NA	NA	NA	NA
Chlordane	0.54	NA	ND @ 0.012	NA	NA	NA	NA	NA	NA
Delta-BHC	0.3	NA	ND @ 0.0059	NA	NA	NA	NA	NA	NA
Dieldrin	0.044	NA	ND @ 0.0059	NA	NA	NA	NA	NA	NA
Endosulfan I	0.9	NA	ND @ 0.0059	NA	NA	NA	NA	NA	NA
Endosulfan II	0.9	NA	ND @ 0.0059	NA	NA	NA	NA	NA	NA
Endosulfan Sulfate	1	NA	ND @ 0.0059	NA	NA	NA	NA	NA	NA
Endrin	0.1	NA	ND @ 0.0059	NA	NA	NA	NA	NA	NA
Endrin Aldehyde	N/A	NA	0.016	NA	NA	NA	NA	NA	NA
Endrin Ketone	N/A	NA	0.015	NA	NA	NA	NA	NA	NA
Gamma-BHC	N/A	NA	ND @ 0.0059	NA	NA	NA	NA	NA	NA
Heptachlor	0.1	NA	ND @ 0.0059	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	0.02	NA	ND @ 0.0059	NA	NA	NA	NA	NA	NA
Methoxychlor	***	NA	ND @ 0.0059	NA	NA	NA	NA	NA	NA
P,P'-DDD	2.9	NA	ND @ 0.0059	NA	NA	NA	NA	NA	NA
P,P'-DDE	2.1	NA	ND @ 0.0059	NA	NA	NA	NA	NA	NA
P,P'-DDT	2.1	NA	0.024	NA	NA	NA	NA	NA	NA
Toxaphene	N/A	NA	ND @ 0.059	NA	NA	NA	NA	NA	NA

Notes

ND - Non Detected at Method Detection Limit

J - Estimated Value

N/A - Indicates no Soil Cleanup Objective number established for that compound.

B - Compound Found in Associated Lab Blank

NA - Not Analyzed

Table 2-1
PSA Subsurface Soil Analytical Results Summary - December 2002
Former MGP, Far Rockaway, New York

Sample Number	NYSDEC	FRSB - 08A	FRSB - 08B	FRSB - 09A	FRSB - 09B	FRSB - 09B(MS)	FRSB - 09B(MSD)	FRSB - 10A	FRSB - 10B	FRSB - 11A	FRSB - 11B
Lab Sample ID No.	Recommended	AB74136	AB74137	AB74448	AB74449	AB74450	AB74451	AB74156	AB74157	AB74404	AB74405
Depth (ft)	Soil	3.5' - 4.5'	14' - 15'	6' - 7'	13' - 14'	13' - 14'	13' - 14'	4' - 5'	12' - 13'	5' - 6'	13' - 14'
SampleType	Cleanup	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Date	Objective	12/2/2002	12/2/2002	12/4/2002	12/4/2002	12/4/2002	12/4/2002	12/2/2002	12/2/2002	12/5/2002	12/5/2002
Units	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
PCB'S											
Aroclor - 1016	1/10	NA	NA	ND @ 0.028	ND @ 0.021	0.22	0.24	NA	NA	NA	NA
Aroclor - 1221	1/10	NA	NA	ND @ 0.028	ND @ 0.021	ND @ 0.02	ND @ 0.02	NA	NA	NA	NA
Aroclor - 1232	1/10	NA	NA	ND @ 0.028	ND @ 0.021	ND @ 0.02	ND @ 0.02	NA	NA	NA	NA
Aroclor - 1242	1/10	NA	NA	ND @ 0.028	ND @ 0.021	ND @ 0.02	ND @ 0.02	NA	NA	NA	NA
Aroclor - 1248	1/10	NA	NA	ND @ 0.028	ND @ 0.021	ND @ 0.02	ND @ 0.02	NA	NA	NA	NA
Aroclor - 1254	1/10	NA	NA	ND @ 0.028	ND @ 0.021	ND @ 0.02	ND @ 0.02	NA	NA	NA	NA
Aroclor - 1260	1/10	NA	NA	ND @ 0.028	ND @ 0.021	0.22	0.24	NA	NA	NA	NA
PESTICIDES											
Aldrin	0.041	NA	NA	ND @ 0.0057	ND @ 0.0042	0.033	0.031	NA	NA	NA	NA
Aplha-BHC	0.11	NA	NA	ND @ 0.0057	ND @ 0.0042	0.033	0.031	NA	NA	NA	NA
Beta-BHC	0.2	NA	NA	ND @ 0.0057	ND @ 0.0042	0.031	0.030	NA	NA	NA	NA
Chlordane	0.54	NA	NA	ND @ 0.011	ND @ 0.0083	ND @ 0.078	ND @ 0.0078	NA	NA	NA	NA
Delta-BHC	0.3	NA	NA	ND @ 0.0057	ND @ 0.0042	0.034	0.033	NA	NA	NA	NA
Dieldrin	0.044	NA	NA	ND @ 0.0057	ND @ 0.0042	0.032	0.030	NA	NA	NA	NA
Endosulfan I	0.9	NA	NA	ND @ 0.0057	ND @ 0.0042	0.030	0.028	NA	NA	NA	NA
Endosulfan II	0.9	NA	NA	ND @ 0.0057	ND @ 0.0042	0.033	0.032	NA	NA	NA	NA
Endosulfan Sulfate	1	NA	NA	ND @ 0.0057	ND @ 0.0042	0.035	0.034	NA	NA	NA	NA
Endrin	0.1	NA	NA	ND @ 0.0057	ND @ 0.0042	0.032	0.030	NA	NA	NA	NA
Endrin Aldehyde	N/A	NA	NA	ND @ 0.0057	ND @ 0.0042	0.029	0.028	NA	NA	NA	NA
Endrin Ketone	N/A	NA	NA	ND @ 0.0057	ND @ 0.0042	0.036	0.035	NA	NA	NA	NA
Gamma-BHC	N/A	NA	NA	ND @ 0.0057	ND @ 0.0042	0.033	0.031	NA	NA	NA	NA
Heptachlor	0.1	NA	NA	ND @ 0.0057	ND @ 0.0042	0.031	0.030	NA	NA	NA	NA
Heptachlor Epoxide	0.02	NA	NA	ND @ 0.0057	ND @ 0.0042	0.031	0.031	NA	NA	NA	NA
Methoxychlor	***	NA	NA	ND @ 0.0057	ND @ 0.0042	0.038	0.037	NA	NA	NA	NA
P,P'-DDD	2.9	NA	NA	ND @ 0.0057	ND @ 0.0042	0.038	0.038	NA	NA	NA	NA
P,P'-DDE	2.1	NA	NA	ND @ 0.0057	ND @ 0.0042	0.035	0.034	NA	NA	NA	NA
P,P'-DDT	2.1	NA	NA	ND @ 0.0057	ND @ 0.0042	0.036	0.034	NA	NA	NA	NA
Toxaphene	N/A	NA	NA	ND @ 0.057	ND @ 0.042	ND @ 0.039	ND @ 0.039	NA	NA	NA	NA

Notes

ND - Non Detected at Method Detection Limit
J - Estimated Value
N/A - Indicates no Soil Cleanup Objective number established for that compound.
B - Compound Found in Associated Lab Blank
NA - Not Analyzed

Table 2-1
PSA Subsurface Soil Analytical Results Summary - December 2002
Former MGP, Far Rockaway, New York

Sample Number	NYSDEC	FRSB - 08A	FRSB - 08B	FRSB - 09A	FRSB - 09B	FRSB - 09B(MS)	FRSB - 09B(MSD)	FRSB - 10A	FRSB - 10B	FRSB - 11A	FRSB - 11B
Lab Sample ID No.	Recommended	AB74136	AB74137	AB74448	AB74449	AB74450	AB74451	AB74156	AB74157	AB74404	AB74405
Depth (ft)	Soil	3.5' - 4.5'	14' - 15'	6' - 7'	13' - 14'	13' - 14'	13' - 14'	4' - 5'	12' - 13'	5' - 6'	13' - 14'
SampleType	Cleanup	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Date	Objective	12/2/2002	12/2/2002	12/4/2002	12/4/2002	12/4/2002	12/4/2002	12/2/2002	12/2/2002	12/5/2002	12/5/2002
Units	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
METALS											
Aluminum	SB	NA	NA	450	NA	NA	NA	NA	NA	NA	NA
Antimony	SB	NA	NA	ND @ 2.3	NA	NA	NA	NA	NA	NA	NA
Arsenic	7.5 or SB	ND @ 2.3	6.3	ND @ 2.3	ND @ 2.5	63	68	ND @ 2.4	ND @ 2.5	3.6	ND @ 2.5
Barium	300 or SB	ND @ 11	19	ND @ 11	ND @ 12	63	74	12	ND @ 12	13	ND @ 13
Beryllium	0.16	NA	NA	ND @ 0.68	NA	NA	NA	NA	NA	NA	NA
Cadmium	1 or SB	ND @ 0.68	ND @ 0.72	ND @ 0.68	ND @ 0.75	56	56	ND @ 0.72	ND @ 0.75	ND @ 0.71	ND @ 0.76
Calcium	SB	NA	NA	ND @ 1100	NA	NA	NA	NA	NA	NA	NA
Chromium	10 or SB	ND @ 5.7	**11**	ND @ 5.7	ND @ 6.2	67	65	ND @ 6	ND @ 6.2	**18**	ND @ 6.3
Cobalt	30 or SB	NA	NA	ND @ 2.8	NA	NA	NA	NA	NA	NA	NA
Copper	25 or SB	NA	NA	ND @ 5.7	NA	NA	NA	NA	NA	NA	NA
Iron	2,000 or SB	NA	NA	1200	NA	NA	NA	NA	NA	NA	NA
Lead	SB	ND @ 5.7	ND @ 6	ND @ 5.7	ND @ 6.2	59	62	ND @ 6	ND @ 6.2	10	47
Magnesium	SB	NA	NA	ND @ 570	NA	NA	NA	NA	NA	NA	NA
Manganese	SB	NA	NA	ND @ 11	NA	NA	NA	NA	NA	NA	NA
Mercury	0.1	ND @ 0.16	ND @ 0.17	ND @ 0.16	ND @ 0.18	2.1	2.1	ND @ 0.17	ND @ 0.18	ND @ 0.17	ND @ 0.18
Nickel	13 or SB	NA	NA	ND @ 5.7	NA	NA	NA	NA	NA	NA	NA
Potassium	SB	NA	NA	ND @ 570	NA	NA	NA	NA	NA	NA	NA
Selenium	2 or SB	ND @ 2.3	ND @ 2.4	ND @ 2.3	ND @ 2.5	55	55	ND @ 2.4	ND @ 2.5	ND @ 2.4	ND @ 2.5
Silver	SB	ND @ 2.8	ND @ 3	ND @ 2.8	ND @ 3.1	56	57	ND @ 3	ND @ 3.1	ND @ 3.2	ND @ 3.2
Sodium	SB	NA	NA	ND @ 570	NA	NA	NA	NA	NA	NA	NA
Thallium	SB	NA	NA	ND @ 1.4	NA	NA	NA	NA	NA	NA	NA
Vanadium	150 or SB	NA	NA	ND @ 11	NA	NA	NA	NA	NA	NA	NA
Zinc	20 or SB	NA	NA	**28**	NA	NA	NA	NA	NA	NA	NA
Cyanide	***	ND @ 0.28	ND @ 0.3	ND @ 0.28	ND @ 0.31	5.2	5.2	ND @ 0.3	ND @ 0.31	ND @ 0.29	ND @ 0.32

Notes

NA - Not Analyzed

ND - Non Detected at Method Detection Limit

SB = Site Background

B - Compound Found in Associated Lab Blank

J - Estimated Value

N/A - Indicates no Soil Cleanup Objective number established for that compound.

*** = Some forms of Cyanide are complex and very stable while other forms are pH dependent and hence are very unstable. Site-specific form(s) of Cyanide should be taken into consideration when establishing soil cleanup objective.

Table 2-1
PSA Subsurface Soil Analytical Results Summary - December 2002
Former MGP, Far Rockaway, New York

Sample Number	NYSDEC	FRSB - 01A	FRSB - 01B	FRSB - 02A	FRSB - 02B	FRSB - 03A	FRSB - 03B	FRSB - 04A	FRSB - 04B
Lab Sample ID No.	Recommended	AB74446	AB74447	AB74154	AB74155	AB74143	AB74144	AB74441	AB74442
Depth (ft)	Soil	2' - 4'	6' - 7'	4' - 5'	13' - 14'	6.5' - 7.5'	12.5' - 13.5'	9' - 10'	15' - 16'
SampleType	Cleanup	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Date	Objective	12/4/2002	12/4/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/4/2002	12/4/2002
Units	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
METALS									
Aluminum	SB	NA	2000	NA	NA	NA	NA	NA	NA
Antimony	SB	NA	ND @ 2.4	NA	NA	NA	NA	NA	NA
Arsenic	7.5 or SB	ND @ 2.2	ND @ 2.4	ND @ 2.3	ND @ 2.5	2.6	3.1	ND @ 2.3	ND @ 2.5
Barium	300 or SB	59	ND @ 12	34	ND @ 12	13	ND @ 12	ND @ 11	ND @ 12
Beryllium	0.16	NA	ND @ 0.71	NA	NA	NA	NA	NA	NA
Cadmium	1 or SB	ND @ 0.65	ND @ 0.71	ND @ 0.68	ND @ 0.75	ND @ 0.69	ND @ 0.73	ND @ 0.68	ND @ 0.74
Calcium	SB	NA	ND @ 1200	NA	NA	NA	NA	NA	NA
Chromium	10 or SB	6	8.1	**13**	ND @ 6.2	**16**	ND @ 6.1	7.4	ND @ 6.2
Cobalt	30 or SB	NA	ND @ 2.9	NA	NA	NA	NA	NA	NA
Copper	25 or SB	NA	ND @ 5.9	NA	NA	NA	NA	NA	NA
Iron	2,000 or SB	NA	**6300**	NA	NA	NA	NA	NA	NA
Lead	SB	210	14	30	ND @ 6.2	ND @ 5.7	ND @ 6.1	ND @ 5.7	ND @ 6.2
Magnesium	SB	NA	ND @ 590	NA	NA	NA	NA	NA	NA
Manganese	SB	NA	24	NA	NA	NA	NA	NA	NA
Mercury	0.1	ND @ 0.15	ND @ 0.17	ND @ 0.16	ND @ 0.18	ND @ 0.16	ND @ 0.17	ND @ 0.16	ND @ 0.18
Nickel	13 or SB	NA	ND @ 5.9	NA	NA	NA	NA	NA	NA
Potassium	SB	NA	ND @ 590	NA	NA	NA	NA	NA	NA
Selenium	2 or SB	ND @ 2.2	ND @ 2.4	ND @ 2.3	ND @ 2.5	ND @ 2.3	ND @ 2.4	ND @ 2.3	ND @ 2.5
Silver	SB	ND @ 2.7	ND @ 2.9	ND @ 2.8	ND @ 3.1	ND @ 2.9	ND @ 3	ND @ 2.8	ND @ 3.1
Sodium	SB	NA	ND @ 590	NA	NA	NA	NA	NA	NA
Thallium	SB	NA	ND @ 14	NA	NA	NA	NA	NA	NA
Vanadium	150 or SB	NA	12	NA	NA	NA	NA	NA	NA
Zinc	20 or SB	NA	ND @ 12	NA	NA	NA	NA	NA	NA
Cyanide	***	ND @ 0.27	ND @ 0.29	ND @ 0.28	ND @ 0.31	ND @ 0.29	ND @ 0.3	ND @ 0.28	ND @ 0.31

Notes

NA - Not Analyzed

ND - Non Detected at Method Detection Limit

SB = Site Background

B - Compound Found in Associated Lab Blank

J - Estimated Value

N/A - Indicates no Soil Cleanup Objective number established for that compound.

*** = Some forms of Cyanide are complex and very stable while other forms are pH dependent and hence are very unstable. Site-specific form(s) of Cyanide should be taken into consideration when establishing soil cleanup objective.

Table 2-2
PSA Surface Soil Analytical Results Summary - December 2002
Former MGP, Far Rockaway, New York

Sample Number	NYSDEC	FRSS-01	FRSS-01 (MS)	FRSS-01 (MSD)	FRSS-02	FRSS-03	FRSS-04	FRSS-05	FRSS-06	FRSS-07
Lab Sample ID No.	Recommended	AB74141	AB74142	AB74153	AB74151	AB74145	AB74150	AB74146	AB74149	AB74147
Depth (ft)	Soil	4"	4"	4"	4"	6"	4"	6"	4"	6"
SampleType	Cleanup	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Date	Objective	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002
Units	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
SEMI-VOLATILE ORGANIC COMPOUNDS										
1,2,4-Trichlorobenzene	N/A	ND @ 1.1	2.000	1.700	ND @ 0.37	ND @ 0.37	ND @ 0.37	ND @ 0.34	ND @ 0.37	ND @ 0.69
1,3-Dichlorobenzene	N/A	ND @ 1.1	2.200	1.900	ND @ 0.37	ND @ 0.37	ND @ 0.37	ND @ 0.34	ND @ 0.37	ND @ 0.69
2,4-Dinitrotoluene	N/A	ND @ 1.1	1.900	1.400	ND @ 0.37	ND @ 0.37	ND @ 0.37	ND @ 0.34	ND @ 0.37	ND @ 0.69
2-Methylnaphthalene	N/A	0.130 J	0.110 J	ND @ 1.1	0.140 J	ND @ 0.37	0.110 J	ND @ 0.34	0.140 J	ND @ 0.69
Acenaphthene	50	ND @ 1.1	2.400	2.200	0.055 J	ND @ 0.37	0.088 J	ND @ 0.34	0.084 J	ND @ 0.69
Acenaphthylene	41	0.120 J	ND @ 1.1	ND @ 1.1	0.210 J	ND @ 0.37	0.150 J	ND @ 0.34	0.200 J	ND @ 0.69
Anthracene	50	0.180 J	ND @ 1.1	ND @ 1.1	0.200 J	ND @ 0.37	0.360 J	ND @ 0.34	0.280 J	ND @ 0.69
Benzo[a]anthracene	0.224 or MDL	**0.620 J**	0.260 J	0.300 J	**0.940**	0.190 J	**1.900**	ND @ 0.34	**0.900**	0.170 J
Benzo[a]pyrene	0.061 or MDL	**0.860 J**	0.380 J	0.410 J	**1.000**	**0.200 J**	**1.700**	ND @ 0.34	**1.000**	**0.230 J**
Benzo[b]fluoranthene	**1.1**	**1.300 J**	0.630 J	0.630 J	**1.700**	0.370 J	**2.600**	ND @ 0.34	**1.600**	0.280 J
Benzo[g,h,I]perylene	50	0.410 J	ND @ 1.1	0.130 J	0.460	ND @ 0.37	0.690	ND @ 0.34	0.530	ND @ 0.69
Benzo[k]fluoranthene	1.1	0.500 J	0.150 J	0.220 J	0.620	0.150 J	0.820	ND @ 0.34	0.670	0.091 J
Butylbenzylphalate	50	ND @ 1.1	ND @ 1.1	ND @ 1.1	0.060 J	0.074 J	ND @ 0.37	ND @ 0.34	ND @ 0.37	ND @ 0.69
Bis(2-Ethylhexyl)phthalate	50	ND @ 1.1	ND @ 1.1	ND @ 1.1	0.081 J	ND @ 0.37	ND @ 0.37	ND @ 0.34	ND @ 0.37	1.600 B
Carbazole	N/A	ND @ 1.1	ND @ 1.1	ND @ 1.1	ND @ 0.37	ND @ 0.37	0.260 J	ND @ 0.34	0.120 J	ND @ 0.69
Chrysene	0.4	**0.890 J**	0.390 J	0.410 J	**1.000**	0.210 J	**1.700**	ND @ 0.34	**0.990**	0.190 J
Dibenzo[a,h]Anthracene	0.014 or MDL	ND @ 1.1	ND @ 1.1	ND @ 1.1	ND @ 0.37	ND @ 0.37	**0.075 J**	ND @ 0.34	ND @ 0.37	ND @ 0.69
Dibenzofuran	6.2	ND @ 1.1	ND @ 1.1	ND @ 1.1	ND @ 0.37	ND @ 0.37	0.048 J	ND @ 0.34	0.061 J	ND @ 0.69
Di-n-butylphalate	8.1	0.160 J	ND @ 1.1	ND @ 1.1	ND @ 0.37	ND @ 0.37	ND @ 0.37	ND @ 0.34	0.049 J	ND @ 0.69
Di-n-octylphthalate	50	ND @ 1.1	ND @ 1.1	ND @ 1.1	ND @ 0.37	ND @ 0.37	ND @ 0.37	ND @ 0.34	ND @ 0.37	ND @ 0.69
Fluoranthene	50	1.200 J	0.500 J	0.600 J	1.600	0.320 J	2.800	0.055 J	1.800	0.110 J
Fluorene	50	ND @ 1.1	ND @ 1.1	ND @ 1.1	0.087 J	ND @ 0.37	0.084 J	ND @ 0.34	0.092 J	ND @ 0.69
Indeno[1,2,3-cd]pyrene	3.2	0.360 J	ND @ 1.1	0.150 J	0.410	ND @ 0.37	0.740	ND @ 0.34	0.440	ND @ 0.69
Isophorone	4.4	ND @ 1.1	ND @ 1.1	0.780 J	ND @ 0.37	ND @ 0.37	ND @ 0.37	ND @ 0.34	ND @ 0.37	ND @ 0.69
Naphthalene	13	0.230 J	0.320 J	0.410 J	0.970	0.048 J	0.570	ND @ 0.34	0.720	ND @ 0.69
Phenanthrene	50	0.720 J	2.500	2.600	0.840	0.099 J	1.300	0.048 J	1.200	0.120 J
Pyrene	50	1.100	ND @ 1.1	ND @ 1.1	1.400	0.360 J	2.100	0.078 J	2.000	0.390 J
Total Non-Targeted SVO's	N/A	41.830 J	33.300 J	26.330 J	27.810 J	53.050 J	21.870 J	40.890 J	34.090 J	64.940 J

Notes

NA - Not Analyzed

ND - Non Detected at Method Detection Limit

N/A - Indicates no Soil Cleanup Objective number established for that compound.

B - Compound Found in Associated Lab Blank

J - Estimated Value

Table 2-2
PSA Surface Soil Analytical Results Summary - December 2002
Former MGP, Far Rockaway, New York

Sample Number	NYSDEC	FRSS-08	FRSS-09	FRSS-11	FRSS-12	FRSS-13	FRSS-14	FRSS-15
Lab Sample ID No.	Recommended	AB74148	AB74135	AB74134	AB74133	AB74139	AB74152	AB74140
Depth (ft)	Soil	4"	4"	4"	4"	4"	4"	4"
SampleType	Cleanup	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Date	Objective	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002
Units	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
SEMI-VOLATILE ORGANIC COMPOUNDS								
1,2,4-Trichlorobenzene	N/A	ND @ 0.37	ND @ 1.4	ND @ 0.39	ND @ 0.35	ND @ 0.36	ND @ 0.39	ND @ 0.36
1,3-Dichlorobenzene	N/A	ND @ 0.37	ND @ 1.4	ND @ 0.39	ND @ 0.35	ND @ 0.36	ND @ 0.39	ND @ 0.36
2,4-Dinitrotoluene	N/A	ND @ 0.37	ND @ 1.4	ND @ 0.39	ND @ 0.35	ND @ 0.36	ND @ 0.39	ND @ 0.36
2-Methylnaphthalene	N/A	0.7	0.66 J	ND @ 0.39	ND @ 0.35	ND @ 0.36	0.05 J	ND @ 0.36
Acenaphthene	50	0.091 J	0.31 J	ND @ 0.39	0.065 J	ND @ 0.36	0.068 J	ND @ 0.36
Acenaphthylene	41	0.43	1.2 J	ND @ 0.39	0.095 J	ND @ 0.36	0.41	ND @ 0.36
Anthracene	50	0.27 J	1.5	0.044 J	0.17 J	ND @ 0.36	0.29 J	ND @ 0.36
Benzo[a]anthracene	0.224 or MDL	**0.52**	**4**	**0.28 J**	**0.64**	0.11 J	**1.3**	0.06 J
Benzo[a]pyrene	0.061 or MDL	**0.55**	**4.1**	**0.3 J**	**0.63**	**0.089 J**	**1.5**	0.052 J
Benzo[b]fluoranthene	1.1	1	**8.1**	0.48	1	0.14 J	**2.9**	0.1 J
Benzo[g,h,I]perylene	50	0.68	2.4	0.17 J	0.24 J	ND @ 0.36	0.58	ND @ 0.36
Benzo[k]fluoranthene	1.1	0.31 J	**4.3**	0.17 J	0.41	0.062 J	0.72	ND @ 0.36
Butylbenzylphalate	50	ND @ 0.37	2.6	0.05 J	ND @ 0.35	ND @ 0.36	0.1 J	ND @ 0.36
Bis(2-Ethylhexyl)phthalate	50	0.65 B	5.6 B	ND @ 0.39	ND @ 0.35	ND @ 0.36	ND @ 0.39	ND @ 0.36
Carbazole	N/A	0.11 J	0.61 J	ND @ 0.39	0.11 J	ND @ 0.36	0.16 J	ND @ 0.36
Chrysene	0.4	**0.54**	**4.5**	0.35 J	**0.7**	0.11 J	**1.4**	0.065 J
Dibenzo[a,h]Anthracene	0.014 or MDL	**0.063 J**	**0.26 J**	ND @ 0.39	ND @ 0.35	ND @ 0.36	ND @ 0.39	ND @ 0.36
Dibenzofuran	6.2	0.085 J	0.22 J	ND @ 0.39	0.041 J	ND @ 0.36	0.063 J	ND @ 0.36
Di-n-butylphalate	8.1	0.042 J	0.41 J	0.12 J	0.1 J	0.043 J	0.099 J	ND @ 0.36
Di-n-octylphthalate	50	ND @ 0.37	ND @ 1.4	ND @ 0.39	ND @ 0.35	ND @ 0.36	ND @ 0.39	ND @ 0.36
Fluoranthene	50	0.7	4.5	0.6	1.5	0.22 J	2.6	0.15 J
Fluorene	50	0.13 J	0.44 J	ND @ 0.39	0.08 J	ND @ 0.36	0.085 J	ND @ 0.36
Indeno[1,2,3-cd]pyrene	3.2	0.47	2.2	0.14 J	0.23 J	ND @ 0.36	0.58	ND @ 0.36
Isophorone	4.4	ND @ 0.37	ND @ 1.4	ND @ 0.39	ND @ 0.35	ND @ 0.36	ND @ 0.39	ND @ 0.36
Naphthalene	13	0.93	2.3	ND @ 0.39	0.076 J	ND @ 0.36	0.13 J	ND @ 0.36
Phenanthrene	50	0.95	3.3	0.25 J	0.8	0.08 J	1.1	0.11 J
Pyrene	50	1.6	9.8	0.45	0.96	0.16 J	2.1	0.11 J
Total Non-Targeted SVO's	N/A	37.61 J	53.75 J	32.74 J	31.35 J	27.39 J	26.37 J	25.74 J

Notes

NA - Not Analyzed

ND - Non Detected at Method Detection Limit

N/A - Indicates no Soil Cleanup Objective number established for that compound.

B - Compound Found in Associated Lab Blank

J - Estimated Value

Table 2-2
PSA Surface Soil Analytical Results Summary - December 2002
Former MGP, Far Rockaway, New York

Sample Number	NYSDEC	FRSS-01	FRSS-01 (MS)	FRSS-01 (MSD)	FRSS-02	FRSS-03	FRSS-04	FRSS-05	FRSS-06	FRSS-07
Lab Sample ID No.	Recommended	AB74141	AB74142	AB74153	AB74151	AB74145	AB74150	AB74146	AB74149	AB74147
Depth (ft)	Soil	4"	4"	4"	4"	6"	4"	6"	4"	6"
SampleType	Cleanup	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Date	Objective	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002
Units	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
VOLATILE ORGANIC COMPOUNDS										
1,1,1-Trichloroethane	0.8	ND @ 0.0056	0.054	0.029	ND @ 0.0056	ND @ 0.0056	ND @ 0.0056	ND @ 0.0052	ND @ 0.0055	ND @ 0.0052
1,1,2,2-Tetrachloroethane	0.6	ND @ 0.0056	0.044	0.025	ND @ 0.0056	ND @ 0.0056	ND @ 0.0056	ND @ 0.0052	ND @ 0.0055	ND @ 0.0052
1,1,2-Trichloroethane	N/A	ND @ 0.0056	0.047	0.025	ND @ 0.0056	ND @ 0.0056	ND @ 0.0056	ND @ 0.0052	ND @ 0.0055	ND @ 0.0052
1,1-Dichloroethane	0.2	ND @ 0.0056	0.043	0.023	ND @ 0.0056	ND @ 0.0056	ND @ 0.0056	ND @ 0.0052	ND @ 0.0055	ND @ 0.0052
1,1-Dichloroethene	0.4	ND @ 0.0056	0.045	0.02	ND @ 0.0056	ND @ 0.0056	ND @ 0.0056	ND @ 0.0052	ND @ 0.0055	ND @ 0.0052
1,2-Dichloroethane	0.1	ND @ 0.0056	0.048	0.024	ND @ 0.0056	ND @ 0.0056	ND @ 0.0056	ND @ 0.0052	ND @ 0.0055	ND @ 0.0052
1,2-Dichloropropane	N/A	ND @ 0.0056	0.046	0.025	ND @ 0.0056	ND @ 0.0056	ND @ 0.0056	ND @ 0.0052	ND @ 0.0055	ND @ 0.0052
2-Butanone	0.3	ND @ 0.028	0.068	0.039	ND @ 0.028	ND @ 0.028	ND @ 0.028	ND @ 0.026	ND @ 0.027	ND @ 0.026
2-Chloroethylvinylether	N/A	ND @ 0.0056	0.02	0.011	ND @ 0.0056	ND @ 0.0056	ND @ 0.0056	ND @ 0.0052	ND @ 0.0052	ND @ 0.0052
2-Hexanone	N/A	ND @ 0.022	0.058	0.029	ND @ 0.022	ND @ 0.022	ND @ 0.022	ND @ 0.021	ND @ 0.022	ND @ 0.021
4-Methyl-2-Pentanone	1	ND @ 0.022	0.049	0.028	ND @ 0.022	ND @ 0.022	ND @ 0.022	ND @ 0.021	ND @ 0.022	ND @ 0.021
Acetone	0.2	0.037	0.56	0.22	ND @ 0.022	ND @ 0.022	ND @ 0.022	ND @ 0.021	ND @ 0.022	ND @ 0.021
Acrolein	N/A	ND @ 0.017	0.35	0.11	ND @ 0.017	ND @ 0.017	ND @ 0.017	ND @ 0.015	ND @ 0.016	ND @ 0.015
Acrylonitrile	N/A	ND @ 0.0078	0.23	0.1	ND @ 0.0077	ND @ 0.0077	ND @ 0.0078	ND @ 0.0071	ND @ 0.0076	ND @ 0.0071
Benzene	0.06	ND @ 0.0011	0.046	0.025	ND @ 0.0011	ND @ 0.0011	ND @ 0.0011	ND @ 0.001	ND @ 0.0011	ND @ 0.001
Bromodichloromethane	N/A	ND @ 0.0056	0.051	0.026	ND @ 0.0056	ND @ 0.0056	ND @ 0.0056	ND @ 0.0052	ND @ 0.0055	ND @ 0.0052
Bromoform	N/A	ND @ 0.0056	0.049	0.024	ND @ 0.0056	ND @ 0.0056	ND @ 0.0056	ND @ 0.0052	ND @ 0.0055	ND @ 0.0052
Bromomethane	N/A	ND @ 0.0056	0.059	0.038	ND @ 0.0056	ND @ 0.0056	ND @ 0.0056	ND @ 0.0052	ND @ 0.0055	ND @ 0.0052
Carbon Disulfide	2.7	ND @ 0.0056	0.037	0.016	ND @ 0.0056	ND @ 0.0056	ND @ 0.0056	ND @ 0.0052	ND @ 0.0055	ND @ 0.0052
Carbon tetrachloride	0.6	ND @ 0.0056	0.051	0.028	ND @ 0.0056	ND @ 0.0056	ND @ 0.0056	ND @ 0.0052	ND @ 0.0055	ND @ 0.0052
Chlorobenzene	1.7	ND @ 0.0056	0.038	0.019	ND @ 0.0056	ND @ 0.0056	ND @ 0.0056	ND @ 0.0052	ND @ 0.0055	ND @ 0.0052
Chloroethane	1.9	ND @ 0.0056	0.054	0.034	ND @ 0.0056	ND @ 0.0056	ND @ 0.0056	ND @ 0.0052	ND @ 0.0055	ND @ 0.0052
Chloroform	0.3	ND @ 0.0056	0.048	0.026	ND @ 0.0056	ND @ 0.0056	ND @ 0.0056	ND @ 0.0052	ND @ 0.0055	ND @ 0.0052
Chloromethane	N/A	ND @ 0.0056	0.051	0.034	ND @ 0.0056	ND @ 0.0056	ND @ 0.0056	ND @ 0.0052	ND @ 0.0055	ND @ 0.0052
Cis-1,2-Dichloroethene	N/A	ND @ 0.0056	0.046	0.026	ND @ 0.0056	ND @ 0.0056	ND @ 0.0056	ND @ 0.0052	ND @ 0.0055	ND @ 0.0052
Cis-1,3-Dichloropropene	N/A	ND @ 0.0056	0.035	0.018	ND @ 0.0056	ND @ 0.0056	ND @ 0.0056	ND @ 0.0052	ND @ 0.0055	ND @ 0.0052
Dibromochlormethane	N/A	ND @ 0.0056	0.048	0.024	ND @ 0.0056	ND @ 0.0056	ND @ 0.0056	ND @ 0.0052	ND @ 0.0055	ND @ 0.0052
Ethylbenzene	5.5	ND @ 0.0011	0.04	0.022	ND @ 0.0011	ND @ 0.0011	ND @ 0.0011	ND @ 0.001	ND @ 0.0011	ND @ 0.001
Methylene Chloride	0.1	0.0056 B	0.048 B	0.029 B	0.0069 B	0.0073 B	0.0075 B	0.0053 B	0.0043 JB	0.0069 B
Styrene	N/A	ND @ 0.0011	0.039	0.018	ND @ 0.0011	ND @ 0.0011	ND @ 0.0011	ND @ 0.001	ND @ 0.0011	ND @ 0.001
Tetrachloroethene	1.4	ND @ 0.0056	0.04	0.02	ND @ 0.0056	ND @ 0.0056	ND @ 0.0056	ND @ 0.0052	ND @ 0.0055	ND @ 0.0052
Toluene	1.5	0.005	0.045	0.025	0.0061	0.0073	0.004	0.0066	0.0016	0.013
Trans-1,2-Dichloroethene	0.3	ND @ 0.0056	0.038	0.018	ND @ 0.0056	ND @ 0.0056	ND @ 0.0056	ND @ 0.0052	ND @ 0.0055	ND @ 0.0052
Trans-1,3-Dichloropropene	N/A	ND @ 0.0056	0.034	0.015	ND @ 0.0056	ND @ 0.0056	ND @ 0.0056	ND @ 0.0052	ND @ 0.0055	ND @ 0.0052
Trichloroethene	0.7	ND @ 0.0056	0.041	0.02	ND @ 0.0056	ND @ 0.0056	ND @ 0.0056	ND @ 0.0052	ND @ 0.0055	ND @ 0.0052
Vinyl Chloride	0.2	ND @ 0.0056	0.048	0.031	ND @ 0.0056	ND @ 0.0056	ND @ 0.0056	ND @ 0.0052	ND @ 0.0055	ND @ 0.0052
Xylenes	1.2	ND	0.127	0.066	ND	ND	ND	ND	ND	ND
Total Non-Targeted VOC's	N/A	0.0117 J	0.0039 J	0.0038 J	ND	0.0073 J	ND	ND	ND	ND

Notes

NA - Not Analyzed
ND - Non Detected at Method Detection Limit
N/A - Indicates no Soil Cleanup Objective number established for that compound.
B - Compound Found in Associated Lab Blank
J - Estimated Value

Table 2-2
PSA Surface Soil Analytical Results Summary - December 2002
Former MGP, Far Rockaway, New York

Sample Number	NYSDEC	FRSS-08	FRSS-09	FRSS-11	FRSS-12	FRSS-13	FRSS-14	FRSS-15
Lab Sample ID No.	Recommended	AB74148	AB74135	AB74134	AB74133	AB74139	AB74152	AB74140
Depth (ft)	Soil	4"	4"	4"	4"	4"	4"	4"
SampleType	Cleanup	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Date	Objective	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002
Units	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
VOLATILE ORGANIC COMPOUNDS								
1,1,1-Trichloroethane	0.8	ND @ 0.0056	ND @ 0.0069	ND @ 0.0058	ND @ 0.0053	ND @ 0.0054	ND @ 0.0058	ND @ 0.0054
1,1,2,2-Tetrachloroethane	0.6	ND @ 0.0056	ND @ 0.0069	ND @ 0.0058	ND @ 0.0053	ND @ 0.0054	ND @ 0.0058	ND @ 0.0054
1,1,2-Trichloroethane	N/A	ND @ 0.0056	ND @ 0.0069	ND @ 0.0058	ND @ 0.0053	ND @ 0.0054	ND @ 0.0058	ND @ 0.0054
1,1-Dichloroethane	0.2	ND @ 0.0056	ND @ 0.0069	ND @ 0.0058	ND @ 0.0053	ND @ 0.0054	ND @ 0.0058	ND @ 0.0054
1,1-Dichloroethene	0.4	ND @ 0.0056	ND @ 0.0069	ND @ 0.0058	ND @ 0.0053	ND @ 0.0054	ND @ 0.0058	ND @ 0.0054
1,2-Dichloroethane	0.1	ND @ 0.0056	ND @ 0.0069	ND @ 0.0058	ND @ 0.0053	ND @ 0.0054	ND @ 0.0058	ND @ 0.0054
1,2-Dichloropropane	N/A	ND @ 0.0056	ND @ 0.0069	ND @ 0.0058	ND @ 0.0053	ND @ 0.0054	ND @ 0.0058	ND @ 0.0054
2-Butanone	0.3	ND @ 0.028	ND @ 0.035	ND @ 0.029	ND @ 0.027	ND @ 0.027	ND @ 0.029	ND @ 0.027
2-Chloroethylvinylether	N/A	ND @ 0.0056	ND @ 0.0069	ND @ 0.0058	ND @ 0.0053	ND @ 0.0054	ND @ 0.0058	ND @ 0.0054
2-Hexanone	N/A	ND @ 0.022	ND @ 0.028	ND @ 0.023	ND @ 0.021	ND @ 0.022	ND @ 0.023	ND @ 0.022
4-Methyl-2-Pentanone	1	ND @ 0.022	ND @ 0.028	ND @ 0.023	ND @ 0.021	ND @ 0.022	ND @ 0.023	ND @ 0.022
Acetone	0.2	ND @ 0.022	ND @ 0.028	ND @ 0.023	ND @ 0.021	ND @ 0.022	ND @ 0.023	ND @ 0.022
Acrolein	N/A	ND @ 0.017	ND @ 0.021	ND @ 0.017	ND @ 0.016	ND @ 0.016	ND @ 0.017	ND @ 0.016
Acrylonitrile	N/A	ND @ 0.0078	ND @ 0.0096	ND @ 0.0081	ND @ 0.0074	ND @ 0.0075	ND @ 0.0081	ND @ 0.0075
Benzene	0.06	ND @ 0.0011	ND @ 0.0014	ND @ 0.0012	ND @ 0.0011	ND @ 0.0011	ND @ 0.0012	ND @ 0.0011
Bromodichloromethane	N/A	ND @ 0.0056	ND @ 0.0069	ND @ 0.0058	ND @ 0.0053	ND @ 0.0054	ND @ 0.0058	ND @ 0.0054
Bromoform	N/A	ND @ 0.0056	ND @ 0.0069	ND @ 0.0058	ND @ 0.0053	ND @ 0.0054	ND @ 0.0058	ND @ 0.0054
Bromomethane	N/A	ND @ 0.0056	ND @ 0.0069	ND @ 0.0058	ND @ 0.0053	ND @ 0.0054	ND @ 0.0058	ND @ 0.0054
Carbon Disulfide	2.7	ND @ 0.0056	ND @ 0.0069	ND @ 0.0058	ND @ 0.0053	ND @ 0.0054	ND @ 0.0058	ND @ 0.0054
Carbon tetrachloride	0.6	ND @ 0.0056	ND @ 0.0069	ND @ 0.0058	ND @ 0.0053	ND @ 0.0054	ND @ 0.0058	ND @ 0.0054
Chlorobenzene	1.7	ND @ 0.0056	ND @ 0.0069	ND @ 0.0058	ND @ 0.0053	ND @ 0.0054	ND @ 0.0058	ND @ 0.0054
Chloroethane	1.9	ND @ 0.0056	ND @ 0.0069	ND @ 0.0058	ND @ 0.0053	ND @ 0.0054	ND @ 0.0058	ND @ 0.0054
Chloroform	0.3	ND @ 0.0056	ND @ 0.0069	ND @ 0.0058	ND @ 0.0053	ND @ 0.0054	ND @ 0.0058	ND @ 0.0054
Chloromethane	N/A	ND @ 0.0056	ND @ 0.0069	ND @ 0.0058	ND @ 0.0053	ND @ 0.0054	ND @ 0.0058	ND @ 0.0054
Cis-1,2-Dichloroethene	N/A	ND @ 0.0056	ND @ 0.0069	ND @ 0.0058	ND @ 0.0053	ND @ 0.0054	ND @ 0.0058	ND @ 0.0054
Cis-1,3-Dichloropropene	N/A	ND @ 0.0056	ND @ 0.0069	ND @ 0.0058	ND @ 0.0053	ND @ 0.0054	ND @ 0.0058	ND @ 0.0054
Dibromochlormethane	N/A	ND @ 0.0056	ND @ 0.0069	ND @ 0.0058	ND @ 0.0053	ND @ 0.0054	ND @ 0.0058	ND @ 0.0054
Ethylbenzene	5.5	ND @ 0.0011	ND @ 0.0014	ND @ 0.0012	ND @ 0.0011	ND @ 0.0011	ND @ 0.0012	ND @ 0.0011
Methylene Chloride	0.1	0.0088 B	0.0051 JB	0.003 JB	0.0047 JB	0.0037 JB	0.0073 B	0.0035 JB
Styrene	N/A	ND @ 0.0011	ND @ 0.0014	ND @ 0.0012	ND @ 0.0011	ND @ 0.0011	ND @ 0.0012	ND @ 0.0011
Tetrachloroethene	1.4	ND @ 0.0056	ND @ 0.0069	ND @ 0.0058	ND @ 0.0053	ND @ 0.0054	ND @ 0.0058	ND @ 0.0054
Toluene	1.5	0.0075	0.0024	0.0022	0.0071	0.0015	ND @ 0.0012	ND @ 0.0011
Trans-1,2-Dichloroethene	0.3	ND @ 0.0056	ND @ 0.0069	ND @ 0.0058	ND @ 0.0053	ND @ 0.0054	ND @ 0.0058	ND @ 0.0054
Trans-1,3-Dichloropropene	N/A	ND @ 0.0056	ND @ 0.0069	ND @ 0.0058	ND @ 0.0053	ND @ 0.0054	ND @ 0.0058	ND @ 0.0054
Trichloroethene	0.7	ND @ 0.0056	ND @ 0.0069	ND @ 0.0058	ND @ 0.0053	ND @ 0.0054	ND @ 0.0058	ND @ 0.0054
Vinyl Chloride	0.2	ND @ 0.0056	ND @ 0.0069	ND @ 0.0058	ND @ 0.0053	ND @ 0.0054	ND @ 0.0058	ND @ 0.0054
Xylenes	1.2	ND @ 0.0056	ND @ 0.0069	ND @ 0.0058	ND @ 0.0053	ND @ 0.0054	ND @ 0.0058	ND @ 0.0054
Total Non-Targeted VOC's	N/A	ND	0.0056 JB	0.0089 J	0.0033 J	ND	ND	ND

Notes

NA - Not Analyzed

ND - Non Detected at Method Detection Limit

N/A - Indicates no Soil Cleanup Objective number established for that compound.

B - Compound Found in Associated Lab Blank

J - Estimated Value

Table 2-2
PSA Surface Soil Analytical Results Summary - December 2002
Former MGP, Far Rockaway, New York

Sample Number	NYSDEC	FRSS-01	FRSS-01 (MS)	FRSS-01 (MSD)	FRSS-02	FRSS-03	FRSS-04	FRSS-05	FRSS-06	FRSS-07
Lab Sample ID No.	Recommended	AB74141	AB74142	AB74153	AB74151	AB74145	AB74150	AB74146	AB74149	AB74147
Depth (ft)	Soil	4"	4"	4"	4"	6"	4"	6"	4"	6"
SampleType	Cleanup	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Date	Objective	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002
Units	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
PCB'S										
Aroclor - 1016	1/10	NA	NA	NA	NA	NA	ND @ 0.019	NA	NA	NA
Aroclor - 1221	1/10	NA	NA	NA	NA	NA	ND @ 0.019	NA	NA	NA
Aroclor - 1232	1/10	NA	NA	NA	NA	NA	ND @ 0.019	NA	NA	NA
Aroclor - 1242	1/10	NA	NA	NA	NA	NA	ND @ 0.019	NA	NA	NA
Aroclor - 1248	1/10	NA	NA	NA	NA	NA	ND @ 0.019	NA	NA	NA
Aroclor - 1254	1/10	NA	NA	NA	NA	NA	ND @ 0.019	NA	NA	NA
Aroclor - 1260	1/10	NA	NA	NA	NA	NA	0.08	NA	NA	NA
PESTICIDES										
Aldrin	0.041	NA	NA	NA	NA	NA	ND @ 0.0037	NA	NA	NA
Aplha-BHC	0.11	NA	NA	NA	NA	NA	ND @ 0.0037	NA	NA	NA
Beta-BHC	0.2	NA	NA	NA	NA	NA	ND @ 0.0037	NA	NA	NA
Chlordane	0.54	NA	NA	NA	NA	NA	ND @ 0.0074	NA	NA	NA
Delta-BHC	0.3	NA	NA	NA	NA	NA	ND @ 0.0037	NA	NA	NA
Dieldrin	0.044	NA	NA	NA	NA	NA	ND @ 0.0037	NA	NA	NA
Endosulfan I	0.9	NA	NA	NA	NA	NA	ND @ 0.0037	NA	NA	NA
Endosulfan II	0.9	NA	NA	NA	NA	NA	ND @ 0.0037	NA	NA	NA
Endosulfan Sulfate	1	NA	NA	NA	NA	NA	ND @ 0.0037	NA	NA	NA
Endrin	0.1	NA	NA	NA	NA	NA	ND @ 0.0037	NA	NA	NA
Endrin Aldehyde	N/A	NA	NA	NA	NA	NA	ND @ 0.0037	NA	NA	NA
Endrin Ketone	N/A	NA	NA	NA	NA	NA	ND @ 0.0037	NA	NA	NA
Gamma-BHC	0.06	NA	NA	NA	NA	NA	ND @ 0.0037	NA	NA	NA
Heptachlor	0.1	NA	NA	NA	NA	NA	ND @ 0.0037	NA	NA	NA
Heptachlor Epoxide	0.02	NA	NA	NA	NA	NA	ND @ 0.0037	NA	NA	NA
Methoxychlor	***	NA	NA	NA	NA	NA	ND @ 0.0037	NA	NA	NA
P,P'-DDD	2.9	NA	NA	NA	NA	NA	ND @ 0.0037	NA	NA	NA
P,P'-DDE	2.1	NA	NA	NA	NA	NA	ND @ 0.0037	NA	NA	NA
P,P'-DDT	2.1	NA	NA	NA	NA	NA	ND @ 0.0037	NA	NA	NA
Toxaphene	N/A	NA	NA	NA	NA	NA	ND @ 0.0037	NA	NA	NA

Notes

NA - Not Analyzed
ND - Non Detected at Method Detection Limit
N/A - Indicates no Soil Cleanup Objective number established for that compound.
B - Compound Found in Associated Lab Blank
J - Estimated Value

Table 2-2
PSA Surface Soil Analytical Results Summary - December 2002
Former MGP, Far Rockaway, New York

Sample Number	NYSDEC	FRSS-08	FRSS-09	FRSS-11	FRSS-12	FRSS-13	FRSS-14	FRSS-15
Lab Sample ID No.	Recommended	AB74148	AB74135	AB74134	AB74133	AB74139	AB74152	AB74140
Depth (ft)	Soil	4"	4"	4"	4"	4"	4"	4"
SampleType	Cleanup	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Date	Objective	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002
Units	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
PCB'S								
Aroclor - 1016	1/10	NA	NA	NA	NA	NA	NA	NA
Aroclor - 1221	1/10	NA	NA	NA	NA	NA	NA	NA
Aroclor - 1232	1/10	NA	NA	NA	NA	NA	NA	NA
Aroclor - 1242	1/10	NA	NA	NA	NA	NA	NA	NA
Aroclor - 1248	1/10	NA	NA	NA	NA	NA	NA	NA
Aroclor - 1254	1/10	NA	NA	NA	NA	NA	NA	NA
Aroclor - 1260	1/10	NA	NA	NA	NA	NA	NA	NA
PESTICIDES								
Aldrin	0.041	NA	NA	NA	NA	NA	NA	NA
Aplha-BHC	0.11	NA	NA	NA	NA	NA	NA	NA
Beta-BHC	0.2	NA	NA	NA	NA	NA	NA	NA
Chlordane	0.54	NA	NA	NA	NA	NA	NA	NA
Delta-BHC	0.3	NA	NA	NA	NA	NA	NA	NA
Dieldrin	0.044	NA	NA	NA	NA	NA	NA	NA
Endosulfan I	0.9	NA	NA	NA	NA	NA	NA	NA
Endosulfan II	0.9	NA	NA	NA	NA	NA	NA	NA
Endosulfan Sulfate	1	NA	NA	NA	NA	NA	NA	NA
Endrin	0.1	NA	NA	NA	NA	NA	NA	NA
Endrin Aldehyde	N/A	NA	NA	NA	NA	NA	NA	NA
Endrin Ketone	N/A	NA	NA	NA	NA	NA	NA	NA
Gamma-BHC	0.06	NA	NA	NA	NA	NA	NA	NA
Heptachlor	0.1	NA	NA	NA	NA	NA	NA	NA
Heptachlor Epoxide	0.02	NA	NA	NA	NA	NA	NA	NA
Methoxychlor	N/A	NA	NA	NA	NA	NA	NA	NA
P,P'-DDD	2.9	NA	NA	NA	NA	NA	NA	NA
P,P'-DDE	2.1	NA	NA	NA	NA	NA	NA	NA
P,P'-DDT	2.1	NA	NA	NA	NA	NA	NA	NA
Toxaphene	N/A	NA	NA	NA	NA	NA	NA	NA

Notes

NA - Not Analyzed

ND - Non Detected at Method Detection Limit

N/A - Indicates no Soil Cleanup Objective number established for that compound.

B - Compound Found in Associated Lab Blank

J - Estimated Value

Table 2-2
PSA Surface Soil Analytical Results Summary - December 2002
Former MGP, Far Rockaway, New York

Sample Number	NYSDEC	FRSS-08	FRSS-09	FRSS-11	FRSS-12	FRSS-13	FRSS-14	FRSS-15
Lab Sample ID No.	Recommended	AB74148	AB74135	AB74134	AB74133	AB74139	AB74152	AB74140
Depth (ft)	Soil	4"	4"	4"	4"	4"	4"	4"
SampleType	Cleanup	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Date	Objective	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002
Units	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
METALS								
Aluminum	SB	NA	NA	NA	NA	NA	NA	NA
Antimony	SB	NA	NA	NA	NA	NA	NA	NA
Arsenic	7.5 or SB	**8.9**	**8.3**	6.6	ND @ 2.1	2.4	5.8	2.4
Barium	300 or SB	200	**320**	110	180	42	140	48
Beryllium	0.16	NA	NA	NA	NA	NA	NA	NA
Cadmium	1 or SB	1	**3.7**	ND @ 0.7	0.76	ND @ 0.65	**1.5**	ND @ 0.65
Calcium	SB	NA	NA	NA	NA	NA	NA	NA
Chromium	10 or SB	**22**	**33**	9.3	ND @ 5.3	9.8	**17**	9.4
Cobalt	30 or SB	NA	NA	NA	NA	NA	NA	NA
Copper	25 or SB	NA	NA	NA	NA	NA	NA	NA
Iron	2,000 or SB	NA	NA	NA	NA	NA	NA	NA
Lead	SB	550	620	310	240	37	530	53
Magnesium	SB	NA	NA	NA	NA	NA	NA	NA
Manganese	SB	NA	NA	NA	NA	NA	NA	NA
Mercury	0.1	**0.8**	**13**	**0.34**	**0.35**	ND @ 0.15	**0.96**	ND @ 0.15
Nickel	13 or SB	NA	NA	NA	NA	NA	NA	NA
Potassium	SB	NA	NA	NA	NA	NA	NA	NA
Selenium	2 or SB	ND @ 2.2	ND @ 2.8	ND @ 2.3	ND @ 2.1	ND @ 2.2	ND @ 2.3	ND @ 2.2
Silver	SB	ND @ 2.8	ND @ 3.5	ND @ 2.9	ND @ 2.7	ND @ 2.7	ND @ 2.9	ND @ 2.7
Sodium	SB	NA	NA	NA	NA	NA	NA	NA
Thallium	SB	NA	NA	NA	NA	NA	NA	NA
Vanadium	150 or SB	NA	NA	NA	NA	NA	NA	NA
Zinc	20 or SB	NA	NA	NA	NA	NA	NA	NA
Cyanide	***	ND @ 0.28	0.93	0.41	ND @ 0.26	ND @ 0.27	ND @ 0.28	ND @ 0.27

Notes

NA - Not Analyzed

ND - Non Detected at Method Detection Limit

N/A - Indicates no Soil Cleanup Objective number established for that compound.

B - Compound Found in Associated Lab Blank

J - Estimated Value

Table 2-2
PSA Surface Soil Analytical Results Summary - December 2002
Former MGP, Far Rockaway, New York

Sample Number	NYSDEC	FRSS-01	FRSS-01 (MS)	FRSS-01 (MSD)	FRSS-02	FRSS-03	FRSS-04	FRSS-05	FRSS-06	FRSS-07
Lab Sample ID No.	Recommended	AB74141	AB74142	AB74153	AB74151	AB74145	AB74150	AB74146	AB74149	AB74147
Depth (ft)	Soil	4"	4"	4"	4"	6"	4"	6"	4"	6"
SampleType	Cleanup	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL	SOIL
Sample Date	Objective	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002	12/2/2002
Units	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM	PPM
METALS										
Aluminum	SB	NA	NA	NA	NA	NA	3800	NA	NA	NA
Antimony	SB	NA	NA	NA	NA	NA	ND @ 2.2	NA	NA	NA
Arsenic	7.5 or SB	3.4	53	56	4.9	3.3	5.5	ND @ 2.1	6.2	ND @ 2.1
Barium	300 or SB	99	99	130	**320**	55	210	ND @ 10	**490**	21
Beryllium	0.16	NA	NA	NA	NA	NA	ND @ 0.67	NA	NA	NA
Cadmium	1 or SB	ND @ 0.67	50	50	**1.2**	ND @ 0.67	**1.2**	ND @ 0.62	**1.3**	ND @ 0.62
Calcium	SB	NA	NA	NA	NA	NA	**21000**	NA	NA	NA
Chromium	10 or SB	**14**	60	65	**15**	**12**	**15**	ND @ 5.2	**17**	8.4
Cobalt	30 or SB	NA	NA	NA	NA	NA	3	NA	NA	NA
Copper	25 or SB	NA	NA	NA	NA	NA	**520**	NA	NA	NA
Iron	2,000 or SB	NA	NA	NA	NA	NA	**13000**	NA	NA	NA
Lead	SB	160	150	200	690	94	690	9.8	750	38
Magnesium	SB	NA	NA	NA	N	NA	9400	NA	NA	NA
Manganese	SB	NA	NA	NA	NA	NA	140	NA	NA	NA
Mercury	0.1	**0.6**	2.4	2.7	**0.5**	ND @ 0.16	**0.5**	ND @ 0.15	**0.7**	**0.18**
Nickel	13 or SB	NA	NA	NA	NA	NA	9.4	NA	NA	NA
Potassium	SB	NA	NA	NA	NA	NA	ND @ 500	NA	NA	NA
Selenium	2 or SB	ND @ 2.2	48	48	ND @ 2.2	ND @ 2.2	ND @ 2.2	ND @ 2.1	ND @ 2.2	ND @ 2.1
Silver	SB	ND @ 2.8	51	50	ND @ 2.8	ND @ 2.8	ND @ 2.8	ND @ 2.6	ND @ 2.7	ND @ 2.6
Sodium	SB	NA	NA	NA	NA	NA	ND @ 560	NA	NA	NA
Thallium	SB	NA	NA	NA	NA	NA	ND @ 1.3	NA	NA	NA
Vanadium	150 or SB	NA	NA	NA	NA	NA	20	NA	NA	NA
Zinc	20 or SB	NA	NA	NA	NA	NA	**280**	NA	NA	NA
Cyanide	***	ND @ 0.28	5.7	5.3	0.29	0.46	ND @ 0.28	0.27	ND @ 0.27	0.27

Notes

NA - Not Analyzed

ND - Non Detected at Method Detection Limit

N/A - Indicates no Soil Cleanup Objective number established for that compound.

B - Compound Found in Associated Lab Blank

J - Estimated Value

Table 2-3
PSA Subsurface Soil Analytical Results Summary - Test Trench December 2002
Former MGP, Far Rockaway, New York

Sample Number	NYSDEC	FRTT - 01	FRTT - 02	FRTT - 03	FRTT - 04
Lab Sample ID No.	Recommended	AB74443	AB74444	AB74445	AB74406
Depth (ft)	Soil	5' - 5.5'	2' - 3'	5' - 5.5'	5' - 5.5'
Sample Type	Cleanup	SOIL	SOIL	SOIL	SOIL
Sample Date	Objective	12/2/2002	12/2/2002	12/2/2002	12/5/2002
Units	PPM	PPM	PPM	PPM	PPM
SEMI-VOLATILE ORGANIC COMPOUNDS					
1,2,4-Trichlorobenzene	N/A	ND @ 0.38	ND @ 1.2	ND @ 5.3	ND @ 0.74
1,3-Dichlorobenzene	N/A	ND @ 0.38	ND @ 1.2	ND @ 5.3	ND @ 0.74
2,4-Dinitrotoluene	N/A	ND @ 0.38	ND @ 1.2	ND @ 5.3	ND @ 0.74
2-Methylnaphthalene	N/A	ND @ 0.38	0.19 J	1.6 J	0.15 J
Acenaphthene	50	ND @ 0.38	0.38 J	1.1 J	0.13 J
Acenaphthylene	41	0.66	ND @ 1.2	4.7 J	0.27 J
Anthracene	50	0.082 J	1.2	5.8	0.51 J
Benzo[a]anthracene	0.224 or MDL	0.07 J	**2.3**	**17**	**1.8**
Benzo[a]pyrene	0.061 or MDL	**0.24 J**	**2.1**	**14**	**1.8**
Benzo[b]fluoranthene	1.1	0.26 J	**3.3**	**25**	**2.9**
Benzo[g,h,I]perylene	50	0.78	0.78 J	4.1 J	0.7 J
Benzo[k]fluoranthene	1.1	0.09 J	1 J	**6.4**	**1.1**
Butylbenzylphthalate	50	ND @ 0.38	ND @ 1.2	ND @ 5.3	ND @ 0.74
Bis(2-Ethylhexyl)phthalate	50	0.24 JB	0.36 JB	ND @ 5.3	0.32 JB
Carbazole	N/A	ND @ 0.38	0.67 J	3.1 J	0.18 J
Chrysene	0.4	0.07 J	**2.3**	**17**	**1.8**
Dibenzo[a,h]Anthracene	0.014 or MDL	ND @ 0.38	**0.39 J**	**0.79 J**	**0.3 J**
Dibenzofuran	6.2	ND @ 0.38	0.33 J	3.1 J	0.078 J
Di-n-butylphthalate	8.1	0.78 J	ND @ 1.2	ND @ 5.3	ND @ 0.74
Di-n-octylphthalate	50	0.042 J	ND @ 1.2	ND @ 5.3	ND @ 0.74
Fluoranthene	50	0.11 J	5.1	33	2.9
Fluorene	50	ND @ 0.38	0.39 J	5.6	0.17 J
Indeno[1,2,3-cd]pyrene	3.2	0.45	0.88 J	**4.8 J**	0.72 J
Isophorone	4.4	ND @ 0.38	ND @ 1.2	ND @ 5.3	ND @ 0.74
Naphthalene	13	ND @ 0.38	0.27 J	2.6 J	0.61 J
Phenanthrene	50	0.043 J	4.8	28	1.8
Pyrene	50	0.17 J	4.1	28	3.3
Total Non-Targeted SVO's	N/A	39.40 J	43.71 J	128.3 J	38.29 J

Notes

NA - Not Analyzed

ND - Non Detected at Method Detection Limit

N/A - Indicates no Soil Cleanup Objective number established for that compound.

B - Compound Found in Associated Lab Blank

J - Estimated Value

Table 2-3
PSA Subsurface Soil Analytical Results Summary - Test Trench December 2002
Former MGP, Far Rockaway, New York

Sample Number	NYSDEC	FRTT - 01	FRTT - 02	FRTT - 03	FRT - 04
Lab Sample ID No.	Recommended	AB74443	AB74444	AB74445	AB74406
Depth (ft)	Soil	5' - 5.5'	2' - 3'	5' - 5.5'	5' - 5.5'
SampleType	Cleanup	SOIL	SOIL	SOIL	SOIL
Sample Date	Objective	12/2/2002	12/2/2002	12/2/2002	12/5/2002
Units	PPM	PPM	PPM	PPM	PPM
VOLATILE ORGANIC COMPOUNDS					
1,1,1-Trichloroethane	0.8	ND @0.0057	ND @ 0.006	ND @ 0.0079	ND @ 0.0056
1,1,2,2-Tetrachloroethane	0.6	ND @0.0057	ND @ 0.006	ND @ 0.0079	ND @ 0.0056
1,1,2-Trichloroethane	N/A	ND @0.0057	ND @ 0.006	ND @ 0.0079	ND @ 0.0056
1,1-Dichloroethane	0.2	ND @0.0057	ND @ 0.006	ND @ 0.0079	ND @ 0.0056
1,1-Dichloroethene	0.4	ND @0.0057	ND @ 0.006	ND @ 0.0079	ND @ 0.0056
1,2-Dichloroethane	0.1	ND @0.0057	ND @ 0.006	ND @ 0.0079	ND @ 0.0056
1,2-Dichloropropane	N/A	ND @0.0057	ND @ 0.006	ND @ 0.0079	ND @ 0.0056
2-Butanone	0.3	ND @ 0.029	ND @ 0.03	ND @ 0.04	ND @ 0.028
2-Chloroethylvinylether	N/A	ND @0.0057	ND @ 0.006	ND @ 0.0079	ND @ 0.0056
2-Hexanone	N/A	ND @ 0.023	ND @ 0.024	ND @ 0.032	ND @ 0.022
4-Methyl-2-Pentanone	1	ND @ 0.023	ND @ 0.006	ND @ 0.032	ND @ 0.022
Acetone	0.2	ND @ 0.023	ND @ 0.006	ND @ 0.032	ND @ 0.022
Acrolein	N/A	ND @ 0.017	ND @ 0.018	ND @ 0.024	ND @ 0.017
Acrylonitrile	N/A	ND @ 0.008	ND @ 0.0083	ND @ 0.011	ND @ 0.0077
Benzene	0.06	ND @ 0.0011	ND @ 0.0012	ND @ 0.016	0.0019
Bromodichloromethane	N/A	ND @0.0057	ND @ 0.006	ND @ 0.0079	ND @ 0.0056
Bromoform	N/A	ND @0.0057	ND @ 0.006	ND @ 0.0079	ND @ 0.0056
Bromomethane	N/A	ND @0.0057	ND @ 0.006	ND @ 0.0079	ND @ 0.0056
Carbon Disulfide	2.7	ND @0.0057	ND @ 0.006	ND @ 0.0079	ND @ 0.0056
Carbon tetrachloride	0.6	ND @0.0057	ND @ 0.006	ND @ 0.0079	ND @ 0.0056
Chlorobenzene	1.7	ND @0.0057	ND @ 0.006	ND @ 0.0079	ND @ 0.0056
Chloroethane	1.9	ND @0.0057	ND @ 0.006	ND @ 0.0079	ND @ 0.0056
Chloroform	0.3	ND @0.0057	ND @ 0.006	ND @ 0.0079	ND @ 0.0056
Chloromethane	N/A	ND @0.0057	ND @ 0.006	ND @ 0.0079	ND @ 0.0056
Cis-1,2-Dichloroethene	N/A	ND @0.0057	ND @ 0.006	ND @ 0.0079	ND @ 0.0056
Cis-1,3-Dichloropropene	N/A	ND @0.0057	ND @ 0.006	ND @ 0.0079	ND @ 0.0056
Dibromochlormethane	N/A	ND @0.0057	ND @ 0.006	ND @ 0.0079	ND @ 0.0056
Ethylbenzene	5.5	ND @ 0.0011	ND @ 0.0012	ND @ 0.0016	ND @ 0.0011
Methylene Chloride	0.1	0.0073 B	0.0071 B	0.0074 JB	0.006 B
Styrene	N/A	ND @ 0.0011	ND @ 0.0012	ND @ 0.0016	ND @ 0.0011
Tetrachloroethene	1.4	ND @ 0.0057	ND @ 0.006	ND @ 0.0079	ND @ 0.0056
Toluene	1.5	ND @ 0.0011	ND @ 0.0012	0.003	0.0051
Trans-1,2-Dichloroethene	0.3	ND @0.0057	ND @ 0.006	ND @ 0.0079	ND @ 0.0056
Trans-1,3-Dichloropropene	N/A	ND @0.0057	ND @ 0.006	ND @ 0.0079	ND @ 0.0056
Trichloroethene	0.7	ND @0.0057	ND @ 0.006	ND @ 0.0079	ND @ 0.0056
Vinyl Chloride	0.2	ND @0.0057	ND @ 0.006	ND @ 0.0079	ND @ 0.0056
Xylenes	1.2	ND	ND	ND	ND
Total Non-Targeted VOC's	N/A	ND	ND	ND	ND

Notes

NA - Not Analyzed

ND - Non Detected at Method Detection Limit

N/A - Indicates no Soil Cleanup Objective number established for that compound.

B - Compound Found in Associated Lab Blank

J - Estimated Value

Table 2-3
PSA Subsurface Soil Analytical Results Summary - Test Trench December 2002
Former MGP, Far Rockaway, New York

Sample Number	NYSDEC	FRTT - 01	FRTT - 02	FRTT - 03	FRTT - 04
Lab Sample ID No.	Recommended	AB74443	AB74444	AB74445	AB74406
Depth (ft)	Soil	5' - 5.5'	2' - 3'	5' - 5.5'	5' - 5.5'
SampleType	Cleanup	SOIL	SOIL	SOIL	SOIL
Sample Date	Objective	12/2/2002	12/2/2002	12/2/2002	12/5/2002
Units	PPM	PPM	PPM	PPM	PPM
PCB'S					
Aroclor - 1016	1/10	NA	NA	ND @ 0.04	NA
Aroclor - 1221	1/10	NA	NA	ND @ 0.04	NA
Aroclor - 1232	1/10	NA	NA	ND @ 0.04	NA
Aroclor - 1242	1/10	NA	NA	ND @ 0.04	NA
Aroclor - 1248	1/10	NA	NA	ND @ 0.04	NA
Aroclor - 1254	1/10	NA	NA	ND @ 0.04	NA
Aroclor - 1260	1/10	NA	NA	ND @ 0.04	NA
PESTICIDES					
Aldrin	0.041	NA	NA	ND @ 0.0079	NA
Aplha-BHC	0.11	NA	NA	ND @ 0.0079	NA
Beta-BHC	0.2	NA	NA	ND @ 0.0079	NA
Chlordane	0.54	NA	NA	ND @ 0.016	NA
Delta-BHC	0.3	NA	NA	ND @ 0.0079	NA
Dieldrin	0.044	NA	NA	ND @ 0.0079	NA
Endosulfan I	0.9	NA	NA	ND @ 0.0079	NA
Endosulfan II	0.9	NA	NA	ND @ 0.0079	NA
Endosulfan Sulfate	1	NA	NA	ND @ 0.0079	NA
Endrin	0.1	NA	NA	ND @ 0.0079	NA
Endrin Aldehyde	N/A	NA	NA	ND @ 0.0079	NA
Endrin Ketone	N/A	NA	NA	0.029	NA
Gamma-BHC	0.06	NA	NA	ND @ 0.0079	NA
Heptachlor	0.1	NA	NA	ND @ 0.0079	NA
Heptachlor Epoxide	0.02	NA	NA	ND @ 0.0079	NA
Methoxychlor	N/A	NA	NA	0.120	NA
P,P'-DDD	2.9	NA	NA	ND @ 0.0079	NA
P,P'-DDE	2.1	NA	NA	ND @ 0.0079	NA
P,P'-DDT	2.1	NA	NA	ND @ 0.0079	NA
Toxaphene	N/A	NA	NA	ND @ 0.0079	NA

Notes

NA - Not Analyzed

ND - Non Detected at Method Detection Limit

N/A - Indicates no Soil Cleanup Objective number established for that compound.

B - Compound Found in Associated Lab Blank

J - Estimated Value

Table 2-3
PSA Subsurface Soil Analytical Results Summary - Test Trench December 2002
Former MGP, Far Rockaway, New York

Sample Number	NYSDEC	FRTT - 01	FRTT - 02	FRTT - 03	FRTT - 04
Lab Sample ID No.	Recommended	AB74443	AB74444	AB74445	AB74406
Depth (ft)	Soil	5' - 5.5'	2' - 3'	5' - 5.5'	5' - 5.5'
SampleType	Cleanup	SOIL	SOIL	SOIL	SOIL
Sample Date	Objective	12/2/2002	12/2/2002	12/2/2002	12/5/2002
Units	PPM	PPM	PPM	PPM	PPM
METALS					
Aluminum	SB	NA	NA	12000	NA
Antimony	SB	NA	NA	6.6	NA
Arsenic	7.5 or SB	ND @ 2.3	**27**	**21**	**10**
Barium	300 or SB	36	**3600**	**540**	**330**
Beryllium	0.16	NA	NA	ND @ 0.95	NA
Cadmium	1 or SB	ND @ 0.69	**26**	**2.3**	**1.2**
Calcium	SB	NA	NA	5600	NA
Chromium	10 or SB	**13**	**88**	**32**	**21**
Cobalt	30 or SB	NA	NA	9.1	NA
Copper	25 or SB	NA	NA	**240**	NA
Iron	2,000 or SB	NA	NA	**31000**	NA
Lead	SB	11	71000	1600	3700
Magnesium	SB	NA	NA	1800	NA
Manganese	SB	NA	NA	240	NA
Mercury	0.1	ND @ 0.16	**2.9**	**1.6**	**0.58**
Nickel	13 or SB	NA	NA	**28**	NA
Potassium	SB	NA	NA	ND @ 790	NA
Selenium	2 or SB	ND @ 2.3	**6.7**	**8.6**	**3.7**
Silver	SB	ND @ 2.9	43	ND @ 4	ND @ 2.8
Sodium	SB	NA	NA	ND @ 790	NA
Thallium	SB	NA	NA	ND @ 1.9	NA
Vanadium	150 or SB	NA	NA	44	NA
Zinc	20 or SB	NA	NA	**1100**	NA
Cyanide	***	ND @ 0.29	ND @ 0.3	0.61	ND @ 0.28

Notes

NA - Not Analyzed

ND - Non Detected at Method Detection Limit

B - Compound Found in Associated Lab Blank

J - Estimated Value

*** = Some forms of Cyanide are complex and very stable while other forms are pH dependent and hence are very unstable, Site-specific form(s) of Cyanide should be taken into consideration when establishing soil cleanup objective.

N/A - Indicates no Soil Cleanup Objective number established for that compound.

Table 2-4
PSA Groundwater Analytical Results - December 2002
Former MGP, Far Rockaway, New York

Sample Number	NYS DEC	FRGW - 01	FRGW - 02	FRGW - 03	FRGW - 03(MS)	FRGW - 03(MSD)	FRGW-05	FRGW-06	FRGW-07	FRGW - 08	FB121202
Lab Sample ID No.	Groundwater	AB74904	AB74905	AB74907	AB74908	AB74909	AB74910	AB74911	AB74903	AB74912	AB74906
SampleType	Standards	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER
Sample Date	Criteria	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002
Units	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB
SEMI-VOLATILE ORGANIC COMPOUNDS											
1,2,4-Trichlorobenzene	N/A	ND @ 10	ND @ 200	ND @ 200	78	71	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
1,2-Dichlorobenzene	N/A	ND @ 10	ND @ 200	ND @ 200	76	68	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
1,2-Diphenylhydrazine	N/A	ND @ 10	ND @ 200	ND @ 200	85	82	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
1,3-Dichlorobenzene	N/A	ND @ 10	ND @ 200	ND @ 200	77	68	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
1,4-Dichlorobenzene	N/A	ND @ 10	ND @ 200	ND @ 200	76	69	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
2,4,6-Trichlorophenol	N/A	ND @ 10	ND @ 200	ND @ 200	69	73	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
2,4-Dichlorophenol	1	ND @ 10	ND @ 200	ND @ 200	66	65	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
2,4-Dimethylphenol	N/A	ND @ 10	ND @ 200	ND @ 200	75	76	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
2,4-Dinitrotoluene	N/A	ND @ 10	ND @ 200	ND @ 200	60	62	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
2,6-Dinitrotoluene	5	ND @ 10	ND @ 200	ND @ 200	72	70	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
2-Chloronaphthalene	N/A	ND @ 10	ND @ 200	ND @ 200	72	71	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
2-Chlorophenol	50	ND @ 10	ND @ 200	ND @ 200	65	62	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
2-Methylnaphthalene	50	ND @ 10	**87 J**	**70 J**	66 J	72 J	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
2-Nitrophenol	5	ND @ 10	ND @ 200	ND @ 200	65	62	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
3,3'-Dichlorobenzidine	N/A	ND @ 10	ND @ 200	ND @ 200	59 J	56 J	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
4,6-Dinitro-2-methylphenol	N/A	ND @ 10	ND @ 200	ND @ 200	35	34	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
4-Bromophenyl-phenylether	N/A	ND @ 10	ND @ 200	ND @ 200	77	74	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
4-Chloro-3-methylphenol	5	NA	NA	NA	ND @ 7.6	69	NA	NA	NA	NA	NA
4-Chlorophenyl-phenylether	N/A	ND @ 10	ND @ 200	ND @ 200	74	73	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
4-Nitrophenol	5	NA	NA	NA	ND @ 5.4	29	NA	NA	NA	NA	NA
Acenaphthene	20	ND @ 10	ND @ 200	ND @ 200	88	89	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Acenaphthylene	20	ND @ 10	ND @ 200	**30 J**	98	110	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Anthracene	50	ND @ 10	ND @ 200	ND @ 200	73	74	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Benzo(a)anthracene	0.002	ND @ 10	ND @ 200	ND @ 200	80	78	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Benzo(a)pyrene	0.002 (ND)	ND @ 10	ND @ 200	ND @ 200	67	66	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Benzo(b)fluoranthene	0.002	ND @ 10	ND @ 200	ND @ 200	66	67	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Benzo(g,h,I)perylene	5	ND @ 10	ND @ 200	ND @ 200	65	66	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Benzo(k)fluoranthene	0.002	ND @ 10	ND @ 200	ND @ 200	76	72	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Bis(2-Chloroethoxy)methane	N/A	ND @ 10	ND @ 200	ND @ 200	78	76	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Bis(2-Chloroethyl)Ether	N/A	ND @ 10	ND @ 200	ND @ 200	70	71	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10

Notes

NA - Not Analyzed

J - Estimated Value

N/A - Indicates that Standards Criteria is not available.

B - Compound Found in Associated Lab Blank

ND - Non Detected at Method Detection Limit

Table 2-4
PSA Groundwater Analytical Results - December 2002
Former MGP, Far Rockaway, New York

Sample Number	NYS DEC	FRGW - 01	FRGW - 02	FRGW - 03	FRGW - 03(MS)	FRGW - 03(MSD)	FRGW-05	FRGW-06	FRGW-07	FRGW - 08	FB121202
Lab Sample ID No.	Groundwater	AB74904	AB74905	AB74907	AB74908	AB74909	AB74910	AB74911	AB74903	AB74912	AB74906
SampleType	Standards	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER
Sample Date	Criteria	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002
Units	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB
SEMI-VOLATILE ORGANIC COMPOUNDS											
Bis(2-Chloroisopropyl)ether	N/A	ND @ 10	ND @ 200	ND @ 200	78	82	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Bis(2-Ethylhexyl)phthalate	50	1.9 JB	ND @ 200	ND @ 200	72 B	67 B	1.4 JB	1.2 JB	2.3 JB	1.5 JB	1.6 JB
Butylbenzylphthalate	50	ND @ 10	ND @ 200	ND @ 200	72	69	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Carbazole	N/A	ND @ 10	ND @ 200	ND @ 200	ND @ 7.8	ND @ 7.8	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Chrysene	0.002	ND @ 10	ND @ 200	ND @ 200	88	86	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Dibenzo(a,h)Anthracene	50	ND @ 10	ND @ 200	ND @ 200	60	54	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Diethylphthalate	50	ND @ 10	ND @ 200	ND @ 200	74	74	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Dimethylphthalate	50	ND @ 10	ND @ 200	ND @ 200	76	77	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Di-n-butylphthalate	50	1.4 JB	ND @ 200	ND @ 200	74	73	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Di-n-octylphthalate	50	ND @ 10	ND @ 200	ND @ 200	56	53	ND @ 10	ND @ 10	1.4 JB	ND @ 10	ND @ 10
Fluoranthene	50	ND @ 10	ND @ 200	ND @ 200	78	76	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Fluorene	50	ND @ 10	ND @ 200	ND @ 200	83	84	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Hexachlorobenzene	0.35	ND @ 10	ND @ 200	ND @ 200	80	75	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Hexachlorobutadiene	N/A	ND @ 10	ND @ 200	ND @ 200	77	78	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Hexachloroethane	N/A	ND @ 10	ND @ 200	ND @ 200	80	79	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Indeno(1,2,3-cd)pyrene	0.002	ND @ 10	ND @ 200	ND @ 200	63	65	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Isophorone	50	ND @ 10	ND @ 200	ND @ 200	70	69	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Naphthalene	10	ND @ 10	**1600**	**3200**	3200	3300	7.5 J	4 J	ND @ 10	6.1 J	ND @ 10
Nitrobenzene	5	ND @ 10	ND @ 200	ND @ 200	85	75	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
N-Nitrosodimethylamine	N/A	ND @ 10	ND @ 200	ND @ 200	41	39	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
N-Nitroso-Di-N-Propylamine	N/A	ND @ 10	ND @ 200	ND @ 200	69	66	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
N-Nitrosodiphenylamine	N/A	ND @ 10	ND @ 200	ND @ 200	71	68	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Pentachlorophenol	1	ND @ 10	ND @ 200	ND @ 200	30	29	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Phenanthrene	50	ND @ 10	ND @ 200	ND @ 200	98	97	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Phenol	1	ND @ 10	ND @ 200	ND @ 200	30	30	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Pyrene	50	ND @ 10	ND @ 200	ND @ 200	86	82	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10
Total Non-Targeted SVO's	N/A	272 J	2072 J	42930 J	30310 J	28520 J	138.3 J	98.9 J	221.8 J	288.9 J	135.6 J

Notes

NA - Not Analyzed

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B - Compound Found in Associated Lab Blank

ND - Non Detected at Method Detection Limit

Table 2-4
PSA Groundwater Analytical Results - December 2002
Former MGP, Far Rockaway, New York

Sample Number	NYS DEC	FRGW - 01	FRGW - 02	FRGW - 03	FRGW - 03(MS)	FRGW - 03(MSD)	FRGW-05	FRGW - 06	FRGW - 07	FRGW - 08	FB121202	TB121202
Lab Sample ID No.	Groundwater	AB74904	AB74905	SB74907	AB74908	AB74909	AB74910	AB74911	AB74903	AB74912	AB74906	AB74913
SampleType	Standards	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER
Sample Date	Criteria	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002
Units	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB
VOLATILE ORGANIC COMPOUNDS												
1,1,1-Trichloroethane	5	ND @ 5	ND @ 50	ND @ 2500	23	23	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5
1,1,2,2-Tetrachloroethane	5	ND @ 5	ND @ 50	ND @ 2500	19	18	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5
1,1,2-Trichloroethane	N/A	ND @ 5	ND @ 50	ND @ 2500	21	19	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5
1,1-Dichloroethane	5	ND @ 5	ND @ 50	ND @ 2500	20	21	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5
1,1-Dichloroethene	5	ND @ 5	ND @ 50	ND @ 2500	23	23	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5
1,2-Dichloroethane	5	ND @ 5	ND @ 50	ND @ 2500	23	23	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5
1,2-Dichloropropane	N/A	ND @ 5	ND @ 50	ND @ 2500	20	19	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5
2-Butanone	50	ND @ 25	ND @ 250	ND @ 13000	16 J	9.9 J	ND @ 25	ND @ 25	ND @ 25	ND @ 25	ND @ 25	ND @ 25
2-Chloroethylvinylether	N/A	ND @ 5	ND @ 50	ND @ 2500	13	13	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5
2-Hexanone	N/A	ND @ 20	ND @ 200	ND @ 10000	18 J	19 J	ND @ 20	ND @ 20	ND @ 20	ND @ 20	ND @ 20	ND @ 20
4-Methyl-2-Pentanone	50	ND @ 20	ND @ 200	ND @ 10000	19 J	17 J	ND @ 20	ND @ 20	ND @ 20	ND @ 20	ND @ 20	ND @ 20
Acetone	50	ND @ 20	ND @ 200	ND @ 10000	89	98	ND @ 20	ND @ 20	ND @ 20	ND @ 20	ND @ 20	ND @ 20
Acrolein	N/A	ND @ 15	ND @ 150	ND @ 7500	59	58	ND @ 15	ND @ 15	ND @ 15	ND @ 15	ND @ 15	ND @ 15
Acrylonitrile	N/A	ND @ 6.9	ND @ 69	ND @ 3500	88	85	ND @ 6.9	ND @ 6.9	ND @ 6.9	ND @ 6.9	ND @ 6.9	ND @ 6.9
Benzene	0.7	ND @ 1	ND @ 10	**540**	10000	10000	ND @ 1	ND @ 1	ND @ 1	ND @ 1	ND @ 1	ND @ 1
Bromodichloromethane	N/A	ND @ 5	ND @ 50	ND @ 2500	22	22	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5
Bromoform	N/A	ND @ 5	ND @ 50	ND @ 2500	17	17	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5
Bromomethane	N/A	ND @ 5	ND @ 50	ND @ 2500	24	23	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5

Notes:

NA - Not Analyzed

ND - Non Detected at Method Detection Limit

N/A - Indicates that Standards Criteria is not available.

B - Compound Found in Associated Lab Blank

J - Estimated Value

Table 2-4
PSA Groundwater Analytical Results - December 2002
Former MGP, Far Rockaway, New York

Sample Number	NYS DEC	FRGW - 01	FRGW - 02	FRGW - 03	FRGW - 03(MS)	FRGW - 03(MSD)	FRGW-05	FRGW - 06	FRGW - 07	FRGW - 08	FB121202	TB121202
Lab Sample ID No.	Groundwater	AB74904	AB74905	AB74907	AB74908	AB74909	AB74910	AB74911	AB74903	AB74912	AB74906	AB74913
SampleType	Standards	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER
Sample Date	Criteria	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002
Units	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB
VOLATILE ORGANIC COMPOUNDS												
Carbon Disulfide	50	ND @ 5	ND @ 50	ND @ 2500	20	21	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5
Carbon tetrachloride	5	ND @ 5	ND @ 50	ND @ 2500	24	25	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5
Chlorobenzene	5	ND @ 5	ND @ 50	ND @ 2500	20	19	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5
Chloroethane	50	ND @ 5	ND @ 50	ND @ 2500	21	24	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5
Chloroform	7	ND @ 5	ND @ 50	ND @ 2500	22	23	ND @ 5	ND @ 5	5 J	ND @ 5	ND @ 5	ND @ 5
Chloromethane	N/A	ND @ 5	ND @ 50	ND @ 2500	20	20	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5
Cis-1,2-Dichloroethene	N/A	ND @ 5	ND @ 50	ND @ 2500	18	20	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5
Cis-1,3-Dichloropropene	N/A	ND @ 5	ND @ 50	ND @ 2500	18	18	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5
Dibromochlormethane	50	ND @ 5	ND @ 50	ND @ 2500	21	20	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5
Ethylbenzene	5	ND @ 1	**41**	**1900**	12000	11000	ND @ 1	ND @ 1	ND @ 1	ND @ 1	ND @ 1	ND @ 1
Methylene Chloride	5	ND @ 5	ND @ 50	ND @ 2500	21	21	ND @ 5	ND @ 5	ND @ 5	ND @ 5	1.6 J	1.8 J
Styrene	N/A	ND @ 1	ND @ 10	6000	18000	18000	3.4	ND @ 1	ND @ 1	ND @ 1	ND @ 1	ND @ 1
Tetrachloroethene	5	ND @ 5	ND @ 50	ND @ 2500	20	19	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5
Toluene	5	ND @ 1	ND @ 10	**24000**	42000	40000	**27**	**11**	ND @ 1	**6.4**	1.2	ND @ 1
Trans-1,2-Dichloroethene	5	ND @ 5	ND @ 50	ND @ 2500	21	22	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5
Trans-1,3-Dichloropropene	N/A	ND @ 5	ND @ 50	ND @ 2500	18	18	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5
Trichloroethene	5	ND @ 5	ND @ 50	ND @ 2500	20	21	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5
Vinyl Chloride	2	ND @ 5	ND @ 50	ND @ 2500	20	23	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5
Xylenes	5	ND @ 5	**29**	**4200**	37000	36000	2.5	1.4 J	ND @ 5	ND @ 5	ND @ 5	ND @ 5
Total Non-Targeted VOC's	N/A	ND	518 J	9400 J	5100 J	8000 J	3.1 J	ND	ND	6.9 J	ND	3.3 J

Notes

NA - Not Analyzed
ND - Non Detected at Method Detection Limit
N/A - Indicates that Standards Criteria is not available.
B - Compound Found in Associated Lab Blank
J - Estimated Value

Table 2-4
PSA Groundwater Analytical Results - December 2002
Former MGP, Far Rockaway, New York

Sample Number	NYSDEC	FRGW - 01	FRGW - 02	FRGW - 03	FRGW - 03(MS)	FRGW - 03(MSD)	FRGW - 05	FRGW - 06	FRGW - 07	FRGW - 08	FB121202
Lab Sample ID No.	Groundwater	AB74904	AB74905	AB74907	AB74908	AB74909	AB74910	AB74911	AB74903	AB74912	AB74906
SampleType	Standards	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER
Sample Date	Criteria	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002
Units	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB
PCB'S											
Aroclor - 1016	0.1	NA	NA	ND @ 0.5	15	15	NA	NA	NA	NA	ND@0.5
Aroclor - 1221	0.1	NA	NA	ND @ 0.5	ND @ 1.1	ND @ 1.1	NA	NA	NA	NA	ND@0.5
Aroclor - 1232	0.1	NA	NA	ND @ 0.5	ND @ 1.1	ND @ 1.1	NA	NA	NA	NA	ND@0.5
Aroclor - 1242	0.1	NA	NA	ND @ 0.5	ND @ 1.1	ND @ 1.1	NA	NA	NA	NA	ND@0.5
Aroclor - 1248	0.1	NA	NA	ND @ 0.5	ND @ 1.1	ND @ 1.1	NA	NA	NA	NA	ND@0.5
Aroclor - 1254	0.1	NA	NA	ND @ 0.5	ND @ 1.1	ND @ 1.1	NA	NA	NA	NA	ND@0.5
Aroclor - 1260	0.1	NA	NA	ND @ 0.5	16	17	NA	NA	NA	NA	ND@0.5
PESTICIDES											
Aldrin	ND (<0.01)	NA	NA	ND @ 0.1	2.1	2.1	NA	NA	NA	NA	ND@0.1
Aplha-BHC	ND (<0.05)	NA	NA	ND @ 0.1	2.2	2.1	NA	NA	NA	NA	ND@0.1
Beta-BHC	ND (<0.05)	NA	NA	ND @ 0.1	1.9	1.8	NA	NA	NA	NA	ND@0.2
Chlordane	0.1	NA	NA	ND @ 0.2	ND @ 0.44	ND @ 0.44	NA	NA	NA	NA	ND@0.1
Delta-BHC	ND (<0.05)	NA	NA	ND @ 0.1	2.2	2.2	NA	NA	NA	NA	ND@0.1
Dieldrin	ND (<0.01)	NA	NA	ND @ 0.1	1.9	1.9	NA	NA	NA	NA	ND@0.1
Endosulfan I	0.1	NA	NA	ND @ 0.1	2.1	2	NA	NA	NA	NA	ND@0.1
Endosulfan II	0.1	NA	NA	ND @ 0.1	2.2	2.2	NA	NA	NA	NA	ND@0.1
Endosulfan Sulfate	0.1	NA	NA	ND @ 0.1	2.5	2.4	NA	NA	NA	NA	ND@0.1
Endrin	ND (<0.01)	NA	NA	ND @ 0.1	2.2	2.3	NA	NA	NA	NA	ND@0.1
Endrin Aldehyde	N/A	NA	NA	ND @ 0.1	2.4	2.4	NA	NA	NA	NA	ND@0.1
Endrin Ketone	N/A	NA	NA	ND @ 0.1	2.4	2.4	NA	NA	NA	NA	ND@0.1
Gamma-BHC	ND (<0.05)	NA	NA	ND @ 0.1	2.1	2.1	NA	NA	NA	NA	ND@0.1
Heptachlor	ND (<0.01)	NA	NA	ND @ 0.1	2.2	2.1	NA	NA	NA	NA	ND@0.1
Heptachlor Epoxide	ND (<0.01)	NA	NA	ND @ 0.1	2.1	2.1	NA	NA	NA	NA	ND@0.1
Methoxychlor	35	NA	NA	ND @ 0.1	2.8	2.8	NA	NA	NA	NA	ND@0.1
P,P'-DDD	ND (<0.01)	NA	NA	ND @ 0.1	2.6	2.5	NA	NA	NA	NA	ND@0.1
P,P'-DDE	ND (<0.01)	NA	NA	ND @ 0.1	2.2	2.2	NA	NA	NA	NA	ND@0.1
P,P'-DDT	ND (<0.01)	NA	NA	ND @ 0.1	2.6	2.5	NA	NA	NA	NA	ND@0.1
Toxaphene	N/A	NA	NA	ND @ 1	ND @ 2.2	ND @ 2.2	NA	NA	NA	NA	ND@1.0

NOTES:

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Table 2-4
PSA Groundwater Analytical Results - December 2002
Former MGP, Far Rockaway, New York

Sample Number	NYSDEC	FRGW - 01	FRGW - 02	FRGW - 03	FRGW - 03(MS)	FRGW - 03(MSD)	FRGW - 05	FRGW - 06	FRGW - 07	FRGW - 08	FB121202
Lab Sample ID No.	Groundwater	AB74904	AB74905	AB74907	AB74908	AB74909	AB74910	AB74911	AB74903	AB74912	AB74906
Sample Type	Standards	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER	WATER
Sample Date	Criteria	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002	12/12/2002
Units	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB	PPB
METALS											
Aluminum	N/A	NA	NA	240	5000	5700	NA	NA	NA	NA	340
Antimony	N/A	NA	NA	ND @ 15	520	500	NA	NA	NA	NA	ND @ 15
Arsenic	N/A	ND @ 7.5	ND @ 7.5	ND @ 7.5	520	510	ND @ 7.5	ND @ 7.5	ND @ 7.5	ND @ 7.5	ND @ 7.5
Barium	N/A	300	160	ND @ 50	540	520	ND @ 50	ND @ 50	ND @ 50	ND @ 50	ND @ 50
Beryllium	N/A	NA	NA	ND @ 4	500	480	NA	NA	NA	NA	ND @ 4
Cadmium	N/A	ND @ 3.5	ND @ 3.5	ND @ 3.5	510	490	ND @ 3.5	ND @ 3.5	ND @ 3.5	ND @ 3.5	ND @ 3.5
Calcium	N/A	NA	NA	46000	95000	89000	NA	NA	NA	NA	ND @ 2000
Chromium	N/A	ND @ 50	ND @ 50	ND @ 50	520	500	ND @ 50	ND @ 50	ND @ 50	ND @ 50	ND @ 50
Cobalt	N/A	NA	NA	ND @ 20	510	490	NA	NA	NA	NA	ND @ 20
Copper	N/A	NA	NA	ND @ 50	510	500	NA	NA	NA	NA	ND @ 50
Iron	N/A	NA	NA	26000	29000	27000	NA	NA	NA	NA	ND @ 280
Lead	N/A	ND @ 5.0	6.3	6.3	520	500	ND @ 5	ND @ 5	ND @ 5	ND @ 5	ND @ 5
Magnesium	N/A	NA	NA	3000	54000	51000	NA	NA	NA	NA	ND @ 2000
Manganese	N/A	NA	NA	410	900	840	NA	NA	NA	NA	ND @ 40
Mercury	N/A	ND @ 0.7	ND @ 0.7	ND @ 0.7	9.5	9.8	ND @ 0.7	ND @ 0.7	ND @ 0.7	ND @ 0.7	ND @ 0.7
Nickel	N/A	NA	NA	ND @ 50	500	480	NA	NA	NA	NA	ND @ 50
Potassium	N/A	NA	NA	5400	54000	51000	NA	NA	NA	NA	ND @ 5000
Selenium	N/A	ND @ 40	ND @ 40	ND @ 40	510	490	ND @ 40	ND @ 40	ND @ 40	ND @ 40	ND @ 40
Silver	N/A	ND @ 20	ND @ 20	ND @ 20	510	490	ND @ 20	ND @ 20	ND @ 20	ND @ 20	ND @ 20
Sodium	N/A	NA	NA	12000	61000	57000	NA	NA	NA	NA	ND @ 5000
Thallium	N/A	NA	NA	ND @ 10	510	500	NA	NA	NA	NA	ND @ 10
Vanadium	N/A	NA	NA	ND @ 50	510	490	NA	NA	NA	NA	ND @ 50
Zinc	N/A	NA	NA	ND @ 50	520	500	NA	NA	NA	NA	ND @ 50
Cyanide	N/A	ND @ 10	ND @ 10	ND @ 10	170	180	ND @ 10	ND @ 10	ND @ 10	ND @ 10	ND @ 10

Notes

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J - Estimated Value

Table 2-5
PSA Subsurface Soil Vapor Analytical Results Summary - December 2002
Former MGP, Far Rockaway, New York

COMPOUND	Mol. Wt.	Soil Vapor Concentration (ppb)				
		FRSV-01	FRSV-02	FRSV-03	FRSV-04	FRSV-06
Propene	42.08	**5.2**	**14**	**5.5**	**21**	**21**
Dichlorodifluoromethane (Freon 12)	120.9	ND	ND	**13**	**25**	**24**
Chloromethane	50.49	ND	ND	ND	ND	ND
1,2-Dichlorotetrafluoroethane (Freon 114)	170.9	ND	ND	ND	ND	ND
Vinyl chloride	62.5	ND	ND	ND	ND	ND
1,3-Butadiene	54.09	ND	ND	ND	ND	ND
Bromomethane	94.95	ND	ND	ND	ND	ND
Chloroethane	64.52	ND	ND	ND	ND	ND
Acetone	58.1	ND	**26**	**11**	ND	ND
Trichlorofluoromethane (Freon 11)	137.38	**0.63**	ND	**4.4**	**2.6**	**2.4**
Ethanol (Ethyl alcohol)	46.1	ND	ND	ND	ND	ND
1,1-Dichloroethene	96.94	ND	ND	ND	ND	ND
Methylene chloride (dichloromethane)	84.9	**4.1**	**1.5**	**1.2**	**0.87**	**1.2**
1,1,2-Trichlorotrifluoroethane (Freon 113)	187.39	ND	ND	ND	ND	ND
Carbon disulfide	76.1	ND	ND	ND	ND	ND
trans-1,2-Dichloroethene	96.94	ND	ND	ND	ND	ND
1,1-Dichloroethane	98.96	ND	ND	ND	ND	ND
MTBE (Methyl tert butyl ether)	88.15	ND	ND	ND	ND	ND
Isopropyl alcohol	60.09	**5.9**	ND	ND	ND	**2**
2-Butanone (MEK)	72.11	ND	ND	ND	ND	ND
cis-1,2-Dichloroethene	96.94	ND	ND	ND	ND	ND
Hexane	86.2	**1.9**	ND	**1.1**	**12**	ND
Vinyl acetate	86.09	ND	ND	ND	ND	ND
Ethyl acetate	88.1	ND	ND	ND	ND	ND
Chloroform	119.39	**1.6**	ND	ND	ND	ND
Tetrahydrofuran	72.1	**0.94**	ND	ND	ND	ND
Ethylene dichloride (1,2-dichloroethane)	99.0	ND	ND	ND	ND	ND
1,1,1-Trichloroethane (Methyl chloroform)	133.42	ND	**1.1**	ND	**0.53**	**0.99**
Benzene	78.1	**1.1**	**1.9**	**18**	ND	**0.65**
Carbon tetrachloride	153.84	**0.65**	ND	ND	ND	ND
Cyclohexane	84.2	ND	ND	ND	ND	ND
1,2-Dibromopropane	231.9	ND	ND	ND	ND	ND
Bromodichloromethane	163.8	ND	ND	ND	ND	ND
Trichloroethylene	131.4	ND	ND	ND	ND	ND
Heptane	100.2	**0.98**	ND	ND	ND	ND
4-Methyl-2-pentanone (MIBK)	100.2	ND	ND	ND	ND	**0.57**
cis-1,3-Dichloropropene	111.0	ND	ND	ND	ND	ND
trans-1,3-Dichloropropene	111.0	ND	ND	ND	ND	ND
1,1,2-Trichloroethane	133.4	ND	ND	ND	ND	ND
Toluene	92.1	**22**	ND	**8**	ND	ND
2-Hexanone (MBK)	100.6	ND	ND	ND	ND	ND
Dibromochloromethane	208.3	ND	ND	ND	ND	ND
Ethylene dibromide (1,2-dibromoethane)	187.87	ND	ND	ND	ND	ND
Tetrachloroethene	165.82	ND	ND	**2.6**	ND	ND
Chlorobenzene	112.6	ND	ND	ND	ND	ND
Ethylbenzene	106.2	ND	ND	ND	ND	ND
M/P-Xylene	106.2	ND	ND	ND	ND	ND
Styrene	104.14	ND	ND	ND	ND	ND
O-Xylene	106.2	ND	ND	ND	ND	ND
1,1,2,2-Tetrachloroethane	167.86	ND	ND	ND	ND	ND
1,3,5-Trimethylbenzene	120.2	ND	ND	ND	ND	ND
4-Ethyltoluene	121.3	ND	ND	ND	ND	ND
1,2,4-Trimethylbenzene	120.2	ND	ND	ND	ND	**0.55**
1,3-Dichlorobenzene	147.0	ND	ND	ND	ND	ND
Benzyl chloride	126.58	ND	ND	ND	ND	ND
1,4-Dichlorobenzene	147.0	ND	ND	ND	ND	ND
1,2-Dichlorobenzene	147.0	ND	ND	ND	ND	ND
1,2,4-Trichlorobenzene	181.5	ND	ND	ND	ND	ND
Hexachlorobutadiene	260.7	ND	ND	ND	ND	ND
Napthalene (semi-volatile compound)	128.17	ND	ND	**1.4**	ND	**3.6**
Total VOC		**45**	**44.5**	**64.8**	**62**	**53.4**

Table 4-1
Proposed RI Sample Location, Rationale, and Analytical Sample Summary
Former MGP, Far Rockaway, New York

Location ID	Sample ID	Completion Depth	Sample Depth	No. of Samples	Analyses	Rationale
Surface Soil						
SS-104 / SB-104	SS-104	2 inches	0-2 inches	1	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	Southwest delineation of SVOCs [B(a)A, B(a)P, B(b)F, Chrysene, and D(a,h)A], and metals (Barium, Cadmium, Chromium, Copper, Iron, Mercury, and Zinc).
SS-105 / SB-105 / MW-105	SS-105	2 inches	0-2 inches	1	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	West delineation of SVOCs [B(a)A, B(a)P, B(b)F, Chrysene, D(a,h)A, and I(1,2,3-cd)P], and metals (Barium, Cadmium, Chromium, Copper, Iron, Mercury, and Zinc).
SS-106 / SB-106	SS-106	2 inches	0-2 inches	1	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	Background sample for SVOCs [B(a)A, B(a)P, B(b)F, Chrysene, D(a,h)A, and I(1,2,3-cd)P], and metals (Barium, Cadmium, Chromium, Copper, Iron, Mercury, and Zinc) values.
SS-112	SS-112	2 inches	0-2 inches	1	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	North delineation from MGP operations area (gas generator and purifier) for VOCs, SVOCs, metals and cyanide.
SS-113 / SB-113 / MW-113	SS-113	2 inches	0-2 inches	1	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	North delineation of SVOCs [B(a)A, B(a)P, B(b)F, Chrysene, D(a,h)A, B(k)F, and I(1,2,3-cd)P], and metals (Barium, Chromium, and Mercury).
SS-200 through SS-209	SS-200 through SS-209	2 inches	0-2 inches	10	SVOCs and RCRA 8 Metals (+ Fe, Cu, & Zn)	Evaluation of site-specific background values for comparison to site surface soil results. Sample locations to be collected in open space areas in vincinity of site.
Subsurface Soil						
SB-100/ MW-100	SB-100	Minimum 10 feet below water	Most impacted interval and top of clean soil / at water table if no field impacts are observed	1 - 2	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	North delineation from MGP operations area (gas generator and purifier) for VOCs, SVOCs, metals and cyanide, and northeast of former gas holder for VOCs (Ethylbenzene, Toluene, and Xylenes) and SVOCs [B(a)A, B(a)P, Chrysene, and D(a,h)A].
SB-101	SB-101	Minimum 10 feet below water	Most impacted interval and top of clean soil / at water table if no field impacts are observed	1 - 2	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	North delineation from MGP operations area (gas generator and purifier) for VOCs, SVOCs, metals and cyanide.
SB-102	SB-102	Minimum 10 feet below water	Most impacted interval and top of clean soil / at water table if no field impacts are observed	1 - 2	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	East delineation from form gas holder for VOCs (Ethylbenzene, Toluene, and Xylenes), SVOCs [Acenaphthylene, B(a)A, B(a)P, B(b)F, B(k)F, Chrysene, D(a,h)A, I(1,2,3-cd)P, Isophorone, 2-Methylnaphthalene, and Naphthalene], and metals (Iron).
SB-103	SB-103	Minimum 10 feet below water	Most impacted interval and top of clean soil / at water table if no field impacts are observed	1 - 2	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	East delineation from former gas holder for SVOCs [Acenaphthylene, B(a)A, B(a)P, B(b)F, B(k)F, Chrysene, D(a,h)A, I(1,2,3-cd)P, Isophorone, 2-Methylnaphthalene, and Naphthalene], and metals (Chromium and Iron).
SS-104 / SB-104	SB-104	Minimum 10 feet below water	Most impacted interval and top of clean soil / at water table if no field impacts are observed	1 - 2	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	West and southwest delineation from former gas holder for VOCs (Ethylbenzene and Xylenes), SVOCs [B(a)P, 2-Methylnaphthalene, and Naphthalene], and metals (Chromium).
SS-105 / SB-105 / MW-105	SB-105	Minimum 10 feet below water	Most impacted interval and top of clean soil / at water table if no field impacts are observed	1 - 2	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	West and northwest delineation from former gas holder for VOCs (Ethylbenzene Toluene and Xylenes), SVOCs [B(a)A, B(a)P, Chrysene, D(a,h)A, 2-Methylnaphthalene, and Naphthalene], and metals (Chromium).
SS-106 / SB-106	SB-106	Minimum 10 feet below water	Most impacted interval and top of clean soil / at water table if no field impacts are observed	1 - 2	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	North delineation from former gas holder for VOCs (Ethylbenzene Toluene and Xylenes), SVOCs [B(a)A, B(a)P, Chrysene, D(a,h)A, 2-Methylnaphthalene, and Naphthalene], and metals (Chromium).
SB-107 / MW-107	SB-107	Minimum 10 feet below water	Most impacted interval and top of clean soil / at water table if no field impacts are observed	1 - 2	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	Southeast delineation from former gas holder for SVOCs [Acenaphthylene, B(a)A, B(a)P, B(b)F, B(k)F, Chrysene, D(a,h)A, I(1,2,3-cd)P, Isophorone, 2-Methylnaphthalene, and Naphthalene], and metals (Chromium and Iron).
SB-109 / MW-109	SB-109	Minimum 10 feet below water	Within Screen Interval: Most impacted interval and top of clean soil / at water table if no field impacts are observed	1 - 2	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	Soil characterization for installation of monitoring well MW-109 and for evaluation of background/upgradient conditions.
SB-110 / MW-110	SB-110	Minimum 10 feet below water	Within Screen Interval: Most impacted interval and top of clean soil / at water table if no field impacts are observed	1 - 2	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	Soil characterization for installation of monitoring well MW-110.
SB-111 / MW-111 S/D	SB-111	Minimum 5 ft into 20 ft clay or 45 feet max.	Within Screen Intervals: Most impacted interval and top of clean soil or clay/ at water table if no field impacts are observed	2 - 3	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	Soil characterization for installation of monitoring well MW-111. Deep sampling to determine if "20-foot" clay present beneath site and if so, to determine if impacts are present above clay unit.
SS-113 / SB-113 / MW-113 S/D	SB-113	Minimum 5 ft into 20 ft clay or 45 feet max.	Within Screen Intervals: Most impacted interval and top of clean soil or clay/ at water table if no field impacts are observed	2 - 3	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	Soil characterization for installation of monitoring well MW-113. Deep sampling to determine if "20-foot" clay present beneath site and if so, to determine if impacts are present above clay unit.

Table 4-1
Proposed RI Sample Location, Rationale, and Analytical Sample Summary
Former MGP, Far Rockaway, New York

Location ID	Sample ID	Completion Depth	Sample Depth	No. of Samples	Analyses	Rationale
Subsurface Soil (continued)						
SB-114 / MW-114	SB-114	Minimum 10 feet below water	Within Screen Interval: Most impacted interval and top of clean soil / at water table if no field impacts are observed	1 - 2	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	Soil characterization for installation of monitoring well MW-114.
SB-115	SB-115	Minimum 10 feet below water	Most impacted interval and top of clean soil / at water table if no field impacts are observed	1 - 2	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	Evaluation of holder construction and soil impacts adjacent to former gas holder.
SB-116 / MW-116 S/D	SB-116	Minimum 5 ft into 20 ft clay or 45 feet max.	Within Screen Intervals: Most impacted interval and top of clean soil or clay/ at water table if no field impacts are observed	2 - 3	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	Soil characterization for installation of monitoring well MW-116. Deep sampling to determine if "20-foot" clay present beneath site and if so, to determine if impacts are present above clay unit.
Groundwater						
SB-100/ MW-100	MW-100	Minimum 10 feet below water table	Across the water table	1	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	Downgradient delineation of VOCs (Toluene) detected at FRGW-06 and water quality evaluation downgradient of former MGP operations area (gas generator and purifier).
SS-105 / SB-105 / MW-105	MW-105	Minimum 10 feet below water table	Across the water table	1	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	Downgradient delineation of VOCs (Ethylbenzene and Xylenes) and SVOCs (Naphthalene) detected at FRGW-02 .
SB-107 / MW-107	MW-107	Minimum 10 feet below water table	Across the water table	1	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	Upgradient evaluation of VOCs, SVOCs, Metals, and Cyanide and for evaluation of results collected at FRGW-07 and FRGW-01.
SB-109 / MW-109	MW-109	Minimum 10 feet below water table	Across the water table	1	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	Upgradient evaluation of VOCs, SVOCs, Metals, and Cyanide for determination of possible off-site source of VOCs (Toluene) detected at FRGW-05 and FRGW-06.
SB-110 / MW-110	MW-110	Minimum 10 feet below water table	Across the water table	1	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	Downgradient delineation of VOCs (Benzene, Ethylbenzene, Toluene, and Xylenes), SVOCs (Naphthalene), and metals (Lead and Manganese) detected at FRGW-03 .
SB-111 / MW-111 S/D	MW-111 S/D	Minimum 5 ft into 20 ft clay or 45 feet max.	Across the water table and above 20-foot clay (or at 35 to 45 feet if clay not present)	2	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	Downgradient delineation of VOCs (Toluene) detected at FRGW-05. Evaluation of deep groundwater in site area either above or at a depth consistent with 20-foot clay unit.
SS-113 / SB-113 / MW-113 S/D	MW-113 S/D	Minimum 5 ft into 20 ft clay or 45 feet max.	Across the water table and above 20-foot clay (or at 35 to 45 feet if clay not present)	2	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	Downgradient delineation of VOCs (BTEX) and PAHs (primarily naphthalene) detected at FRGW-03. Evaluation of deep groundwater downgradient of site either above or at a depth consistent with 20-foot clay unit.
SB-114 / MW-114	MW-114	Minimum 10 feet below water table	Across the water table	1	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	Downgradient of gas holder and evaluation of VOCs (ethylbenzene and xylenes) and PAHs (naphthalene) detected at FRGW-02.
SB-116 / MW-116 S/D	MW-116 S/D	Minimum 5 ft into 20 ft clay or 45 feet max.	Across the water table and above 20-foot clay (or at 35 to 45 feet if clay not present)	2	VOCs, SVOCs, RCRA 8 Metals (+ Fe, Cu, & Zn), and Total Cn	Evaluation of groundwater conditions adjacent to former MGP operations building and for confirmation of results collected at FRGW-06. Evaluation of deep groundwater in site area either above or at a depth consistent with 20-foot clay unit.
Soil Vapor						
SV-1 / IA-1	SV-1	Approximately 2 inches below the floor slab		1	VOCs + Naphthalene	Satisfy the requirements of the NYSDOH Soil Vapor Intrusion Guidance
SV-2 / IA-2	SV-2	Approximately 2 inches below the floor slab		1	VOCs + Naphthalene	Satisfy the requirements of the NYSDOH Soil Vapor Intrusion Guidance
SV-3 / IA-3	SV-3	Approximately 2 inches below the floor slab		1	VOCs + Naphthalene	Satisfy the requirements of the NYSDOH Soil Vapor Intrusion Guidance
Indoor Air						
SV-1 / IA-1	IA-1	To be collected at SV-1 location		1	VOCs + Naphthalene	Satisfy the requirements of the NYSDOH Soil Vapor Intrusion Guidance
SV-2 / IA-2	IA-2	To be collected at SV-2 location		1	VOCs + Naphthalene	Satisfy the requirements of the NYSDOH Soil Vapor Intrusion Guidance
SV-3 / IA-3	IA-3	To be collected at SV-3 location		1	VOCs + Naphthalene	Satisfy the requirements of the NYSDOH Soil Vapor Intrusion Guidance
Ambient Air						
AMB-1	AMB-1	NA		1	VOCs + Naphthalene	Satisfy the requirements of the NYSDOH Soil Vapor Intrusion Guidance, evaluate Background Conditions

Notes

1. No. - number
2. ID - identification
3. NA - Not applicable
4. NYSDOH - New York State Department of Health
5. MGP - Manufactured Gas Plant
6. RCRA - Resource Conservation and Recovery Act
7. SS - Surface Soil
8. SB - Soil Boring (Subsurface Soil)
9. MW - Monitoring Well (Groundwater Sample)
10. SV - Soil Vapor
11. IA- Indoor Air
12. AMB - Ambient Air
13. VOCs - volatile organic compounds
14. SVOCS - semi-volatile organic compounds
15. Cn - cyanide
16. B(a)A - Benzo(a)anthracene
17. B(a)P - Benzo(a)pyrene
18. B(b)F - Benzo(b)fluoranthene
19. B(k)F - Benzo(k)fluoranthene
20. D(a,h)A - Dibenzo(a,h)anthracene
21. I(1,2,3-cd)P - Indeno(1,2,3-cd)pyrene
22. Fe - Iron
23. Cu - Copper
24. Zn - Zinc

Table 4-2
Investigation Derived Waste Management Summary
Former MGP Site, Far Rockaway, New York

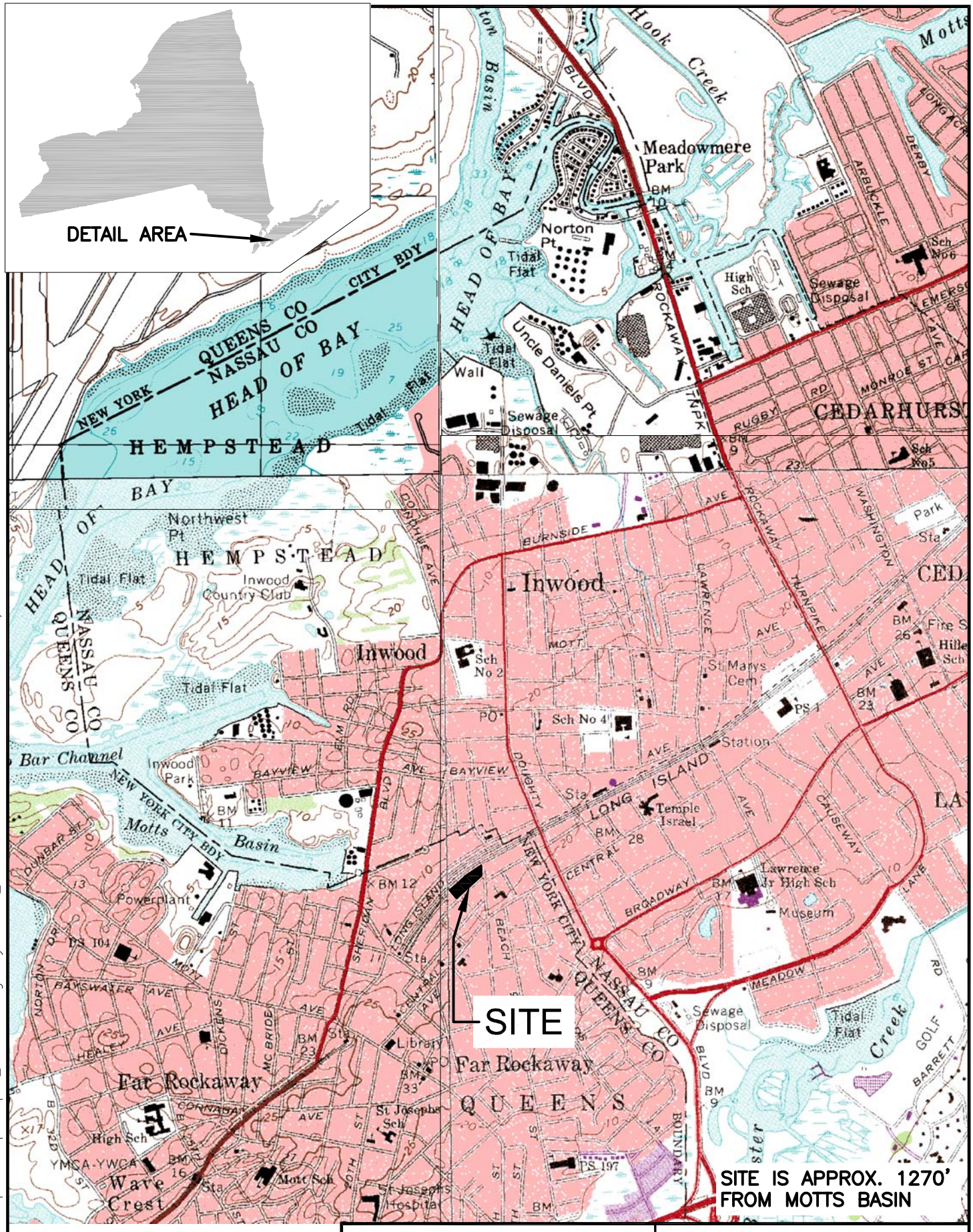
Line #	Drum ID	Media	Date Created	Source	Date Sampled	Date Shipped	Waste Hauler
1							
2							
3							
4							
5							
6							
7							
8							
9							
10							
11							
12							
13							
14							
15							
16							
17							
18							
19							
20							
21							
22							
23							
24							
25							
26							
27							
28							
29							
30							

Notes: 1. Media Designations -
S - Soil
W - Water
P - PPE/Plastic
C&D - Construction Debris
2. FR - Far Rockaway

Additional Notes: 3. _____ 6. _____
4. _____ 7. _____
5. _____ 8. _____

Comments: _____

Figures



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KEYSPAN CORPORATION
FAR ROCKAWAY FORMER MGP SITE

SITE LOCATION MAP

DATE: 05/16/07 | DRWN: RCW/CON | **FIGURE 2-1**

File: U:\KShankaran\KEYSPAN\EDITS\FAR_ROCKAWAY.dwg Layout: ANSI_AVI-CP User: kshankaran Plotted: Jun 19, 2007 - 10:05am Xref's:

SCALE IS **APPROXIMATE**
FROM SCANED IMAGE

EXISTING STRUCTURE
FORMER MGP SITE BOUNDARY
HISTORIC STRUCTURE
ID-# EXISTING PSA SAMPLING LOCATION
FRSS SURFACE SOIL SAMPLE
FRSB SOIL BORING/SUBSURFACE SAMPLE
FRGW MONITORING WELL/GROUNDWATER SAMPLE
FRSV SOIL VAPOR SAMPLE

*NOTE:
BASEMAP PROVIDED BY
PAULUS, SOKOLOWSKI and SARTOR,
PSA REPORT(MARCH 2003)

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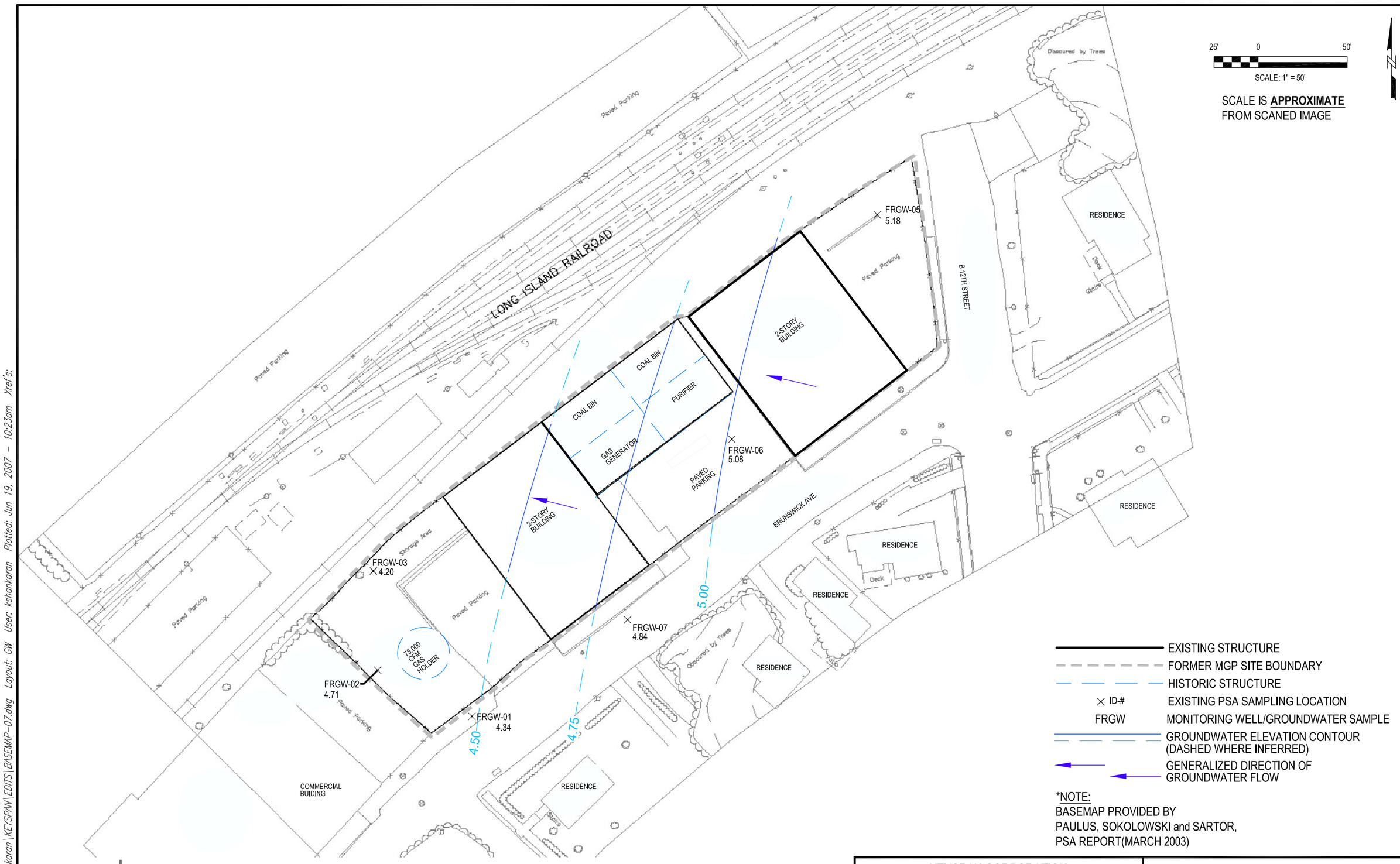
KEYSPAN CORPORATION FAR ROCKAWAY, NY FORMER MGP SITE			**SITE LAYOUT CURRENT STRUCTURES AND FORMER MGP STRUCTURES**
DATE: 5/16/07	DRWN: BcV/CON		**FIGURE 2-2**



*NOTE:
BASEMAP PROVIDED BY
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KEYSPAN CORPORATION FAR ROCKAWAY FORMER MGP SITE			**GROUNDWATER ELEVATION CONTOURS (DECEMBER 2002)**
DATE: 5/16/07	DRWN: BcV/CON		**FIGURE 2-3**

File: U:\KShankaran\KEYSPAN\EDITS\BASEMAP-07.dwg Layout: GW User: kshankaran Plotted: Jun 19, 2007 - 10:23am Xref's:

*NOTE:
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KEYSPAN CORPORATION FAR ROCKAWAY FORMER MGP SITE			**SURFACE SOIL ANALYTICAL RESULTS**
DATE: 5/16/07	DRWN: BcV/CON		**FIGURE 2-4**

File: U:\KShankaran\KEYSPAN\EDITS\BASEMAP-07.dwg Layout: SURFACE-SOIL User: kshankaran Plotted: Jun 19, 2007 - 10:25am Xref's:

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KEYSPAN CORPORATION FAR ROCKAWAY FORMER MGP SITE			**SUBSURFACE SOIL ANALYTICAL RESULTS (0 TO 10 FEET BELOW GROUND SURFACE)**
DATE: 5/16/07	DRWN: BcV/CON		**FIGURE 2-5**

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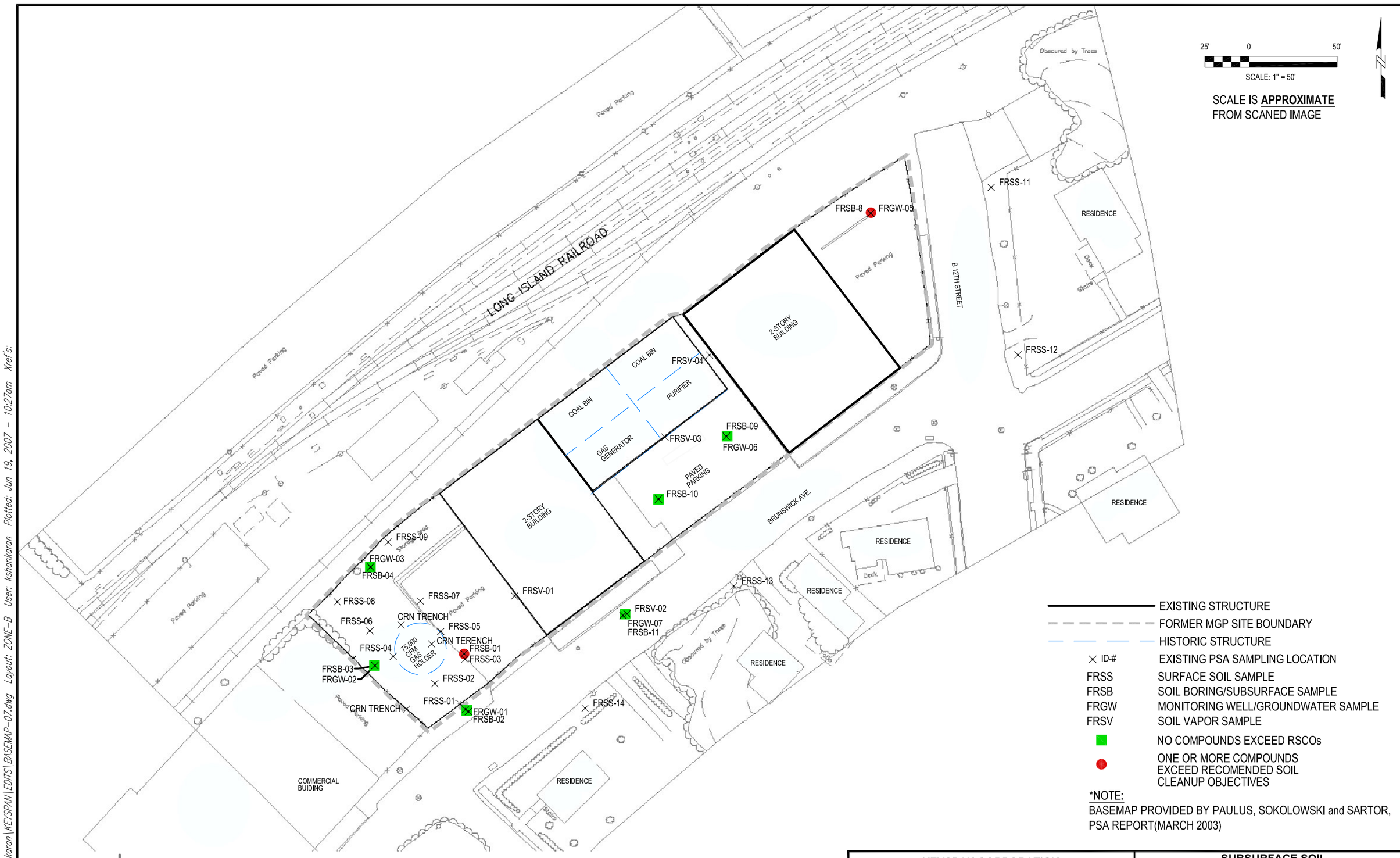

*NOTE:
BASEMAP PROVIDED BY PAULUS, SOKOLOWSKI and SARTOR, PSA REPORT(MARCH 2003)

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KEYSPAN CORPORATION FAR ROCKAWAY FORMER MGP SITE			**SUBSURFACE SOIL ANALYTICAL RESULTS (GREATER THAN 10 FEET BELOW GROUND SURFACE)**
DATE: 5/16/07	DRWN: BcV/CON		**FIGURE 2-6**

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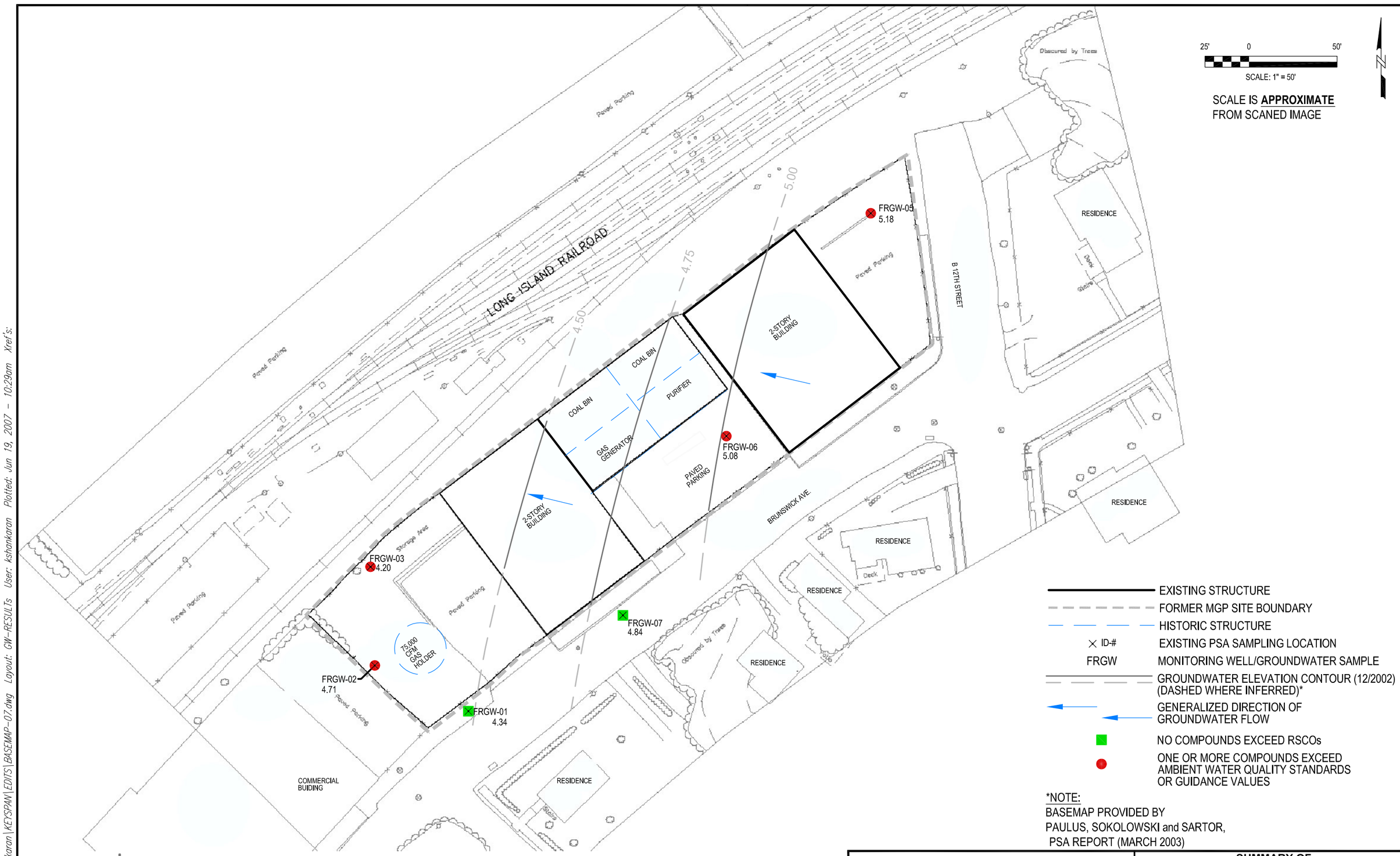

*NOTE:
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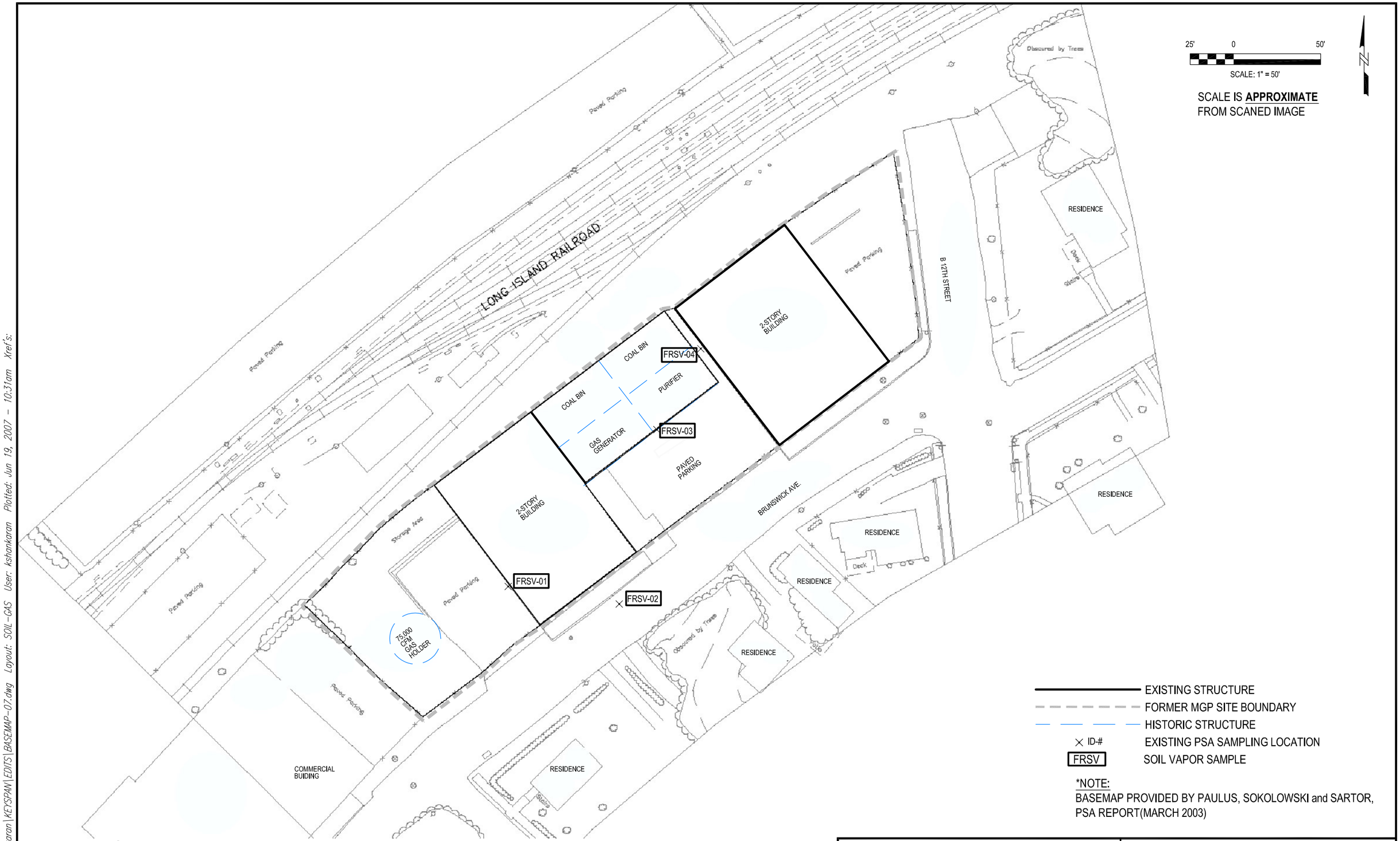
KEYSPAN CORPORATION FAR ROCKAWAY FORMER MGP SITE			**SUMMARY OF GROUNDWATER ANALYTICAL RESULTS**
DATE: 5/16/07	DRWN: BcV/CON		**FIGURE 2-7**

File: U:\KShankaran\KEYSPAN\EDITS\BASEMAP-07.dwg Layout: GW-RESULTs User: kshankaran Plotted: Jun 19, 2007 - 10:29am Xref's:



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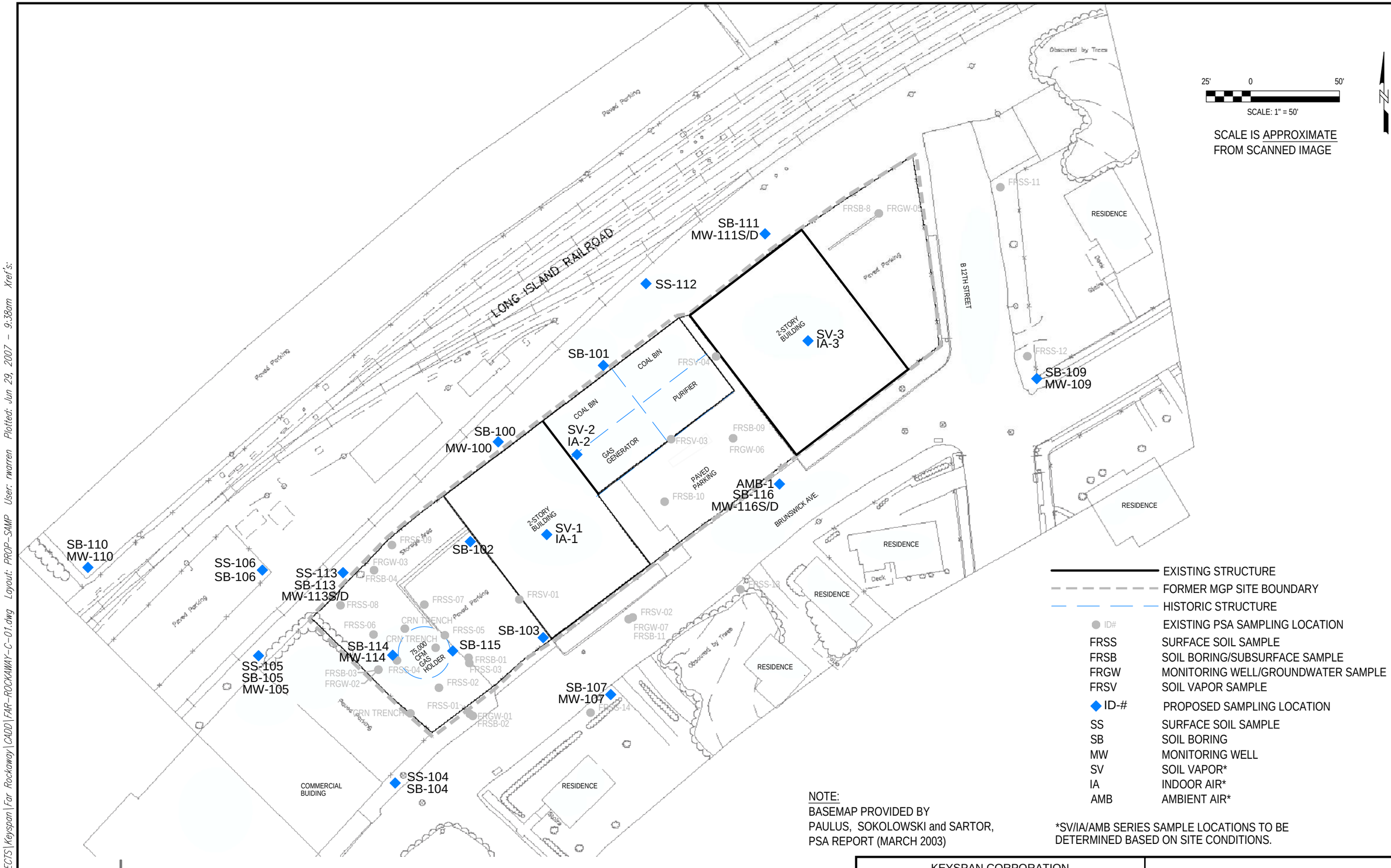
KEYSPAN CORPORATION FAR ROCKAWAY FORMER MGP SITE			SOIL GAS SAMPLING LOCATIONS
DATE: 5/16/07	DRWN: BcV/CON		FIGURE 2-8

File: U:\KShankaran\KEYSPAN\EDITS\BASEMAP-07.dwg Layout: SOIL-GAS User: kshankaran Plotted: Jun 19, 2007 - 10:31am Xref's:



SCALE IS APPROXIMATE
FROM SCANNED IMAGE

EXISTING STRUCTURE
FORMER MGP SITE BOUNDARY
HISTORIC STRUCTURE

ID#	EXISTING PSA SAMPLING LOCATION
FRSS	SURFACE SOIL SAMPLE
FRSB	SOIL BORING/SUBSURFACE SAMPLE
FRGW	MONITORING WELL/GROUNDWATER SAMPLE
FRSV	SOIL VAPOR SAMPLE
◆ ID-#	PROPOSED SAMPLING LOCATION
SS	SURFACE SOIL SAMPLE
SB	SOIL BORING
MW	MONITORING WELL
SV	SOIL VAPOR*
IA	INDOOR AIR*
AMB	AMBIENT AIR*

NOTE:
BASEMAP PROVIDED BY
PAULUS, SOKOLOWSKI and SARTOR,
PSA REPORT (MARCH 2003)

*SV/IA/AMB SERIES SAMPLE LOCATIONS TO BE DETERMINED BASED ON SITE CONDITIONS.

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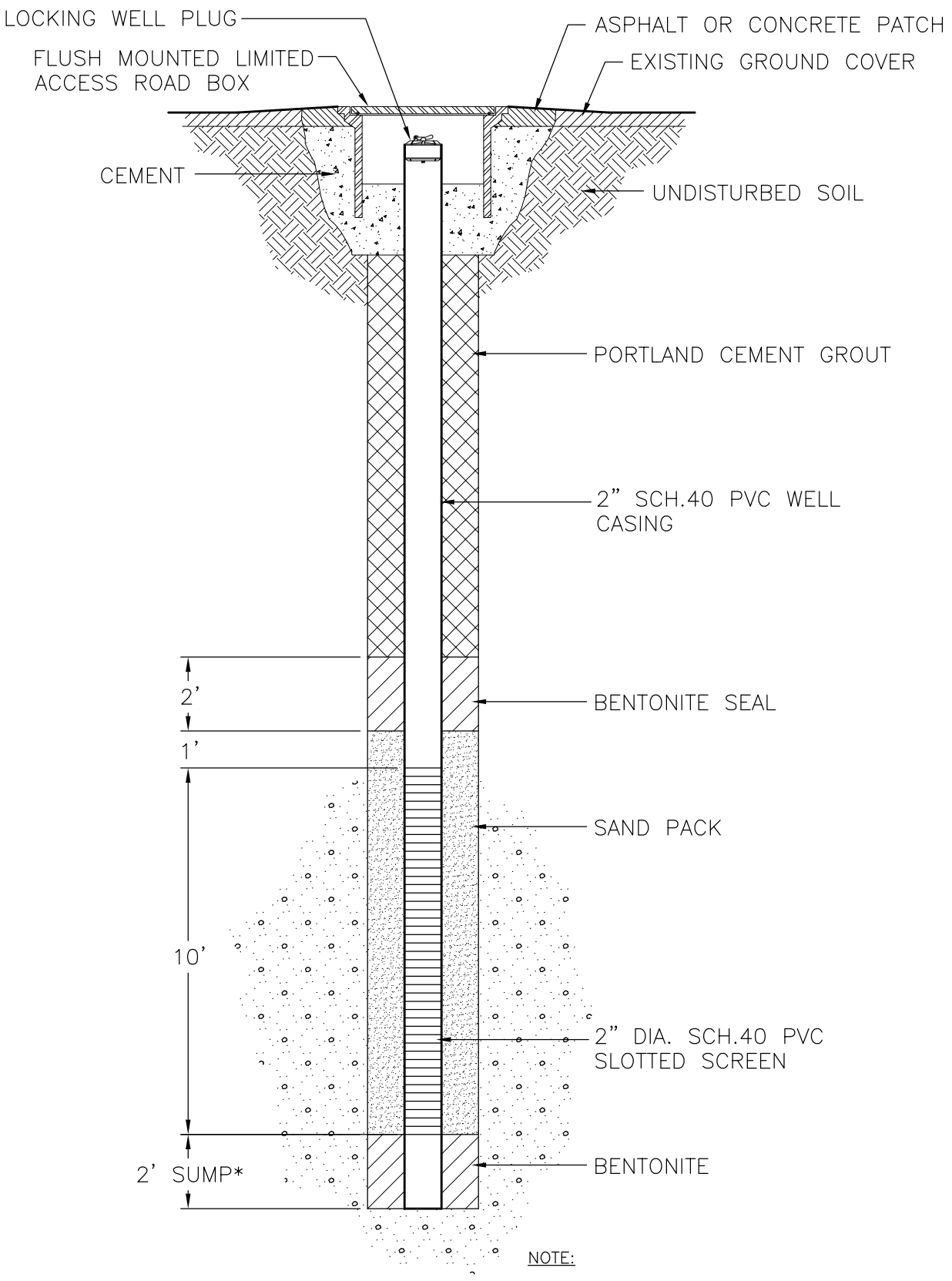
KEYSPAN CORPORATION
FAR ROCKAWAY FORMER MGP SITE

PROPOSED RI SAMPLE LOCATIONS

DATE: 06/29/07 | DRWN: RCW/CON | **FIGURE 4-1**

File: F:\PROJECTS\Keyspan\Far Rockaway\CADD\FAR-ROCKAWAY-C-01.dwg Layout: PROP-SAMP User: rwarren Plotted: Jun 29, 2007 - 9:38am Xref's:



NOTE:

* SUMPS MAY NOT BE INSTALLED IF NO NON-AQUEOUS PHASE LIQUID OBSERVED IN SOIL BORING, PENDING NYSDEC CONSULTATION.

NOT TO SCALE

RETEC

KEYSPAN CORPORATION FAR ROCKAWAY FORMER MGP SITE KED04-20370-100			**MONITORING WELL CONSTRUCTION DIAGRAM**
DATE: 06/18/07	DRWN: RCW/CON		**FIGURE 4-2**

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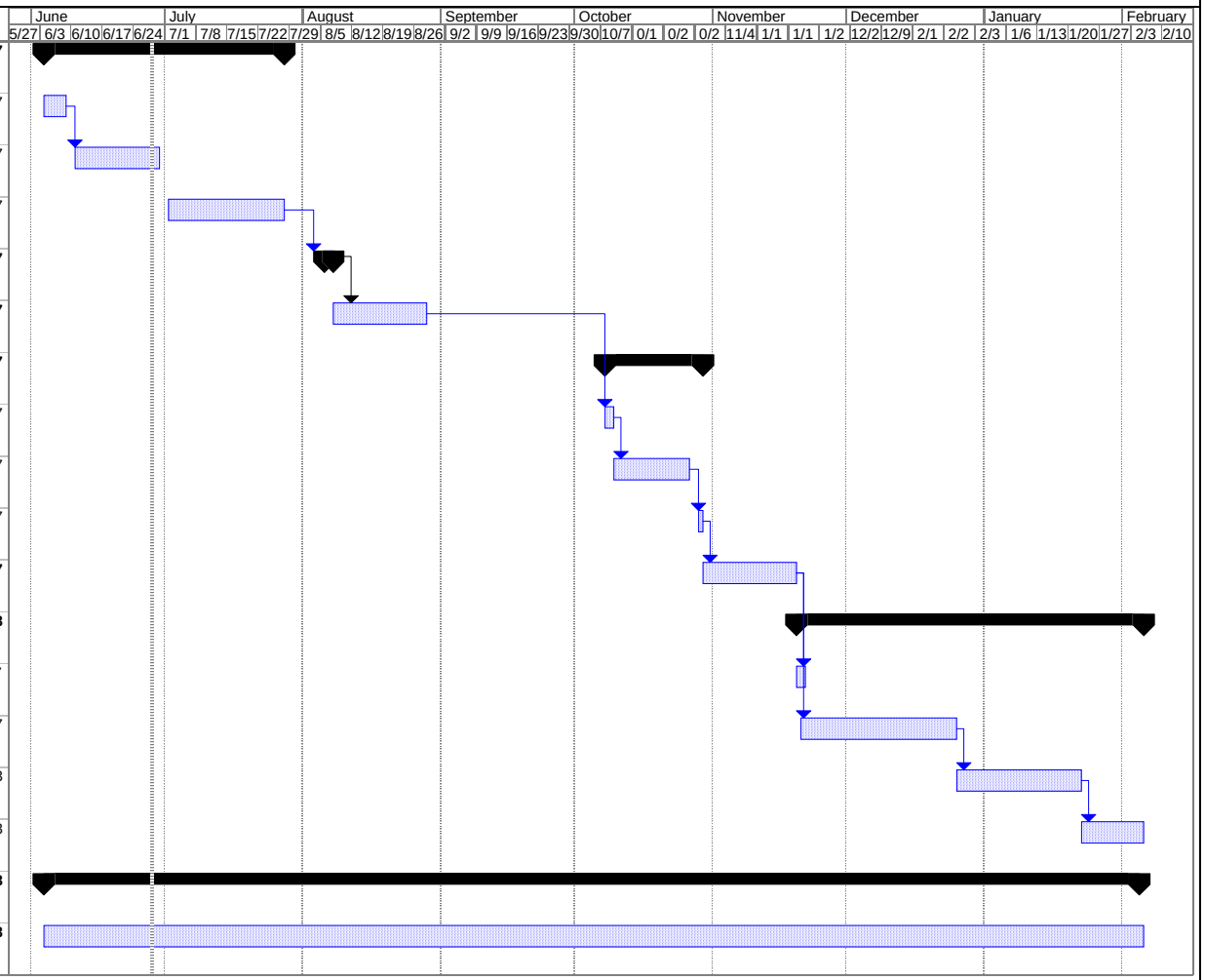
Figure 6-1 Proposed Project Schedule

Task Name	Duration	Start	Finish
RI Work Plan Completion	**40 days**	**Mon 6/4/07**	**Fri 7/27/07**
Internal KeySpan Review and Comments	5 days	Mon 6/4/07	Fri 6/8/07
Revisions to Work Plan	15 days	Mon 6/11/07	Fri 6/29/07
External NYSDEC Review and Comment	20 days	Mon 7/2/07	Fri 7/27/07
Site Meetings	**2 days**	**Mon 8/6/07**	**Tue 8/7/07**
Access Coordination (est)	**15 days**	**Wed 8/8/07**	**Tue 8/28/07**
RI Investigation	**16 days**	**Mon 10/8/07**	**Mon 10/29/07**
SVI Evaluation	2 days	Mon 10/8/07	Tue 10/9/07
RI Sampling	13 days	Wed 10/10/07	Fri 10/26/07
Surveying	1 day	Mon 10/29/07	Mon 10/29/07
Lab Analysis (CemTec)	**15 days**	**Tue 10/30/07**	**Mon 11/19/07**
RI Report	**56 days**	**Tue 11/20/07**	**Tue 2/5/08**
Data Validation	2 days	Tue 11/20/07	Wed 11/21/07
RI Preparation	25 days	Wed 11/21/07	Tue 12/25/07
KeySpan Review and Comment	20 days	Wed 12/26/07	Tue 1/22/08
Revision to RI	10 days	Wed 1/23/08	Tue 2/5/08
Monthly Progress Reports	**176 days**	**Mon 6/4/07**	**Mon 2/4/08**
Project Management	**177 days**	**Mon 6/4/07**	**Tue 2/5/08**



Project: Far Rockaway, NY
Date: Thu 6/28/07
Project Schedule-01.mpp

Task | Progress | Summary | External Tasks | Deadline
Split | Milestone | Project Summary | External Milestone

Appendix A

Quality Assurance Project Plan

ENSR | AECOM

Prepared for:
KeySpan Corporation
175 East Old Country Road
Hicksville, New York 11801

Quality Assurance Project Plan

Order on Consent D1-0001-99-05
NYSDEC Site Number 2-41-032

Far Rockaway Former Manfactured Gas Plant Site
1200-1224 Brunswick Avenue
Far Rockaway, Queens County, New York

The RETEC Group, Inc.
June 2007
Document No.: KED04-20370-100

Merged with ENSR in 2007
RETEC

Prepared for:
KeySpan Corporation
175 East Old Country Road
Hicksville, New York 11801

Quality Assurance Project Plan

Order on Consent D1-0001-99-05
NYSDEC Site Number 2-41-032

Far Rockaway Former Manfactured Gas Plant Site
1200-1224 Brunswick Avenue
Far Rockaway, New York

Prepared By: Jennifer L. Atkins

Reviewed By: Gregory Malzone

The RETEC Group, Inc.
June 2007
Document No.: KED04-20370-100

Contents

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1.0 Introduction

This Quality Assurance Project Plan (QAPP) details the protocols and procedures that will be followed during the proposed Remedial Investigation (RI) that will occur at the KeySpan Corporation (KeySpan) Far Rockaway former manufactured gas plant (MGP) site (Site). The purpose of these protocols and procedures is to ensure that all project activities will be performed in a manner consistent with the data quality objectives (DQOs) established for the project and all data collected during the RI are precise, accurate, representative, comparable, and complete.

1.1 Project description

The Site is located between B12th Street and Minton Avenue, on the north side of Brunswick Avenue in Far Rockaway, Queens County, New York. The Site is approximately one-acre in size and is currently used by three separate tenants for warehousing, shipping, and distribution operations. The Site contains three two-story buildings which are used for office space and warehousing and includes paved parking and landscaped areas. The Site is located in a mixed industrial and residential area. The Long Island RailRoad (LIRR) bounds the Site to the north. Residential housing is located to the east and south of the Site, and commercial buildings are situated west of the Site.

A gas works operated at the Site between the mid 1890's and 1909. The former MGP included a building that housed coal bins, a purifier, a gas generator, and a 75,000 cubic foot gas holder. There was also a former gasoline tank in the southern central portion of the property near Brunswick Avenue. The Site was used as office space following the cessation of MGP operations. Based on Sanborn Fire Insurance Maps, it appears that the gas holder was demolished between 1950 and 1981.

The Site is being investigated in accordance with Order on Consent #D1-0001-99-05 between KeySpan and the New York State Department of Environmental Conservation (NYSDEC). The RI is designed to be an extension of the preliminary site assessment (PSA) performed in December 2002 for the purpose of delineating the extent of MGP impacts observed during the PSA.

1.2 Scope of work

The scope of work at the Site is described in the Remedial Investigation Work Plan dated May 2007. The following tasks will be performed as a part of the RI:

- Pre-investigation coordination (i.e. access agreements)
- Utility clearance
- Mobilization
- Surface soil sampling and analysis
- Soil boring advancement, subsurface soil sampling and analysis
- Monitoring well installation and development
- Groundwater sampling and analysis
- Aquifer slug testing at select locations
- Sub-slab soil vapor and indoor air sampling and analysis
- Investigation derived waste management
- Community air monitoring

- Site survey
- Data evaluation and reporting

1.3 Data quality objectives

DQOs are qualitative and quantitative statements to ensure that data of known and appropriate quality are obtained during sampling and analysis activities. Data developed during the RI will be used to fulfill the overall objectives of the project. These objectives are to:

- Fill data gaps to determine the nature and extent of MGP impacts at the Site and offsite. Specifically, delineate the areal extent of MGP impacts, determine the surface and subsurface characteristics of the Site, identify sources of contamination, migration pathways and potential human or ecological receptors at the Site and offsite. The DQOs for delineation data include:
  - data will identify MGP-related constituents in soil and groundwater
  - data will be collected using a systematic method to delineate the perimeter of MGP-related impacts
  - analytical methods will be of sufficient sensitivity that method detection limits (MDLs) and practical quantitation limits (PQLs) measure constituent concentrations at or below constituent NYSDEC guidance values
- Perform a soil vapor survey in accordance with New York State Department of Health (NYSDOH) Guidance for Evaluating Soil Vapor Intrusion in the State of New York. The DQOs for vapor intrusion data include:
  - data will identify MGP-related constituents in soil vapor
  - data will be collected using a systematic method to determine whether vapor intrusion of MGP-related impacts is occurring.
  - analytical methods will be of sufficient sensitivity to meet a minimum reporting limit of at most one part per billion.

1.3.1 Data quality levels

There are five analytical levels of data quality which may be used to accomplish these Site objectives. They are typically designated as follows:

- Level I – Field screening or analysis using portable instruments, calibrated to non-compound specific standards
- Level II – Field analysis using portable instruments, calibrated to specific compounds
- Level III – Non-Contract Laboratory Program (CLP/ASP) laboratory methods
- Level IV – ASP-CLP Routine Analytical Services methods
- Level V – Non-standard analytical methods.

To meet the specific objectives of this project, Levels I, II, and IV data quality levels will be utilized.

1.3.1.1 Level I – field screening methods

These tests, which are quantitative and/or semi-quantitative, are classified as field screening evaluations, even though they typically are not used for site characterization purposes.

Soil and soil headspace screening will be conducted using a photoionization detector (PID) to determine the soil boring interval(s) that will be submitted for analytical laboratory analysis.

In addition, as part of the Health and Safety Plan (HASP) and the Community Air Monitoring Plan (CAMP), worker safety and ambient air quality may be monitored using one or more of a variety of field screening tests. Applicable equipment may include but not be limited to: a PID, Draeger tubes, and personal monitors to test for volatile organic vapors, or a combustible gas indicator to test for explosive potential. Health & safety requirements are specified in the HASP.

1.3.1.2 Level IV – CLP/ASP methodologies

Soil samples will be analyzed according to CLP protocols described in the most recent edition of the New York State Analytical Services Program (ASP). This level of data quality will ensure the generation of legally, and technically defensible data for project use. The laboratory performing the analysis of samples will be certified for the specific parameters pursuant to NYSDOH ELAP Certification program. Laboratory data will be reported in the NYSDEC ASP Category B deliverables format. Level IV data will also be provided for the hazardous waste classification.

2.0 Project organization

This RI will be completed for KeySpan by ENSR Corporation (d/b/a The RETEC Group, Inc. [RETEC]), an environmental contractor (the Contractor), who will arrange for the drilling and analytical services and provide an onsite field representative to perform the soil logging, soil sampling, surveying, and groundwater sampling. The Contractor will also perform the data interpretation and reporting tasks.

Key contacts for this project are as follows:

KeySpan Project Manager:
Thomas Campbell
Telephone: 516-545-2555
Fax: 516-545-2582

Contractor Project Manager (RETEC):
Peter Cox, PG
Telephone: 978-371-1422
Fax: 978-371-1448

Laboratory Representative:
CEMTECH
Joseph Carabillo
Telephone: 908-789-8900

Laboratory Quality Assurance Officer (QAO)
CEMTECH
Krupa Dubey
Telephone: 908-789-8900

3.0 Quality assurance/quality control objectives for measurement of data

3.1 Introduction

The quality assurance and quality control (QA/QC) 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) and Contract Required Detection Limits (CRDLs) 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 field 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

For soil samples, the data quality objectives for analytical precision, calculated as the RPD between duplicate analyses, is presented in Table 3-1.

The same is presented for groundwater in Table 3-2 and air samples in Table 3-3.

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 established and be within method control limits. Instrument and method analytical accuracy can then 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, 3-2, and 3-3.

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 that 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 Appendix C of the RI Work 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 also must 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 USEPA or National Institute of Standards and Technology (NIST)
- Requiring that all calibrations be verified with an independently traceable 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 all of the analytical results, including the use of data qualifiers in all cases where appropriate
- Requiring that all validation qualifiers be considered 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.

4.0 Sampling program

4.1 Introduction

The sampling program will provide data concerning the presence and the nature and extent of contamination of groundwater, soil, and air. This section presents sample collection procedures, sample container preparation procedures, sample preservation procedures, sample holding times, and field QC sample requirements. Sample matrices and the number of environmental and QC samples to be collected are given in Table 4-1.

4.2 Sample collection

Soil, groundwater, and air samples will be collected at the Site. The location and frequency of sampling and the methods selected for field procedures and laboratory analysis are described in detail in the RI Work Plan.

4.3 Sample container preparation and sample preservation

All sample containers will be new and will meet the specifications required by the USEPA. Copies of the sample container QC analyses will be provided by the laboratory for each container lot used for sample collection. The containers will be labeled and the appropriate preservatives will be added. The container requirements are shown in Tables 4-2, 4-3, and 4-4.

Samples shall be preserved according to the preservation techniques given in Tables 4-2 through 4-4. 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 ± 2ºC with ice and delivered to the laboratory within 48 hours of collection. Chain-of-custody (COC) procedures are described in Section 5.

4.4 Sample holding times

The sample holding times for organic and inorganic parameters are given in Tables 4-2 through 4-4 and must be in accordance with the NYSDEC ASP requirements. Holding times for Toxicity Characteristic Leaching Procedure (TCLP) samples are given in Table 4-5. The NYSDEC ASP holding times must be strictly adhered to by the laboratory. Any holding time exceedances must be reported to KeySpan.

4.5 Field quality control 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 the following.

- 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 volatiles analysis. The trip blank will be analyzed for volatile organic compounds to assess any contamination from sampling, transport, storage, and internal laboratory procedures.
- Rinseate Blanks – Rinseate blanks will be taken at a minimum frequency of one per 20 field samples per sample matrix. Rinseate blanks are used to determine the effectiveness of the decontamination procedures for sampling equipment. It is a sample of reagent 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 rinseate blank may be analyzed for all or some of the parameters of interest.

The duplicates will consist of the following.

- Coded Field Duplicate – To determine the representativeness of the sampling methods, coded field duplicates will be collected. 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 field duplicate samples. This will eliminate any possible bias that could arise. Field duplicates will be taken at a minimum frequency of one per 20 field samples per sample matrix.
- Matrix Spike/Matrix Spike Duplicate (MS/MSD) – MS/MSD samples (MS/MSD for organics; MS and laboratory duplicate for inorganics) will be collected at a frequency of one pair per 20 field samples. MS/MSD samples are used to assess the effect of the sample matrix on the recovery of target compounds or target analytes. The advisory acceptance limits for MS/MSD percent recoveries and RPDs are given in Tables 3-1 and 3-2.

5.0 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 collected in the field is the responsibility of field personnel. Both laboratory and field personnel involved in collection and transfer of samples will be trained as to the purpose and procedures for sample custody 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
- 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 collection and preservation, and during the 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. Errors in field records will be crossed out with a single line in ink and initialed by the author.

One copy of the COC is retained by sampling personnel 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 documentation or sample integrity issues, 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 COC procedure.
- The soil, water, and air samples will be stored in a secured area until analyses commence, at a temperature of approximately 4 ± 2 C if required.
- 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.

6.0 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 Appendix C of RI Work 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 onsite by the Field Team Leader.

Calibration procedures for instruments used for monitoring health and safety hazards (e.g., photoionization detector [PID] and explosimeter) are provided in the HASP. More frequent calibration may be needed depending on conditions encountered in the field.

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.

7.0 Analytical procedures

7.1 Introduction

Soil, water, and waste samples will be analyzed according to the USEPA SW-846 "Test Methods for Evaluating Solid Waste," November 1986, 3rd edition and subsequent updates. Air and soil gas samples will be analyzed according to the USEPA Compendium Method TO-15, Determination of VOCs in Air Collected in Specially Prepared-Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS), January 1999 and helium (fixed gas) analyses will be performed using American Society for Testing Materials (ASTM), Method 1945 mod. The methods to be used for the laboratory analysis of water and soil samples are presented in Tables 7-1 and 7-2. The soil gas and ambient air samples will be analyzed by EPA Method TO-15 as presented in Table 7-3. These methods were selected because they attain the quantitation limits and DQOs required by the project, which are compiled on Tables 7-1 through 7-3.

Based on the results of the PSA work, tentatively identified compound (TIC) analysis did not provide additional information beyond typical MGP-related impacts, and therefore, TICs are not included in the RI analyses.

8.0 Data reduction, assessment, and reporting

8.1 Data reduction

Data collected during the field investigation will be reduced in accordance with SW-846 protocols and reviewed by the laboratory QA personnel. 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.

8.2 Data quality assessment

NYSDEC recommends two levels of data review. The basic review is a Data Usability Summary Report (DUSR). Current NYSDEC policy is to require this level of review for analytical data from investigations on most sites. Full data validation is called for at sites where the data will be used in litigation, or where problems are expected with data quality (such as where matrix interference is expected to be significant). The laboratory deliverables (i.e., NYSDEC ASP Category B) are the same in both cases, and a DUSR can be upgraded to full validation at a later time if necessary. For this investigation a DUSR will be performed.

Based on the results of data assessment, the validated analytical results reported by the laboratory will be assigned one of the following USEPA-defined data usability qualifiers:

- 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
- No Flag - Result accepted without qualification

Trained and experienced data assessors, who meet NYSDEC approval criteria, will perform the data review. Résumés of people who will perform the data validation and prepare the DUSR will be provided to NYSDEC for review and approval.

8.2.1 Data usability summary report

Data for this investigation will be evaluated accordance with the *USEPA National Functional Guidelines for Organic Data Review*, October 1999 and *USEPA Validation Functional Guidelines for Inorganic Data Review*, October 2004. A DUSR will be generated in accordance with USEPA Region II guidelines.

The DUSR will include a review and an evaluation of all the analytical results. To ensure compliance with the analytical method protocols the following parameters will be reviewed:

- Chain-of-custody forms
- Holding times
- Initial and continuing calibrations
- Blanks
- Laboratory control standards and matrix spikes
- Surrogate recoveries

- Matrix interference checks
- Field and laboratory duplicates
- Sample data

The DUSR will contain a description of the samples and parameters reviewed. Any deficiencies identified during the review will be noted and the effect on the generated data will be discussed. Any re-sampling or reanalysis recommendations will be then be made to the investigation's Project Manager. The results of the evaluation will be incorporated into the final investigative report.

8.2.2 Data validation

The determination to validate data will be made based on the presence of data anomalies, suspect data, or laboratory issues. Data will be validated in accordance with the *USEPA National Functional Guidelines for Organic Data Review, October 1999,* and *USEPA Validation Functional Guidelines for Inorganic Data Review,* October 2004. If applicable, a data validation report will be prepared and reviewed by the Quality Assurance Office (QAO) before issuance. The data validation report 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 sample delivery group will follow. For each of the organic analytical methods, the following parameters 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
- Field duplicate results
- Target compound identification
- Result calculations
- Pesticide cleanup (if applicable)
- Compound quantitation and reported detection limits
- System performance
- 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(s)
- Furnace atomic absorption analysis QC
- ICP serial dilutions
- Results verification and reported detection limits
- Result calculations

8.3 Data reporting

The data package provided by the laboratory will contain all items discussed above in a “CLP-equivalent” format. Data quality issues will be discussed in a case narrative included with the data report. The completed copies of the COC 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.

Two copies of the analytical data packages and an electronic data deliverable (EDD) will be provided by the laboratory approximately 30 days after receipt of a complete sample delivery group. The Project Manager will immediately arrange for filing one package. A second copy and the EDD will be used to generate summary tables. These tables will form the database for assessment of the site contamination condition.

The EDD format required is an ASCII comma-delimited file with the fields and character lengths summarized in Table 8-1. Alternatively, a comma-delimited MS Excel file may be issued.

Each EDD 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 EDDs 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 nonconformance issues are resolved prior to use of the data.

9.0 Internal quality control checks

QC procedures and checks are used to evaluate the precision and accuracy of analytical data. Field QC checks are used to identify potential problems associated with sample collection procedures. Laboratory QC checks are used to identify problems associated with sample preparation and analysis.

9.1 Field quality control checks

To check the quality of data from field sampling efforts, blanks and duplicate samples will be collected for analysis. Field duplicate and rinseate blank samples will be collected at a frequency of one in 20 samples. Trip blank samples will be analyzed at a frequency of one per each shipment of VOC samples. Field MS/MSD samples will be collected at a frequency of one in 20 samples. These samples will be treated as separate samples for identification, logging, and shipping purposes. Analytical results on blanks and duplicates will be reported with the data.

9.2 Laboratory quality control checks

The analytical laboratory must have an implemented QC program documented in a QA manual to ensure the reliability and validity of the analysis performed at the laboratory. All analytical procedures are documented in writing as SOPs and each SOP must include a QC section that addresses the minimum QC requirements for the procedure. The internal QC checks differ slightly for each individual procedure, but in general the QC requirements include the following:

- Method blanks
- Reagent/preparation blanks (applicable to inorganic analysis)
- Instrument blanks
- MS/MSDs
- Surrogate spikes (organic methods only)
- Analytical spike (applicable to graphite furnace analysis)
- Laboratory control samples
- Internal standard areas for Gas Chromatography / Mass Spectroscopy (GC/MS) analysis
- Mass tuning for GC/MS analysis
- Endrin/DDT degradation checks for pesticide analysis
- Second, dissimilar column confirmation for pesticide and PCB analysis

All data obtained will be properly recorded. The data package will include a full deliverable package capable of allowing the recipient to reconstruct QC information and compare it to QC acceptance criteria. The laboratory will reanalyze any samples associated with nonconforming quality control checks, if sufficient volume is available. It is expected that sufficient volumes/weights of samples will be collected to allow for reanalysis when necessary.

10.0 Performance and system audits and frequency

Two types of audit procedures are conducted during any environmental investigation: performance and system audits. These audits are performed on the laboratory as well as field activities. The laboratory and field auditors will be independent of the function they will be auditing. Audits will be documented and maintained by the Contractor Project Manager.

10.1 Performance audits

10.1.1 Laboratory performance audits

Laboratory performance audits are administered by the laboratory QA department on a periodic basis (e.g., semi-annually). The audit samples are used to monitor accuracy and identify and resolve problems in sample preparation and analysis techniques, which lead to the generation of nonconforming data.

The laboratory performance audits include verification of each analyst's record keeping, proper use and understanding of procedures, and accuracy evaluation. Corrective action will be taken for any performance failure noted.

10.1.2 Field performance audits

The Quality Assurance Officer (QAO) or designee will perform field performance audits of the field sample team on an annual basis at a minimum. The field team leader will review all field data. The analytical results of the field blanks and replicate samples are indirect audits of the level of performance of field activities. If a nonconformance is found in the evaluation of field QC data, corrective action will be taken to resolve the issue. The corrective action will be documented.

10.2 System audits

10.2.1 Laboratory system audits

Laboratory system audits will be conducted against the QA Manual and the administrative and method SOPs, by the laboratory QA department, on an annual basis. System audits are used to ensure that all aspects of the laboratory's QC program are effective. This involves a thorough review of all laboratory practices and documentation to confirm that work is performed according to project specifications.

Outside agency performance and system audits may be used to verify contract compliance or the laboratory's ability to meet requirements for analytical methods and documentation. Copies of current certifications and accreditations may be used in lieu of an audit by the Project Manager.

10.2.2 Field system audits

The QAO or designee shall perform field system audits of the field sampling team on an annual basis at a minimum. All field activities will be audited to ensure that the field work is being performed according to the approved work plans, QAPP, and method procedures. Accuracy, precision, and documentation clarity will be evaluated. Any time a deficiency is noted during an ongoing systems audit, the project manger or designee will inform the field staff immediately so that corrective actions may be implemented.

11.0 Preventive maintenance

11.1 Field instrument preventive maintenance

Written procedures will establish the schedule for servicing critical items in order to minimize the downtime of the measurement system(s). Field instruments will be checked and calibrated daily before use. Calibration checks will be documented on the field calibration log sheets. Critical spare parts such as tape and batteries will be kept on-site to reduce potential downtime. Backup instruments and equipment will be available on-site or within 1-day shipment to avoid delays in the field schedule.

11.2 Laboratory instrument preventive maintenance

Designated laboratory employees regularly perform routine scheduled maintenance and repair of all instruments. All maintenance that is performed is documented in the laboratory's operating records. All laboratory instruments are maintained in accordance with manufacturer's specifications. The laboratory's QA Manual specifies the typical frequency with which components of key analytical instruments or equipment will be serviced.

11.3 Records

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

12.0 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, 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 recurrence. Condition identification, cause, reference documents, and corrective action planned to be taken will be documented and reported to the QAO, Contractor 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, report, and investigate 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 audit findings
- As a result of a management assessment
- As a result of laboratory/field comparison studies
- 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, will 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 nonconforming 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 Contractor 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.

Any project personnel may identify issues requiring corrective action; however, the QAO is responsible for documenting, numbering, logging, and verifying the closeout action. The Contractor Project Manager will be responsible for ensuring that all recommended corrective actions are implemented, documented, and approved.

13.0 References

American Society of Testing Materials, 2003. D1945-03. *Standard Test Method for Analysis of Natural Gas by Gas Chromatograph,* 2003.

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

United States Environmental Protection Agency (USEPA), 1986. SW-846 Test Method for Evaluating Solid Waste, Washington, D.C., November 1986,

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

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USEPA, 1999. Compendium Method TO-15, Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially-Prepared Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS). January 1999.

Tables

Table 3-1
Quality Control Limits For Soil Samples
Far Rockaway Former Manufactured Gas Plant, Far Rockaway, New York

Analytical	Analytical Method [a]	Matrix Spike (MS) Compounds	Laboratory Accuracy and Precision			Surrogate Compounds	Surrogate Recovery (%)
			MS/MSD [b] Recovery (%)	MS/MSD RPD [c] (%)	LCS [d] 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 [h]	Series 6000-7000 (metals)	Inorganic Analyte	75-125 [i]	20 (j)	80-120	NA	NA
	9012 (cyanide)		75-125 i	20 (j)	80-120	NA	NA

Notes

(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) Target Analyte List Inorganics (metals and cyanide)

(i) Matrix spike only

(j) Laboratory duplicate RPD

NA - Not Applicable

Table 3-2
Quality Control Limits For Water Samples
Far Rockaway Former Manufactured Gas Plant, Far Rockaway, New York

Analytical	Analytical Method [a]	Matrix Spike Compounds	Laboratory Accuracy and Precision			Surrogate Compounds	Surrogate Recovery (%)
			MS/MSD [b] Recovery (%)	MS/MSD RPD [c] (%)	LCS [d] 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	43-118	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 [h]	Series 6000-7000 (metals)	Inorganic Analyte	75-125 [i]	20 [j]	80-120	NA	NA
	9012 (cyanide)	Cyanide	75-125 [i]	20 [j]	80-120	NA	NA

Notes

(a) Analytical Methods: USEPA SW-846, 3rd edition, Revision 1, November 1990, any subsequent revisions shall supersede this information

(b) MS/MSD = Matrix Spike/Matrix Spike Duplicate

(c) RPD = Relative Percent Difference

(d) LCS = Laboratory Control Sample

(e) Target Compound List Volatile Organic Compounds

(f) Target Compound List Semivolatile Organic Compounds

(g) Limits are advisory only

(h) Target Analyte List Inorganics (metals and cyanide)

(i) Matrix spike only

(j) Laboratory duplicate RPD

NA - Not Applicable

Table 3-3
Quality Control Limits For Air Samples
Far Rockaway Former Manufactured Gas Plant, Far Rockaway, New York

Analytical Parameter	Analytical Method [a]	Analyte Compounds	LCS [d] Recovery (%)	Duplicate RPD [c, e] (%)	Laboratory Accuracy and Precision			
					MS/MSD [b] Recovery (%)	MS/MSD RPD [c] (%)	Surrogate Compounds	Surrogate Recovery (%)
VOCs	TO-15 Mod.	Acetone	60-140	25	NA	NA	Toluene-d8	70-130
		Bromodichloromethane	60-140	25			Bromofluorobenzene	70-130
		Butadiene, 1,3-	60-140	25			1,2-Dichloroethane-d4	70-130
		Carbon Disulfide	60-140	25				
		Chloro-1-Propene, -3 (Allyl Chloride)	60-140	25				
		Chlorodibromomethane	60-140	25				
		Cumene	60-140	25				
		Dichloroethylene, Trans-1,2-	60-140	25				
		Dioxane, 1,4-	60-140	25				
		Hexane	60-140	25				
		Methyl Ethyl Ketone	60-140	25				
		Methyl Isobutyl Ketone	60-140	25				
		Methyl Tert-Butyl Ether (MTBE)	60-140	25				
		Naphthalene	60-140	25				
		Propylbenzene, N-	60-140	25				
		Tribromomethane (Bromoform)	60-140	25				
		Cyclohexane	60-140	25				
		2-Hexanone	60-140	25				
		4-Ethyltoluene	60-140	25				
		Ethanol	60-140	25				
		Heptane	60-140	25				
		2-Methylpentane	60-140	25				
		Isopentane	60-140	25				
		2,3-Dimethylpentane	60-140	25				
		2,2,4-Trimethylpentane	60-140	25				
		Indene	60-140	25				
		Indan	60-140	25				
		Thiopene	60-140	25				
		2-Propanol	60-140	25				
		Tetrahydrofuran	60-140	25				
		Benzene	70-130	25				
		Bromomethane	70-130	25				
		Carbon Tetrachloride	70-130	25				
		Chlorobenzene	70-130	25				
		Chloroethane	70-130	25				
		Chloroform	70-130	25				
		Dibromoethane, 1,2- (Ethylene Dibromide)	70-130	25				
		Dichlorobenzene, 1,2-	70-130	25				
		Dichlorobenzene, 1,3-	70-130	25				
		Dichlorobenzene, 1,4-	70-130	25				
		Dichlorodifluoromethane (Freon 12)	70-130	25				
		Dichloroethane, 1,1-	70-130	25				
		Dichloroethane, 1,2-	70-130	25				

Table 3-3
Quality Control Limits For Air Samples
Far Rockaway Former Manufactured Gas Plant, Far Rockaway, New York

Analytical Parameter	Analytical Method [a]	Analyte Compounds	LCS [d] Recovery (%)	Duplicate RPD [c, e] (%)	Laboratory Accuracy and Precision			
					MS/MSD [b] Recovery (%)	MS/MSD RPD [c] (%)	Surrogate Compounds	Surrogate Recovery (%)
		Dichloroethylene, 1,1-	70-130	25				
		Dichloroethylene, Cis-1,2-	70-130	25				
		Dichloromethane (Methylene Chloride)	70-130	25				
		Dichloropropane, 1,2-	70-130	25				
		Dichloropropene, Cis-1,3-	70-130	25				
		Dichloropropene, Trans-1,3-	70-130	25				
		1,2-Dichloro-1,1,2,2,-tetrafluoroethane	70-130	25				
		Ethyl Benzene	70-130	25				
		Fluorotrichloromethane (Freon 11)	70-130	25				
		Methyl Chloride	70-130	25				
		Styrene	70-130	25				
		Tetrachloroethane, 1,1,2,2-	70-130	25				
		Tetrachloroethylene (PCE)	70-130	25				
		Toluene	70-130	25				
		Trichloro-1,2,2-Trifluoroethane, 1,1,2-	70-130	25				
		Trichlorobenzene, 1,2,4-	70-130	25				
		Trichloroethane, 1,1,1-	70-130	25				
		Trichloroethane, 1,1,2-	70-130	25				
		Trichloroethylene (TCE)	70-130	25				
		Trimethylbenzene, 1,3,4- (1,2,4-)	70-130	25				
		Trimethylbenzene, 1,3,5-	70-130	25				
		Vinyl Chloride	70-130	25				
		m,p-xylene	70-130	25				
		o-xylene	70-130	25				
		Hexachlorobutadiene	70-130	25				
		alpha-chlorotoluene	70-130	25				
Fixed Gas	ASTM D1945 Mod.	Helium	75-125	30	NA	NA	NA	NA

Notes

(a) USEPA, 1999. Compendium Method TO-15, Determination of Volatile Organic Compounds (VOCs) in Air Collected in Specially-Prepared-Canisters and Analyzed by Gas Chromatography/Mass Spectrometry (GC/MS). January 1999.
American Society of Testing Materials, 2003. D1945-03. Standard Test Method for Analysis of Natural Gas by Gas Chromatograph, 2003.

(b) Matrix Spike/Matrix Spike Duplicate

(c) Relative Percent Difference

(d) Laboratory Control Sample

(e) Laboratory duplicate RPD

NA - Not Applicable

Table 4-1
Summary Of Samples and Analyses
Far Rockaway Former Manufactured Gas Plant, Far Rockaway, New York

Matrix [a]	Parameter	Analytical Method	Field Samples				QC Blanks		Total
			Field Samples	Field Duplicate	MS/MSD [b] (Total)	Sub-Total	Trip Blank	Rinse Blank	
Surface Soil Samples	VOCs	EPA SW 8260B (NY ASP OLM04.2)	15	1	1	17	1	1	19
	SVOCs	EPA SW 8270C (NY ASP OLM04.2)	15	1	1	17		1	18
	Total Cyanide	EPA SW 9012/9010A (NY ASP ILM04.1)	5	1	1	7		1	8
	RCRA 8 Metals + Fe, Cu, Zn	EPA SW 6000/7000 Series (NY ASP ILM04.1)	15	1	1	17		1	10
Soil Boring Samples	VOCs	EPA SW 8260B (NY ASP OLM04.2)	33	2	2	37	3	2	42
	SVOCs	EPA SW 8270C (NY ASP OLM04.2)	33	2	2	37		2	39
	Total Cyanide	EPA SW 9012/9010A (NY ASP ILM04.1)	33	2	2	37		2	39
	RCRA 8 Metals + Fe, Cu, Zn	EPA SW 6000/7000 Series (NY ASP ILM04.1)	33	2	2	37		2	39
Groundwater Samples	VOCs	EPA SW 8260B (NY ASP OLM04.2)	12	1	1	14	1	1	16
	SVOCs	EPA SW 8270C (NY ASP OLM04.2)	12	1	1	14		1	15
	Total Cyanide	EPA SW 9012/9010A (NY ASP ILM04.1)	12	1	1	14		1	15
	RCRA 8 Metals + Fe, Cu, Zn	EPA SW 6000/7000 Series (NY ASP ILM04.1)	12	1	1	14		1	15
Soil Gas Samples	VOCs and others *	EPA TO-15	3	1	-	4	-	1	5
Indoor Air Samples	VOCs and others *	EPA TO-15	3	-	-	3	-	-	3
Ambient Air Samples	VOCs and others *	EPA TO-15	1	-	-	1	-	-	1
Waste Characterization (solids)	TCLP VOCs	EPA SW 1311/8260B (NY ASP OLM04.2)	5	-	-	5	-	-	5
	TCLP SVOCs	EPA SW 1311/8270C (NY ASP OLM04.2)	5	-	-	5	-	-	5
	TCLP Metals	EPA SW 1311/6010B (NY ASP ILM04.1)	5	-	-	5	-	-	5

Notes

TCLP – Toxicity Characteristic Leaching Procedure

(a) Number of samples is approximate and for information purposes only.

(b) Matrix spike / matrix spike duplicate for organic analyses; matrix spike and laboratory duplicate for inorganic analysis.

* Other parameters include naphthalene, indan, indene, thiophene, 2-methyl pentane, isopentane, 2,3-dimethyl pentane, isooctane, and methyl tert butyl ether (MTBE).

Table 4-2
Soil and Waste Sample
Containerization and Holding Times
Far Rockaway Former Manufactured Gas Plant, Far Rockaway, New York

Analysis	Bottle Type	Preservation [a]	Holding Time [b]
Volatile Organic Compounds (VOCs)	Wide-mouth glass w/ Teflon lined cap	Cool to 4ºC	10 days
Other Organic Compounds [c]	Wide-mouth glass w/ Teflon lined cap	Cool to 4ºC	10 days*
Metals	Wide-mouth plastic or glass	Cool to 4ºC	6 months, except mercury (26 days)
Cyanide	Wide-mouth plastic	Cool to 4ºC	10 days
TCLP Organic Compounds	Wide-mouth glass w/ Teflon lined cap	Cool to 4ºC	See Table 4-5
TCLP Metals	Wide-mouth plastic or glass	Cool to 4ºC	See Table 4-5

Notes

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

(b) Days from date of sample collection

(c) Semivolatile organic compounds

* Sohxlet or sonication procedures for extraction and concentration of soil/waste samples for SVOCs must be completed within 5 days of VTSR. Sohxlet or sonication procedures for extraction and concentration of soil/sediment/waste samples for PCBs must be completed within 5 days of VTSR. Extracts of soil samples must be analyzed within 40 days of extraction.

Table 4-3
Water Sample ContainerIzation and Holding Times
Far Rockaway Former Manufactured Gas Plant, Far Rockaway, New York

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

Notes

(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 SVOC analysis must begin within 5 days and be completed within 7 days of VTSR. Extracts of water samples must be analyzed within 40 days of extraction.

Table 4-4
Soil Gas, Indoor, and Ambient Air Sample
Containerization and Holding Times
Far Rockaway Former Manufactured Gas Plant, Far Rockaway, New York

Analysis	Bottle Type	Preservation	Holding Time [b]
Volatile Organic Compounds (VOCs)	6 L Summa® canister [a]	NA	30 days
Fixed Gases (Helium)	6 L Summa® canister [a]	NA	30 days

Notes

(a) Stainless steel SUMMA® canisters must be certified clean by the laboratory using TO-15 § 8.4.1. The canisters will be delivered to the field with a pressure of 28-30" Hg. Canisters received with a vacuum pressure less than 25" Hg will not be used.

(b) Days from date of sample collection. The holding time for the TO-15 analysis is 30 days. The holding time for an evacuated canister is 30 days. After 30 days, unused canisters must be exchanged for a recently cleaned canister.

Table 4-5
TCLP[a] Sample Holding Times
Far Rockaway Former Manufactured Gas Plant, Far Rockaway, New York

Analytical Parameter	From: Sample Collection To: TCLP Extraction*	From: TCLP Extraction To: Preparative Extraction	From: Preparative Extraction To: Determinative Analysis
Volatiles	7 days	NA	7 days
Semivolatiles	5 days	7 days	40 days
Mercury	5 days	NA	28 days
Metals (except Mercury)	180 days	NA	180 days

Notes

(a) Toxicity Characteristic Leaching Procedure.

NA - Not Applicable.

*Times shown are from verified time of sample receipt.

Table 7-1
Project Quantitation Limits for Soil and Water
Far Rockaway Former Manufactured Gas Plant, Far Rockaway, New York

Analysis/Compound	Method	Quantitation Limits		State of New York Standards	
		Water (µg/L)	Soil (µg/kg)	Water [a] (µg/L)	Soil [b] (µg/kg)
Volatile Organics					
1,1,1-Trichloroethane	SW8260B	1	5	5	800
1,1,2,2-Tetrachloroethane	SW8260B	1	5	5	600
1,1,2-Trichloroethane	SW8260B	1	5	1	
1,1-Dichloroethane	SW8260B	1	5	5	200
1,1-Dichloroethene	SW8260B	1	5	5	400
1,2-Dichloroethane	SW8260B	1	5	0.6	100
1,2-Dichloroethene(total)	SW8260B	1	5	5	300
1,2-Dichloropropane	SW8260B	1	5	1	
2-Butanone (MEK)	SW8260B	10	20		300
2-Hexanone	SW8260B	10	20		
4-Methyl-2-pentanone(MIBK)	SW8260B	5	20		1000
Acetone	SW8260B	10	20		200
Benzene	SW8260B	1	5	1	60
Bromodichloromethane	SW8260B	1	5		
Bromoform	SW8260B	1	5		
Bromomethane	SW8260B	2	10	5	
Carbon Disulfide	SW8260B	1	5		2700
Carbon Tetrachloride	SW8260B	1	5	5	600
Chlorobenzene	SW8260B	1	5	5	1700
Chloroethane	SW8260B	2	10	5	1900
Chloroform	SW8260B	1	5	7	300
Chloromethane	SW8260B	2	10	5	
cis-1,3-Dichloropropene	SW8260B	1	5	0.4	
Dibromochloromethane	SW8260B	1	5	5	
Ethyl Benzene	SW8260B	1	5	5	5500
Methylene Chloride	SW8260B	1	5	5	100
Styrene	SW8260B	1	5	5	
Tetrachloroethene	SW8260B	1	5	5	1400
Toluene	SW8260B	1	5	5	1500
trans-1,3-Dichloropropene	SW8260B	1	5	0.4	
Trichloroethene	SW8260B	1	5	5	700
Vinyl Chloride	SW8260B	2	10	2	200
Xylenes(total)	SW8260B	1	5	5	1200
Semivolatile Organics					
1,2,4-Trichlorobenzene	SW8270C	10	330	5	3400
1,2-Dichlorobenzene	SW8270C	10	330	3	7900
1,3-Dichlorobenzene	SW8270C	10	330	3	1600
1,4-Dichlorobenzene	SW8270C	10	330	3	8500
2,2'-oxybis(1-chloropropane)	SW8270C	10	330	5	
2,4,5-Trichlorophenol	SW8270C	25	330	1	100
2,4,6-Trichlorophenol	SW8270C	10	330	1	
2,4-Dichlorophenol	SW8270C	10	330	1	400
2,4-Dimethylphenol	SW8270C	10	330	1	
2,4-Dinitrophenol	SW8270C	25	330	1	200
2,4-Dinitrotoluene	SW8270C	10	330	5	
2,6-Dinitrotoluene	SW8270C	10	330	5	1000
2-Chloronaphthalene	SW8270C	10	330		
2-Chlorophenol	SW8270C	10	330	1	800
2-methyl-4,6-Dinitrophenol	SW8270C	25	330		
2-Methylnaphthalene	SW8270C	10	330		36400
2-Methylphenol	SW8270C	10	330	1	100
2-Nitrolaniline	SW8270C	25	330	5	430
2-Nitrophenol	SW8270C	10	330	1	330
3,3'-Dichlorobenzidine	SW8270C	10	330	5	
3-Nitroaniline	SW8270C	25	330	5	500
4-Bromophenyl-phenyl ether	SW8270C	10	330		
4-Chloro-3-methylphenol	SW8270C	10	330		240
4-Chloroaniline	SW8270C	10	330	5	220
4-Chlorophenyl-phenyl ether	SW8270C	10	330		
4-Methylphenol	SW8270C	10	330	1	900
4-Nitroaniline	SW8270C	25	330	5	
4-Nitrophenol	SW8270C	25	330	1	100
Acenaphthene	SW8270C	10	330		50000
Acenaphthylene	SW8270C	10	330		41000
Anthracene	SW8270C	10	330		50000
Benzo(a)anthracene	SW8270C	10	330		224
Benzo(a)pyrene	SW8270C	10	330		61

Table 7-1
Project Quantitation Limits for Soil and Water
Far Rockaway Former Manufactured Gas Plant, Far Rockaway, New York

Analysis/Compound	Method	Quantitation Limits		State of New York Standards	
		Water (µg/L)	Soil (µg/kg)	Water [a] (µg/L)	Soil [b] (µg/kg)
Semivolatile Organics (continued)					
Benzo(b)fluoranthene	SW8270C	10	330		1100
Benzo(g,h,i)perylene	SW8270C	10	330		50000
Benzo(k)fluoranthene	SW8270C	10	330		1100
bis(2-Chloroethoxy) methane	SW8270C	10	330	5	
bis(2-Chloroethyl) ether	SW8270C	10	330	1	
bis(2-ethylhexyl)phthalate	SW8270C	10	330	5	50000
Butylbenzylphthalate	SW8270C	10	330		50000
Carbazole	SW8270C	10	330		
Chrysene	SW8270C	10	330		400
Di-n-butylphthalate	SW8270C	10	330	50	8100
Di-n-octylphthalate	SW8270C	10	330		50000
Dibenz(a,h)anthracene	SW8270C	10	330		14
Dibenzofuran	SW8270C	10	330		6200
Diethylphthalate	SW8270C	10	330		7100
Dimethylphthalate	SW8270C	10	330		2000
Fluoranthene	SW8270C	10	330		50000
Fluorene	SW8270C	10	330		50000
Hexachlorobenzene	SW8270C	NA (8081A)	330		410
Hexachlorobutadiene	SW8270C	10	330	0.5	
Hexachlorocyclopentadiene	SW8270C	10	330	5	
Hexachloroethane	SW8270C	10	330	5	
Indeno(1,2,3-cd)pyrene	SW8270C	10	330		3200
Isophorone	SW8270C	10	330		4400
N-Nitroso-di-n-propylamine	SW8270C	10	330		
N-nitrosodiphenylamine	SW8270C	10	330		
Naphthalene	SW8270C	10	330		13000
Nitrobenzene	SW8270C	10	330	0.4	200
Pentachlorophenol	SW8270C	25	330	1	1000
Phenanthrene	SW8270C	10	330		50000
Phenol	SW8270C	10	330	1	30
Pyrene	SW8270C	10	330		50000
Metals					
Arsenic	SW6010B	0.01	1	0.025	7.5
Barium	SW6010B	0.01	1	1	300
Cadmium	SW6010B	0.005	0.5	0.005	1
Chromium	SW6010B	0.01	1	0.05	10
Lead	SW6010B	0.01	0.5	0.025	400 [c]
Selenium	SW6010B	0.01	1	0.01	2
Silver	SW6010B	0.01	1	0.05	
Copper	SW6010B	0.03	2.5	0.2	25
Iron	SW6010B	0.1	10	0.3	2000
Zinc	SW6010B	0.02	2	2	20
Mercury	SW7470A/7471A	0.0002	0.01	0.0007	0.1

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

Table 7-2
Practical Quatitation Limits (PQLs) for TCLP
Far Rockaway Former Manufactured Gas Plant, Far Rockaway, New York

Compound	SW-846 Analysis	Water (µg/L)
TCLP Volatile Organic Compounds		
Benzene	1311 / 8260B	5
Carbon Tetrachloride	1311 / 8260B	5
Chloroform	1311 / 8260B	5
1,2-Dichlorethane	1311 / 8260B	5
1,1-Dichloroethene	1311 / 8260B	5
2-Butanone	1311 / 8260B	100
Tetrachloroethene	1311 / 8260B	5
Trichloroethene	1311 / 8260B	5
Vinyl Chloride	1311 / 8260B	100
TCLP Semivolatile Organic Compounds		
2-Methylphenol	1311 / 3510 / 8270B	10
3 & 4-Methylphenol	1311 / 3510 / 8270B	10
1,4-Dichlorobenzene	1311 / 3510 / 8270B	10
2,4-Dinitrotoluene	1311 / 3510 / 8270B	10
Hexachlorobutadiene	1311 / 3510 / 8270B	10
Hexachloroethane	1311 / 3510 / 8270B	10
Hexachlorobenzene	1311 / 3510 / 8270B	10
Nitrobenzene	1311 / 3510 / 8270B	10
Pentachlorophenol	1311 / 3510 / 8270B	50
Pyridine	1311 / 3510 / 8270B	ND
2,4,5-Trichlorophenol	1311 / 3510 / 8270B	10
2,4,6-Trichlorophenol	1311 / 3510 / 8270B	10
TCLP Metals		
Arsenic	1311 / 3010 / 6010B	0.05
Barium	1311 / 3010 / 6010B	0.002
Cadmium	1311 / 3010 / 6010B	0.004
Chromium	1311 / 3010 / 6010B	0.007
Lead	1311 / 3010 / 6010B	0.04
Selenium	1311 / 3010 / 6010B	0.07
Silver	1311 / 3010 / 6010B	0.007
Mercury	7470A	0.0002

Notes:
ND - Not Determined

Table 7-3
Project Quantitation Limits for Air
Far Rockaway Former Manufactured Gas Plant, Far Rockaway, New York

Analysis / Compound	Method	Quantitation Limits Soil Gas / Air ($\mu g/M^3$)
Fixed Gases		
Helium	ASTM D1945 mod.	16360 (0.01%)
Volatile Organics [1]		
Freon 12	TO-15 Mod.	0.81
Freon 114	TO-15 Mod.	1.14
Chloromethane	TO-15 Mod.	0.34
Vinyl Chloride	TO-15 Mod.	0.42
Bromomethane	TO-15 Mod.	0.63
Chloroethane	TO-15 Mod.	0.43
Freon 11	TO-15 Mod.	0.92
1,1-Dichloroethene	TO-15 Mod.	0.64
Freon 113	TO-15 Mod.	1.26
Methylene Chloride	TO-15 Mod.	0.56
1,1-Dichloroethane	TO-15 Mod.	0.66
cis-1,2-Dichloroethene	TO-15 Mod.	0.64
Chloroform	TO-15 Mod.	0.81
1,1,1-Trichloroethane	TO-15 Mod.	0.89
Carbon Tetrachloride	TO-15 Mod.	1.03
Benzene	TO-15 Mod.	0.52
1,2-Dichloroethane	TO-15 Mod.	0.66
Trichloroethene	TO-15 Mod.	0.89
1,2-Dichloropropane	TO-15 Mod.	0.76
cis-1,3-Dichloropropene	TO-15 Mod.	0.74
Toluene	TO-15 Mod.	0.61
trans-1,3-Dichloropropene	TO-15 Mod.	0.74
1,1,2-Trichloroethane	TO-15 Mod.	0.89
Tetrachloroethene	TO-15 Mod.	1.11
1,2-Dibromoethane (EDB)	TO-15 Mod.	1.26
Chlorobenzene	TO-15 Mod.	0.76
Ethyl Benzene	TO-15 Mod.	0.71
m,p-Xylene	TO-15 Mod.	0.71
o-Xylene	TO-15 Mod.	0.71
Styrene	TO-15 Mod.	0.69
1,1,2,2-Tetrachloroethane	TO-15 Mod.	1.13
1,3,5-Trimethylbenzene	TO-15 Mod.	0.81
1,2,4-Trimethylbenzene	TO-15 Mod.	0.81
1,3-Dichlorobenzene	TO-15 Mod.	0.98
1,4-Dichlorobenzene	TO-15 Mod.	0.98
alpha-Chlorotoluene	TO-15 Mod.	0.85
1,2-Dichlorobenzene	TO-15 Mod.	0.98
1,2,4-Trichlorobenzene	TO-15 Mod.	6.12
Hexachlorobutadiene	TO-15 Mod.	8.69
Propylene	TO-15 Mod.	1.4
1,3-Butadiene	TO-15 Mod.	1.77
Acetone	TO-15 Mod.	1.93
Carbon Disulfide	TO-15 Mod.	2.58
trans-1,2-Dichloroethene	TO-15 Mod.	3.22
2-Butanone (MEK)	TO-15 Mod.	2.42
Hexane	TO-15 Mod.	2.9

Table 7-3
Project Quantitation Limits for Air
Far Rockaway Former Manufactured Gas Plant, Far Rockaway, New York

Analysis / Compound	Method	Quantitation Limits Soil Gas / Air ($\mu g/M^3$)
Tetrahydrofuran	TO-15 Mod.	2.42
Cyclohexane	TO-15 Mod.	2.74
1,4-Dioxane	TO-15 Mod.	2.9
Bromodichloromethane	TO-15 Mod.	5.47
4-Methyl-2-pentanone	TO-15 Mod.	3.38
2-Hexanone	TO-15 Mod.	3.38
Dibromochloromethane	TO-15 Mod.	6.92
Bromoform	TO-15 Mod.	8.37
4-Ethyltoluene	TO-15 Mod.	4.03
Ethanol	TO-15 Mod.	1.55
Methyl tert-butyl ether	TO-15 Mod.	2.9
Heptane	TO-15 Mod.	3.38
Naphthalene	TO-15 Mod.	4.35
2-Methylpentane	TO-15 Mod.	2.9
Isopentane	TO-15 Mod.	2.42
2,3-Dimethylpentane	TO-15 Mod.	3.38
2,2,4-Trimethylpentane	TO-15 Mod.	3.86
Indene	TO-15 Mod.	3.86
Indan	TO-15 Mod.	3.86
Thiophene	TO-15 Mod.	2.74
2-Propanol	TO-15 Mod.	1.93

Notes

(1) The final quantitation limit (QL) is adjusted to reflect the initial pressurization step, dilution required to bring target analyte levels into the calibration range, and/or minimize matrix interferences

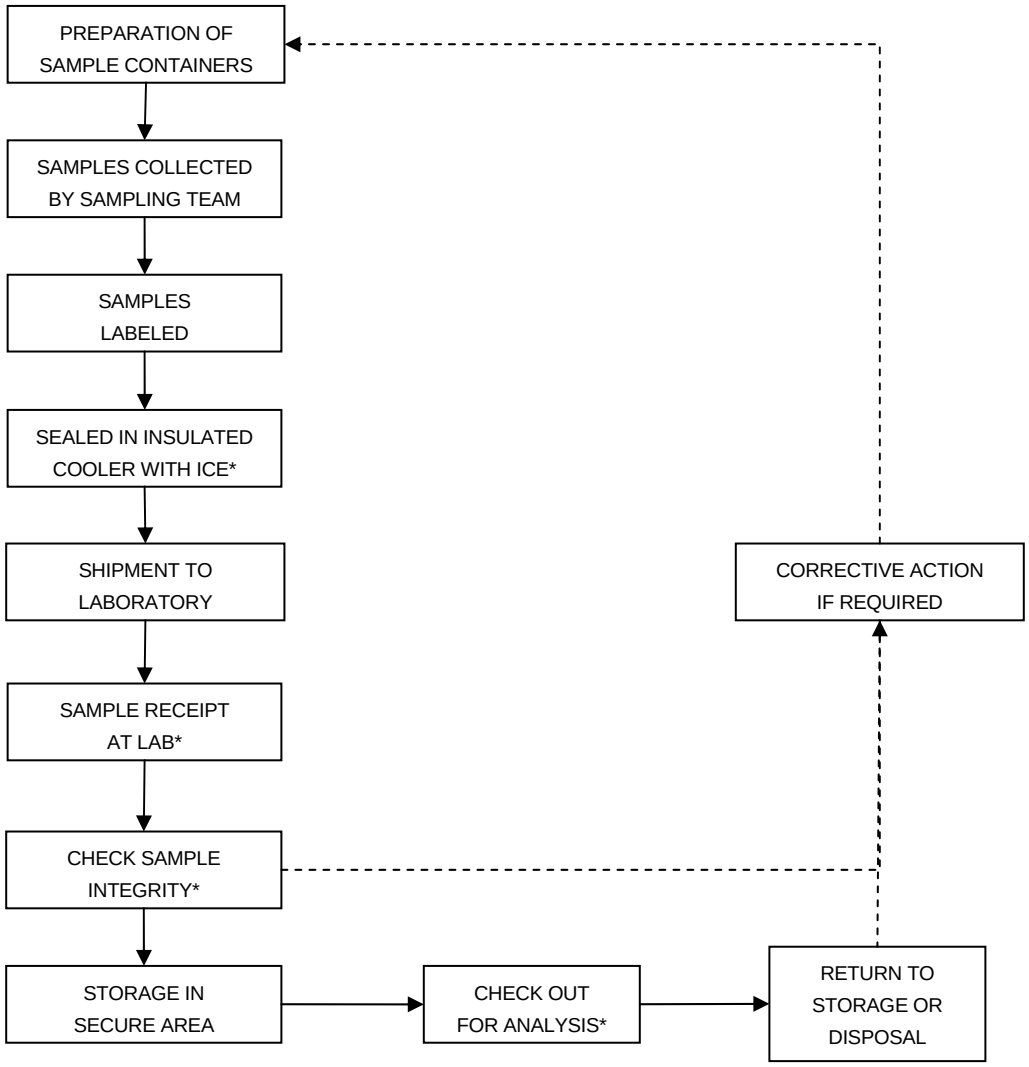
Final QL = QL * DF, DF was assumed to be 1.61 for a 6-L Canister, with 5 in. Hg Final Canister Pressure.

Table 8-1
Field And Character Lengths For Disk Deliverable
Far Rockaway Former Manufactured Gas Plant, Far Rockaway, New York

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)	5	Character
Method Detection Limit	13	Numeric
Method Code	8	Character
Lab Code	6	Character

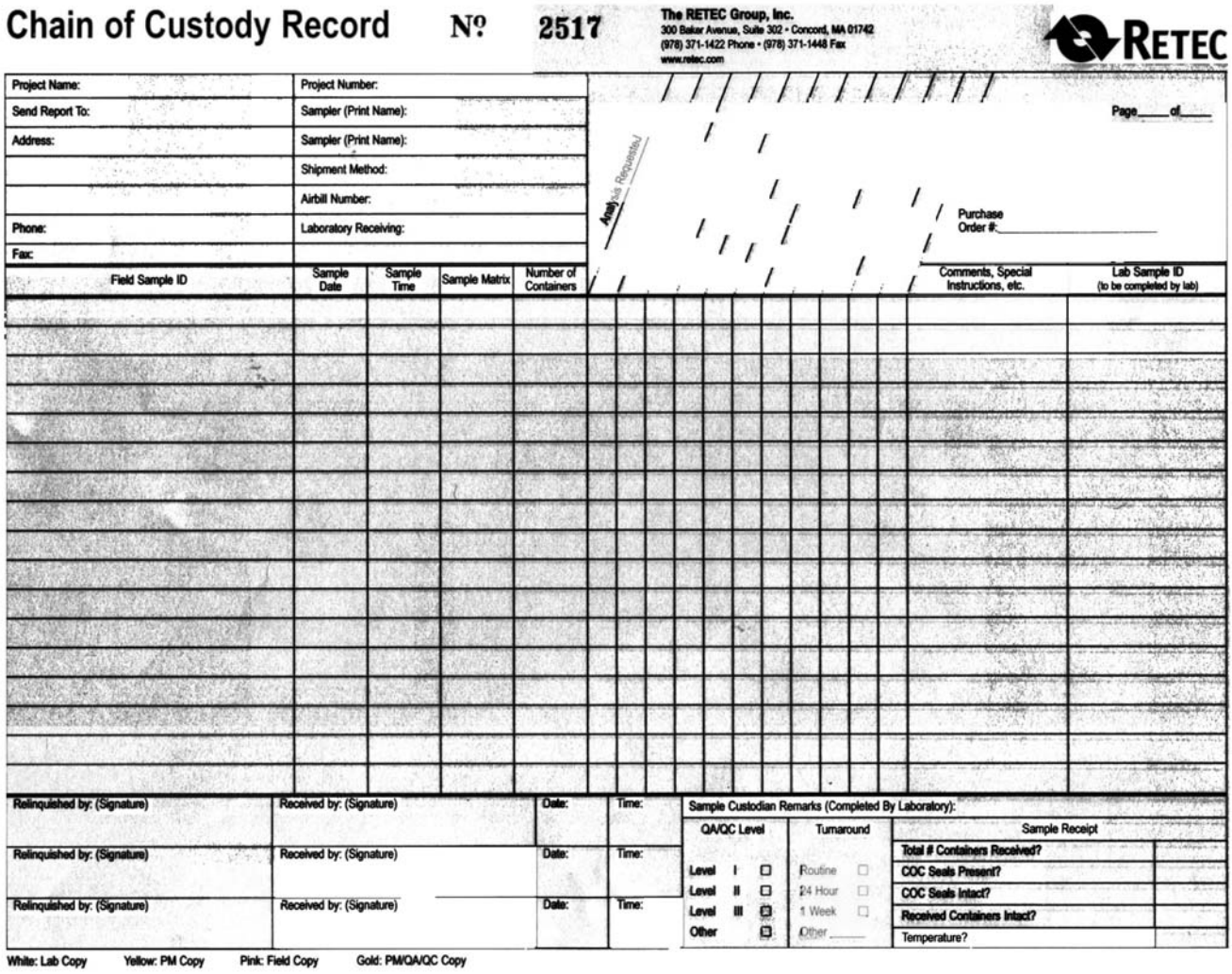
Figures

Figure 5-1 Sample Custody Flowdown



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

Figure 5-2 Chain-Of-Custody Record



Chain of Custody Record № 2517

The RETEC Group, Inc.
300 Baker Avenue, Suite 302 • Concord, MA 01742
(978) 371-1422 Phone • (978) 371-1448 Fax
www.retec.com

RETEC

Project Name:	Project Number:
Send Report To:	Sampler (Print Name):
Address:	Sampler (Print Name):
	Shipment Method:
	Airbill Number:
Phone:	Laboratory Receiving:
Fax:	

Page ____ of ____

Analysis Requested

Purchase Order #: _____

Field Sample ID	Sample Date	Sample Time	Sample Matrix	Number of Containers	Comments, Special Instructions, etc.	Lab Sample ID (to be completed by lab)

Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:
Relinquished by: (Signature)	Received by: (Signature)	Date:	Time:

Sample Custodian Remarks (Completed By Laboratory):

QA/QC Level		Turnaround		Sample Receipt	
Level I	☐	Routine	☐	Total # Containers Received?	
Level II	☐	24 Hour	☐	COC Seals Present?	
Level III	☒	1 Week	☐	COC Seals Intact?	
Other	☐	Other ____		Received Containers Intact?	
				Temperature?	

White: Lab Copy Yellow: PM Copy Pink: Field Copy Gold: PM/QA/QC Copy

Figure 12-1 Corrective Action Request

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. FOLLOW-UP:

CORRECTIVE ACTION VERIFIED BY: _____

DATE:_____

Appendix B

Site-Specific Health and Safety Plan

ENSR | AECOM

Prepared for:
KeySpan Corporation
175 East Old Country Road
Hicksville, New York 11801

Site-Specific Health and Safety Plan

Order on Consent D1-0001-99-05
NYSDEC Site Number 2-41-032

Far Rockaway Former Manufactured Gas Plant Site
1200-1224 Brunswick Avenue
Far Rockaway, New York

On-Site Emergency Phone Numbers	
Fire:	911
Police:	911
Ambulance:	911
For more emergency numbers and directions to the hospital, turn to page 7-1	

The RETEC Group, Inc.
Date: June 2007
Document No.: KED04-20370

Merged with ENSR in 2007
RETEC

Prepared for:
KeySpan Corporation
175 East Old Country Road
Hicksville, New York 11801

Site-Specific Health and Safety Plan

Order on Consent D1-0001-99-05
NYSDEC Site Number 2-41-032

Far Rockaway Former Manufactured Gas Plant Site
1200-1224 Brunswick Avenue
Far Rockaway, New York

Neeraj Ghai /mvc

Prepared By: Neeraj Ghai

Reviewed By: Jennifer L. Atkins

The RETEC Group, Inc.
Date: June 2007
Document No.: KED04-20370

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ANNUAL HEALTH AND SAFETY PLAN CHECKLIST
(For Verification Purposes Only)

Project Number: KED04-20370	**Date: KED04-20370**
Client: KeySpan Corporation	**Verified by:**
Site: Far Rockaway Former Manufactured Gas Plant Site	

The purpose of this checklist is to guide and document the annual review of all RETEC Site-Specific Health and Safety Plans (HASPs) and determine whether amendment of the HASP is necessary. The project manager must ensure this checklist is completed annually.

Please make sure that you verify compliance with the following items:

Has the generic RETEC HASP been modified since issuance of this site-specific HASP? Y ☐ N ☐

If yes, the HASP must be amended using the updated format.

All site personnel are current for:

Training Requirements (Section 1.3) ☐
Medical Monitoring Requirements (Section 1.4) ☐
Fit-Testing Requirements (Section 1.5) ☐

The following items are accurate:

Emergency Telephone Numbers Verified & Posted (Section 7) ☐
Hospital Route Verified & Posted (Section 7) ☐
Material Safety Data Sheets Included (Appendix G) ☐

If any of these items are changed, the HASP must be amended.

The following items are in place on site:

Emergency Telephone Numbers Posted (Section 7) ☐
Hospital Route Posted (Section 7) ☐
Appendix E Notice Posted (Section 1.7) ☐
Hazard Communication Program Material Posted (Section 1.8) ☐
Appropriate PPE Available (Section 3) ☐
Work Zones Established (Section 5.1) ☐
Appropriate Signage in Place (Section 5.1) ☐
Appropriate Decontamination Equipment and Procedures in Place (Section 6.6) ☐
Evacuation Routes Established (Section 7.6) ☐

Reread HASP Section 2 and referenced sections:

Are there changes in on-site activities? Y ☐ N ☐
Are there changes in hazards at the site? Y ☐ N ☐

If yes to either question, the HASP must be amended.

Signature _____
Name, Title

Note: ( ) Location in HASP
This completed verification sheet should be inserted at the front of all copies of the HASP on an annual basis.

HEALTH AND SAFETY PLAN AMENDMENT RECORD

Client: KeySpan Corporation		
Project No.: KED04-20370		
Project Manager: Pete Cox		
Site Safety and Health Officer: Jennifer Koch		
Amendment No.	**Date**	**Description**

NOTE: See HASP Amendments (Appendix A) for Complete Description

1.0 Introduction

This document describes the health and safety protocols developed for the KeySpan Corporation, Far Rockaway Former MGP Site, in Far Rockaway, New York. This plan was developed to protect ENSR Corporation (d/b/a The RETEC Group, Inc. [RETEC]) personnel and make others involved with the project (subcontractors directly contracted by RETEC, visitors, and the public) aware of known or suspected health and safety hazards. General site information is summarized in Table 1-1. Background information pertaining to site history and general hazards is listed in Table 1-2.

This is an "evergreen" document, so specific sections of this plan should be changed or revised when additional information is received or when conditions at the site change. Any changes or revisions to this plan will be made by a written amendment, which will become a permanent part of this plan and placed in Appendix A. Amendments must be approved by a RETEC Environmental Health and Safety (EHS) coordinator prior to implementation.

1.1 Site safety plan acknowledgment and acceptance

The project manager or site safety and health officer (SSHO) shall be responsible for informing all individuals assigned to work on the site, or visit the site beyond the clean/support zone, of the contents of this plan and ensuring that each person signs the Site Safety Plan Acknowledgment Form in Appendix B. By signing the Site Safety Plan Acknowledgment Form, individuals recognize the site health and safety hazards, known or suspected, and will adhere to the protocols required to minimize exposure to such hazards.

Additionally, all personnel visiting the site who do not visit the site beyond the clean/support zone must sign the visitor's log in Appendix C.

1.2 Site health and safety meetings

A pre-work meeting addressing site-specific EHS issues shall be held on the first day of mobilization to the site and prior to the commencement of any work activities. Mandatory attendance is required for all personnel assigned to the site. At the conclusion of the meeting, personnel are to sign the Site Safety Plan Acknowledgment Form in Appendix B, indicating their attendance and understanding of the health and safety protocols. As additional personnel are assigned to the site, it is the responsibility of the project manager and/or SSHO to ensure that new personnel are briefed on health and safety protocols and that they also have reviewed and signed the Site Safety Plan Acknowledgment Form.

Additional EHS tailgate meetings will be held on a daily basis. These meetings shall be conducted to inform all personnel of changing site conditions, to review the Safety Task Analysis Review (STAR) Form (Appendix H-8), to understand any near misses and "lessons learned," to present pertinent site safety topics, and to address any worker health and safety concerns. The SSHO will complete the Site Safety Meeting form in Appendix D indicating the date, time, topics discussed, and personnel in attendance at all health and safety meetings. The STAR Form (Appendix H-8) may be used in place of the Site Safety Meeting Form if signed by all site personnel.

1.3 Training requirements

All personnel assigned to work on this site beyond the support zone must have successfully completed 40 hours of Training for Hazardous Waste Site Work, in accordance with Occupational Safety Health Act (OSHA) 29 CFR 1910.120(e)(3), and be current with their 8-hour Refresher Training, in accordance with OSHA 29 CFR 1910.120(e)(8).

Personnel managing or supervising work on site must also have successfully completed 8 hours of Manager/Supervisor Training, meeting the requirements of 29 CFR 1910.120(e)(4). Documentation of RETEC staff training is maintained via the RETEC H&S Tracker database. For subcontractors, documentation of OSHA training is required prior to personnel being permitted to work on site.

Any exceptions to the training requirements will be explicitly specified either in this Health and Safety Plan (HASP) or through a HASP amendment.

1.4 Medical monitoring requirements

All personnel assigned to work on this site beyond the support zone must be enrolled in a medical surveillance program meeting the requirements of OSHA 29 CFR 1910.120(f). Personnel must have successfully passed an occupational physical during the past 12 months (24 months if approved by RETEC Corporate EHS), be medically cleared to work on hazardous waste sites, and be capable of wearing appropriate personal protective equipment (PPE), including any respiratory protection.

Any exceptions to the medical monitoring requirements will be explicitly specified either in this HASP or through a HASP amendment.

1.5 Fit testing requirements

All personnel assigned to work on this site beyond the support zone, and who must wear a respirator, must be familiar with the requirements in RETEC's respiratory protection program and the OSHA respiratory standard (29 CFR 1910.134). All personnel who are required to wear respiratory protection must have successfully passed a respirator fit test within the past 12 months. Personnel who do not have a current fit test are prohibited from working in areas where any potential exists for exceeding OSHA Permissible Exposure Limits. Documentation of a successful respirator fit test for the appropriate type of respirator needed for work on this specific site (half-face or full-face air-purifying respiratory [APR] or supplied air) will be required. The project manager or SSHO is to ensure that the respirator being worn by personnel is the same size, make, and model as that specified on any respirator fit test records from the past 12-month period.

1.6 Project staff responsibilities

The project manager or SSHO is responsible for overall project administration and for coordinating health and safety protocols and procedures for all personnel on site at all times. All applicable United States Environmental Protection Agency (U.S. EPA), OSHA, state, and local health and safety requirements, shall be maintained throughout the course of the project. This HASP covers all personnel on site; however, each subcontractor is also responsible for the health and safety of its employees. If there is a dispute with regards to health and safety, the following procedures shall be followed:

- The project manager or SSHO shall attempt to resolve the issue independently with a complete written follow-up to RETEC's Corporate EHS Director, or
- If the issue cannot be resolved, the project manager shall consult the RETEC Corporate EHS Director immediately, and the specific task or operation in dispute shall be discontinued until the issue is resolved.

Any person who observes health and safety problems or infractions should immediately report the problem or infraction to appropriate personnel.

1.7 Access to employee exposure and medical records

OSHA provides employees and their designated representatives a right-of-access to relevant exposure and medical records (29 CFR 1910.20). The “Notification of Access to Employee Exposure and Medical Records” (Appendix E) is to be made accessible to all employees involved with RETEC field operations.

1.8 Hazard communication

RETEC will advise everyone assigned to this site of the hazards associated with working on site and the methodology to be utilized to mitigate those hazards and prevent exposures. This information will be presented to personnel prior to initiation of any field activities.

The following information regarding hazardous materials will be presented to site personnel per RETEC's Hazard Communication Program:

- Material Safety Data Sheets (MSDS) located in Appendix G
- Chemical/physical hazards
- Appropriate PPE for protection from exposure
- Labeling

1.9 Behavior-based safety

RETEC utilizes a behavioral safety process rooted in periodic observation and feedback (O&F). This approach seeks to encourage safe behavior through 1) monitoring work activities to confirm safe practices, 2) providing immediate feedback to motivate safe behavior, and 3) taking preemptive actions to correct observed shortcomings before they might result in an accident or injury. These corrective actions focus on uncovering and addressing the root causes of unsafe behavior.

The O&F process consists of the following:

Certain activities deemed most critical to safe performance are targeted for periodic observation on an O&F checklist. Checklists are included in RETEC O&F booklets.

O&F checklists will be completed at a frequency of one per week.

- Assigned observers record whether the targeted activities are being performed “100% Safe” or note specific incidents of unsafe behavior (without identifying individuals).
- Observers provide immediate feedback, either commending safe performance or correcting unsafe behaviors.
- Completed O&F checklists are submitted to the local office EHS Coordinator.

More detail on RETEC’s safety O&F process can be found in the document entitled BEST: Employees’ Guide to Optimizing Environmental, Health and Safety Performance found on the RETEC EHS Forum Database and in the RETEC O&F booklet.

Table 1-1 General Information

Client: KeySpan Corporation	**Proj. No.:** KED04-20370
Site Name: Far Rockaway Former Manufactured Gas Plant Site	
Site Location: Far Rockaway, New York	
Description of Field Activities: Soil and groundwater sampling, aquifer slug testing, soil vapor sampling, indoor air sampling, and well installation via hollow stem auger rig or geoprobe.	
Dates of Field Activities: Summer of 2007	
Project Manager: Peter Cox	**Project Manager Telephone Number: 978-371-1422**
Site Manager: Julia Shackford	**Office: Concord, MA**
Designated SSHO: Jennifer Koch	
The following EHS Program requirements have been checked on the RETEC EHS Tracker database for each employee to work on site: ☐Completed OSHA 40-Hour HAZWOPER Training ☐Current OSHA 8-Hour HAZWOPER Refresher (within last 12 months) ☐Current Medical Surveillance Examination (within last 12 months) ☐Current Respirator Fit-test (within last 12 months) ☐Current First Aid Training (within last 2 years) ☐Current CPR Training (within last 12 months) Note: RETEC employees may not enter a site beyond the clean/support zone unless the training/qualifications listed above are current. Documentation and further information may be obtained from the RETEC Monroeville office from Tina McHugh, EHS Administrative Manager, at (412) 380-0140.	

Table 1-2 Background Information

Overall Hazard Is:			
High: ☐	**Low:** ☒	**Moderate:** ☐	**Unknown:** ☐
Facility Description: The Far Rockaway Former MGP Site is located between B12th Street and Minton Avenue, on the north side of Brunswick Avenue. The Site address is 1200-1224 Brunswick Avenue and it occupies Section 59/Block 15529/Lots 102, 105, 110, and 115 according to the Far Rockaway Tax Department. The Site is approximately one-acre in size and is currently used by three separate tenants for warehousing, shipping, and distribution operations. The MGP operated from the mid-1890's to 1909.			
Status: Residential/commercial			
Unusual Features: (containers, dikes, buildings, power lines, terrain, etc.): Active railroad tracks to the south west.			
Site History (worker injury, complaints, regulatory agency action): The former MGP included a building which housed coal bins, a purifier, a gas generator, and a 75,000 cubic foot (cf) gas holder. Based on Sanborn Fire Insurance Maps, it appears that the gas holder was demolished between 1950 and 1981.			
Waste Types:			
Liquid: ☒	**Solid:** ☒	**Sludge:** ☐	**Gas:** ☐
Characteristics:			
Corrosive: ☐	**Ignitable:** ☐	**Volatile:** ☒	**Toxic:** ☒
Reactive: ☐	**Unknown:** ☐	**Radioactive:** ☐	**Other (name):** ☒ **MGP Residuals**
Hazards posed by site activities (attach Job Hazard Analysis in Appendix H-9):Working near heavy equipment (Geoprobe, drill rig), slips, trips, falls, vehicle traffic, noise, dermal contact and inhalation of MGP residuals, heat stress, hand safety, working near railroad tracks.			
Unusual Hazards: Curiosity / interference of local population.			

2.0 Health and safety risk analysis

This section identifies the specific hazards associated with site operations and presents an analysis of documented or potential chemical hazards that exist at the site. Every effort must be made to reduce or eliminate these hazards. Hazards that cannot be eliminated must be abated by use of engineering controls and/or PPE.

2.1 Hazard analysis requirements

2.1.1 Job hazard analysis

A Job Hazard Analysis (JHA) Form, located in Appendix H-9, is a basic tool that allows personnel to think through the steps involved in each job and discuss how to complete the job safely prior to mobilizing to the field. Each JHA accomplishes the following:

- Breaks a job down into individual steps
- Lists the safety hazards in each step
- Lists appropriate precautions to be followed for each hazard and safety resources (equipment, permits, etc.) to be obtained and coordinated

Completion of a JHA requires thoroughness and attention to detail, as well as input of all those who participate in the job. As part of this HASP and prior to commencement of work, an initial JHA will be completed by the SSHO or field task manager, along with other personnel conducting the activity, and reviewed by the project manager or local office EHS Coordinator. This JHA will be modified as job scope or conditions change. The completed JHA for this project is included in Appendix I. If additional tasks are added to the scope of work in the field, the JHA form in Appendix H-9 will be completed and approved by the SSHO prior to the commencement of additional tasks.

2.1.2 Safety task analysis review (STAR)

A STAR Form, located in Appendix H-8, will be completed daily as a more specific supplement to the pre-project JHA. Specific tasks for the day are listed, potential hazards are identified, and controls to mitigate hazards are identified. Team members sign the form, which can also serve to document the daily safety meeting.

2.2 Precautions when working around heavy equipment

The following precautions will be taken to minimize heavy equipment hazards:

- All equipment must have back-up alarms.
- All equipment must be equipped with roll-over protection structures (ROPS) meeting the minimum performance criteria established by OSHA in 29 CFR 1926.1001 and 1929.1002.
- Personnel must make eye contact with the operator before approaching the equipment and remain safely outside the swing radius of the equipment.
- Personnel must wear orange visibility vests in addition to standard Level D PPE.
- Personnel must never stand on track-hoe tracks to communicate with the operator.
- Operators must be aware of personnel in the area and use proper hand signals before maneuvering.

- Operators must wear hard hats when operating machines and when going to and from their equipment.
- Operators must wear seat belts at all times during equipment operation.
- Operators must use spotters and be cautious when maneuvering equipment within 15 feet of overhead power lines and utility pole guy wires, and maintain safe distances at all times (greater than 10 feet).
- Provisions will be made to prevent the unauthorized start-up of equipment when personnel leave the site at the end of the shift, such as battery ignition locks.

2.3 General site hazards

2.3.1 Lighting

Work areas must have adequate lighting for employees to see to work and identify hazards (5-foot candles minimum, comparable to a single 75- to 100-watt bulb). Personnel should have flashlights available in all indoor or dimly lighted areas for use in the event of a power failure, or if working outdoors after daylight hours. Applicable OSHA standards for lighting (29 CFR 1910.120(m)) shall apply.

2.3.2 Electrical power

All electrical power must have a ground fault circuit interrupter as part of the circuit, including generators. All equipment must be suitable and approved for the class of hazardous atmosphere in which it is being used. Applicable OSHA standards for electric power (29 CFR 1910 Subpart S) shall apply.

2.3.3 Lockout/tagout

Operations where the unexpected energization, or start-up of equipment, or release of stored energy could cause injury to personnel will be protected by the implementation of a lockout/tagout program meeting the requirements of 29 CFR 1910.147. See Section 11 of this HASP for more details.

Sites that have structural barriers preventing the equipment from being moved on to the tracks are not required to have these lockable disconnect switches. Fencing, ditches, and walls would be considered adequate structural barriers to equipment movement on the tracks.

2.3.4 Fall protection

Work site slip, trip, and fall accidents can result in serious injuries or fatalities. Procedures to help prevent these types of incidents will be implemented. Elevated work (above 4 feet) where a fall potential exists will be performed using appropriate ladders and/or fall protection (i.e., body harness, lifeline, etc.) Applicable OSHA standards for fall protection (29 CFR 1910.21 through 29 CFR 1910.32) shall apply. See Section 12 of this HASP for more details.

2.3.5 Drum handling

The movement, opening, and sampling of drums will be conducted in accordance with 29 CFR 1910.120(j). See Section 8 of this HASP for more details.

2.3.6 Cold stress

When the temperature falls below 40°F, cold stress protocols shall be followed. Employees must be supplied with adequate clothing to maintain core temperature. Cold stress is discussed in detail in Appendix F.

2.3.7 Heat stress

When the temperature exceeds 70°F and personnel are wearing personal protective clothing, a heat stress monitoring program shall be implemented. Employees shall have frequent break periods and access to drinking water. Heat stress is discussed in detail in Appendix F.

2.3.8 Eye wash protection

All operations involving the potential for eye injury, splash, etc., must have approved eye wash units locally available as per 29 CFR 1910.151(c).

2.3.9 Hearing protection

When the noise level of any operation exceeds the 8-hour Time Weight Average (TWA) of 85 decibels (dB), a hearing protection program meeting the requirements of 29 CFR 1910.95 will be implemented.

2.3.10 Fire prevention

Operations involving the potential for fire hazards shall be conducted in a manner that minimizes the risk. Non-sparking tools and fire extinguishers shall be used or available as required. Sources of ignition shall be removed. When necessary, explosion-proof instruments and/or bonding and grounding will be used to prevent explosion and/or fire.

2.3.11 Utilities

All underground utility hazards shall be identified and/or inspected prior to conducting operations involving potential contact.

2.3.12 Confined space entry

If any operation is conducted in an area classified as a permit-required confined space by OSHA, a “Confined Space Entry Permit” will be completed and all applicable procedures meeting the requirements of 29 CFR 1910.146 will be implemented. See Section 10 of this HASP for more details.

2.3.13 Excavation/trenching

Any excavation/trench greater than units of 4 feet deep in which personnel must enter will be designed and constructed per all applicable requirements of 29 CFR 1926, Subpart P. See Section 9 of this HASP for more details.

2.3.14 Overhead utilities and power lines

Anytime work is performed in the vicinity of overhead utilities, including power lines, a spotter will be assigned to help operators maneuver equipment in and around the wires.

The following distances will always be maintained around high-tension wires:

- For lines rated 50 Kilo Volt (kV) or below, minimum clearance between the lines and any part of the crane or load shall be 10 feet.
- For lines rated over 50 kV, minimum clearance between the lines and any part of the crane or load shall be 10 feet plus 0.4 inch for each 1 kV, over 50 kV, or twice the length of the line insulator, but never less than 10 feet.

- In transit with no load and boom lowered, the equipment clearance shall be a minimum of 4 feet for voltages less than 50 kV, 10 feet for voltages over 50 kV, up to and including 345 kV, and 16 feet for voltages up to and including 750 kV.

In addition, all utility pole "guy-wire" support cables will be identified, marked, and/or barricaded prior to work. Unintended equipment or vehicle contact with these guy wires may result in utility poles or power lines falling on personnel or equipment.

2.3.15 Hot work

Prior to initiation of any hot work, a "Hot Work Permit" (Appendix H-6) must be approved by a client representative and the SSHO. Client forms meeting the substantive requirements of the RETEC permit form may be used in place of Appendix H-6.

2.3.16 Severe weather and lightning

The SSHO will monitor local media resources to identify possible severe weather situations at the project site. Site work may be delayed, postponed, or cancelled due to severe weather based on the project manager's discretion. In the event of a weather emergency, the site will be evacuated in accordance with Section 7 of this document.

Lightning can strike up to a distance of 10 miles, but thunder can only be heard at a distance of 8 miles. Therefore, if site personnel working outdoors hear thunder and/or see lightning, work will be stopped and personnel will move to an indoor location. If indoor facilities are not available, personnel will move inside of passenger vehicles such as cars and pickups. During a thunderstorm with thunder/lightning, avoid trees/poles, standing water, high areas, and metal structures (fences, scaffolding, etc.). Work will resume 30 minutes following the final observance of thunder and/or lightning.

2.3.17 Faulty tools and equipment

The SSHO will ensure that equipment is properly inspected and tested to reduce hazards posed by faulty tools and equipment. An inspection checklist for various types of equipment used on RETEC sites is included in Appendix H-10.

2.4 Chemical hazards

Previous sampling and analytical data, or previous site history and investigation, have indicated that the chemical hazards listed in Table 2-1, either documented or suspected, exist at the site. Detailed hazard information for these chemicals is available through Material Safety Data Sheets (MSDS) in Appendix G. Workers will use appropriate PPE if exposure to a known or suspected contaminated medium is likely.

2.4.1 Chemicals potentially used

In addition to the site contaminants, chemical products will be purchased for use at the site. These chemicals may include diesel fuel, gasoline, bentonite, Portland cement, silica sand, and decontamination materials such as isopropyl alcohol, n-hexane, and soaps (e.g., Alconox). Other materials may be purchased as needed. MSDSs required by OSHA will be obtained for chemical products used at the site. Copies of the MSDSs will be maintained at the site for worker review.

2.4.2 Sample preservatives

Preservatives including hydrochloric acid, nitric acid, sulfuric acid, zinc acetate, and sodium hydroxide may be encountered during sampling activities. Safe and proper handling techniques are to be used when collecting samples. Individuals should work upwind from the open sample keeping the bottle away from the breathing

zone (approximately one arm's length) to minimize potential exposure. Personnel should be aware of any changes in wind direction that may also affect potential for exposure to vapors. Gloves and safety glasses will always be worn when collecting samples. Sample vessel seals should be immediately replaced after sample is gathered.

Should any sample preservatives come in contact with skin, the exposed area should be thoroughly irrigated with fresh water immediately.

Table 2-1 Chemical Hazards

Contaminant	PELa	TLVb	RELc	STELd	IDLHe	Odor Threshold	IPf
Benzene (Ca)	1ppm	0.5 ppm	0.1 ppm	5 ppm	500 ppm	0.78-160 ppm	9.24 eV
Coal Tar Pitch Volatiles (Ca)	0.2 mg/m^3	0.2 mg/m^3	0.1 mg/m^3	NA	80 mg/m^3	NA	NA
Cyanide	5 mg/m^3	NA	NA	NA	NA	NA	NA
Ethylbenzene	100 ppm	100 ppm	100 ppm	125 ppm	800 ppm	0.092-0.60 ppm	8.76 eV
Naphthalene	10 ppm	10 ppm	10 ppm	15 ppm	250 ppm	0.0095 – 0.64 ppm	8.12 eV
Phenol	5 ppm	5 ppm	5 ppm	15.6 ppm	250 ppm	0.0045 – 1	8.50 eV
Toluene	200 ppm	50 ppm	100 ppm	150 ppm	500 ppm	0.024 – 69 ppm	8.82 eV
Xylene (o-,m-,p-)	100 ppm	100 ppm	100 ppm	150 ppm	900 ppm	0.081 – 5.4 ppm	8.44 eV

Note:

[a] OSHA Permissible Exposure Limit (PEL) (8-hour time weighted average [TWA])

[b] American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value (TLV) (8-hour TWA)

[c] National Institute for Occupational Safety and Health (NIOSH) Recommended Exposure Limit (REL) (8-hour TWA)

[d] Short-Term Exposure Limit (15-minute TWA that should not be exceeded at anytime during the work day)

[e] Immediately Dangerous to Life & Health

[f] Ionization Potential

C = Ceiling Limit (Concentration that should not be exceeded during any part of the working exposure)

CA = Carcinogenic

mg/m^3: milligrams per cubic meter

2.5 Hazardous plants and animals

This section provides an overview of some of the major plant and animal hazards in the United States (U.S.) and information on identification and prevention of injury or illness from these hazards.

2.5.1 Hazardous plants

Common poisonous plants in the U.S. that cause allergic reactions include 1) poison ivy, 2) poison oak, and 3) poison sumac. Plant descriptions and photographs to aid in the identification of these plants are shown on Figure 2-1.

Figure 2-1 Hazardous Plant Identification Guide

Poison Ivy • Grows in West, Midwest, Texas, East. • Several forms – vine, trailing shrub, or shrub. • Three leaflets (can vary 3-9). • Leaves green in summer, red in fall. • Yellow or green flowers. • White berries.	 
Poison Oak • Grown in the East (NJ to Texas), Pacific Coast. • 6-foot tall shrubs or long vines. • Oak-like leaves, clusters of three. • Yellow berries.	 
Poison Sumac • Grows in boggy areas, especially in the Southwest and Northern states. • Shrub up to 15 feet tall. • Seven to 13 smooth-edged leaflets. • Glossy pale yellow or cream-colored berries.	 

If you have been exposed to poison ivy, oak, or sumac, act quickly, because the toxin in the plants penetrates the skin within minutes. If possible, stay outdoors until you complete the first two steps:

- Cleanse the exposed skin with generous amounts of isopropyl alcohol.
- Wash the skin with water.
- Take a regular shower with soap and warm water. Do not use soap until this point because it will pick up the toxin from the surface and move it around.
- Wash clothes, tools, and anything else that may have been in contact with the toxin, with alcohol and water. Be sure to wear hand protection during that process.

Signs and symptoms of exposure include redness and swelling that appears 12 to 48 hours after exposure. Blistering and itching will follow. If you have had a severe reaction in the past, you should see a physician right away. Otherwise, according to the Federal Drug Administration (FDA), there are quite a few effective over-the-

counter products to help with symptoms, including Cortaid and Lanacort, baking soda, Aveeno oatmeal bath, and calamine lotion.

2.5.2 Bees and wasps

On RETEC sites, most encounters with bees and wasps occur when nests built in well casings or excavation areas are disturbed. Before opening a well casing, take a few moments to observe whether or not insects are entering or exiting. If they are flying to and from the casing, avoid it if possible. If you must be in an area where disturbing a nest is likely, be sure to wear long pants and a long-sleeved shirt. Stinging insects fly around the top of their target, so if you get into trouble, pull a portion of your shirt over your head and run away.

If you get stung, look for a stinger, and, if present, remove it within 15 seconds of the sting. Several over-the-counter products or a simple cold compress can be used to alleviate the pain of the sting. If the sting is followed by severe symptoms, or if it occurs in the neck or the mouth, seek medical attention immediately because swelling could cause suffocation.

If you need to destroy a nest, consult with the site project manager and your EHS Coordinator first. Commercially available stinging insect control aerosols are very effective, but could potentially contaminate the well. Once the nest is destroyed, fine mesh may be applied over the exit and entry points of a well casing to prevent re-infestation.

2.5.3 Ticks

Ticks in North America can be carriers of several diseases, including Lyme Disease, Rocky Mountain Fever, and ehrlichiosis.

Limiting exposure to ticks reduces the likelihood of infection when you're exposed to tick-infested habitats. Here are some measures that you can take to prevent tick exposure:

- Remove leaf litter and brush in areas where you will be working prior to tick season.
- Wear light colored clothing so that ticks are visible.
- Tuck your pant legs into your socks.
- Apply repellents to discourage tick attachment.
- Promptly inspect your body and remove crawling or attached ticks when you leave a tick-infested area.

If a tick bites you, use the following procedure to remove it:

- Use fine-tipped tweezers or shield your fingers with tissue, paper towel, or rubber gloves.
- Grasp the tick as close to the skin surface as possible and pull upward with steady, even pressure. Do not twist or jerk the tick; this may cause mouthparts to break off and remain in the skin.
- Do not squeeze, crush, or puncture the body of the tick because its fluids may contain infectious organisms.
- Do not handle the tick with bare hands because infectious agents may enter through mucous membranes or breaks in the skin.
- After removing the tick, thoroughly disinfect the bite site and wash your hands with soap and water.
- You may wish to save the tick for identification in case you become ill within 2-3 weeks. Place the tick in a zip lock bag in the freezer, and mark the bag with the date of the bite.

2.5.4 Mosquitoes

Mosquitoes in the U.S. have been known to carry West Nile Virus, St. Louis encephalitis, and Dengue Fever. To avoid mosquito bites:

- Apply insect repellent containing DEET (N,N-diethyl-meta-toluamide) when you're outdoors.
- Read and follow the product directions whenever you use insect repellent.
- Wearing long-sleeved clothes and long pants treated with repellent to further reduce your risk, as will staying indoors during peak mosquito feeding hours (dusk until dawn).
- Limit the number of places available for mosquitoes to lay their eggs by eliminating standing water sources from around the work area.
- Check to see if there is an organized mosquito control program near the project site. If no program exists, work with your local government officials to establish a program.

2.5.5 Spiders

The most dangerous spiders to humans in North America are black widows and brown spiders (also known as brown recluse or fiddleback spiders). A guide to identifying these spiders is presented in Figure 2-2.

Figure 2-2 Hazardous Spider Identification Guide

Black Widow Spider • Abdomen usually shows hourglass marking. • The female is 3-4 centimeters in diameter. • Have been found in well casings and flush-mount covers. • Not aggressive, but more likely to bite if guarding eggs. • Light, local swelling and reddening of the bite are early signs of a bite, followed by intense muscular pain, rigidity of the abdomen and legs, difficulty breathing, and nausea. • If bitten, see physician as soon as possible.	
Brown Spiders (Recluse) • Central and South U.S., although in some other areas, as well. • ¼-to-½-inch-long body, and size of silver dollar. • Hide in baseboards, ceiling cracks, and undisturbed piles of material. • Bite either may go unnoticed or may be followed by a severe localized reaction, including scabbing, necrosis of affected tissue, and very slow healing. • If bitten, see physician as soon as possible.	

2.5.6 Bird droppings

Large populations of roosting birds may present a disease risk. The most serious health risks arise from disease organisms that grow in the accumulations of bird droppings, feathers, and debris under a roost,

especially if roosts have been active for years. Among the fungal diseases associated with bird droppings, the two most common are Histoplasmosis and Cryptococcosis.

If you are working in an area where large quantities of droppings are present, follow certain precautions to minimize the risk from disease organisms in the droppings:

- Wear a respirator that can filter particles as small as 0.3 microns, such as a HEPA filter.
- Wear disposable protective gloves, hat, coveralls, and boots if you will be in close contact.
- Wash or shower at the work site after cleanup, if possible.
- Modify the structure or use methods to prevent birds from reestablishing the roost.

2.5.7 Snakes

Venomous snakes native to the U.S. include rattlesnakes, copperheads, and cottonmouths (water moccasins). Precautions to lower the risk of being bitten:

- Leave snakes alone. Many people are bitten because they try to kill a snake or get a closer look.
- Stay out of tall grass unless you wear thick leather boots, and remain on paths as much as possible.
- Keep hands and feet out of areas that you can't see.

If you encounter a snake, walk around it, giving it a berth of about 6 feet.

If someone is a snakebite victim, the following first aid should be administered:

- Wash the bite with soap and water.
- Immobilize the bitten area and keep it lower than the heart.
- Get medical help immediately.

There is a lot of false advice about how to treat snakebites. Do not ice or cool the bite, apply a tourniquet, or cut into the wound!

2.5.8 Chiggers

Chigger bites are from the tiny, six-legged larvae of the chigger mite, which are so small they can't be seen without a magnifying glass. Chiggers hide out in the grass, weeds, and vegetation, and then bite their victim by inserting their mouthparts into a pore or hair follicle of the skin. Within 3 to 6 hours of exposure to a chigger, a small, inflamed welt will appear on the skin and will itch intensely. Itching can continue for a week or more, and if nothing is done to relieve itching, secondary infections may develop from scratching. Chiggers are not known to carry disease in the U.S.

If you have been working in a chigger-infested area, take these special precautions:

- Mow vegetation from the working area.
- Eliminate shade and moisture from the area.
- Wear high boots and pants made out of tightly woven fabric.
- Tuck your pants into your socks or boots.
- Wear an insect repellent that is applied to skin, clothing, and clothing openings.

- Bring a field chair to sit on—don't sit on the grass.
- Stick to roads and trails.

When you return from a chigger-infested area in the field, do the following:

- Wash your clothes in hot, soapy water. If you can't wash your clothes, put them in a sealed, plastic bag in your hotel room. Don't wear clothes until they are washed in hot water or exposed to hot sunshine.
- Take a hot bath or shower, and wash with soap numerous times to dislodge larvae.

If you are bitten, there are numerous over-the-counter treatments that a pharmacist can recommend, such as benzocaine, hydrocortisone, and calamine lotion. Treat the itching as soon as possible to prevent secondary infection from scratching.

2.5.9 Feral dogs

Feral dogs have shown up on several RETEC jobsites. Packs of feral dogs can be dangerous, so if you observe them on the site, call animal control immediately. If a dog approaches you, take the following steps to reduce your chances of being attacked:

- Don't run away or run past the dog.
- Remain calm. Don't scream. If you say anything, speak calmly and firmly. Avoid eye contact. Try to stay still until the dog leaves, or back away slowly until the dog is out of sight. Don't turn and run.
- If you fall to the ground or are knocked down, curl into a ball, placing your hands over your head and neck. Protect your face.

If a dog bites someone, take the following steps:

- Restrain the dog immediately, if it is safe to do so. The dog will have to be quarantined or tested for rabies.
- Check on the victim's condition. Call 911 if paramedic response is required.
- Call the EHS Department to arrange for medical treatment.

2.5.10 Rodent-borne diseases

Rodent infestation in the workplace has the potential to cause serious communicable diseases including hantavirus pulmonary syndrome and bubonic plague. The most common rodent-borne disease is hantavirus which may infect workers who inhale tiny droplets containing the virus when fresh rodent urine, droppings or nesting materials are stirred up.

Working conditions that my put workers at risk of hantavirus include:

- Contact with rodent feces or dried urine which may mobilize particles of these wastes into the air where they may be inhaled.
- Entry into rooms or warehouses that have been closed up and infested for extended periods.
- Activities that stir up dust which may mobilize hantavirus.

If working in areas of obvious rodent infestation, take the following precautions:

- Do not enter rooms or warehouses that have been closed up unless absolutely necessary.
- If work in closed up areas or areas with rodent infestation is necessary, contact professional exterminators to eliminate the infestation and clean up the location.
- If an exterminator is not available/possible, employees should clean up the infested area using the following steps:
  - When going into outbuildings or rooms that have been closed for an extended period, open them up and air out before cleaning.
  - Don an air purifying respirator equipped with HEPA P-100 cartridges and nitrile gloves before cleaning.
  - Don't stir up dust by sweeping up or vacuuming up droppings, urine or nesting materials.
  - Thoroughly wet contaminated areas with detergent or liquid to deactivate the virus. Most general-purpose disinfectants and household detergents are effective. However, a hypochlorite solution prepared by mixing 1 and 1/2 cups of household bleach in 1 gallon of water may be used in place of commercial disinfectant.
  - Once everything is wet, take up contaminated materials with a damp towel, then mop or sponge the area with disinfectant.
  - Spray dead rodents with disinfectant and flea repellent (to avoid bubonic plague), then double-bag and dispose in appropriate waste disposal system. Contact the local or state health department other disposal methods.
  - Finally, remove respirator and disinfect gloves before taking them off with disinfectant or soap and water. After taking off the clean gloves, thoroughly wash hands with soap and warm water.

If you experience hantavirus symptoms (fatigue, fever, and muscle aches) within 1 to 5 weeks of exposure to potentially affected rodents and their droppings, contact the Corporate EHS Department immediately.

3.0 Personal protective equipment

The following is a brief description of the PPE that may be required during various phases of the project. The U.S. EPA terminology for protective equipment will be used: Levels A, B, C, and D. A guide to the type of chemical protective clothing and respirator cartridges to be used for chemicals commonly encountered by RETEC is provided in Table 3-1.

Respiratory protective equipment shall be NIOSH-approved and use shall conform to OSHA 29 CFR 1910.134. All protective footwear shall comply with ANSI Z41 1999 I/75, C/75, PR as defined in the RETEC EHS Manual.

Table 3-1 RETEC PPE Selection Guide

Chemical Hazard	Glove Material	Coverall Material	Boot Material	Respirator Cartridge
Acids Hydrochloric Sulfuric	Butyl rubber	Saranex or Butyl rubber apron	Butyl rubber	Acid vapor
Coal Tar Polyisocyanate Naphtha	Nitrile rubber	Polycoated Tyvek	Nitrile rubber	Organic vapor
Creosote	Butyl rubber	Polycoated Tyvek	Butyl rubber	Organic vapor
Dry Particulates Metals Asbestos	Nitrile rubber	Tyvek	Tyvek	HEPA
Fuel Hydrocarbons Gasoline Diesel	Nitrile rubber	Polycoated Tyvek	Nitrile rubber	Organic vapor
Halogens, Aliphatic Carbon tetrachloride Ethylene dichloride	Teflon	Polycoated Tyvek	Nitrile rubber	Organic vapor
Halogens, Vinylic Vinyl chloride	Nitrile rubber	Polycoated Tyvek	Nitrile rubber	Organic vapor

Forsberg, K. and Mansdorf, S.Z., 1997. Quick Selection Guide to Chemical Protective Clothing, Third Edition. John Wiley & Sons, Inc.

3.1 Level A (MUST OBTAIN PRIOR APPROVAL FROM CORPORATE EHS)

Level A protection shall be used when:

- The hazardous substance requires the highest level of protection for skin, eyes, and the respiratory system

- Substances with a high degree of hazard to the skin are known or suspected
- Chemical concentrations are known to be above the Immediately Dangerous to Life and Health (IDLH) levels
- Biological hazards requiring Level A are known or suspected

Table 3-2 Level A PPE to Be Utilized (Check Appropriate PPE)

☐	Positive-pressure (pressure demand), full-face piece self-contained, or in-line breathing apparatus with escape/egress pack (OSHA/NIOSH-approved)
☐	Fully encapsulating chemical-resistant suit (selected for resistance to chemicals at the site) **Fabric Type:**
☐	Disposable chemical-resistant inner gloves
☐	Disposable chemical-resistant outer gloves **Material Type:**
☐	Chemical-resistant work boots with safety toe and puncture resistant sole (depending on suit boot construction, worn over or under suit boot) **Material Type:**
☐	Two-way radio communication (intrinsically safe)
☐	Retractable knife strapped to body for emergency egress from suit
☐	Hearing protectors (**REQUIRED** if site noise levels are greater than 85 dB based on an 8-hour TWA)
☐	Hard hat (under suit)
☐	Coveralls and/or long cotton underwear
☐	**Modifications:**

Note: Maximum distance personnel are allowed to travel from air source on an in-line system is 300 feet.

3.2 Level B (MUST OBTAIN PRIOR APPROVAL FROM CORPORATE EHS)

Level B protection shall be used when:

- The substance(s) has been identified and requires a high level of respiratory protection but a lesser degree of skin protection
- Concentrations in the air are IDLH or above the maximum use limit of Air Purifying Respirator (APR) with full-face mask
- Oxygen deficient or potentially oxygen deficient atmospheres (<19.5%) are possible

Table 3-3 Level B PPE to Be Utilized (Check Appropriate PPE)

☐	Positive-pressure (pressure demand), full-face piece self-contained, or in-line breathing apparatus with escape/egress pack (OSHA/NIOSH-approved)
☐	Chemical-resistant clothing (check appropriate garments) with one- or two-piece chemical splash suit; or disposable chemical-resistant one-piece suit ☐ Hooded one- or two-piece chemical splash suit ☐ Disposable chemical-resistant one-piece suit **Fabric Type:**
☐	Disposable inner gloves (surgical)
☐	Disposable chemical-resistant outer gloves **Material Type:**
☐	Chemical-resistant work boots with safety toe and puncture resistant sole. **Material Type:**
☐	Sleeves to be duct-taped over gloves and pants to be duct-taped over boots. Duct tape to be used over zippers and any other area where the potential for exposure exists.
☐	Two-way radio communication (intrinsically safe)
☐	Hearing protectors (**REQUIRED** if site noise levels are greater than 85 dB based on an 8-hour TWA)
☐	Hard hat
☐	Coveralls under splash suit
☐	Long cotton underwear
☐	**Modifications:**

Note: Maximum distance personnel are allowed to travel from air source on an in-line system is 300 feet.

3.3 Level C

Level C protection shall be used when:

- Substance(s) require the same level of skin protection as Level B, but a lesser level of respiratory protection
- The types of air contaminants have been identified, concentrations measured, and respirator decision logic indicates that APRs are sufficient to remove the contaminants
- The substance has adequate warning properties (odor threshold is below occupational exposure limits) and all criteria for the selection of APR has been met

Table 3-4 Level C PPE to Be Utilized (Check Appropriate PPE)

☒	Half-face APR (OSHA/NIOSH-approved)
☒	Full-face APR (OSHA/NIOSH-approved)
☒	**Type of Cartridges to be Used: OV/P100**
☒	Chemical-resistant clothing check appropriate garments (one-piece coverall; hooded one- or two-piece; chemical splash suit; chemical-resistant hood and apron; disposable chemical coveralls [i.e., Tyvek]) ☐ One-piece coverall ☐ Hooded one- or-two piece chemical splash suit ☐ Chemical-resistant hood and apron ☒ Disposable chemical-resistant coveralls **Fabric Type:** Tyvek
☐	Disposable inner gloves (surgical)
☒	Disposable chemical-resistant outer gloves **Material Type:** Nitrile
☒	Chemical-resistant work boots with safety toe and puncture resistant sole, or disposable boot covers for standard work boots with safety toe and puncture resistant sole. **Material Type:** Nitrile
☐	Sleeves to be duct-taped over gloves and pants to be duct-taped over boots
☐	Safety goggles
☒	Safety glasses
☒	Hard hat
☐	Hard hat with face shield
☒	Hearing protectors (**REQUIRED** if site noise levels are greater than 85 dB based on an 8-hour TWA). **Type:**
☐	Two-way radio communication (intrinsically safe)
☐	Long cotton underwear
☐	**Modifications:**

3.4 Level D

Level D protection will be used when:

- The atmosphere contains no known hazard.
- Work functions preclude splashes, immersions, or the potential for unexpected inhalation of, or contact with, hazardous concentrations of chemicals.
- Atmospheric concentrations of contaminants are less than the Threshold Limit Value (TLV).

Table 3-5 Level D PPE (Minimum Work Uniform Permitted) (Check Appropriate PPE)

☐	Standard work uniform/coveralls
☒	Work boots with safety toe and puncture resistant sole
☒	Work gloves
☐	Safety goggles
☒	Safety glasses
☒	Hearing protectors (**REQUIRED** if site noise levels are greater than 85 dB based on an 8-hour TWA)
☒	Hard hat
☐	Hard hat with face shield
☐	Two-way radio communication (intrinsically safe)
☐	Long cotton underwear
☒	**Modifications:** Wear polycoated Tyvek if impacted soil is expected or encountered. Upgrade respiratory protections to Level C based on air monitoring results. Sampling activities require safety glasses and nitrile outer gloves.

Table 3-6 Activity vs. Level of Protection

Activity	Level of PPE	Special Requirements
Drilling, surface soil sampling, soil gas, well installation, groundwater sampling, residual management	D/C	Upgrade to Level C respiratory protection based on air monitoring results. Upgrade to level C dermal protection based on levels of soil impacts.

4.0 Air monitoring and action levels

According to 29 CFR 1910.120(h), air monitoring shall be used to identify and quantify airborne levels of hazardous substances and health hazards in order to determine the appropriate level of employee protection required for personnel working on site.

4.1 Initial determination air monitoring requirements

As part of the RETEC Respiratory Protection Program, "initial determination" personal air monitoring data is required for sites where the chemical hazards listed in Table 4-1 may be present. Initial determination data will consist of: 1) objective personal data collected within the last 12 months from another site with similar work operations, workplace conditions, and levels of chemical hazard to this project site; or 2) personal air monitoring laboratory analytical data collected at the site during tasks with the highest potential for chemical exposure. Table 4-2 includes initial determination data to be used for this project.

Table 4-1 Chemicals Requiring Initial Determination Air Monitoring

Chemical	OSHA Standard for Respiratory Protection
Acrylonitrile	1910.1045
Arsenic, inorganic	1910.1018
Asbestos	1910.1001 – General Industry 1926.1101 – Construction Sites
Benzene	1910.1028
1,3-Butadiene	1910.1051
Cadmium	1910.1027 1926.1127
Coal Tar Pitch Volatiles Acenaphthene Benzo(a)pyrene Chrysene Phenanthrene Pyrene	1910.1029
1,2-dibromo-3-chloropropane	1910.1044
Formaldehyde	1910.1048
Lead	1910.1025 – General Industry 1926.62 – Construction
Methylene chloride	1910.1052
Methylenedianiline	1910.1050 – General Industry 1926.60 – Construction
Vinyl chloride	1910.1017

Table 4-2 Initial Determination Personal Air Monitoring Matrix

Type of Initial Determination (Check One)	Initial Determination Data						
☐	Not Applicable – no chemical hazards from Table 4-1 will be encountered on site						
☒	Objective Data[1]	Chemical	Work Activity	Date	Max Site Soil Concentration	TWA	Personal Air Monitoring Result
		Benzene	Excavation	2/2004	(1)	1 ppm	<0.022 ppm
		Anthracene	Excavation	2/2004	(1)	0.2 mg/m^3	< 0.002 mg/m^3
		Benzo (a) pyrene	Excavation	2/2004	(1)	0.2 mg/m^3	< 0.002 mg/m^3
		Chrysene	Excavation	2/2004	(1)	0.2 mg/m^3	< 0.002 mg/m^3
		Phenanthrene	Excavation	2/2004	(1)	0.2 mg/m^3	< 0.002 mg/m^3
		Pyrene	Excavation	2/2004	(1)	0.2 mg/m^3	< 0.002 mg/m^3
		Naphthalene	Excavation	5/2002	(2)	10 ppm	< 1.4 ppm
☐	Previous Personal Monitoring Data from Site[1]	Chemical	Work Activity	Date	Max Site Soil Concentration	TWA	Personal Air Monitoring Result
☐	Personal Monitoring Data to be Collected On Site	Chemical		Analytical Method		Matrix (badge, filter)	

[1] Data are available on the RETEC Personal Air Monitoring Database in the RETEC Forum at T-EHS\\Respiratory Protection\\Initial Determination Database. Data must have been collected within the last 12 months.
(1) Data available upon request from RETEC Fort Collins office for Poudre River project.
(2) Data available upon request from RETEC Atlanta office for Macon project.

4.2 Real time air monitoring requirements

Air monitoring shall be conducted at the following times or as specified by the SSHO:

- Upon initial entry to rule out oxygen deficient, flammable, and/or IDLH conditions
- When the possibility of an oxygen deficient, flammable, and/or IDLH condition or flammable atmosphere has developed
- As an on-going check of the levels of contaminants in the breathing zone
- When work is initiated on a different portion of the site
- When contaminants other than those previously identified are encountered
- When a different operation is initiated
- When work involves the handling of leaking drums, containers, or when working in areas with obvious liquid contamination
- During confined space entry
- At the perimeter of the site as required
- Outside the site perimeter as required (e.g., adjacent buildings)

Real time air monitoring with direct reading instruments will consist, at a minimum, of the criteria listed in Table 4-3. The results of all air monitoring data will be recorded on the "Air Quality Monitoring Record" in Appendix H-1. All air monitoring equipment calibration data is to be recorded on the "Equipment Calibration Log" in Appendix H-2. Upon request, this data will be made available for review to all interested persons. Air monitoring instruments will be calibrated and maintained in accordance with the manufacturer's specifications.

Table 4-3 Air Monitoring/Instrumentation (Check Appropriate Instrumentation)

Use	**Photoionization Detector**[1] (specify model): Mini Rae or similar Detection of Organic Gases and Vapors Please Check Bulb Size:		
	9.5eV: ☐	10.2eV: ☒	11.7eV: ☐
Action Level:	Workzone: > 1 ppm sustained for 5 minutes, check for benzene with a Draeger Tube >25 ppm sustained for 5 minutes, upgrade to Level C PPE with minimum full face respirator with organic HEPA cartridge, monitor with Draeger Tube		
Frequency:	continuous		
Use:	**Detector Tubes**[1] **(**specify chemical and brand): Benzene Draeger Tubes Detection of Organic Gases and Vapors		
Action Level:	> 1 ppm Benzene - Implement engineering controls, such as temporarily halting work, utilizing odor suppressant or moving to another work location. > 50 ppm Benzene - Evacuate site immediately		
Frequency:	Based on photoionization detector results		

Use:	**Specify Other Instrument:** Mini Ram Dust Monitoring
Action Level:	Exclusion Zone: 3.0 mg/m^3 Perimeter: 0.17 mg/m^3
Frequency:	continuous

4.3 Respirator cartridge change out

Respirator cartridges will be replaced with new cartridges daily during field work. For organic cartridges, certain conditions may dictate that the cartridges are changed out more frequently as listed below:

- If the organic chemical's boiling point is <70°F and the concentration is greater than 200 parts per million (ppm), contact the Corporate EHS Director to discuss cartridge change out and options for respiratory protection.
- If physical work rate exceeds a moderate level, replace cartridges every 4 hours of work.
- If relative humidity exceeds 85%, replace cartridges every 4 hours of work.

5.0 Site control

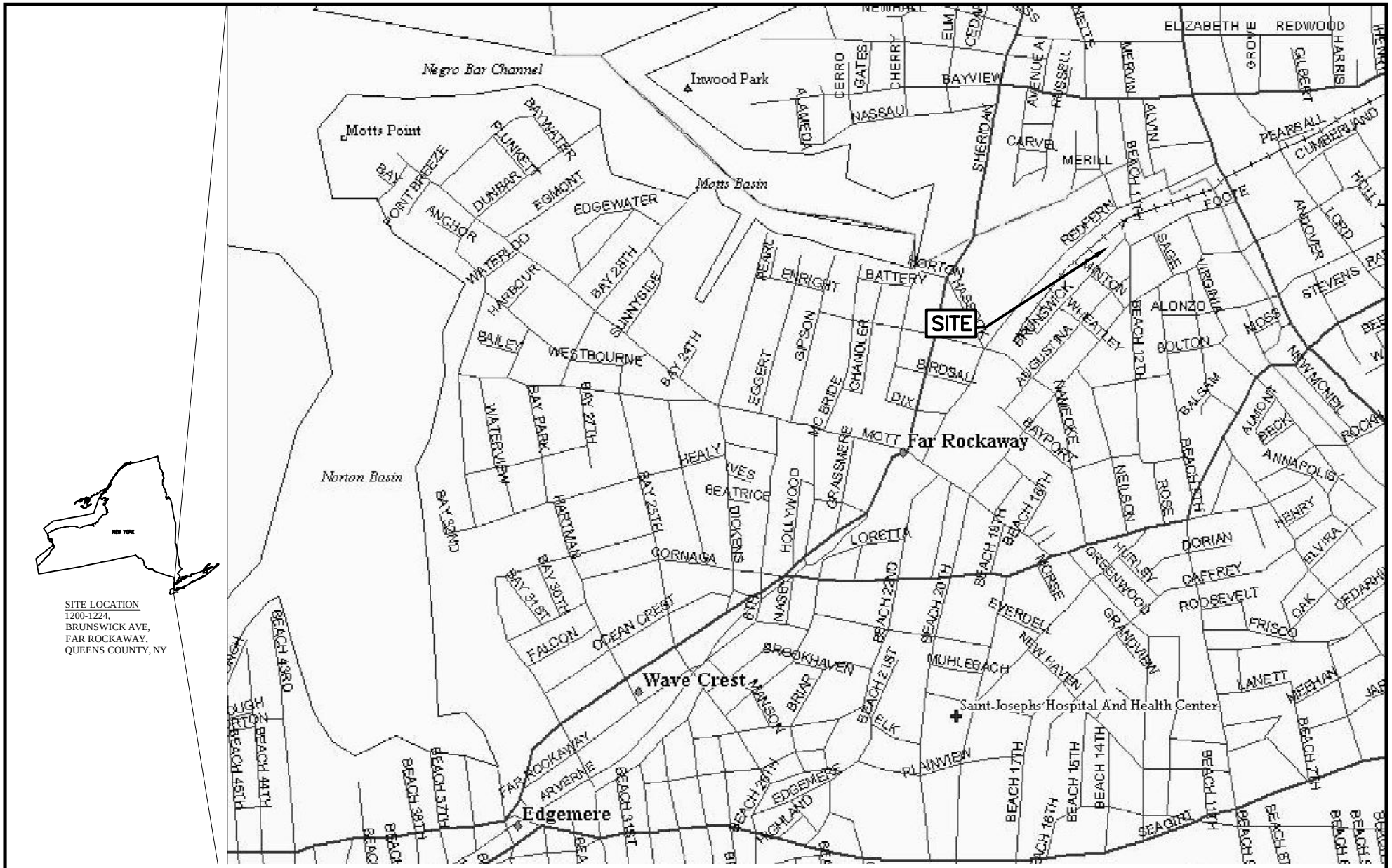
5.1 Work zones

The primary purpose for site controls is to establish the hazardous area perimeter, to reduce migration of contaminants into clean areas, and to prevent access or exposure to hazardous materials by personnel. At the end of each workday, the site should be secured and/or guarded to prevent unauthorized entry. Site work zones will include:

- Clean Zone/Support Zone. This uncontaminated zone will be the area outside the exclusion and decontamination (decon) zone and within the geographic perimeters of the site (typically the job trailer). This area is used for staging of materials, parking of vehicles, office and laboratory facilities, sanitation facilities, and receipt of deliveries. Personnel entering this zone may include delivery personnel, visitors, security guards, etc., who will not necessarily be permitted in the exclusion zone.
- All personnel arriving in the support zone will report to the SSHO and sign the Visitor Sign-in Log in Appendix C of this HASP.
- Contaminant Reduction Zone (CRZ). The contaminant reduction zone will provide a location for removal of contaminated PPE and final decontamination of PPE. A separate decontamination area will be established for heavy equipment. All personnel and equipment must exit via the decon area.
- Exclusion Zone/Hot Zone. The exclusion zone will be the “hot zone” or contaminated area inside the site perimeter. Entry to and exit from this zone will be made through a designated point. Appropriate warning signs to identify the exclusion zone should be posted (*i.e., DANGER, AUTHORIZED PERSONNEL ONLY, PROTECTIVE EQUIPMENT BEYOND THIS POINT, etc*.). Personnel and equipment decontamination must accompany exit from the exclusion zone.

A site map (Figure 5-1) depicting the location of the site and Figure 5-2 showing the work area is shown on pages 5-2 and 5-3 of this HASP.

File: F:\PROJECTS\Keyspan\Far Rockaway\CADD\HASP\HASP.dwg Layout: ANSI_A1-LJ User: BVershon Plotted: Jun 21, 2007 - 3:11pm Xref's:



ENSR | AECOM

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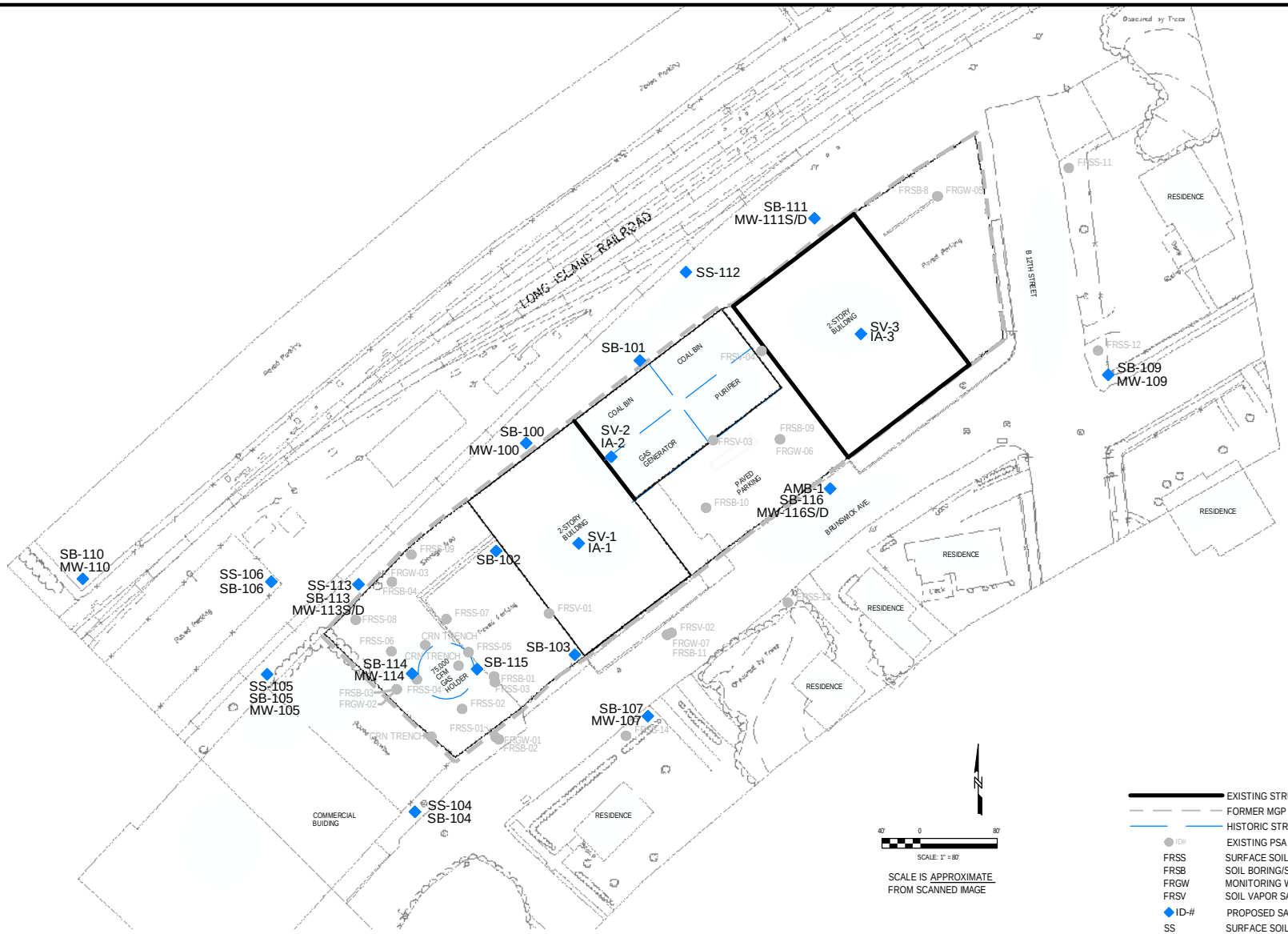
RETEC

NTS
Source: 1993 DeLorme Mapping

KEYSPAN CORPORATION FAR ROCKAWAY, NY, FORMER MGP SITE			FAR ROCKAWAY HASP SITE LOCATION MAP
DATE: 06/13/07	DRWN: K.S./UKN		FIGURE 5-1

File: F:\PROJECTS\Keyspan\Far Rockaway\CADD\HASP\HASP-02.dwg Layout: PROP-SAMP User: BVershon Plotted: Jun 29, 2007 - 3:14pm Xref's:



ENSR | AECOM

Merged with ENSR in 2007

RETEC

KEYSPAN CORPORATION
FAR ROCKAWAY FORMER MGP SITE

WORK AREAS
REMEDIAL INVESTIGATION

DATE: 06/29/07 | DRWN: BcV/CON

FIGURE 5-2

5.2 General site control safety procedures

- The Buddy System will be used at all times by all field personnel in the exclusion zone, especially if personnel are required to wear Level C or higher PPE. No one is to perform fieldwork alone unless approved by the office Health and Safety Coordinator and/or the Corporate EHS Director. Maintain visual, voice, and/or radio communication at all times.
- Whenever possible, avoid contact with contaminated (or potentially contaminated) surfaces. Walk around (not through) puddles and discolored surfaces. Do not kneel or set equipment on the ground. Stay away from waste drums unless it is necessary to sample or handle the drums. Protect equipment from contamination by bagging.
- Eating, drinking, and/or smoking are only permitted in designated areas in the support zone.
- Hands and face must be thoroughly washed upon leaving the decon area.
- Beards and/or other facial hair that interferes with respirator fit will preclude admission to the exclusion zone.
- All equipment must be decontaminated or properly discarded upon exit from the exclusion zone as determined by the SSHO.
- All personnel exiting the exclusion zone must go through the decontamination procedures as described in this HASP.
- PPE as described in this HASP will be required for all field personnel working on site.
- Contact lenses may be worn on the site provided safety glasses or goggles are also worn. Any exceptions to wearing of contact lenses will be specified in this HASP or through a HASP amendment.

6.0 Decontamination

In general, everything that enters the exclusion zone must either be decontaminated or properly discarded upon exit from the exclusion zone. All personnel, including any state or local officials, must enter and exit the exclusion zone through the decon area. Prior to demobilization, contaminated equipment will be decontaminated and inspected by the project manager/site engineer before it is moved into the clean zone. Any material that is generated by decontamination procedures will be stored in a designated area in the exclusion zone pending disposal approvals and disposition.

The type of decontamination solution to be used is dependent on the type of chemical hazards. The decontamination solution for this project can be determined from Table 6-1 based on the expected chemicals encounter. Decontamination solutions will be changed as required and collected and stored on site until disposal approvals are secured and the arrangements for their final disposition are finalized. A listing of appropriate decontamination solutions for the chemical contaminants commonly encountered at RETEC sites is available on the RETEC Forum database under T-EHS\Form Library\Health and Safety Plan.

6.1 Personnel decontamination

Personnel may become contaminated in a number of ways including, but not limited to:

- Contacting vapors, gases, mists, or particulates in the air
- Being splashed by materials while sampling open containers
- Walking through puddles of liquids or on contaminated soil
- Using contaminated instruments or equipment

Even with safeguards, personnel contamination may occur. Harmful materials can be transferred into the clean area, exposing unprotected personnel. In removing contaminated clothing, personnel may contact contaminants on clothing or inhale them. To prevent such occurrences, decontamination procedures must be developed and established before anyone enters the site and must continue throughout site operations.

Personnel decontamination procedures will be based on the contaminants of concern and the level of protection being worn by site personnel.

6.2 Sampling equipment

Sampling devices, when used on site, require special cleaning procedures, which are delineated in Table 6-1.

6.3 Equipment decontamination

Heavy equipment will be decontaminated by moving the equipment to the designated decon area and brushing off the heavy contamination with a broom, etc. The equipment will then be steam cleaned with the decon waters collected for proper disposition. Following the decontamination and prior to exiting the decontamination zone, the project manager and/or SSHO will inspect the equipment and, if it is properly decontaminated, make note of the date, time, method, and name of decon personnel in the field notebook. The equipment may then be tagged by using a tag containing the same information as that entered into the field log.

6.4 Disposal of contaminated materials

All materials and equipment used for decontamination must be disposed of properly. Clothing, tools, buckets, brushes, and all other equipment that is contaminated must be properly packaged and stored on site until disposal arrangements are finalized. Clothing not completely decontaminated on site should be secured in plastic bags before being removed from the site.

The proper disposal methods for the site are outlined in Table 6-1.

6.5 Emergency decontamination

Personnel with medical problems or injuries may also require decontamination. There is the possibility that the decontamination may aggravate or cause more serious health effects. If prompt lifesaving, first aid, and medical treatment are required, decontamination procedures will be omitted. In either case, a member of the site management team will accompany contaminated personnel to the medical facility to advise on matters involving decontamination.

Emergency decontamination procedures for this site are discussed in the chart in Table 6-1.

6.6 Sanitizing of personal protective equipment

Respirators, reusable protective clothing, and other personal articles not only must be decontaminated before being reused, but also sanitized. The insides of masks and clothing become soiled due to exhalation, body oils, and perspiration. Manufacturer's instructions should be used to sanitize the respirator masks. If practical, reusable protective clothing should be machine-washed after a thorough decontamination; otherwise, it must be cleaned by hand.

Table 6-1 Decontamination Procedures

☐	**Level A:** Segregated equipment drop, boot cover and glove wash, boot cover and glove rinse, tape removal, boot cover removal, outer glove removal, suit/hard hat removal, SCBA removal, inner glove wash, inner glove removal, field wash, re-dress. **Modifications:**
☐	**Level B:** Segregated equipment drop, boot cover and glove wash, boot cover and glove rinse, tape removal, boot cover removal, outer glove removal, suit/safety boot wash, suit/SCBA/boot/glove rinse, (tank change), safety boot removal, splash suit removal, SCBA removal, inner glove wash, inner glove rinse, face piece removal, inner glove removal, inner clothing removal, field wash, re-dress. **Modifications:**
☐	**Level C:** Segregated equipment drop, boot cover and glove wash, boot cover and glove rinse, boot cover removal, outer glove removal, suit/safety boot wash, suit/safety boot rinse, (canister or mask change), safety boot removal, splash suit removal, inner glove wash, face piece removal, inner glove removal, inner clothing removal, field wash, re-dress. Modifications:
☒	**Level D:** Segregated equipment drop, boot and glove wash, boot and glove rinse. Modifications: Follow Level C procedures if upgraded PPE for dermal or respiratory protection

☒	**Sampling Equipment:** Scrubbing with a non-phosphate soap and water solution followed by clean water rinses.
☒	**Heavy Equipment Decontamination:** High pressure steam rinse.
☒	**Decontamination Disposal Procedures:** Staged on site pending proper disposal.
☐	**Emergency Decontamination Equipment Procedures:**

7.0 Emergency response/contingency plan

It is essential that site personnel be prepared in the event of an emergency. Emergencies can take many forms: illnesses/injuries, chemical exposure, fires, explosions, spills, leaks, releases of harmful contaminants, or sudden changes in weather. Table 7-1 outlines the contact information for emergencies.

7.1 Emergency Contacts/Telephone Numbers

Table 7-1 Emergency Contacts/Telephone Numbers

Fire:	911 or (718) 474-2593
Police:	911 or (718) 868-3400 (101st Precinct)
Ambulance:	911
Capable of Transporting Contaminated Personnel?	**Yes:** ☒ **No:** ☐
Hospital:	St. John's Episcopal Hospital, South Shore 327 Beach 19th Street, Far Rockaway, NY 11691 (718) 868-7000
Chemical Trauma Capabilities?	Yes: ☒ No: ☐
Decontamination Capabilities?	Yes: ☒ No: ☐
Directions from Site to Hospital:	Start out going SOUTHWEST on Brunswick Ave toward MINTON ST. Turn LEFT onto NAMEOKE AVE. Turn RIGHT onto CNETRAL AVE. CENTRAL AVE becomes BEACH 20th ST Turn LEFT onto PLAINVIEW AVE. Turn SLIGHT LEFT onto BEACH 19th ST. End at 327 Beach 19th St.
Note: See map for route to hospital at the end of this section. The route to the hospital was verified by: _____. Distance from the Site to the hospital is: 1.2 miles. The approximate driving time is: 4 minutes.	
Poison Control Center:	(800) 222-1222
Electric Company: Long Island Power Authority	(800) 490-0025
Gas Company: KeySpan	(800) 490-0045
Water Company: NYC OEP	(212) 639-9675
Airport: JFK Airport	(718) 244-4335
National Response Center	(800) 424-8802
Center for Disease Control	(800) 232-4636 (24-hour)
ATF (explosion information)	(202) 972-8210
INFOTRAC	(800) 535-5053 (U.S. and Canada)
Dig Safely New York	(800) 962-7962
State Environmental Agency: Solid and Hazardous Material Engineer	(718) 482-4996 Regional office
U.S. EPA Region Name: 2	(212) 637-3668
RETEC Corporate Office	Mr. Mike Knupp (978) 371-1422
RETEC Personnel Office (local)	Nyack: (845) 348-1520
RETEC Corporate EHS Director	Mr. Jim Colbert (970) 493-3700
RETEC Personnel Medical Consultant (Corporate)	Health Resources (800) 350-4511 600 West Cumming Park, Ste 3400, Woburn, MA 01810
RETEC Project Manager	Peter Cox (978) 371-1422, ext 119
Client Contact	Thomas Campbell – (516) 545-2555

Table 7-2 Emergency Equipment Available On Site

Communication Equipment:	
☐	Public Telephones
☐	Private Telephones
☒	Cellular Telephones Pete Cox (RETEC) (978) 764-4257 Jennifer Koch (RETEC) (914) 227-3779
☐	Two-Way Radio (walkie-talkie)
☐	Emergency Alarms/Horns
Medical Equipment:	
☒	First Aid Kits
☐	Stretcher
☒	Eye Wash Station and/or Bottle
☐	Safety Shower
☐	Blankets
☐	Other (please specify):
Fire Fighting Equipment:	
☒	Fire Extinguisher Type: ABC
☐	Other:
Spill/Leak Equipment	
☒	Absorbent Boom Pads
☐	Dry Absorbent
Additional Safety Equipment:	

7.2 Incident definitions and reporting criteria

RETEC definitions and classifications for the types of incidents that could occur on this site are listed in Table 7-3. The SSHO is responsible for executing the reporting and notification steps for each incident as outlined in Table 7-1. The RETEC EHS Incident Report Form is included in Appendix H-4.

Table 7-3 RETEC EHS Incident Determination and Reporting Matrix

Incident Type	Classification Criteria			Notification and Reporting	
	Injury/Illness	Environmental Release/Impact	Property Damage	Verbal	Written
Incident – Major	Professional medical treatment received (hospital, clinic)	>1 bbl material released	Cost estimate of damage >$10,000	Immediate call to Corporate EHS**	Use RETEC Incident Report Form: Submit to the following within 24 hours Project Manager Office EHS Coordinator Corporate EHS
Incident – Minor	First Aid with no professional follow-up or no treatment	1 qt* to 1 bbl of material released	Cost estimate of damage >$500	Call to the following within 24 hours: Project Manager Office EHS Coordinator Corp. EHS**	Use RETEC Incident Report Form Submit to the following within 72 hours: Project Manager Office EHS Coordinator Corporate EHS
Near Miss	Event or condition with moderate to high potential for I/I, but no I/I occurs	<1 qt* released or event or condition with moderate to high potential for release	Damage occurs, but is estimated <$500	Call to the following in 48 hours: Project Manager Office EHS Coordinator	Use RETEC Near Miss Report Form Submit to the following within 72 hours: Project Manager Office EHS Coordinator Corporate EHS
EHS Opportunity	Suggestion, observation, or idea to prevent I/I	Suggestions, observation, or idea to prevent release	Suggestions, observation, or idea to prevent property damage	No verbal notification required	Use RETEC Near Miss Report Form marked as 'EHS Opportunity' Submit to the following within 2 weeks: Office EHS Coordinator

*Reportable quantities will vary based on the material released and federal and state regulations. One quart designated to inform necessary parties and allow for proper identification of reportable quantity for material released.

** Using call progression below, notify the first available individual:
1. Tina McHugh – Pittsburgh office (Office Phone: (412) 380-0140, cell phone (412) 370-7458)
2. Jim Colbert – Fort Collins office (Office Phone (970) 493-3700, cell phone (970) 214-7371)
3. Jessica Cassens – Austin office (Office Phone (512) 330-0507, cell phone (512) 565-4630)4.

Determination and reporting requirements pertain to RETEC employees, RETEC subcontractors, clients, and third parties. Information presented above pertains to work-related incidents only.

7.3 Injury/illness case management

The following steps should be followed if an injury or illness case occurs:

- Check the scene of the injury or illness and; either provide first aid, if trained and the conditions are safe to do so, or call an EMS (911) to care for the victim.
- Ensure that appropriate decontamination treatment for exposed or injured personnel is obtained.
- Once the victim is stabilized, contact the RETEC Corporate EHS Department immediately in the order of the employees listed below:

Tina McHugh - Pittsburgh	**(412) 380-0140 (Office) (412) 370-7458 (Cellular)**
Jim Colbert - Fort Collins	**(970) 493-3700 (Office) (970) 214-7371 (Cellular)**
Jessica Cassens - Austin	**(512) 330-0507 (Office) (512) 565-4630 (Cellular)**

- If the victim must be transported to the hospital, do not transport the victim yourself, but accompany the victim to the hospital.
- Notify the victim to inquire with the medical care provider about whether there is an "over-the-counter" medication that would work as well as a prescription medication, or if non-prescription strengths of a medication may have the same therapeutic benefit. This is to avoid unnecessary prescriptions that would result in the incident being considered an OSHA recordable.
- Per Table 7-3, notify the office EHS Coordinator, the Project Manager, and the Operations Manager at the numbers identified in Table 7-1.
- Per Table 7-3, complete the Incident or Near-Miss report and collect additional information as necessary. Send the completed information to the office EHS Coordinator and Project Manager via fax.
- If the incident results in one or more fatalities or hospitalization of three or more personnel, notify the local OSHA office within 8 hours.
- The RETEC project manager or his designee will follow up with the victim after receiving medical attention to find out about the nature of the injury or illness, medical care given, and whether there are any work restrictions or modifications.

Any person transporting an injured/exposed person to a hospital for treatment should take directions to the hospital with them (Figure 7-1), and information on the chemicals involved. Any vehicle used to transport contaminated personnel will be cleaned or decontaminated as necessary.

7.4 Environmental or property damage incident response

The SSHO or designee has primary responsibility for responding to environmental and property damage incidents as defined in Table 7-3. The on site SSHO will:

- Take appropriate measures to protect the public and the environment including isolating and securing the site, preventing run-off to surface waters, and ending and/or controlling the emergency to the extent possible.
- Ensure that the appropriate federal, state, and local agencies are informed, and emergency response plans are coordinated. In the event of an air release of toxic materials, the local authorities should be informed in order to assess the need for evacuation. In the event of a spill, sanitary districts and drinking water systems may need to be alerted.

- Per Table 7-3, notify the office Coordinator, the Project Manager, and the local Operations Manager.
- Per Table 7-3, complete the Incident or Near-Miss report and collect additional information as necessary. Send the completed information to the RETEC EHS Coordinator or the project manager via fax.
- The RETEC project manager or his designee will follow up with the victim after receiving medical attention to find out about the nature of the injury or illness, medical care given, and whether there are any work restrictions or modifications.

7.5 Fire or explosion

In the event of a fire or explosion, the local fire department must be summoned immediately. Upon their arrival, the project manager and/or SSHO will advise the fire commander of the location and nature of the fire and identification of all hazardous materials on site.

If it is safe to do so and personnel have been properly trained, site personnel may use fire-fighting equipment available on site, or remove or isolate flammable or other hazardous materials, which may contribute to the fire (i.e., incipient stage fire-fighting only).

7.6 Evacuation routes and resources

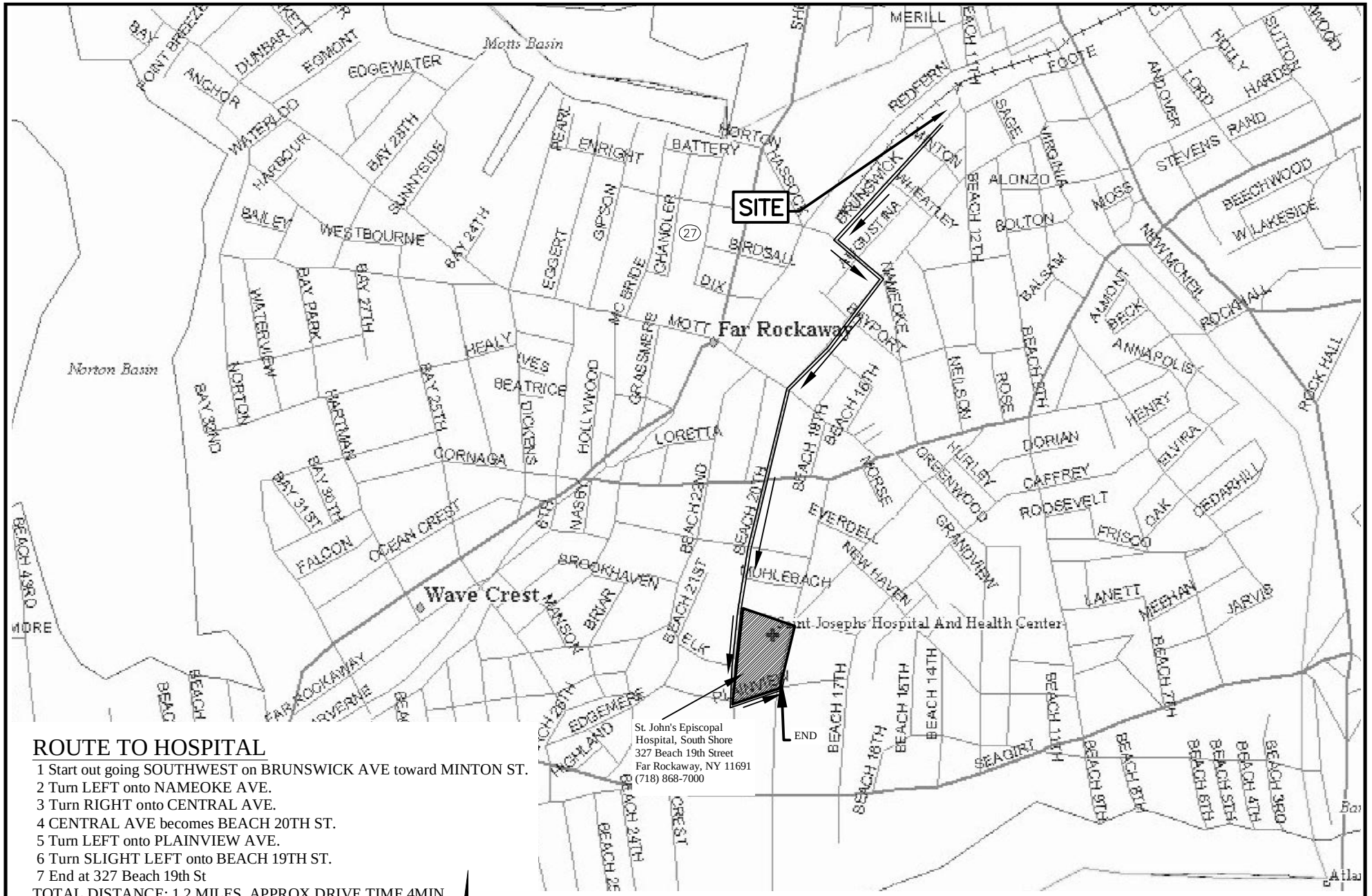
Evacuation routes will be established by work area locations for the site. Evacuation should be conducted immediately, without regard for equipment, under conditions of extreme emergency. See site map (Figure 5-1) for evacuation routes.

- Evacuation notification will be a continuous blast on an air horn, vehicle horn, or by verbal communication via radio.
- Keep upwind of smoke, vapors, or spill location.
- Exit through the decontamination corridor, if possible.
- If evacuation is not via the decontamination corridor, site personnel should remove contaminated clothing once they are in a safe location and leave the clothing near the exclusion zone or in a safe place.
- The project manager or SSHO will conduct a head count to ensure all personnel have been evacuated safely.
- In the event a site evacuation is necessary, all personnel are to:
  - Escape the emergency situation
  - Decontaminate to the maximum extent practical
  - Meet at RETEC's site trailer, command post, or some other pre-arranged location

7.6.1 Near miss

If anyone on site witnesses a near-miss (as defined in Table 7-3), they must complete the Near-Miss Report (Appendix H-5) and submit it to the SSHO, Corporate EHS, or the Local EHS Coordinator *within 72 hours.* Near misses are events that, depending on the circumstances, could have resulted in death, personal injury, and/or property/equipment damage. If the near-miss occurs during normal work hours, the SSHO will take action to prevent any possible incident/accidents from taking place. The SSHO will discuss the near-miss and actions taken with appropriate site personnel as soon as possible.

File: F:\PROJECTS\Keyspan\Far Rockaway\CADD\HASP\HASP.dwg Layout: ANSI_A1-LJ (2) User: BVershon Plotted: Jun 21, 2007 - 3:12pm Xref's:



ROUTE TO HOSPITAL

1 Start out going SOUTHWEST on BRUNSWICK AVE toward MINTON ST.
2 Turn LEFT onto NAMEOKE AVE.
3 Turn RIGHT onto CENTRAL AVE.
4 CENTRAL AVE becomes BEACH 20TH ST.
5 Turn LEFT onto PLAINVIEW AVE.
6 Turn SLIGHT LEFT onto BEACH 19TH ST.
7 End at 327 Beach 19th St
TOTAL DISTANCE: 1.2 MILES, APPROX DRIVE TIME 4MIN

ENSR | AECOM
Merged with ENSR in 2007
RETEC

NTS
Source: 1993 DeLorme Mapping

KEYSPAN CORPORATION
FAR ROCKAWAY, NY, FORMER MGP SITE

FAR ROCKAWAY HASP
ROUTE TO HOSPITAL
ST. JOHN'S EPISCOPAL HOSPITAL, SOUTH SHORE
327 BEACH 19TH STREET, NY 116910

DATE: 06/13/07 | DRWN: K.S./UKN | **FIGURE 7-1**

8.0 Drum handling/sampling

Will this project require the handling or sampling of drummed materials?

No: ☐	Yes: ☒

If the answer to this question is *NO*, proceed to the next section. If the answer is *YES*, read this section and follow all procedures for safe drum handling and sampling.

Accidents may occur during handling of drums and other hazardous waste containers. Hazards include detonation, fires, explosions, vapor generation, and/or physical injury resulting from moving heavy containers by hand and working around stacked drums, heavy equipment, and deteriorated drums. OSHA regulations (29 CFR Parts 1910 and 1926) include general requirements and standards for storing, containing, and handling chemicals and containers, and for maintaining equipment used for handling materials. U.S. EPA regulations 40 CFR Part 265 stipulate requirements for types of containers, maintenance of containers and containment structures, and design and maintenance of storage areas. Department of Transportation (DOT) regulations (49 CFR Parts 171 through 178) also stipulate requirements for containers and procedures for shipment of hazardous waste.

- Have a dry chemical fire extinguisher on hand to control small fires.
- Check for labels, markings, etc., and note conditions of containers. Are the drums bulging, deteriorated, or leaking?
- Before moving any drum or container, determine the most appropriate sequence in which the various containers should be moved.
- Exercise extreme caution in handling drums that are not intact or tightly sealed.
- Use the following types of equipment to move drums and/or containers: 1) drum grappler attached to a hydraulic excavator, 2) small front-end loader with a bucket sling, 3) rough terrain fork lift, or 4) drum cart.
- Drums shall be moved manually only if they are empty. Drums shall be palletized, and staged on pallets so that lid rim bolts face outward for easy access during subsequent opening. Additionally, personnel will not use prying objects to create leverage to reposition drums as prying objects may become projectiles and cause other severe injuries.
- Train personnel in proper lifting and moving techniques to prevent back injuries.
- Have over packs ready before any attempt is made to move drums.
- Pressurized drums are extremely hazardous. If possible, do not move drums that may be under internal pressure as evidenced by bulging or swelling.
- If a pressurized drum has to be moved, handle the drum with a grappler unit constructed for explosive containment, if possible. Either move the drum only as far as necessary to allow seating on firm ground, or carefully over pack the drum.
- If a drum containing liquid cannot be moved without rupture, immediately transfer its contents to a sound drum using a pump designed for transferring the liquid.
- Unless drum contents are known, exercise extreme caution when opening drums.
- If an explosive situation exists, use non-sparking tools such as a bronze wrench.

- If a drum shows signs of swelling or bulging, relieve excess pressure prior to opening and, if possible, open using such remote devices as pneumatically operated impact wrenches, hydraulically or pneumatically operated drum piercers, or a backhoe equipped with bronze spikes for penetrating drum tops.
- DO NOT use picks, chisels, or firearms to open drums.
- If pressure must be released manually, place a barrier such as explosion-resistant plastic sheeting between the worker and bung to deflect any gas, liquid, or solid that may be expelled as the bung is loosened.
- Reseal open bungs and drill holes with new bungs or plugs to avoid explosions and/or vapor generation. If an open drum cannot be resealed, place the drum into an over pack. Plug any opening in pressurizing drums with pressure venting caps set for 5 psi.
- When manually sampling a drum, keep sampling personnel at a safe distance while drums are being opened. Sample only after opening operations are complete.
- Do not lean over other drums to reach the drum being sampled.
- Cover drum tops with plastic sheeting or other suitable non-chlorinated material to avoid excessive contact with drum tops.
- Never stand on drum tops.
- Obtain samples with either glass rods or vacuum pumps.

9.0 Excavation and trenching

Will this project require any excavations or trenches greater than 4 feet in depth?

No: ☒	Yes: ☐

If excavations or trenches are required and are greater than 4 feet in depth, will personnel be required to enter the excavations and/or trenches?

No: ☒	Yes: ☐

If the answer to the last question is *NO*, proceed to the next section. If the answer is *YES*, OSHA's Final Rule for Excavations (29 CFR 1926 Subpart P) must be implemented, and personnel must comply with the following excavation guidelines and complete the attached excavation worksheet.

- Remove all surface encumbrances.
- Locate all underground installations prior to opening excavation.
- Supply means of egress so that no more than 25 feet of lateral travel is required by personnel in the excavation.
- Supply warning vests for personnel exposed to vehicular traffic.
- Utilize barricades, hand signals, or stop logs for equipment operating next to excavations and slope grade away from excavation.
- Check for hazardous atmospheres (oxygen deficient, flammable, toxic gases).
- Protect excavation and personnel from water accumulation.
- Check stability of adjacent structures.
- Protect personnel from loose rock or soil.
- Inspect excavations and record information from the inspection in the field logbook.
- Stockpile excavation spoils a minimum of 2 feet from edge of excavation.
- Provide for fall protection (Section 12).
- Classify soil.
- Describe in detail any protective system used for personnel protection (sloping and benching of sides, support systems, or shield systems).

Trench Dimensions			
Length:	Width:	Depth:	
Soil Classification			
Stable Rock ☐	A ☐	B ☐	C ☐
Note: If soil class is unknown, assume Class C for trench/shoring design.			
Support System			
☐ Sloping or benching sides			
☐ Slope to be used based on soil class and trench dimensions			
☐ Shield System			
☐ Support System			
☐ Upright Dimensions			
☐ Whale Dimensions			
☐ Cross-Bracing Dimensions			
Sketch of Protective System To Be Utilized			

10.0 Confined space entry

Confined spaces pose unique problems due to their unique contents and/or configuration. Some confined spaces, for example, pose entrapment hazards for entrants, while others restrict air circulation so that hazardous atmospheres may accumulate quickly. Confinement itself can increase the risk of injury or death by making personnel work closer to hazards than they would otherwise. OSHA considers an area to be a Permit Required Confined Space if it is an enclosed space which:

- Is large enough and so configured that an employee can bodily enter and perform assigned work
- Has limited or restricted means for entry and exit (e.g., tanks, vessels, silos, storage bins, hoppers, vaults, pits, and diked areas)
- Is not designed for continuous employee occupancy
- Has one or more of the following characteristics:
  - Contains or has a potential to contain a hazardous atmosphere
  - Contains a material with the potential for engulfment of an entrant
  - Has an internal configuration such that an entrant could be trapped or asphyxiated by inwardly converging walls, or a floor which slopes downward and tapers to a smaller cross-section
  - Contains any other recognized serious safety or health hazard

Does this project require personnel to enter a Permit Required Confined Space as defined above?

No: ☒	Yes: ☐

If the answer is *NO*, proceed to the next section. If the answer is *YES*, OSHA regulations for Confined Space Entry (29 CFR 1910.146) must be implemented and personnel must comply with all Confined Space Entry procedures.

- Complete and submit a Confined Space Entry Permit (Appendix H-3) to the Director of Environmental Health and Safety for approval.
- Certify that all personnel have completed the OSHA 40-hour course in Health and Safety and are current with their 8-hour refresher training.
- Certify that all personnel are enrolled in a medical surveillance program and are physically capable of performing a confined space entry.
- Certify that all personnel have successfully passed a respirator fit-test within the past year.
  - Identify entrants and ensure they are properly trained and understand their duties.
  - Identify attendants and ensure they are properly trained and understand their duties.
  - Identify a rescue team or make arrangements with an outside agency for rescue assistance. If site personnel are assigned to a rescue team, ensure that the personnel are properly trained and are familiar with the operation, capabilities, and maintenance of rescue equipment.
  - Ensure that at least one member of the rescue team is current in his/her First Aid and CPR certification.

- Ensure that the entry permit contains the required information before authorizing entry.
- Determine that the necessary procedures, practices, and equipment for safe entry are in effect before allowing entry.
- Determine, at appropriate intervals, that entry operations remain consistent with the terms of the entry permit, and that acceptable entry conditions are present.
- Cancel the entry authorization and terminate entry whenever acceptable conditions are not present.
- Take the necessary measures for concluding an entry operation, such as closing off a permit space and canceling the permit, once the work authorized by the permit has been completed.
- Take the appropriate measures to remove unauthorized personnel who are in or near permit spaces.

11.0 Lockout/tagout

Does this project involve the operation of machines and/or equipment in which the unexpected energization or start up of the machinery or equipment, or release of stored energy, could cause injury to personnel?

No: ☐	Yes: ☒

If the answer is *NO*, proceed to the next section. If the answer is *YES*, OSHA regulations for Lockout/Tagout (29 CFR 1910.147) must be implemented and personnel must comply with all Lockout/Tagout procedures.

To assure personnel are protected from equipment accidentally operating during maintenance and servicing, OSHA requires the utilization of lockout/tagout procedures. These procedures apply to maintenance and/or servicing of equipment and not to normal operations.

These procedures apply to operations when guards are removed or bypassed, other safety devices are bypassed, or any part of the body is in a danger zone for the servicing and/or maintenance of the equipment. The procedures do not apply to cord-plug-connected equipment, which is under the control of the operator.

Some of the common energy sources which require lockout/tagout procedures include, but are not limited to:

- Electrical
- Hydraulic
- Pneumatic
- Chemical
- Thermal

11.1 Tags

Tags are only warning devices and do not provide physical restraint. Tags *MUST NOT* be removed without authorization of the person responsible for its attachment and must never be bypassed or ignored. Tags must be legible, understandable, and used as part of the overall lockout/tagout program. Tagout devices shall warn against hazardous conditions and shall include verbiage such as:

- DO NOT START
- DO NOT OPEN
- DO NOT CLOSE
- DO NOT ENERGIZE
- DO NOT OPERATE

11.2 Locks

Locks are used as a positive means to hold energy isolating devices in the “safe” or “off” position. Locks prevent removal without excessive force or unusual techniques such as the use of bolt cutters, etc.

The lockout/tagout procedure requires the utilization of a lockout device on all energy isolating devices, which can be locked out, unless it can be demonstrated that a tagout device provides the equivalent amount of protection. If tagouts are authorized, they must be placed in the same location where the lock would be placed. All lockout/tagout devices shall be singularly identified, used only for controlling energy, durable, standardized, and identifiable.

11.3 Procedures

- Prepare. Notify affected personnel that work requiring lockout/tagout will be performed.
- Shutdown. Turn off or shut down the equipment by following an orderly shutdown procedure.
- Isolation. Locate and isolate the equipment energy isolating devices. Isolate equipment from both primary and secondary power sources.
- Lockout/Tagout. Lockout/tagout each energy isolating device in a “safe” or “off” position. If the tagout device is utilized, affix it at the same point where the lock would be used or as close as possible to that location.
- Stored Energy. Assure all potentially hazardous or residual energy is relieved or otherwise made safe. Make sure the stored energy will not reaccumulate by locking a vent valve in the open position.
- Verify. Verify proper isolation and/or de-energization by testing the start button to ensure that the equipment will not operate. Make sure you push the STOP button after activating the start button.
- Perform Work. After lockout/tagout procedures have been implemented, execute the maintenance and/or servicing work.
- Release. Ensure that all non-essential items (tools, etc.) have been removed and the equipment is operationally intact. Ensure that personnel are safely positioned and affected personnel have been notified.
- Removal. Only the authorized employee who applied the devices may remove lockout/tagout devices.
- Notification. Notify affected personnel that the maintenance and/or servicing is complete, the lockout/tagout devices have been removed, and the equipment is released for operation.

Testing or positioning may be required for some equipment. Before removing lockout/tagout devices, clear the machine, remove personnel, remove devices, energize, and proceed with testing. After testing, de-energize and reapply the lockout/tagout procedures.

Outside personnel, such as contractors, and RETEC personnel shall inform each other of their lockout/tagout procedures to assure compliance of all lockout/tagout procedures.

Some jobs may require lockout/tagout of numerous energy isolation devices. A group lockout/tagout is then used which provides equal protection. Group lockout/tagout must be under the primary responsibility of an authorized employee. Each group member must apply his/her own personal lockout/tagout device.

During shift changes, special procedures must be utilized to assure the continuity of lockout/tagout protection. There must be an orderly transfer between off-going and on-coming personnel.

Sites that have structural barriers preventing the equipment from being moved on to the tracks are not required to have these lockable disconnect switches. Fencing, ditches, and walls would be considered adequate structural barriers to equipment movement on the tracks.

12.0 Fall protection

Does this project involve the use of any floors, platforms, and/or runways 4 feet or more above adjacent flooring or ground level, or the use of ladders, scaffolding, or power platforms?

No: ☒	Yes: ☐

If the answer is *NO*, proceed to the next section. If the answer is *YES*, OSHA regulations for Fall Protection (29 CFR 1910.21 through 29 CFR 1910.32) must be implemented and appropriate fall protection devices must be utilized.

Complete the questionnaire in Table 12-1 and ensure that all rules and regulations of this section are implemented for this project.

Table 12-1 Fall Protection

Describe the Areas and Operations On Site Where Fall Protection Will Be Required:	
Describe the Types of Fall Protection to Be Implemented:	
Check Type of Fall Protection Equipment to Be Utilized On Site:	
☐	Full-Body Harness
☐	Positioning Belt
☐	Rope Grab
☐	Vertical Lifeline
☐	Horizontal Lifeline (Static Line)
☐	Self-retracting Lifeline
☐	Lanyard
☐	Shock Absorbing Lanyard
☐	Locking Snap Hook
☐	Snap Hook
☐	Safety Net
☐	Non-Skid Surfaces
☐	Platforms, Walkways, or Temporary Flooring with Standard Guard Railing and Toeboard
☐	Appropriate Designed Ladders
☐	Stairs with Standard Railing

Rules and regulations include, but are not limited to, the following:

A. Floor Openings, Open Sides, etc.

- Every stairway and ladder way floor opening must be guarded by a standard railing with standard toeboard on all exposed sides except the entrance. The entranceway to ladder way openings will be guarded to prevent a person walking directly into the opening. For infrequently used stairways, the guards may consist of a hinged cover and removable standard railing.
- Every hatchway and chute floor opening must be guarded by a hinged floor opening cover equipped with standard railings which leave only one exposed side, or a removable railing with toeboard on not more than two sides and fixed standard railing with toeboards on all other exposed sides.
- Every floor hole into which persons can accidentally walk must be guarded by either a standard railing with standard toeboard on all exposed sides, or a floor hole cover which should be hinged in place. While the cover is not in place, the floor hole must be attended or must be protected by a removable standard railing.
- Every open-sided floor, platform, or runway 4 feet or more above adjacent floor or ground level must be guarded by a standard railing with toeboard on all open sides, except where there is an open entrance to a ramp, stairway, or fixed ladder. Runways not less than 18 inches wide used exclusively for special purposes may have the railing on one side omitted where operating conditions necessitate.
- Regardless of height, all open-sided floors, walkways, platforms, or runways above or adjacent to dangerous equipment must be guarded with standard railing and toeboard.

B. Stairs, Fixed Industrial

- Every flight of stairs having four or more risers must be provided with a standard railing on all open sides. Handrails must be provided on at least one side of closed stairways, preferably on the right side descending.
- Stairs must be constructed so that rise height and tread width is uniform throughout.
- Fixed stairways must have a minimum width of 22 inches.
- Fixed stairs must be provided for access from one structure level to another where operations necessitate regular travel between levels, and for access to operating platforms at any equipment, which requires attention routinely during operations. Fixed stairs must also be provided where access to elevations is daily or at each shift where such work may expose employees to harmful substances, or for which purposes the carrying of tools or equipment by hand is normally required.
- Spiral stairways must not be permitted except for special limited usage and secondary access situations where it is not practical to provide a conventional stairway.

C. Safety Nets

- Safety nets must be provided when workplaces are more than 25 feet above the surface where the use of ladders, scaffolds, catch platforms, temporary floors, and safety lines or safety belts is impractical.
- Where nets are required, operations must not be undertaken until the net is in place and has been tested.

As a general condition, a standard toeboard and guardrail are required whenever people walk near or beneath the open sides of a platform or under similar structures or where things could fall from the structures or could fall from the structures into machinery below.

A standard guardrailing consists of a top rail and posts. The normal distance from the upper surface of the top rail to the floor, platform, runway, or ramp should be 42 inches. There must be an intermediate rail spaced approximately halfway between the top rail and the floor. All handrails and railings should be provided with a clearance of not less than 3 inches between the handrail or railing and any other object.

A standard guardrailing can be of any configuration and construction that meets the basic dimension requirement (42 inches high with midrail), and can withstand 200 pounds applied in any direction at any point on the top rail. For wood railings, the rails and posts must be at least 2 x 4-inch stock with posts spaced not more than 6 feet apart. For pipe railings, the rails and posts must be at least 1-inch outside diameter (OD) pipe with posts spaced not more than 8 feet apart. For structural steel rails, posts and rails must be of 2 x 2 x 3/8-inch angles or other metal shapes of equivalent strength, with posts not more than 8 feet apart.

The standard toeboard must be approximately 4 inches in height from the floor to the top edge, with no more than a 1/4-inch gap between the toeboard and the floor. The toeboard may be constructed of any solid or perforated substantial material, as long as the openings are smaller than 1 inch.

OSHA considers a platform to be any elevated surface designed or used primarily as a walking or working surface, and any other elevated surface on which employees are required or allowed to walk or work while performing assigned tasks on a predictable or regular basis. Employee activities are considered predictable and regular when the activity is performed at least one (1) day every two (2) weeks or a total of four (4) man hours or more during any sequential four-week period.

If fall protection is required on a project, the following checklist should be used to check for walking and working surface problems:

- Are all places of operations kept clean and orderly?
- Are floors, aisles, and passageways kept clean and dry, and are spills cleaned up immediately?
- Are floor holes, such as drains, covered?
- Are permanent aisles appropriately marked?
- Are wet and/or greasy areas covered with non-slip materials?
- Are floor mats (rubber and wood) in good repair?
- Are signs showing floor-load capacities present?
- Are platform, storage lofts, balconies, etc., which are more than 4 feet above the floor, protected with standard guardrails?
- Are floor holes, through which a person could fall or accidentally walk into and trip, guarded by standard guardrails and toeboards?
- Have defective ladders (e.g., with broken rungs or split side rails) been tagged as “Dangerous, Do Not Use” and removed from service for repair or destruction?
- Are stepladders equipped with a metal spreader or locking device?
- Is the use of the top of an ordinary stepladder as a step prohibited?
- Do portable ladders have non-slip bases?
- Is the distance between the centerline of rungs on a fixed ladder and the nearest permanent object in back of the ladder at least 7 inches?
- Do all fixed ladders have a preferred pitch of 75° to 90° with the horizontal?

- Do stairs have at least 7 feet overhead clearance?
- Do stairs angle no more than 50° and no less than 30° off the horizontal?

13.0 Drilling safety

Will this project require the use of a drill or direct push equipment rig for well installation and/or subsurface sampling?

No: ☐	Yes: ☒

If the answer to this question is *NO,* proceed to the next section. If the answer is *YES*, read this section and follow all procedures for safe work practices around a drill rig.

Note: The SSHO must complete the Drill Rig Inspection Log in Appendix H-7 prior to the initiation of any drilling operations.

Accidents may occur during drilling activities. Hazards include subsurface and overhead utilities, heavy machinery, heavy falling objects, slip/trip/fall, and potential flying debris. It is the SSHO's responsibility to ensure drilling activities are conducted safely. During the site safety meeting, the SSHO should check that all of the following requirements are in place:

- Personnel are 40-Hour OSHA trained
- Personnel are current with 8-Hour Annual Refresher Training
- Personnel are enrolled in a medical monitoring program
- Personnel have been successfully fit-tested within the last 12 months
- Personnel are trained in drill rig safe operating practices
- Personnel are trained in First Aid/CPR
- Personnel are trained in emergency procedures
- Emergency telephone numbers are posted
- Personnel have received site orientation
- Personnel have reviewed the HASP

Every drill crew should have a designated safety supervisor who has authority to enforce safety on the drilling site.

Prior to the commencement of any drilling activities, the SSHO must ensure the following:

PPE

- All drilling crewmembers are wearing appropriate PPE including, at a minimum: hard hat, work boots with safety toe and puncture resistant sole, appropriate gloves, safety glasses, and any other PPE that may be required on a particular site.
- Clothing of drilling crew is close fitting without loose ends, straps, draw strings, belts, or other unfastened parts.
- Drilling crew is not wearing jewelry.

Housekeeping

- Suitable storage is used for tools, materials, and supplies.

- Pipes, drill rods, casings, augers, and other drilling tools are properly placed in racks or sills to prevent rolling and/or sliding.
- Penetration or other driving hammers are placed at a safe location on the ground and secure from moving.
- Work area, platforms, walkways, scaffolding, and other access ways are free of materials, debris, obstructions, and substances.
- All controls and control linkages, warning and operation lights, and lenses are free of oil and grease and/or ice.
- Gasoline is stored only in non-sparking red containers with a flame arrester in the fill spout and the word “gasoline” easily visible.

Maintenance

- The drill rig engine is shut down to make repairs and/or adjustments. Follow lockout/tagout procedures in Section 11.
- Wheels are blocked, leveling jacks are lowered, and hand breaks set before working under a drill rig.
- All pressure on hydraulics, fluid, and air systems, as appropriate, are released prior to performing maintenance.
- Personnel do not touch engine or exhaust systems immediately after a drilling operation.
- Personnel never climb the mast for maintenance or repairs.
- Personnel never weld or cut near fuel tank.
- Drill rig is kept well maintained with appropriate quantities and qualities of lubricants, hydraulic oils, etc.
- Filter plugs, guards, high-pressure hose clamps, chains, and cables that have been removed for maintenance are replaced.

Hand Tools

- All hand tools are kept in good condition.
- All damaged tools are either repaired or replaced immediately.
- Personnel must use the right tool for the right job.

Clear Work Area

- The site is adequately cleared and leveled prior to drilling to accommodate drill rig and supplies.
- Drainage is established to channel away drilling fluids or precipitation

Drilling Operations

- Drill rigs are not to be driven from hole to hole with derrick in raised position.
- Personnel must check for overhead obstruction before raising the derrick.
- The raised mast should be a minimum of one mast length from overhead power lines.
- Drill rig is leveled and stabilized with leveling jacks and/or solid cribbing before derrick is raised.
- Derrick is locked before initiating operations.

- Personnel only operate drill rig from position of controls.
- Exhaust fumes are vented out of area if drilling in a confined or enclosed area.
- Personnel should clean mud and grease from their boots before stepping onto the drill rig platform and use handholds and railings.
- Personnel do not touch any metal parts with exposed flesh during freezing weather.
- All unattended boreholes are adequately covered and marked.
- All operations are terminated during electrical storms.
- Personnel working on an elevated derrick platform must wear appropriate fall protection and attach the lifeline to the derrick just above the derrick platform to a solid structural derrick.
- When drilling in areas of high-level soil and groundwater impact using air rotary methods, ensure the following precautions are taken to avoid splashing workers and equipment with free-phase product or highly impacted groundwater which may "air lift" rapidly from the borehole:
  - Attempt to complete the boring to total depth without work stoppages, which may allow liquids to accumulate in the boring (unless unsafe conditions arise).
  - Upgrade to modified Level D, including polycoated Tyvek, if impacted soil is expected or encountered.
  - Ensure the work zone is properly ventilated by positioning personnel and potential ignition sources upwind of the boring or utilizing engineering controls such as fans or blowers.
  - Use the minimum amount of air pressure necessary to evacuate cuttings from the boring once impacted soil is encountered.
- All tools are attached to derrick with safety lines.
- While working on a derrick platform, never guide drill rods or pipe into racks or other supports by taking hold of a moving hoist line or traveling block.
- Loose tools are never left on derrick platform.
- Personnel must use appropriate lifting techniques to prevent bodily injury.

Overhead and Buried Utilities

- All overhead and buried utilities are identified and located and noted on all boring location plans and boring assignment sheets.
- Utility pole guy wires will be identified, marked, and avoided.

Supplying Power to Job Site

- All wiring and fixtures used to provide electricity for drilling operations are installed by a qualified person in accordance with the National Electric Code (NFPA 70-1984) with consideration with the American Petroleum Institutes recommended practices for electrical installation for production facilities (API-RP-500 B).
- Ground fault protection should be used for all separators and remote power sources.

Contact with Electricity

- If a drilling rig or a drill rig carrier makes contact with overhead or underground electrical wiring, that the operator and the person in the seat of the vehicle remain seated and not leave the vehicle and not touch any part of the vehicle or drill rig.

- If personnel must evacuate the drill rig, they must jump clear, as far as possible, and land with both feet together, and then hop from the scene.

Safety Operating Practices

- There exists a system of responsibility between the operator and the tool handler when connecting and disconnecting auger sections.
- Handler stands away from rotating auger when connecting and disconnecting auger sections.
- A pin is inserted and tapped in place, using a hammer or similar device, when securing the augur to a power coupling.
- A tool hoist is used when lowering second section of auger into place.
- Both operators stand clear of auger as it is being lifted into place.
- Long-handled shovels are used to move dirt away from auger.
- No attempt shall be made to exceed manufacturers' ratings of speed, force, torque, pressure, flow, etc. The drill rig and tools are to be used only for the purposes for which they are intended and designed.
- Soil and mud are cleaned from rotating augers using appropriate tools and not by hand.

14.0 Railroad safety

Working on railroad property or near trackage poses unique EHS hazards. A summary of railroad project procedures and hazards is provided in this section. In addition, RETEC's Roadway Worker Protection requirements are included in Appendix J.

14.1 Job safety briefing

Before beginning any task, a complete job safety briefing will be conducted with all individuals involved with the task, and again if the task changes. If the task is within 25 feet of any track, the job briefing must include the Long Island RailRoad (LIRR) flagman.

All contractor employees will receive safety instruction from the contractor's safety officer or a qualified LIRR representative prior to the start of any project. Contractor's safety officer will review the safety guidelines to familiarize their employees with safety issues that exist when working in a railroad environment. This should be reviewed at least weekly, and immediately with any new employee(s) coming on the job. It is the responsibility of the contractor's safety officer to instruct employees on these guidelines and to require their compliance.

14.2 Housekeeping

Good housekeeping is of the utmost importance in the prevention of accidents, injuries, and fires. Cleanup will be conducted on a daily basis.

14.3 Personal protective equipment

All contractor employees working on LIRR property will be required to wear OSHA-approved safety glasses with side shields, hard hats with a high visibility, orange cover, and above the ankle, lace up, safety toe boots with puncture resistant soles and a defined heel. Office employees restricted to office work will not be required to comply with these PPE requirements. Reflective vests are required in certain locations as specified by the LIRR representative in charge of the project. During inclement weather, proper clothing to protect against frostbite, etc. will be worn. Particular attention to footing and the use of proper footwear are essential when working in snow or other slippery conditions. Hearing protection, fall protection, and respirators will be worn as required by state and federal regulations.

14.4 Fouling tracks

Train or equipment movement should be expected on any track, in any direction, at any time. Work will not be performed at less than 25 feet from the centerline of any track without a LIRR representative present, unless track is protected by track bulletin and work has been authorized by the LIRR representative in charge of the project. Do not walk between rails or foul track, except when duties require and proper protection is provided. When necessary to cross tracks, look in both directions and keep a minimum of 25 feet from the nearest end of stationary rail equipment. Do not crawl under or between rail cars. Under certain conditions, trains and equipment can approach without being heard. Proper attention and protection are essential to personnel safety when working near railroad tracks. Work cannot be performed within 8 feet of the nearest rail of any live track without first providing for positive protection for personnel and equipment.

14.5 Work protection

If work protection is provided, every employee must know:

- Who the LIRR flagman is, and how to contact him
- Limits of the work protection
- The method of communication to stop and resume work
- Entry into work limits when designated

Note: Personnel or equipment entering work limits that were not previously job briefed must notify the flagman immediately, and be given a job briefing if working less than 25 feet from the centerline of the track.

14.6 Riding on equipment

Riding on rail equipment is prohibited unless authorized by the LIRR representative in charge of the project.

14.7 Damage to Long Island RailRoad property

Any damage to LIRR property will be reported immediately to the LIRR representative in charge of the project. Any vehicle or machine contact with a track, signal equipment or structure (bridge) could result in derailment and is to be reported by the quickest means possible to the LIRR representative in charge of the project or the respective System or Network Operations Center. Emergency numbers are to be obtained from the LIRR representative in charge of the project, prior to the start of any work, and posted at the job site for the duration of the project.

14.8 Passing trains

When a train is approaching, personnel or equipment working less than 25 feet from the centerline of track will stop work and move as far away from the track as practical, until the ENTIRE train has passed. This assures the train engineer that the train has been seen and it is safe to proceed. Failure to do this could result in the engineer placing the train into emergency that could result in damage to the train and delay to railroad traffic. After notification by the LIRR flagman that no other trains are within the working limits, work may then resume. If a train is stopped on a track, work can only be performed that is beyond 8 feet of the nearest rail of the track the train is on. No work within 8 feet of the nearest rail can be performed. In passing around the ends of standing cars, engines, roadway machines, or work equipment, leave at least 20 feet between yourself and the end of the equipment. Do not go between pieces of equipment if the opening is less than one car length (50 feet).

NOTE: Some projects may require a different procedure. In these cases, the LIRR representative in charge of the project will advise the contractor of the proper work procedure adjacent to passing trains.

Violent arm, flag, or flashlight movement while trains are passing indicates an emergency (requires trains to stop) and must not be done unless an emergency exists. NEVER stand with your back to a moving train. Metal banding and other components sometimes break during shipment and can swing out several feet from the train.

14.9 Stepping or sitting on rails

Stepping, walking, or sitting on the top of rail is prohibited. The railhead becomes very slick from oil buildup and presents a slipping hazard.

14.10 Environmental

No contaminates are to be discharged on LIRR property. Should it occur, it must be reported by the quickest means possible to the LIRR representative in charge of the project (this includes oils, diesel fuel, gasoline, etc.).

14.11 Excavation

Excavating on the right-of-way could result in damage to buried cables resulting in delay to railroad traffic. Before any excavation commences, contact the LIRR signal and track representative in charge of the area. All underground and overhead wires are to be considered *HIGH VOLTAGE* and dangerous until verified with the company having ownership of the line. It is the contractor's responsibility to notify any other companies that have underground utilities in the area before excavating. All excavation will be protected as required by the LIRR representative in charge of the project and backfilled as quickly as possible.

14.12 Reporting

Any personal injury sustained by a contractor employee while on railroad property must be reported immediately to the LIRR representative in charge of the project. The injury report form provided by LIRR is to be completed and sent by Fax to the address indicated on the form, no later than close of shift on the date of injury.

14.13 Weekend/after hours

When contractor employees are required to work on LIRR property after normal working hours or on weekends, the LIRR representative in charge of the project must be notified. When it is necessary to work during these times, a minimum of two employees are required to be present. This could be RETEC employees with a contractor employee/client or two contractor employees. Exceptions must be approved by the LIRR representative in charge of the project. Any work performed less than 25 feet from the centerline of track must be protected by a flagman or by a qualified lookout.

14.14 Operation of vehicles and equipment

Equipment and vehicles must operate at a safe speed being aware of operating conditions as well as other equipment and personnel working in close proximity. Vehicles left unattended must be secured so as to prevent unexpected roll away.

Extreme caution must be exercised at all grade crossings.

- STOP, LOOK, AND LISTEN
- THINK
- When in Doubt, Take the Safe Course

Appendix A

Site safety plan amendments

PLEASE USE THIS DOCUMENT TO MAKE ANY CHANGES TO THE HEALTH AND SAFETY PLAN

Site safety plan amendments

Amendment No.: _____

Client:	**Project Number:**
Location:	**Date:**
Project Manager:	**Site Engineer:**
Site EHS Officer:	
Amendment:	
Reason for Amendment:	
Alternative Safeguard Procedures:	
Required Changes in PPE:	

_____ _____

Site EHS Officer Date

_____ _____

Corp. EHS Manager Effective Date

Appendix B

Site safety plan acknowledgement form

Site safety plan acknowledgment form

I have been informed, understand, and will abide by all the procedures and protocols set forth in this Site Health and Safety Plan for the _____ site.

Name (Print)	Signature	Affiliation	Date

Appendix C

Visitor sign-in log

Visitor sign-in log

Client: _____ **Project Number:** _____

Location: _____ **Site Engineer:** _____

Project Mgr.: _____ **Site EHS Officer:** _____

Date	Name	Affiliation	Purpose of Visit	Site EHS Training		Do you have Level D PPE?		Time In	Time Out
				Yes	No	Yes	No		

Appendix D

Site safety meeting form

Our behavior-based safety process is the key to our success!

Site Safety Meeting Form

Project Name:_____ Location:_____

Date:_____ Time:_____

Project Number:_____ Instructor:_____

Safety Topics Presented

JHA/STAR:_____

_____

Lessons Learned:_____

_____

BEST O&F:_____

_____

General Safety Topics:_____

_____

Name	Attendee's Signature

Appendix E

Notification of access to employee exposure and medical records

Notice

To All Employees: This Notice Is to Provide Information for Compliance with 29 CFR Part 1910 Subpart C - General Safety and Health Provisions - Paragraph 1910.1020, Access to Employee Exposure and Medical Records.

(i) The existence, location, and availability of any records covered by this section is as follows:

The RETEC Group, Inc.
Corporate One Office Park
Building II, Suite 400
4075 Monroeville Boulevard
Monroeville, PA 15146
PH: (412) 380-0140
FAX: (412) 380-0141

Attn: Tina McHugh
tmchugh@retec.com
Corporate Environmental Health and Safety Administrative/Workers' Comp. Manager

(ii) The person responsible for maintaining and providing access to these records is RETEC's Corporate Environmental Health and Safety Administrative Manager.

(iii) Each employee has the right to access these records.

(iv) A copy of this standard and its appendices are available to all affected employees at each RETEC office location.

For More Information or Questions Contact:

Ms. Tina L. McHugh
Corporate EHS Administrative/Worker's Comp. Manager
(412) 380-0140

Appendix F

Cold & Heat Stress and Other Physiological Factors

Cold Stress

These Threshold Limit Values (TLVs) are intended to protect workers from the severe effects of cold stress (hypothermia) and cold injury and to describe exposures to cold working conditions under which it is believed that nearly all workers can be repeatedly exposed without adverse health effects. The TLV objective is to prevent the deep body core temperature from falling below 36ºC and to prevent cold injury to body extremities. Deep body temperature is the core temperature of the body as determined by rectal temperature measurements. For a single, occasional exposure to a cold environment, a drop in core temperature to no lower than 35ºC should be permitted. In addition to provisions for total body protection, TLV objective is to protect all parts of the body, with emphasis on hands, feet, and head, from cold injury.

Introduction
Fatal exposures to cold among workers have almost always resulted from accidental exposures involving failure to escape from low environmental air temperatures or from immersion in low temperature water. The single most important aspect of life-threatening hypothermia is the fall in the deep core temperature of the body. The clinical presentations of victims of hypothermia are shown in Table 1 (taken from Dembert in AFP, January 1982). Workmen should be protected from exposure to cold so that the deep core temperature does not fall below 36ºC (96.8ºF); lower body temperatures will very likely result in reduced mental alertness, reduction in rational decision-making, or loss of consciousness with the threat of fatal consequences.

Pain in the extremities may be the first early warning of danger to cold stress. During exposure to cold, maximum severe shivering develops when the body temperature has fallen to 35ºC (95ºF). This must be taken as a sign of danger to the workers and exposure to cold should be immediately terminated for any workers when severe shivering becomes evident. Useful physical or mental work is limited when severe shivering occurs.

Since prolonged exposure to cold air or to immersion in cold water in temperatures well above freezing can lead to dangerous hypothermia, whole body protection must be provided.

- Adequate insulating clothing to maintain core temperatures above 36ºC must be provided to workers if work is performed in air temperatures below 4ºC (40ºF). Wind chill factor or the cooling power of the air is a critical factor. An equivalent chill temperature chart relating the actual dry bulb air temperature and the wind velocity is presented in Table 2. The equivalent chill temperatures on exposed skin are determined by estimating the combined cooling effect of wind and low air temperatures.
- Unless there are unusual or extenuating circumstances, cold injury to other than hands, feet, and head is not likely to occur without the development of the initial signs of hypothermia. Older workers or workers with circulatory problems require special precautionary protection against cold injury. The use of extra insulating clothing and/or a reduction in the duration of the exposure period are among the special precautions, which should be considered. The precautionary action to be taken will depend upon the physical condition of the worker and should be determined with the advice of a physician with knowledge of the cold stress factors and the medical condition of the worker.

Evaluation and Control
For exposed skin, continuous exposure should not be permitted when the air speed and temperature result in an equivalent chill temperature of -32ºC (-25ºF). Superficial or deep local tissue freezing will occur only at temperatures below -1ºC regardless of wind speed.

At air temperatures of 2ºC (35.6ºF) or less, it is imperative that workers who become immersed in water or whose clothing becomes wet be immediately provided a change of clothing and be treated for hypothermia.

Table 1 Progress Clinical Presentations of Hypothermia1

Core Temperature		Clinical Signs
°C	°F	
37.6	99.6	"Normal" rectal temperature
37.0	98.6	"Normal" oral temperature
36.0	96.8	Metabolic rate increases in an attempt to compensate for heat loss
35.0	95.0	Maximum shivering
34.0	93.2	Victim conscious and responsive, with normal blood
33.0	91.4	Severe hypothermia below this temperature
32.0 31.0	89.6 87.8	Consciousness clouded; blood pressure becomes difficult to obtain; pupils dilated but react to light; shivering ceases
30.0 29.0	86.0 84.2	Progressive loss of consciousness; muscular rigidity increases; pulse and blood pressure difficult to obtain; respiratory rate decreases
28.0	82.4	Ventricular fibrillation possible with myocardial irritability
27.0	80.6	Voluntary motion ceases; pupils non-reactive to light; deep tendon and superficial reflexes absent
26.0	78.8	Victim seldom conscious
25.0	77.0	Ventricular fibrillation may occur spontaneously
24.0	75.2	Pulmonary edema
22.0 21.0	71.6 69.8	Maximum risk of ventricular fibrillation
20.0	68.0	Cardiac standstill
18.0	64.4	Lowest accidental hypothermia victim to recover
17.0	62.6	Isoelectric electroencephalogram
9.0	48.2	Lowest artificially cooled hypothermia patient to recover

1 Presentations approximately related to core temperature. Reprinted from the January 1982 issue of American Family Physician published by the American Academy of Family Physicians.

Table 2 Cooling Power of Wind on Exposed Flesh Expressed as Equivalent Temperature (under calm conditions)

Est. Wind Speed (mph)	Actual Temperature Reading (ºF)											
	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
	Equivalent Chill Temperature (ºF)											
Calm	50	40	30	20	10	0	-10	-20	-30	-40	-50	-60
5	48	37	27	16	6	-5	-15	-26	-36	-47	-57	-68
10	40	28	16	4	-9	-24	-33	-46	-58	-70	-83	-95
15	36	22	9	-5	-18	-32	-45	-58	-72	-85	-99	-112
20	32	18	4	-10	-25	-39	-53	-67	-82	-96	-110	-131
25	30	16	0	-15	-29	-44	-59	-74	-88	-104	-118	-133
30	28	13	-2	-18	-33	-48	-63	-79	-94	-109	-125	-140
35	27	11	-4	-20	-35	-51	-67	-82	-98	-113	-129	-145
40	26	10	-6	-21	-37	-53	-69	-85	-100	-116	-132	-148
(Wind speeds greater than 40 mph have little additional effect).	**Little Danger** In < 1 hr. with dry skin. Maximum danger of false sense of security.				**Increasing Danger** Danger from freezing of exposed flesh within one minute.			**Greater Danger** Flesh may freeze within 30 seconds.				
	Trench foot and immersion foot may occur at any point on this chart.											

Developed by U.S. Army Research Institute of Environmental Medicine, Natick, MA

Recommended limits for properly clothed workers for periods of work at temperatures below freezing are shown in Table 3. Special protection of the hands is required to maintain manual dexterity for the prevention of accidents:

- If fine work is to be performed with bare hands for more than 10 to 20 minutes in an environment below 16ºC (60ºF), special provisions should be established for keeping the workers' hands warm. For this purpose, warm air jets, radiant heaters (fuel burner or electric radiator), or contact warm plates may be utilized. Metal handles of tools and control bars shall be covered by thermal insulating material at temperatures below -1ºC (30ºF).

To prevent contact frostbite, the workers should wear anti-contact gloves.

- When cold surfaces below -7ºC (20ºF) are within reach, a warning should be given to each worker by his supervisor to prevent inadvertent contact by skin.
- If the air temperature is -17.5ºC (9ºF) or less, the hands should be protected by mittens. Machine controls and tools for use in cold conditions should be designed so that they can be handled without removing the mittens.

Provisions for additional total body protection are required if work is performed in an environment at or below 4ºC (40ºF). The workers shall wear cold protective clothing appropriate for the level of cold and physical activity:

- If the air velocity at the job site is increased by wind, draft, or artificial ventilating equipment, the cooling effect of the wind shall be reduced by shielding the work area, or by wearing an easily removable outer windbreak layer garment. Wind chill cooling rates are illustrated in Table 4.
- If only light work is involved and if the clothing on the worker may become wet on the job site, the outer layer of the clothing used may be of a type impermeable to water. With more severe work under such conditions, the outer layer should be water repellent and the outerwear should be changed as it becomes wet. The outer garments must include provisions for easy ventilation in order to prevent wetting of inner layers by sweat. If work is done at normal temperatures or in a hot environment before entering the cold area, and the clothing is wet, the employee shall change into dry clothes before entering the cold area. The workers shall change socks and any removable felt insoles at regular daily intervals or use vapor barrier boots. The optimal frequency of change shall be determined empirically and will vary individually and according to the type shoe worn and how much the individual's feet sweat.
- If extremities (ears, toes, and nose) cannot be protected sufficiently to prevent sensation of excessive cold or frostbite by handwear, footwear, and facemasks, these protective items shall be supplied in auxiliary heated versions.
- If the available clothing does not give adequate protection to prevent hypothermia or frostbite, work shall be modified or suspended until adequate clothing is made available or until weather conditions improve.
- Workers handling evaporative liquid (gasoline, alcohol, or cleaning fluids) at air temperature below 4ºC (40ºF) shall take special precautions to avoid soaking of clothing or gloves with the liquids because of the added danger of cold injury due to evaporative cooling. Special note should be taken of the particularly acute effects of splashes of "cryogenic fluids" or those liquids with a boiling point only just above ambient temperatures.

Table 3 Threshold Limit Values Work/Warm-up Schedule for Four Hour Shift

Air Temp – Sunny Sky		Non-Noticeable Wind		5 mph Wind		10 mph Wind		15 mph Wind		20 mph Wind	
ºC	**ºF**	**Max. Work Period (min.)**	**No. of Breaks**	**Max. Work Period (min.)**	**No. of Breaks**	**Max. Work Period (min.)**	**No. of Breaks**	**Max. Work Period (min.)**	**No. of Breaks**	**Max. Work Period (min.)**	**No. of Breaks**
-26º to -28º	-15º to -1º	Normal Breaks		Normal Breaks		75	2	55	3	40	4
-29º to -31º	-20º to -24º	Normal Breaks		75	2	55	3	40	4	30	5
-32º to -34º	-25º to -29º	75	2	55	3	40	4	30	5	Non-emergency work should cease	
-35º to -37º	-30º to -34º	55	3	40	4	30	5	Non-emergency work should cease			
-38º to -39º	-35º to -39º	40	4	30	5	Non-emergency work should cease					
-40º to -42º	-40º to -44º	30	5	Non-emergency work should cease							
-43º & below	-45º & below	Non-emergency work should cease									

Notes:

- Schedule applies to moderate-to-heavy work activity with warm-up breaks of ten (10) minutes in a warm location. For light-to-moderate work (limited physical movement): apply the schedule one step lower. For example, at 30ºF with no noticeable wind (Step 4), a worker at a job with little physical movement should have a maximum work period of 40 minutes with 4 breaks in a 4-hour period (5).
- The following is suggested as a guide for estimating wind velocity if accurate information is not available: 5 mph - light flag moves; 10 mph - light flag fully extended; 15 mph - raises newspaper sheet; 20 mph - blowing and drifting snow.
- If only the wind chill cooling rate is available, a rough rule of thumb for applying it rather than the temperature and wind velocity factors given above would be:
  - (1) special warm-up breaks should be initiated at a wind chill of about 1720 Wm/2
  - (2) all non-emergency work should have ceased at or before a wind chill of 2250 W/m2.
- In general, the warm-up schedule provided above slightly under-compensates for the wind at the warmer temperatures, assuming acclimatization and clothing appropriate for winter work. On the other hand, the chart slightly over-compensates for the actual temperatures in the colder ranges, since windy conditions rarely prevail at extremely low temperatures.

*Adapted from Occupational Health & Safety Division, Saskatchewan Department of Labor.

Table 4 Wind Chill Cooling Rate Effects

Wind Chill Rates (Watts/m3)	Comments/Effects
700	Conditions considered comfortable when dressed skiing.
1200	Conditions no longer pleasant for outdoor activities on overcast days.
1400	Conditions no longer pleasant for outdoor activities on sunny days.
1600	Freezing of exposed skin begins for most people depending on the degree of activity and the amount of sunshine.
2300	Conditions for outdoor travel such as walking become dangerous. Exposed areas of the face freeze in less than 1 minute for the average person.
2700	Exposed flesh will freeze within half a minute for the average person.

*Adapted from Canadian Department of the Environment, Atmospheric Environment Service.

Work-Warming Regimen

If work is performed continuously in the cold at an equivalent chill temperature (ECT) or below -7ºC (20ºF), heated warming shelters (tents, cabins, rest rooms, etc.) shall be made available nearby and the workers should be encouraged to use these shelters at regular intervals, the frequency depending on the severity of the environmental exposure. The onset of heavy shivering, frostbite, the feeling of excessive fatigue, drowsiness, irritability, or euphoria are indications for the immediate return to the shelter. When entering the heated shelter, the outer layer of clothing shall be removed and the remainder of the clothing loosened to permit sweat evaporation. Also, a change of dry work clothing may be provided. A change of dry work clothing shall be provided as necessary to prevent workers from returning to their work with wet clothing. Dehydration, or the loss of body fluids, occurs insidiously in the cold environment and may increase the susceptibility of the worker to cold injury due to a significant change in blood flow to the extremities. Warm sweet drinks and soups should be provided at the work site to provide caloric intake and fluid volume. The intake of coffee should be limited because of the diuretic and circulatory effects.

For work practices at or below -12ºC (10ºF) ECT, the following shall apply:

- The worker shall be under constant protective observation (buddy system or supervision).
- The work rate should not be so high as to cause heavy sweating that will result in wet clothing; if heavy work must be done, rest periods must be taken in heated shelters and opportunity for changing into dry clothing shall be provided.
- New employees shall not be required to work full time in cold in the first days until they become accustomed to the working conditions and required protective clothing.
- The weight and bulkiness of clothing shall be included in estimating the required work performance and weights to be lifted by the worker.
- The work shall be arranged in such a way that sitting still or standing still for long periods is minimized. Unprotected metal chair seats shall not be used. The worker should be protected from drafts to the greatest extent possible.
- The workers shall be instructed in safety and health procedures. The training program shall include, at a minimum, instruction in:

- Proper re-warming procedures and appropriate first aid treatment
- Proper clothing practices
- Proper eating and drinking habits
- Recognition of impending frostbite
- Recognition of signs and symptoms of impending hypothermia or excessive cooling of body even when shivering does not occur
- Safe work practices

Special Workplace Recommendations
Special design requirements for refrigerator rooms include the following:

- In refrigerator rooms, the air velocity should be minimized as much as possible and should not exceed 1 meter per second (200 fpm) at the job site. This can be achieved by properly designed air distribution systems.
- Special wind-protective clothing shall be provided based upon existing air velocities to which workers are exposed.

Special caution shall be exercised when working with toxic substances and when workers are exposed to vibration. Cold exposure may require reduced exposure limits.

Eye protection for workers employed outdoors in a snow and/or ice-covered terrain shall be supplied. Special safety goggles to protect against ultraviolet light and glare (which can produce temporary conjunctivitis and/or temporary loss of vision) and blowing ice crystals are required when there is an expanse of snow coverage causing a potential eye exposure hazard.

Workplace Monitoring is required as Follows:

- Suitable thermometry should be arranged at any workplace where the environmental temperature is below 16ºC (60ºF) to enable overall compliance with the requirements of the TLV to be maintained.
- Whenever the air temperature at a workplace falls below -1ºC (30ºF), the dry bulb temperature should be measured and recorded at least every 4 hours.
- In an indoor workplace, the wind speed should also be recorded at least every 2 hours whenever the rate of air movement exceeds 2 meters per second (5 miles per hour).
- In an outdoor work situation, the wind speed should be measured and recorded together with the air temperature whenever the air temperature is below -1ºC (30ºF).
- The equivalent chill temperature shall be recorded with the other data whenever the equivalent chill temperature is below -7ºC (20ºF).

Employees shall be excluded from work in cold at -1ºC (30ºF) or below if they are suffering from diseases or taking medication, which interferes with normal body temperature regulation or reduces tolerance to work in cold environments. Workers who are routinely exposed to temperatures below -24ºC (-10ºF) with wind speeds less than 5 miles per hour should be medically certified as suitable for such exposures.

Trauma sustained in freezing or subzero conditions requires special attention because an injured worker is predisposed to secondary cold injury. Special provisions must be made to prevent hypothermia and secondary freezing of damaged tissues, in addition to providing first aid treatment.

Heat Stress and Other Physiological Factors

Wearing PPE puts a hazardous waste worker at considerable risk of developing heat stress. This can result in health effects ranging from transient heat and fatigue to serious illness or death. Heat stress is caused by a number of interacting factors, including environmental conditions, clothing, workload, and the individual characteristics of the worker. Because heat stress is probably one of most common (and potentially serious) illnesses at hazardous wastes sites, regular monitoring and other preventative precautions are vital.

Individuals vary in their susceptibility to heat stress. Factors that may predispose someone to heat stress include:

- Lack of physical fitness
- Lack of acclimatization
- Age
- Dehydration
- Obesity
- Alcohol and drug use
- Infection
- Sunburn
- Diarrhea
- Chronic disease

Reduced work tolerance and the increased risk of excessive heat stress is directly influenced by the amount and type of PPE worn. PPE adds weight and bulk, severely reduces the body's access to normal heat exchange mechanisms (evaporation, convection, and radiation), and increases energy expenditure. Therefore, when selecting PPE, each item's benefit should be carefully evaluated in relation to its potential for increasing the risk of heat stress. Once PPE is selected, the safe duration of work/rest periods should be determined based on the following:

- Anticipated work rate
- Ambient temperature and other environmental factors
- Type of protective ensemble
- Individual worker characteristics and fitness

Monitoring
Because the incidence of heat stress depends on a variety of factors, all workers, even those not wearing protective equipment, should be monitored.

- For workers wearing permeable clothing (*e.g.*, standard cotton or synthetic work clothes), follow recommendations for monitoring requirements and suggested work/rest schedules in the current American Conference of Governmental Industrial Hygienists' (ACGIH) Threshold Limit Values for Heat Stress. If the actual work clothing differs from the ACGIH standard ensemble in insulation value and/or wind and vapor permeability, change the monitoring requirements and work/rest schedules accordingly.

- For workers wearing semi-permeable or impermeable[1] encapsulating ensembles, the ACGIH standard cannot be used. For these situations, workers should be monitored when the temperature in the work area is above 21ºC (70ºF).

To monitor the worker, measure the following:

- Heart Rate. Count the radial pulse during a 30-second period as early as possible in the rest period. If the heart rate exceeds 110 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 110 beats per minute at the next rest period, shorten the following work cycle by one-third.
- 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 the oral temperature exceeds 37.7ºC (99.6ºF) at the beginning of the next rest period, shorten the following work cycle by one-third. Do not permit a worker to wear a semi-permeable or impermeable garment when his/her oral temperature exceeds 38.1ºC (100.6ºF).
- Body Water Loss, If Possible. Measure weight on a scale accurate to +0.25 pounds at the beginning and end of each workday to see if enough fluids are being taken to prevent dehydration. Weights should be taken while the employee wears similar clothing. The body water loss should not exceed 1.5 percent total body weight loss in a workday.

Initially, the frequency of physiological monitoring depends on the air temperature adjusted for solar radiation and the level of physical work (see Table 1). The length of the work cycle will be governed by the frequency of the required physiological monitoring.

Table 5 Suggested Frequency of Physiological Monitoring for Fit and Acclimatized Workers [1]

Adjusted Temperature [2]		Normal Ensemble [3]	Impermeable Ensemble
ºF	ºC		
90 or above	32.2 or above	After each 45 minutes of work	After each 15 minutes of work
87.5 – 90	30.8 – 32.2	After each 60 minutes of work	After each 30 minutes of work
87.5 – 85.5	28.1 – 30.8	After each 90 minutes of work	After each 60 minutes of work
77.5 – 82.5	25.3 – 28.1	After each 120 minutes of work	After each 90 minutes of work
72.5 – 77.5	22.5 – 25.3	After each 150 minutes of work	After each 120 minutes of work

[1]For work levels of 250 Kilocalories/hour.

[2]Calculate the adjusted air temperature (ta adj) using this equation: ta adj = ta º = (13 + % sunshine). Measure air temp. (ta) with a standard 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, distant shadow, 0 percent sunshine = no shadows).

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

[1] Although no protective ensemble is "completely" impermeable, for practical purposes an outfit may be considered impermeable when calculating heat stress risk.

Prevention

Proper training and preventive measures will help avert serious illness and decrease in productivity. Preventing heat stress is particularly important because once someone suffers from heat stroke or heat exhaustion; the person may be predisposed to additional heat injuries. To avoid heat stress, management should take the following steps.

- Adjust work schedules:
  - Modify work/rest schedules according to monitoring requirements.
  - Mandate work slowdowns as needed.
  - Rotate personnel: alternate job functions to minimize overstress or overexertion at one task.
  - Add additional personnel to work teams.
  - 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 workers' 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. The normal thirst mechanism is not sensitive enough to ensure that enough water will be drunk to replace lost water. When heavy sweating occurs, encourage the worker to drink more. The following strategies may be useful:
  - Maintain water temperature at 10º to 15.6ºC (50º to 60ºF)
  - Provide small disposable cups that hold about 4 ounces (0.1 liter)
  - Have workers drink 16 ounces (0.5 liters) of fluid (preferably water or diluted 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
  - Weigh workers before and after work to determine if fluid replacement is adequate
- Provide cooling devices to aid natural body heat exchange during prolonged work or severe heat exposure. Cooling devices include:
  - Field showers or hose-down areas to reduce body temperature and/or to cool off protective clothing
  - Cooling jackets, vests, or suits
- Train workers to recognize and treat heat stress. As part of training, identify the signs and symptoms of heat stress.

Other Factors

PPE decreases worker performance as compared to an unequipped individual. The magnitude of this effect varies considerably, depending on both the individual and the PPE ensemble used. This section discusses the demonstrated physiological responses to PPE, the individual human traits that play a factor in these responses, and some of the precautionary and training measures that need to be taken to avoid PPE-induced injury.

The physiological factors, which may affect worker ability to function using PPE, include:

- Physical condition
- Level of acclimatization
- Age
- Gender
- Weight

Physical Condition

Physical fitness is a major factor influencing a person's ability to perform work under heat stress. The more fit someone is, the more work they can safely perform. At a given level of work a fit person, relative to an unfit person, will have:

- Less physiological strain
- A lower heart rate
- A lower body temperature, which indicates less retained body heat (a rise in internal temperature precipitates heat injury)
- A more efficient sweating mechanism
- Slightly lower oxygen consumption
- Slightly lower carbon dioxide production

Level of Acclimatization.

The degree to which a worker's body has physiologically adjusted or acclimatized to working under hot conditions affects his or her ability to do work. Acclimatized individuals generally have lower heart rates and body temperatures than non-acclimatized individuals and sweat sooner and more profusely. This enables them to maintain lower skin and body temperatures at a given level of environmental heat and work loads than non-acclimatized workers. Sweat composition also becomes more dilute with acclimatization, which reduces salt loss.

Acclimatization can occur after just a few days of exposure to a hot environment. NIOSH recommends a progressive 6-day acclimatization period for the non-acclimatized worker before allowing him/her to do full work on a hot job. Under this regimen, the first day of work on site is begun using only 50 percent of the anticipated workload and exposure time, and is increased slowly over the next several days. If the workers can acclimatize quickly, this period may be shortened by two or three days. If this period includes time off, however, workers can lose acclimatization in a matter of days, and work regimens should be adjusted taking this into account.

When enclosed in an impermeable suit, fit-acclimatized individuals sweat more profusely than un-fit or non-acclimatized individuals and may, therefore, actually face a greater danger of heat exhaustion due to rapid dehydration. Consuming adequate quantities of water can prevent this. See previous section on prevention for additional information.

Age

Generally, maximum work capacity declines with increasing age, but this is not always the case. Active, well-conditioned seniors often have performance capabilities equal to or greater than young sedentary individuals. However, there is some evidence, indicated by lower sweat rate and higher body core temperatures, that older individuals are less effective in compensating for a given level of environmental heat and work load. At

moderate thermal loads, however, the physiological responses of "young" and "old" are similar and performance is not affected.

Age should not be the sole criterion for judging whether or not an individual should be subjected to moderate heat stress. Fitness level is a more important factor.

Gender

The literature indicates that women tolerate heat stress at least as well as their male counterparts. Generally, a woman's work capacity averages 10 to 30 percent less than that of a man. The primary reasons for this are the greater oxygen-carrying capacity and the stronger heart in the male. However, a similar situation exists as with aging: not all men have greater work capacities than all women.

Weight

The ability of a body to dissipate heat depends on the ratio of its surface area to its mass (surface area/weight). Heat loss (dissipation) is a function of surface area and heat production is dependent on mass. Therefore, heat balance is described by the ratio of the two.

Since overweight individuals (those with a low ratio) produce more heat per units of surface area than thin individuals (those with a high ratio), overweight individuals should be given special consideration in heat stress situations. However, when wearing impermeable clothing, the weight of an individual is not a critical factor in determining the ability to dissipate excess heat.

Signs and Symptoms of Heat Stress

- Heat rash may result from continuous exposure to heat or humid air.
- Heavy sweating with inadequate electrolyte replacement causes heat cramps. Signs and symptoms include:
  - Muscle spasms
  - Pain in the hands, feet, and abdomen
- Heat exhaustion occurs from increased stress on various body organs including inadequate blood circulation due to cardiovascular insufficiency or dehydration. Signs and symptoms include:
  - Pale, cool, moist skin
  - Heavy sweating
  - Dizziness
  - Nausea
  - Fainting
- Heat stroke is the most serious form of heat stress. Temperature regulation fails and the body temperature rises to critical levels. Immediate action must be taken to cool the body before serious injury and death occurs. Competent medical help must be obtained. Signs and symptoms are:
  - Red, hot, usually dry skin
  - Lack of or reduced perspiration
  - Nausea
  - Dizziness and confusion

- Strong, rapid pulse
- Coma

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Appendix G

Material Safety Data Sheets

MSDS LIST

Alconox
Bentonite
Benzene
BioSolve
Coal Tar Pitch
Cresol
Cyanide (ferric)
Diesel fuel
Ethylbenzene
Gasoline
Hydrochloric Acid (HCl)
Hydrogen cyanide (HCN)
Isobutylene
Isopropyl alcohol
Methanol
Methylnaphthalene (2-)
Naphthalene
Nitric Acid (HNO_3)
Phenol
Portland Cement
Simple Green Cleaner/Degreaser
Toluene
Xylenes (m-, o-, and p- isomers)

Alconox® Material Safety Data Sheet

Alconox, Inc.
30 Glenn Street, Suite 309
White Plains, NY 10603

24 Hour Emergency Number - Chem-Tel (800) 255-3924

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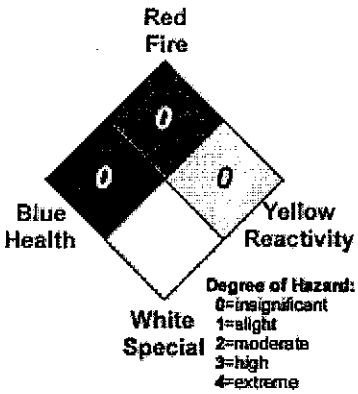
I. Identification

Product Name (shown on label):	ALCONOX
CAS Registry Number:	Not Applicable
Effective Date:	January 1, 2001
Chemical Family:	Anionic Powdered Detergent
Mfr. Catalog #s for Sizes:	1104, 1125, 1150, 1101, 1103, 1112

National Fire Protection Association 704 Labeling:



NJTSRN: 1100

II. Hazardous Ingredients/Identity Information

There are no hazardous ingredients in ALCONOX as defined by the OSHA Standard and Hazardous Substance List 29 CFR 1910 Subpart Z.

III. Physical/Chemical Characteristics

Boiling Point (F):	Not Applicable
Vapor Pressure (mm Hg):	Not Applicable
Vapor Density (AIR=1):	Not Applicable
Specific Gravity (Water=1):	Not Applicable
Evaporation Rate (Butyl Acetate=1):	Not Applicable
Melting Point:	Not Applicable
Solubility in Water:	Appreciable-Soluble to 10% at ambient conditions
Appearance:	White powder interspersed with cream colored flakes.
pH:	9.5 (1%)

IV. Fire and Explosion Data

Flash Point (Method Used):	None
Flammable Limits:	LEL: No Data UEL: No Data
Extinguishing Media:	Water, dry chemical, CO2, foam
Special Fire fighting Procedures:	Self-contained positive pressure breathing apparatus and protective clothing should be worn when fighting fires involving chemicals.
Unusual Fire and Explosion Hazards:	None

V. Reactivity Data

Stability:	Stable
Hazardous Polymerization:	Will not occur
Incompatibility (Materials to Avoid):	None
Hazardous Decomposition or Byproducts:	May release CO2 on burning

VI. Health Hazard Data

Route(s) of Entry:	Inhalation? Yes Skin? No Ingestion? Yes
Health Hazards (Acute and Chronic):	Inhalation of powder may prove locally irritating to mucous membranes. Ingestion may cause discomfort and/or diarrhea. Eye contact may prove irritating.
Carcinogenicity:	NTP? No IARC Monographs? No OSHA Regulated? No
Signs and Symptoms of Exposure:	Exposure may irritate mucous membranes. May cause sneezing.
Medical Conditions Generally Aggravated by Exposure:	Not established. Unnecessary exposure to this product or any industrial chemical should be avoided. Respiratory conditions may be aggravated by powder.
Emergency and First Aid Procedures:	Eyes: Immediately flush eyes with water for at least 15 minutes. Call a physician. Skin: Flush with plenty of water. Ingestion: Drink large quantities of water or milk. Do not induce vomiting. If vomiting occurs administer fluids. See a physician for discomfort.

VII. Precautions for Safe Handling and Use

Steps to be Taken if Material is Released or Spilled:	Material foams profusely. Recover as much as possible and flush remainder to sewer. Material is biodegradable.
Waste Disposal Method:	Small quantities may be disposed of in sewer. Large quantities should be disposed of in accordance with local ordinances for detergent products.
Precautions to be Taken in Storing and Handling:	Material should be stored in a dry area to prevent caking.
Other Precautions:	No special requirements other than the good industrial hygiene and safety practices employed with any industrial chemical.

VII. Control Measures

Respiratory Protection (Specify Type):	Dust mask - Recommended
Ventilation:	Local Exhaust-Normal Special-Not Required Mechanical-Not Required Other-Not Required
Protective Gloves:	Impervious gloves are useful but not required.
Eye Protection:	Goggles are recommended when handling solutions.
Other Protective Clothing or Equipment:	None
Work/Hygienic Practices:	No special practices required

THE INFORMATION HEREIN IS GIVEN IN GOOD FAITH BUT NO WARRANTY IS EXPRESSED OR IMPLIED.

1. PRODUCT AND COMPANY IDENTIFICATION

Product Code	00040
Trade Name	HOLEPLUG® 3/8
Generic Description	BENTONITE, SODIUM MONTMORILLONITE (CAS# 1302-78-9)
Manufacturer/Supplier	Baroid
Address	P.O. Box 1675 Houston, TX 77251
Phone Number	(281) 871-5900
Emergency Phone Number	(281) 871-5900
Chemtrec Number	(800)424-9300
MSDS first issued	7 January 1999
MSDS data revised	

2. COMPOSITION/INFORMATION ON THE COMPONENTS

Hazardous Components in Preparation for US

Component Name	Codes	Concentration
SILICA, CRYSTALLINE AS QUARTZ	14808-60-7	2.00 - 6.00

3. HAZARD IDENTIFICATION

Routes of Entry	- Inhalation of dusts - Eye contact - Skin contact
Carcinogenic Status	An ingredient is: - Listed as carcinogenic by: - IARC
Target Organs	- Eye - Skin - Lung
Health Effects - Eyes	Dust may cause slight transient irritation.
Health Effects - Skin	Material may cause slight irritation on prolonged or repeated contact.
Health Effects - Ingestion	Swallowing may have the following effects: - irritation of mouth, throat and digestive tract
Health Effects - Inhalation	Exposure to dust may have the following effects: - irritation of nose, throat and respiratory tract Prolonged inhalation of dust may result in cancerous and noncancerous lung disease. Crystalline silica inhaled in the form of quartz or cristobalite from occupational sources is carcinogenic to humans.

4. FIRST AID MEASURES

First Aid - Eyes	Immediately flood the eye with plenty of water for at least 15 minutes, holding the eye open. Obtain medical attention if soreness or redness persists.
First Aid - Skin	Wash skin thoroughly with soap and water.
First Aid - Ingestion	Wash out mouth with water.
First Aid - Inhalation	Remove from exposure. If there is difficulty in breathing, give oxygen. Seek medical attention if symptoms persist.
Advice to Physicians	Treat symptomatically.

5. FIRE FIGHTING MEASURES

Extinguishing Media	Not readily combustible. Select extinguishing agent appropriate to other materials involved.
Special Hazards of Product	Avoid the formation of dust clouds.
Protective Equipment for Fire-Fighting	No specific measures necessary.

6. ACCIDENTAL RELEASE MEASURES

Spill Procedures	Avoid creating a dust. Sweep or preferably vacuum up and collect in suitable containers for recovery or disposal. Avoid accumulation of dust.
Personal Precautions	Wear appropriate protective clothing. Wear respiratory protection. Material can create slippery conditions underfoot.
Environmental Precautions	No specific measures necessary.

7. HANDLING AND STORAGE

Handling	Avoid creating a dust. Use in well ventilated area. Avoid inhaling dust.
Storage	Store in original containers. Storage area should be: - cool - dry - well ventilated - under cover

8. EXPOSURE CONTROLS/PERSONAL PROTECTION

Occupational Exposure Standards

SILICA, CRYSTALLINE AS QUARTZ	OSHA (respirable): 10 mg/m3 / %SiO2 + 2 OSHA (Total Dust): 30 mg/m3 / %SiO2 + 2 Dust, respirable: ACGIH: TLV 0.1mg/m3 8h TWA. UK EH40: MEL 0.4mg/m3 8h TWA.
Engineering Control Measures	Engineering methods to prevent or control exposure are preferred. Methods include process or personnel enclosure, mechanical ventilation (dilution and local exhaust), and control of process conditions. If engineering controls and work practices are not effective in preventing or controlling exposure, then suitable personal protective equipment, which is known to perform satisfactorily, should be used. Use of the basic principles of Industrial Hygiene will enable this material to be used safely.
Respiratory Protection	The specific respirator selected must be based on the airborne concentration found in the workplace and must not exceed the working limits of the respirator.
Hand Protection	Work gloves
Eye Protection	Dust tight goggles.
Body Protection	Normal work wear. - overall or apron

9. PHYSICAL AND CHEMICAL PROPERTIES

Physical State	Pellets

9. PHYSICAL AND CHEMICAL PROPERTIES

Color	Light Brown - Grey - Varies with product.
Odor	Odorless
pH	Not applicable.
Specific Gravity	2.5
Boiling Range/Point (°C/F)	Not determined.
Flash Point (PMCC) (°C/F)	None.
Explosion Limits (%)	None.
Vapor Pressure	Not applicable.
Density	49.5 lb/cu ft at 20 °C. (loose)
Solubility in Water	Not applicable.
Vapor Density (Air = 1)	Not applicable.
Evaporation Rate	Not applicable.
VOC (g/l)	0

10. STABILITY AND REACTIVITY

Stability	Stable under normal conditions.
Materials to Avoid	None known.
Hazardous Polymerization	Will not occur.
Hazardous Decomposition Products	None known.

11. TOXICOLOGICAL INFORMATION

Acute Toxicity	Low order of acute toxicity predicted.
Chronic Toxicity/Carcinogenicity	IARC assessment: one of the components of this product is carcinogenic to humans (Group 1).
Genotoxicity	No relevant studies identified.
Reproductive/Developmental Toxicity	No relevant studies identified.

12. ECOLOGICAL INFORMATION

Mobility	The product is insoluble in water.
Persistence/Degradability	No relevant studies identified.
Bio-accumulation	No relevant studies identified.
Ecotoxicity	No relevant studies identified.

13. DISPOSAL

Product Disposal	Dispose of in accordance with all applicable local and national regulations.
Container Disposal	Dispose of containers with care.

14. TRANSPORT INFORMATION

DOT CFR 172.101 Data	Proper Shipping Name: Not Regulated
UN Proper Shipping Name	Not Regulated
UN Class	None.
UN Number	None.

15. REGULATORY INFORMATION

TSCA Listed	Yes.
MA Right To Know Law	Listed.
PA Right To Know Law	Listed
NJ Right to Know Law	Listed
California Proposition 65	This product contains the following chemicals that have been found by the State of California to cause cancer, birth defects or other reproductive harm: - Silica, crystalline
SARA Title III Sect. 302 (EHS)	Not listed.
SARA Title III Sect. 311/312 Categorization	Delayed (Chronic) Health Hazard
SARA Title III Sect. 313	This product does not contain a chemical which is listed in Section 313 at or above de deminis concentrations.

16. OTHER INFORMATION

NFPA Ratings	NFPA Code for Health 1 NFPA Code for Flammability 0 NFPA Code for Reactivity 0
Abbreviations	® Registered trademark of Baroid Technology (TM) Trademark of Halliburton Energy Services N/A: Denotes no applicable information found or available CAS#: Chemical Abstracts Service Number ACGIH: American Conference of Governmental Industrial Hygienists OSHA: Occupational Safety and Health Administration TLV: Threshold Limit Value PEL: Permissible Exposure Limit STEL: Short Term Exposure Limit NTP: National Toxicology Program IARC: International Agency for Research on Cancer R: Risk S: Safety LC50: Lethal Concentration 50% LD50: Lethal Dose 50% BOD: Biological Oxygen Demand KoC: Soil Organic Carbon Partition Coefficient
Prepared By:	Environmental Services

All information recommendations and suggestions herein concerning our product are based on tests and data believed to be reliable, however, it is the user's responsibility to determine the safety, toxicity and suitability for his own use of the product described herein. Since the actual use by others is beyond our control, no guarantees, expressed or implied, is made by Baroid as to the effects of such use, the results to be obtained, or the safety and toxicity of the product nor does Baroid assume any liability arising from the use, by others, of the product referred to herein. Nor is the information

16. OTHER INFORMATION

herein to be construed as absolutely complete since additional information may be necessary or desirable when particular or exceptional conditions or circumstances exist or because of applicable laws or government regulations.

1.1 MATERIAL SAFETY DATA SHEET

BENZENE (AMOCO/TOTAL)

MSDS No. 11697000 ANSI/ENGLISH

1.1.1 1.0 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: BENZENE (AMOCO/TOTAL)

MANUFACTURER/SUPPLIER:

Amoco Oil Company
200 East Randolph Drive
Chicago, Illinois 60601 U.S.A.

EMERGENCY HEALTH INFORMATION:
1 (800) 447-8735
EMERGENCY SPILL INFORMATION:
1 (800) 424-9300 CHEMTREC (USA)
OTHER PRODUCT SAFETY INFORMATION:
(312) 856-3907

1.1.2 2.0 COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS#	Range % by Wt.
Benzene	71-43-2	99.80
Toluene	108-88-3	0.20

(See Section 8.0, "Exposure Controls/Personal Protection", for exposure guidelines)

1.1.3 3.0 HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Danger! Extremely flammable. Causes eye and skin irritation. Inhalation causes headaches, dizziness, drowsiness, and nausea, and may lead to unconsciousness. Harmful or fatal if liquid is aspirated into lungs. Danger! Contains Benzene. Cancer hazard. Can cause blood disorders. Harmful when absorbed through the skin.

POTENTIAL HEALTH EFFECTS:

EYE CONTACT: Causes mild eye irritation.

SKIN CONTACT: Causes mild skin irritation. Causes skin irritation on prolonged or repeated contact. Harmful when absorbed through the skin.

INHALATION: Cancer hazard. Can cause blood disorders. Inhalation causes headaches, dizziness, drowsiness, and nausea, and may lead to unconsciousness. See "Toxicological Information" section (Section 11.0).

INGESTION: Harmful or fatal if liquid is aspirated into lungs. See "Toxicological Information" section (Section 11.0).

HMIS CODE: (Health:2) (Flammability:3) (Reactivity:0)
NFPA CODE: (Health:2) (Flammability:3) (Reactivity:0)

1.1.4 4.0 FIRST AID MEASURES

EYE: Flush eyes with plenty of water for at least 15 minutes. Get medical attention if irritation persists.
SKIN: Wash exposed skin with soap and water. Remove contaminated clothing, including shoes, and thoroughly clean and dry before reuse. Get medical attention if irritation develops.
INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.
INGESTION: If swallowed, drink plenty of water, do NOT induce vomiting. Get immediate medical attention.

1.1.5 5.0 FIRE FIGHTING MEASURES

FLASHPOINT: 12°F(-11°C)
UEL: 8.0%
LEL: 1.5%
AUTOIGNITION TEMPERATURE: 928°F (498°C)
FLAMMABILITY CLASSIFICATION: Extremely Flammable Liquid.
EXTINGUISHING MEDIA: Agents approved for Class B hazards (e.g., dry chemical, carbon dioxide, foam, steam) or water fog.
UNUSUAL FIRE AND EXPLOSION HAZARDS: Extremely flammable liquid. Vapor may explode if ignited in enclosed area.
FIRE-FIGHTING EQUIPMENT: Firefighters should wear full bunker gear, including a positive pressure self-contained breathing apparatus.
PRECAUTIONS: Keep away from sources of ignition (e.g., heat and open flames). Keep container closed. Use with adequate ventilation.
HAZARDOUS COMBUSTION PRODUCTS: Incomplete burning can produce carbon monoxide and/or carbon dioxide and other harmful products.

1.1.6 6.0 ACCIDENTAL RELEASE MEASURES

Remove or shut off all sources of ignition. Remove mechanically or contain on an absorbent material such as dry sand or earth. Increase ventilation if possible. Wear respirator and spray with water to disperse vapors. Keep out of sewers and waterways.

1.1.7 7.0 HANDLING AND STORAGE

HANDLING: Use with adequate ventilation. Do not breathe vapors. Keep away from ignition sources (e.g., heat, sparks, or open flames). Ground and bond containers when transferring materials. Wash thoroughly after handling. After this container has been emptied, it may contain flammable vapors; observe all warnings and precautions listed for this product.
STORAGE: Store in flammable liquids storage area. Store away from heat, ignition sources, and open flame in accordance with applicable regulations. Keep container closed. Outside storage is recommended.

1.1.8 8.0 EXPOSURE CONTROLS / PERSONAL PROTECTION

EYE: Do not get in eyes. Wear eye protection.
SKIN: Do not get on skin or clothing. Wear protective clothing and gloves.
INHALATION: Do not breathe mist or vapor. If heated and ventilation is inadequate, use supplied-air respirator approved by NIOSH/MSHA.
ENGINEERING CONTROLS: Control airborne concentrations below the exposure guidelines.
EXPOSURE GUIDELINES:

Component	CAS#	Exposure Limits
Benzene	71-43-2	OSHA PEL: 1 ppm OSHA STEL: 5 ppm ACGIH TLV-TWA: 10 ppm
Toluene	108-88-3	OSHA PEL: 100 ppm (1989); 200 ppm (1971) OSHA STEL: 150 ppm (1989); Not established. (1971) OSHA Ceiling: 300 ppm (1971) ACGIH TLV-TWA: 50 ppm (skin)

1.1.9 9.0 CHEMICAL AND PHYSICAL PROPERTIES

APPEARANCE AND ODOR: Liquid. Colorless. Sweet odor.
pH: Not determined.
VAPOR PRESSURE: 74.6 mm Hg at 20 °C
VAPOR DENSITY: Not determined.
BOILING POINT: 176°F(80°C)
MELTING POINT: 42°F(6°C)
SOLUBILITY IN WATER: Slight, 0.1 to 1.0%.
SPECIFIC GRAVITY (WATER=1): 0.88

1.1.10 10.0 STABILITY AND REACTIVITY

STABILITY: Stable.
CONDITIONS TO AVOID: Keep away from ignition sources (e.g. heat, sparks, and open flames).
MATERIALS TO AVOID: Avoid chlorine, fluorine, and other strong oxidizers.
HAZARDOUS DECOMPOSITION: None identified.
HAZARDOUS POLYMERIZATION: Will not occur.

1.1.11 11.0 TOXICOLOGICAL INFORMATION

ACUTE TOXICITY DATA:

EYE IRRITATION: Testing not conducted. See Other Toxicity Data.
SKIN IRRITATION: Testing not conducted. See Other Toxicity Data.

DERMAL LD50: Testing not conducted. See Other Toxicity Data.
ORAL LD50: 3.8 g/kg (rat).
INHALATION LC50: 10000 ppm (rat)

OTHER TOXICITY DATA: Acute toxicity of benzene results primarily from depression of the central nervous system (CNS). Inhalation of concentrations over 50 ppm can produce headache, lassitude, weariness, dizziness, drowsiness, or excitation. Exposure to very high levels can result in unconsciousness and death.

Long-term overexposure to benzene has been associated with certain types of leukemia in humans. In addition, the International Agency for Research on Cancer (IARC) and OSHA consider benzene to be a human carcinogen. Chronic exposures to benzene at levels of 100 ppm and below have been reported to cause adverse blood effects including anemia. Benzene exposure can occur by inhalation and absorption through the skin.

Inhalation and forced feeding studies of benzene in laboratory animals have produced a carcinogenic response in a variety of organs, including possibly leukemia, other adverse effects on the blood, chromosomal changes and some effects on the immune system. Exposure to benzene at levels up to 300 ppm did not produce birth defects in animal studies; however, exposure to the higher dosage levels (greater than 100 ppm) resulted in a reduction of body weight of the rat pups (fetotoxicity). Changes in the testes have been observed in mice exposed to benzene at 300 ppm, but reproductive performance was not altered in rats exposed to benzene at the same level.

Aspiration of this product into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this product. Do not siphon by mouth.

1.1.12 12.0 ECOLOGICAL INFORMATION

Ecological testing has not been conducted on this product.

1.1.13 13.0 DISPOSAL INFORMATION

Disposal must be in accordance with applicable federal, state, or local regulations. Enclosed-controlled incineration is recommended unless directed otherwise by applicable ordinances. Residues and spilled material are hazardous waste due to ignitability.

1.1.14 14.0 TRANSPORTATION INFORMATION

U.S. DEPT OF TRANSPORTATION

Shipping Name	Benzene
Hazard Class	3
Identification Number	UN1114
Packing Group	II
RQ	RQ

INTERNATIONAL INFORMATION:

Sea (IMO/IMDG)

Shipping Name Not determined.

Air (ICAO/IATA)

Shipping Name Not determined.

European Road/Rail (ADR/RID)

Shipping Name Not determined.

Canadian Transportation of Dangerous Goods

Shipping Name Not determined.

1.1.15 15.0 REGULATORY INFORMATION

CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR Part 302.4): This product is reportable under 40 CFR Part 302.4 because it contains the following substance(s):

Component/CAS Number	Weight %	Component Reportable Quantity (RQ)
Benzene 71-43-2	99.80	10 lbs.

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR Part 355): This product is not regulated under Section 302 of SARA and 40 CFR Part 355.
SARA TITLE III SECTIONS 311/312 HAZARDOUS CATEGORIZATION (40 CFR Part 370): This product is defined as hazardous by OSHA under 29 CFR Part 1910.1200(d).
SARA TITLE III SECTION 313 (40 CFR Part 372): This product contains the following substance(s), which is on the Toxic Chemicals List in 40 CFR Part 372:

Component/CAS Number	Weight Percent
Benzene 71-43-2	99.80

U.S. INVENTORY (TSCA): Listed on inventory.
OSHA HAZARD COMMUNICATION STANDARD: Flammable liquid. Carcinogen. Irritant. CNS Effects. Target organ effects.
EC INVENTORY (EINECS/ELINCS): In compliance.
JAPAN INVENTORY (MITI): Not determined.
AUSTRALIA INVENTORY (AICS): Not determined.
KOREA INVENTORY (ECL): Not determined.
CANADA INVENTORY (DSL): Not determined.
PHILIPPINE INVENTORY (PICCS): Not determined.

1.1.16 16.0 OTHER INFORMATION

Prepared by:

Environment, Health and Safety Department
Issued: November 14, 1995

This material Safety Data Sheet conforms to the requirements of ANSI Z400.1.
This material safety data sheet and the information it contains is offered to you in good faith as accurate. We have reviewed any information contained in this data sheet which we received from sources outside our company. We believe that information to be correct but cannot guarantee its accuracy or completeness. Health and safety precautions in this data sheet may not be adequate

for all individuals and/or situations. It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. No statement made in this data sheet shall be construed as a permission or recommendation for the use of any product in a manner that might infringe existing patents. No warranty is made, either express or implied.

MATERIAL SAFETY DATA SHEET

THE WESTFORD CHEMICAL CORPORATION®
P.O. Box 798
Westford, Massachusetts 01886 USA

Ref. No.: 2001
Date: 1/1/2002

Phone: (978) 392-0689
Phone: (508) 878-5895
Emergency Phone-24 Hours: 1-800-225-3909

Fax: (978) 692-3487
Web Site: http://www.BioSolve.com
E-Mail: info@BioSolve.com

SECTION I - IDENTITY

Name:	**BioSolve®**
CAS #:	138757-63-8
Formula:	Proprietary
Chemical Family:	Water Based, Biodegradable, Wetting Agents & Surfactants
HMIS Code:	Health 1, Fire 0, Reactivity 0
HMIS Key:	4 = Extreme, 3 = High, 2 = Moderate, 1 = Slight, 0 = Insignificant

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SECTION II - HAZARDOUS INGREDIENTS

Massachusetts Right to Know Law or 29 C.F.R. (Code of Federal Regulations) 1910.1000 require listing of hazardous ingredients.

This product does not contain any hazardous ingredients as defined by CERCLA, Massachusetts Right to Know Law and California's Prop. 65.

SECTION III - PHYSICAL - CHEMICAL CHARACTERISTICS

Boiling Point	: 265°F	Specific Gravity	: 1.00 +/-.01
Melting Point	: 32°F	Vapor Pressure mm/Hg	: Not Applicable
Surface Tension- 6% Solution	: 29.1 Dyne/cm at 25°C	Vapor Density Air = 1	: Not Applicable
Reactivity with Water	: No	Viscosity - Concentrate	: 490 Centipoise
Evaporation Rate	: >1 as compared to Water	Viscosity - 6% Solution	: 15 Centipoise
Appearance	: Clear Liquid unless Dyed	Solubility in Water	: Complete
Odor	: Pleasant Fragrance	pH	: 9.1+/-.3
Pounds per Gallon	: 8.38		

SECTION IV - FIRE AND EXPLOSION DATA

Special Fire Fighting Procedures	: None	Flammable Limit	: None
Unusual Fire and Explosion Hazards	: None	Auto Ignite Temperature	: None
Solvent for Clean-Up	: Water	Fire Extinguisher Media	: Not Applicable
Flash Point	: None		

SECTION V - SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

Precautions to be taken in Handling and Storage: Use good normal hygiene.
Precautions to be taken in case of Spill or Leak -

Small spills, in an undiluted form, contain. Soak up with absorbent materials.
Large spills, in an undiluted form, dike and contain. Remove with vacuum truck or pump to storage/salvage vessel. Soak up residue with absorbent materials.

Waste Disposal Procedures -

Dispose in an approved disposal area or in a manner which complies with all local, state, and federal regulations.

SECTION VI - HEALTH HAZARDS

Threshold Limit Values: Not applicable
Signs and Symptoms of Over Exposure-

Acute : Moderate eye irritation. Skin: Causes redness, edema, drying of skin.
Chronic: Pre-existing skin and eye disorders may be aggravated by contact with this product.

Medical Conditions Generally Aggravated by Exposure: Unknown
Carcinogen: No
Emergency First Aid Procedures -

Eyes: Flush thoroughly with water for 15 minutes. Get medical attention.
Skin: Remove contaminated clothing. Wash exposed areas with soap and water. Wash clothing before reuse. Get medical attention if irritation develops.
Ingestion: Get medical attention.
Inhalation: None considered necessary.

SECTION VII - SPECIAL PROTECTION INFORMATION

Respiratory Protection	: Not necessary	Local Exhaust Required	: No
Ventilation Required	: Normal	Protective Clothing	: Gloves, safety glasses Wash clothing before reuse.

SECTION VIII - PHYSICAL HAZARDS

Stability	: Stable	Incompatible Substances	: None Known
Polymerization	: No	Hazardous Decomposition Products	: None Known

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SECTION IX - TRANSPORT & STORAGE

DOT Class	: Not Regulated/Non Hazardous		
Freeze Temperature	: 28°F	Storage	: 35°F-120°F
Freeze Harm	: None (thaw & stir)	Shelf Life	: Unlimited Unopened

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SECTION X - REGULATORY INFORMATION

The Information on this Material Safety Data Sheet reflects the latest information and data that we have on hazards, properties, and handling of this product under the recommended conditions of use. Any use of this product or method of application, which is not described on the Product label or in this Material Safety Data Sheet, is the sole responsibility of the user. This Material Safety Data Sheet was prepared to comply with the OSHA Hazardous Communication Regulation and Massachusetts Right to Know Law.

SECTION 1: CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

Product Name: **Coal Tar Pitch**

Chemical Name: Pitch, coal tar, high-temperature

Synonyms: Roofing Pitch Type I; Roofing Pitch Type III; Electrode Binder Pitch; Anode Binder Pitch; Cathode Binder Pitch; Rod Pitch; 15 Vac Pitch; 925 Pitch; 425 Pitch; CPO-202 Pitch

CAS Number: 65996-93-2

Product Use: waterproofing, roofing, industrial anodes

Manufacturer Information:
Reilly Industries, Inc.
300 North Meridian Street
Suite 1500
Indianapolis, Indiana 46204
USA

Emergency Phone Number (24 hr.): (317) 247-8141
CHEMTREC Phone Number (24 hr.): (800) 424-9300
(collect calls are accepted)
Non-Emergency Phone Number: (317) 247-8141
Non-Emergency Fax Number: (317) 248-6413

SECTION 2: COMPOSITION AND INFORMATION ON INGREDIENTS

Ingredient	CAS Number	Concentration (%)	Exposure Limits	
			OSHA PEL	ACGIH TLV
Coal Tar Pitch	65996-93-2	100 %	0.2 mg/m³ as 8-hr TWA (for coal tar pitch volatiles)	0.2 mg/m³ as 8-hr TWA (for coal tar pitch volatiles)

SECTION 3: HAZARDS IDENTIFICATION

Emergency Overview:

A black solid with a slight aromatic odor, which intensifies into a tarry odor upon melting. Carcinogen. Toxic. Irritant. Sensitizer (skin).

Signs and Symptoms of Potential Overexposure:
Coal tar pitch vapors and dust are irritating to the skin, eyes and respiratory tract. Direct skin contact with coal tar pitch dust and/or high vapor concentrations may cause burning and itching, changes in pigmentation, and skin eruptions. When accentuated by sunlight, skin exposure may result in a phototoxic skin reaction. Direct eye contact with the dust may cause inflammation, discomfort, conjunctivitis, and possible abrasion of the cornea. In general, acute oral toxicity is expected to be moderate, but ingestion is not likely to be a primary route of exposure. Symptoms of systemic poisoning after ingestion of other coal tar products include salivation, nausea, vomiting, abdominal discomfort, respiratory difficulties, dizziness, headache, loss of pupillary reflex, cyanosis, hypothermia, and mild convulsions. It is assumed that ingestion of pitch would produce similar symptoms. Care should be taken to ensure that exposure limits for dust are not exceeded if pitch dust is present (OSHA PEL for particulates = 15 mg/m3 for total dust; 5 mg/m3 for respirable fraction).

Primary Route(s) of Entry:
skin contact, skin absorption, eye contact, inhalation, ingestion

Medical Conditions Aggravated by Exposure:
Persons with pre-existing skin disorders or central nervous functional illnesses may be at increased risk from overexposure. Exposure to vapors may aggravate pre-existing lung conditions. This is not likely to be a problem when appropriate procedures are used to minimize exposure.

SECTION 4: FIRST AID MEASURES

Skin Contact:
For contact with solid pitch, remove contaminated clothing and wash exposed area twice with waterless hand cleaner, soap and water, or a mild detergent. Do not use solvents on skin, as they may promote absorption of this material. The exposed area should be examined by medical personnel if irritation or pain persists after washing.

Eye Contact:
Rinse eyes immediately with large amounts of water for at least 15 minutes, occasionally lifting the eyelids. GET MEDICAL ATTENTION.

Inhalation:	Remove from exposure area to fresh air immediately. If breathing has stopped, give artificial respiration. Keep affected person warm and at rest. Give oxygen if respiration is shallow. GET MEDICAL ATTENTION.
Ingestion:	If conscious, induce vomiting to prevent further absorption. Give oxygen if respiration is shallow. GET MEDICAL ATTENTION. Do not give anything by mouth to an unconscious person.
Thermal Exposure:	Contact with molten pitch causes serious burns. For contact with molten product, do not remove contaminated clothing. Flush skin immediately with large amounts of cold water. If possible, submerge area in cold water. Pack affected area with ice and GET MEDICAL ATTENTION immediately.
Delayed Effects:	none known
Note to Physician:	No specific antidote known. Treatment should be based on the judgment of the physician in response to the reactions of the patient.

SECTION 5: FIRE FIGHTING MEASURES

Flash Point: > 374°F **Method:** TCC **Autoignition Temperature:** > 750°F (399°C)

Flammable Limits: **UFL :** not available **LFL:** not available

Flammability Classification (OSHA):	not applicable
Hazardous Products of Combustion:	Toxic vapors may be released upon thermal decomposition (nitrogen oxides, carbon monoxide, carbon dioxide, sulfur dioxide, PAH's).
Potential for Dust Explosion:	Fine pitch dust has a dust explosion potential similar to coal dust, with a minimum cloud ignition temperature of 710°C (1310°F). Dust explosion concentration is 0.035 ounces/cubic foot (1000 mg/0.03 m3).
Special Flammability Hazards:	Liquid pitch at elevated temperatures will sustain combustion, and may generate vapors that may ignite in the presence of air and a source of ignition. Closed containers may explode when exposed to extreme heat. Solid pitch dust is sensitive to static discharge.
Appropriate Extinguishing Media:	Water fog, carbon dioxide, dry chemical, foam, sand, steam. Water spray can control unconfined pitch fires, but may cause frothing or eruption in closed tanks.
Basic Fire Fighting Guidance:	Wear self-contained breathing apparatus and full protective clothing. Skin and eye contact should be avoided. Normal fire fighting procedures may be used.

SECTION 6: ACCIDENTAL RELEASE MEASURES

Containment Techniques:	If solid pitch is spilled, shovel the spilled material into disposal containers. If liquid pitch is spilled, contain the material using inert solids (i.e., sand, earth, etc.) and allow the material to solidify and cool. Cooled pitch may then be shoveled into disposal containers.
Clean-up Procedures & Equipment:	Wear protective equipment during clean-up. Remove all ignition sources. Ventilate area of spill or leak. Collect material for later disposal. After collection of product, flush area with water.
Evacuation Procedures:	Isolate the hazard area and deny entry to unnecessary and unprotected personnel.
Special Instructions:	Avoid dust generation or exposure to hot product during clean up. Ensure thorough decontamination of the release area and clean-up personnel.
Special Reporting Requirements:	Notify appropriate authorities if required by regulation.

SECTION 7: HANDLING AND STORAGE

Storage Precautions:	Protect containers from physical damage, sparks and flames.
Storage Recommendations:	Outside or detached storage is preferable. Maintain dry, ventilated conditions for storage. Containers should be periodically inspected.
Precautions for Unique Hazards:	This material may present a dust explosion hazard in solid form and is sensitive to ignition by electrostatic discharge. Maintain areas below flammable vapor/explosive dust concentrations.
Practices to Minimize Risk:	Wear appropriate protective equipment when performing maintenance on contaminated equipment. Avoid prolonged or repeated contact with skin or breathing of dust and vapors. Do not smoke or eat in areas where this material is handled. Wash hands thoroughly before eating or smoking. A complete soap and water shower should be taken at the end of each work day. Contaminated clothing should not be reworn until cleaned. Launder contaminated clothing separately from other laundry before reuse.
Special Handling Equipment:	Closed system handling of liquid pitch may create excessive vapor concentrations in confined spaces; i.e., tanks, rail cars, tank trailers. Follow appropriate confined space entry procedures when entering any

	tanks, rail cars, tank trailers. Follow appropriate confined space entry procedures when entering any confined space that has been in liquid pitch service.
Dangerous Incompatibility Reactions:	Keep away from strong oxidizing agents.
Incompatibilities with Materials of Construction:	none known

SECTION 8: EXPOSURE CONTROLS AND PERSONAL PROTECTION

Exposure Limits:	**OSHA PEL:** 0.2 mg/m³ as 8-hr TWA (coal tar pitch volatiles) **ACGIH TLV:** 0.2 mg/m³ as 8-hr TWA (coal tar pitch volatiles)
Personal Protective Equipment:	Use NIOSH-approved chemical cartridge respirator with organic vapor cartridges, or any supplied-air respirator as necessary for protection from coal tar pitch volatiles. Wear impervious gloves (i.e., latex rubber), boots, work uniform and safety glasses or chemical goggles. Application of certain protective creams for coal tar products and sunscreens (SPF of at least 15) before and during work may be beneficial in reducing the risk of overexposure.
Respirator Caution:	Observe OSHA regulations for respirator use (29 CFR 1910.134). Air-purifying respirators must not be used in oxygen-deficient atmospheres.
Ventilation:	All operations should be conducted in well-ventilated conditions. Local exhaust ventilation should be provided.
Other Engineering Controls:	All appropriate engineering controls should be used to minimize exposure potential.
Thermal Hazards:	When handling liquid pitch (i.e., taking samples), wear appropriate thermal protection equipment and use tongs as needed. Use of chemical goggles or faceshields is highly recommended when handling molten material.
Additive or Synergistic Effects:	Overexposure to this material causes photosensitization of the skin. See sunscreen recommendations above.

SECTION 9: PHYSICAL AND CHEMICAL PROPERTIES

Molecular Formula:	a complex hydrocarbon mixture which includes polynuclear aromatic hydrocarbons (PAH's)
Molecular Weight:	not available
Appearance, State & Odor (ambient temperature):	black solid with slight aromatic odor; becomes black liquid with strong tarry odor upon melting
pH:	not available
Vapor Pressure:	< 1 mm Hg @ 20°C
Vapor Density (air = 1):	> 1.0
Boiling Point:	> 250°C (initial)
Freezing Point:	not available
Melting Point:	not available
Solubility in Water:	insoluble to slightly soluble
Specific Gravity or Density:	1.3 +/- 0.04 @ 15.5°C
VOC Content:	not available
Softening Point:	60°C to 140°C, depending on the specific product
Bulk Density:	> 10.0 lbs/gal
Octanol / Water Partition Coefficient:	not available
Odor Threshold:	not available

SECTION 10: STABILITY AND REACTIVITY

Chemical Stability:	Stable

Conditions to Avoid:	Avoid static discharge and generation of dust. Contact with water can cause frothing or eruption of closed tanks.
Incompatibilities:	strong oxidizers
Hazardous Decomposition Products:	none known
Hazardous Polymerization:	will not occur

SECTION 11: TOXICOLOGICAL INFORMATION

Acute Oral LD_{50}:	6200 mg/kg	**Species:**	rat		
Acute Dermal LD_{50}:	not available	**Species:**	not available		
Acute Inhalation LC_{50}:	not available	**Duration:**	not available	**Species:**	not available

Skin / Eye Irritation: Mild skin irritant / Mild eye irritant

Target Organs: Skin, possibly lungs, bladder, kidney and central nervous system.

Carcinogenicity: Coal tar pitch volatiles, soots, tars and oils are listed as a carcinogenic category by OSHA, ACGIH, the National Toxicology Program (NTP) and the International Agency for Research on Cancer (IARC). Prolonged or repeated contact may lead to dermatitis, and with poor hygienic practices, to more serious skin disorders such as ulcerations, benign skin growths and skin cancer. Some epidemiological studies have suggested that workers exposed to coal tar pitch emissions in Soderberg aluminum manufacturing facilities may have a slightly increased risk of developing lung or bladder cancer. It is important to note, however, that the relevance of these findings to non-Soderberg facilities is currently unknown.

Teratogenicity: No data available.

Reproductive Effects: No scientific study supports an association between coal tar pitch exposures and human reproductive hazards.

Neurotoxicity: No data available.

Mutagenicity: Available data characterizes coal tar pitch as a mutagen.

Additional Toxicity Information: Overexposures may lead to photosensitization of the skin.

SECTION 12: ECOLOGICAL INFORMATION

Ecotoxicity: No data available.

Environmental Fate: No data available.

SECTION 13: DISPOSAL CONSIDERATIONS

US EPA Waste Number: not applicable

Classification of Waste as Manufactured: (per federal regulations) Non Hazardous
NOTE: Generator is responsible for proper waste characterization. State hazardous waste regulations may differ substantially from federal regulations.

Waste Disposal: Dispose of this material in accordance with standard practice for disposal of potentially hazardous materials as required by applicable federal, state or local laws. Note that disposal regulations may also apply to empty containers and equipment rinsates.

SECTION 14: TRANSPORT INFORMATION

DOT Proper Shipping Name: ***When shipped < 212°F:*** RQ Environmentally hazardous substance, solid, n.o.s., (Contains Benzo(a)pyrene and Dibenz(a,h)anthracene), 9, UN3077, PG III.

OR

RQ Other Regulated Substance, solid, n.o.s., (Contains Benzo(a)pyrene and

Dibenz(a,h)anthracene), 9, NA3077, PG III.

When shipped 212°F to 374°F: RQ Elevated Temperature Liquid, n.o.s., (Contains Benzo(a)pyrene and Dibenzo(a,h)anthracene), 9, UN3257, PG III.

When shipped > 374°F: RQ Elevated Temperature Liquid, Flammable, n.o.s., (Contains Benzo(a)pyrene and Dibenzo(a,h)anthracene), 3, UN3256, PG III

Emergency Guidebook Numbers: **NAERG:** 171 for UN3077 or NA3077; 128 for elevated temperature shipments

SECTION 15: REGULATORY INFORMATION

OSHA Hazards: Carcinogen. Toxic. Irritant. Sensitizer (skin).

Chemical Inventory Status:

TSCA:	Yes	**EINECS:**	Yes	**Canada:**	Yes - DSL
Japan:	Yes	**Korea:**	Yes	**Australia:**	Yes
China:	Yes	**Philippines:**	Yes		

SARA 313:

Phenanthrene (CAS #: 85-01-8)	1 - 4.5%
Anthracene (CAS #: 120-12-7)	0.5 - 1.5%
Polycyclic Aromatic Compounds (PAC's)	4.5 – 5.0%

Other Regulatory Listings: WHMIS Classification:
Class D Division 2 Subdivision A: Very Toxic Material.
Class D Division 2 Subdivision B: Irritant
Class D Division 2 Subdivision B: Sensitizer

Reportable Quantities: Approximately 167 – 222 lbs. (17 – 22 gallons) based on content of benzo(a)pyrene.

State Regulations: MA Haz Substance
CA Prop 65: Contains chemicals known to the State of California to cause cancer.

SECTION 16: OTHER INFORMATION

Precautionary Statement: Please note that the information contained herein is furnished without warranty of any kind. Users should consider these data only as a supplement to other information gathered by them and must make independent determinations of suitability and completeness of information from all sources to assure proper use and disposal of these materials and the safety and health of employees and customers.

Reilly Industries Hazard Rating System: **H:** 3* **F:** 1 **R:** 0

Revision Date: 02 October 2002 **Original Date of Issue:** 1985

Revision Details: Revised Section 14

Material Safety Data Sheet
Cresol, tech.

ACC# 37930

Section 1 - Chemical Product and Company Identification

MSDS Name: Cresol, tech.
Catalog Numbers: AC405720000, AC405720010, AC405720030
Synonyms: Hydroxytoluene; Methylphenol.
Company Identification:

Acros Organics N.V.
One Reagent Lane
Fair Lawn, NJ 07410

For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
1319-77-3	Cresol	100	215-293-2
7732-18-5	Water	<0.2	231-791-2

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: light yellow to light pink liquid. Flash Point: 82 deg C.
Danger! Corrosive. Causes eye and skin burns. Causes digestive and respiratory tract burns. Harmful if swallowed or absorbed through the skin. **Combustible liquid and vapor.** May be harmful if inhaled. May cause central nervous system effects. Air sensitive. Light sensitive. May cause liver and kidney damage. Hygroscopic (absorbs moisture from the air). Marine pollutant.
Target Organs: Kidneys, central nervous system, liver, eyes, skin, mucous membranes.

Potential Health Effects

Eye: Causes eye burns. May result in corneal injury. May cause conjunctivitis and keratitis.
Skin: Harmful if absorbed through the skin. May cause dermatitis. Causes severe skin irritation and burns. Allergic reactions have been reported. When it comes in contact with the skin, it may not produce any burning sensation immediately.
Ingestion: Harmful if swallowed. May cause severe gastrointestinal tract irritation with nausea, vomiting and possible burns. May cause liver and kidney damage. May cause central nervous system depression, convulsions, coma, and possible death due to respiratory paralysis.
Inhalation: Causes severe irritation of upper respiratory tract with coughing, burns, breathing difficulty, and possible coma. May cause effects similar to those described for ingestion. Inhalation of appreciable amounts of vapor under normal conditions is unlikely because of the material's low vapor pressure. Hazardous concentrations may develop at elevated temperatures.
Chronic: Prolonged or repeated skin contact may cause dermatitis. May cause liver and kidney damage. May cause digestive tract disturbances. Repeated exposure may cause central nervous system damage.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid immediately.
Skin: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.
Ingestion: If swallowed, do NOT induce vomiting. Get medical aid immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Treat symptomatically and supportively.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Use water spray to keep fire-exposed containers cool. Combustible liquid and vapor. Vapors are heavier than air and may travel to a source of ignition and flash back. Vapors can spread along the ground and collect in low or confined areas.
Extinguishing Media: Use water spray, dry chemical, carbon dioxide, or appropriate foam.
Flash Point: 82 deg C (179.60 deg F)
Autoignition Temperature: 558 deg C (1,036.40 deg F)
Explosion Limits, Lower:1 - 1.4%
Upper: Not available.
NFPA Rating: (estimated) Health: 3; Flammability: 2; Instability: 0

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Remove all sources of ignition. Provide ventilation. Approach spill from upwind. U.S. regulations require reporting spills and releases to soil, water and air in excess of reportable quantities. Control runoff and isolate discharged material for proper disposal.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Do not get in eyes, on skin, or on clothing. Do not ingest or inhale. Discard contaminated shoes. Use only with adequate ventilation. Keep away from heat and flame.
Storage: Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Corrosives area. Store protected from light and air. Separate from oxidizing materials.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Cresol	5 ppm TWA; Skin - potential significant contribution to overall exposure by the cutaneous r oute	none listed	5 ppm TWA; 22 mg/m3 TWA
Water	none listed	none listed	none listed

OSHA Vacated PELs: Cresol: 5 ppm TWA; 22 mg/m3 TWA Water: No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes: Wear chemical splash goggles.
Skin: Wear appropriate protective gloves to prevent skin exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: Follow the OSHA respirator regulations found in 29 CFR 1910.134 or European Standard EN 149. Use a NIOSH/MSHA or European Standard EN 149 approved respirator if exposure limits are exceeded or if irritation or other symptoms are experienced.

Section 9 - Physical and Chemical Properties

Physical State: Liquid
Appearance: light yellow to light pink
Odor: phenolic
pH: Not available.
Vapor Pressure: 1 mm Hg @38-53 deg C
Vapor Density: 3.7 (Air=1)
Evaporation Rate: Not available.
Viscosity: Not available.
Boiling Point: 200 deg C
Freezing/Melting Point:12-30 deg C
Decomposition Temperature: Not available.
Solubility: 2% @ 25°C
Specific Gravity/Density:1.0400g/cm3
Molecular Formula:C7H8O
Molecular Weight:108.14

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures. Darkens on exposure to light and air.
Conditions to Avoid: Light, ignition sources, excess heat, prolonged exposure to air.
Incompatibilities with Other Materials: Strong acids, oxidizing agents, alkalies, aliphatic

amines, amides (e.g. butyramide, diethyltoluamide, dimethyl formamide), chlorosulfonic acid, oleum, brass, bronze, aluminum.
Hazardous Decomposition Products: Carbon monoxide, carbon dioxide, formaldehyde.
Hazardous Polymerization: Has not been reported

Section 11 - Toxicological Information

RTECS#:
CAS# 1319-77-3: GO5950000
CAS# 7732-18-5: ZC0110000
LD50/LC50:
CAS# 1319-77-3:
Oral, mouse: LD50 = 760 mg/kg;
Oral, mouse: LD50 = 860 mg/kg;
Oral, rat: LD50 = 1454 mg/kg;
Skin, rabbit: LD50 = 2 gm/kg;
Skin, rabbit: LD50 = 200 mg/kg;
.

CAS# 7732-18-5:
Oral, rat: LD50 = >90 mL/kg;
.

Carcinogenicity:
CAS# 1319-77-3: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 7732-18-5: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: 7 workers exposed to cresol vapor for 1.5-3 yrs experienced headaches with nausea and vomiting. 4 of these workers also had elevated blood pressure, signs of impaired kidney function, blood calcium imbalance, and marked tremors.
Teratogenicity: No data available.
Reproductive Effects: See actual entry in RTECS for complete information.
Mutagenicity: See actual entry in RTECS for complete information.
Neurotoxicity: No data available.
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: No data available. No information available.
Environmental: In air, cresols quickly break down into other chemicals. Cresols do not evaporate quickly from water, but they can be removed by bacteria. Cresols may last longer in deep groundwater or water that does not have bacteria. In soil, half the total amount of cresols will break down in about a week. Cresols do not appear to accumulate in fish or meat.
Physical: No information available.
Other: No information available.

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a

hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series:
CAS# 1319-77-3: waste number U052.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	CRESOLS, LIQUID	CRESOLS
Hazard Class:	6.1	6.1(8)
UN Number:	UN2076	UN2076
Packing Group:	II	II

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 1319-77-3 is listed on the TSCA inventory.
CAS# 7732-18-5 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 1319-77-3: 100 lb final RQ; 45.4 kg final RQ
SARA Section 302 Extremely Hazardous Substances
None of the chemicals in this product have a TPQ.
Section 313
This material contains Cresol (CAS# 1319-77-3, 100%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:
CAS# 1319-77-3 is listed as a hazardous air pollutant (HAP).

This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
CAS# 1319-77-3 is listed as a Hazardous Substance under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.
STATE
CAS# 1319-77-3 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.
CAS# 7732-18-5 is not present on state lists from CA, PA, MN, MA, FL, or NJ.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

T C

Risk Phrases:

R 34 Causes burns.
R 24/25 Toxic in contact with skin and if swallowed.

Safety Phrases:

S 36/37/39 Wear suitable protective clothing, gloves and eye/face pr otection.
S 45 In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

WGK (Water Danger/Protection)

CAS# 1319-77-3: No information available.
CAS# 7732-18-5: No information available.

Canada - DSL/NDSL

CAS# 1319-77-3 is listed on Canada's DSL List.
CAS# 7732-18-5 is listed on Canada's DSL List.

Canada - WHMIS

not available.

This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 1319-77-3 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 10/15/1997
Revision #4 Date: 3/04/2004

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

MATERIAL SAFETY DATA SHEET

Prussian blue
62402

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: Prussian blue

C.I. 77510 ; Ferric ferrocyanide ; Pigment Blue 27
Company Identification: Acros Organics N.V.
One Reagent Lane
Fairlawn, NJ 07410
For information in North America, call: 800-ACROS-01
For emergencies in the US, call CHEMTREC: 800-424-9300

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
14038-43-8	PRUSSIAN BLUE		237-875-5

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: purple.
Caution! The toxicological properties of this material have not been fully investigated. May cause eye and skin irritation. May cause respiratory and digestive tract irritation.
Target Organs: None known.

Potential Health Effects

Eye:
May cause eye irritation.

Skin:
May cause skin irritation.

Ingestion:
May cause irritation of the digestive tract. The toxicological properties of this substance have not been fully investigated.

Inhalation:
May cause respiratory tract irritation. The toxicological properties of this substance have not been fully investigated.

Chronic:
Not available.
None

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:
Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower lids. Get medical aid.
Skin:
Get medical aid if irritation develops or persists. Flush skin with plenty of soap and water.
Ingestion:
If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid.
Inhalation:
Remove from exposure to fresh air immediately. Get medical aid if cough or other symptoms appear.
Notes to Physician:
Treat symptomatically and supportively.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:
As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Substance is noncombustible.
Extinguishing Media:
Use extinguishing media most appropriate for the surrounding fire.
Autoignition Temperature: Not available.
Flash Point: Not available.
NFPA Rating: Not published.
Explosion Limits, Lower: Not available.
Upper: Not available.

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks:
Sweep up or absorb material, then place into a suitable clean, dry, closed container for disposal. Avoid generating dusty conditions.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:
Wash thoroughly after handling. Use with adequate ventilation. Minimize dust generation and accumulation. Avoid breathing dust, vapor, mist, or gas. Avoid contact with skin and eyes. Avoid ingestion and inhalation.
Storage:
Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:
Use adequate ventilation to keep airborne concentrations low.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
PRUSSIAN BLUE	as Fe: 1 mg/m3 TWA (listed under IRON SALTS	1 mg/m3 TWA (listed under IRON SALTS	none listed

	(SOLUBLE)).	(SOLUBLE)).		

OSHA Vacated PELs:
PRUSSIAN BLUE:
as Fe: 1 mg/m3 TWA (listed under IRON SALTS (SOLUBLE))

Personal Protective Equipment

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

Skin:
Wear appropriate protective gloves to prevent skin exposure.

Clothing:
Wear appropriate protective clothing to prevent skin exposure.

Respirators:
Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Solid
Appearance:	purple
Odor:	Not available.
pH:	Not available.
Vapor Pressure:	Not available.
Vapor Density:	Not available.
Evaporation Rate:	Not available.
Viscosity:	Not available.
Boiling Point:	Not available.
Freezing/Melting Point:	Not available.
Decomposition Temperature:	Not available.
Solubility:	practically insoluble in water
Specific Gravity/Density:	Not available.
Molecular Formula:	C18Fe7N18
Molecular Weight:	859.25

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable under normal temperatures and pressures.
Conditions to Avoid:
Incompatible materials.
Incompatibilities with Other Materials:
Strong acids - strong oxidizing agents, reducing agents, bases.
Hazardous Decomposition Products:
Hydrogen cyanide, nitrogen oxides, carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:
CAS# 14038-43-8: LJ8200000
LD50/LC50:
Not available.
Carcinogenicity:

PRUSSIAN BLUE -
Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.
Epidemiology:
No data available.
Teratogenicity:
No data available.
Reproductive Effects:
No data available.
Neurotoxicity:
No data available.
Mutagenicity:
No data available.
Other Studies:
No data available.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

Ecotoxicity:
Not available.

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Dispose of in a manner consistent with federal, state, and local regulations.
RCRA D-Series Maximum Concentration of Contaminants:
None listed.
RCRA D-Series Chronic Toxicity Reference Levels: None listed.
RCRA F-Series: None listed.
RCRA P-Series: None listed.
RCRA U-Series: None listed.
Not listed as a material banned from land disposal according to RCRA.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT
No information available
IMO
Not regulated as a hazardous material.
IATA
Not regulated as a hazardous material.
RID/ADR
Not regulated as a hazardous material.
Canadian TDG
No information available.

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL
TSCA
CAS# 14038-43-8 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA
Section 302 (RQ)
None of the chemicals in this material have an RQ.
Section 302 (TPQ)

None of the chemicals in this product have a TPQ.

Section 313

No chemicals are reportable under Section 313.

Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

PRUSSIAN BLUE can be found on the following state right to know lists: California, (listed as IRON SALTS (SOLUBLE)), Pennsylvania, (listed as IRON SALTS (SOLUBLE)), Minnesota, (listed as IRON SALTS (SOLUBLE)).

California No Significant Risk Level:

None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: Not available.

Risk Phrases:

Safety Phrases:

S 24/25 Avoid contact with skin and eyes.

WGK (Water Danger/Protection)

CAS# 14038-43-8: 0

Canada

CAS# 14038-43-8 is listed on Canada's DSL/NDSL List.

WHMIS: Not available.

CAS# 14038-43-8 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 6/04/1992 Revision #2 Date: 9/02/1997

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

Back to product information.

CITGO No. 2 Diesel Fuel, High Sulfur, All Grades
Material Safety Data Sheet

CITGO Petroleum Corporation
P.O. Box 3758
Tulsa, OK 74102-3758

MSDS No. DF2HS
Revision Date 10/08/2003

IMPORTANT: Read this MSDS before handling or disposing of this product and pass this information on to employees, customers and users of this product.

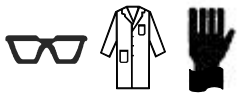
Hazard Rankings

	HMIS	NFPA
Health Hazard	* 2	0
Fire Hazard	2	2
Reactivity	0	0

*** = Chronic Health Hazard**

Protective Equipment

Minimum Recommended
See Section 8 for Details



Emergency Overview

Physical State Liquid.

Color Transparent, clear to yellow or red. **Odor** Characteristic, kerosene-like.

WARNING!
Combustible liquid; vapor may cause flash fire.
Harmful or fatal if swallowed - can enter lungs and cause damage.
Can cause eye, skin or respiratory tract irritation.
May be harmful if inhaled or absorbed through the skin.
Overexposure can cause central nervous system (CNS) depression and/or other target organ effects.
Possible Cancer Hazard (See Section 3)
Harmful to aquatic organisms.

SECTION 1. PRODUCT IDENTIFICATION

Trade Name	CITGO No. 2 Diesel Fuel, High Sulfur, All Grades	**Technical Contact**	(918) 495-5940 or (918) 495-5933
Product Number	Various	**Medical Emergency**	(918) 495-4700
CAS Number	68476-34-6	**CHEMTREC Emergency (United States Only)**	(800) 424-9300

Product Family Motor fuels.

Synonyms No. 2 Grade Diesel Fuel Oil; Diesel No. 2; Off-Road Diesel Fuel; Diesel Motor Fuel No. 2; High Sulfur Diesel Fuel; HS Diesel Fuel; Gas Oil (Medium); C9-C16 Petroleum Hydrocarbons.

SECTION 2. COMPOSITION

This product may be composed, in whole or in part, of any of the following refinery streams:

Diesel Fuel No. 2 [CAS No.: 68476-34-6]
Hydrodesulfurized Middle Distillate (petroleum) [CAS No.: 64742-80-9]
Straight-run Middle Distillate (Petroleum) [CAS No.: 64741-44-2]
Hydrodesulfurized Light Catalytic Cracked Distillate (Petroleum) [CAS No.: 68333-25-5]
Kerosene [CAS No.: 8008-20-6]
Hydrodesulfurized Kerosine (Petroleum) [CAS No.: 64742-81-0]
Light Catalytic Cracked Distillate (Petroleum) [CAS No.: 64741-59-9]

This product contains the following chemical components:

Component Name(s)	CAS Registry No.	Concentration (%)
Nonane, all isomers	Mixture	1 - 10
Trimethylbenzenes, all isomers	25551-13-7	0 - 2
Naphthalene	91-20-3	0 - 2
Biphenyl (Diphenyl)	92-52-4	0 - 2
Cumene	98-82-8	0 - 1
Ethylbenzene	100-41-4	0 - 1

SECTION 3. HAZARDS IDENTIFICATION

Also see Emergency Overview and Hazard Ratings on the top of Page 1 of this MSDS.

Major Route(s) of Entry Skin contact. Inhalation.

Signs and Symptoms of Acute Exposure

Inhalation

Breathing high concentrations may be harmful. Mist or vapor can irritate the throat and lungs. Breathing this material may cause central nervous system depression with symptoms including nausea, headache, dizziness, fatigue, drowsiness, or unconsciousness.

Eye Contact

This material can cause eye irritation with tearing, redness, or a stinging or burning feeling. Further, it can cause swelling of the eyes with blurred vision. Effects may become more serious with repeated or prolonged contact.

Skin Contact

This material can cause skin irritation. Symptoms include redness, itching, and burning of the skin. This material can be absorbed by the skin and produce central nervous system depression (headache, nausea, fatigue and/or other symptoms including unconsciousness). If the skin is damaged, absorption increases. Prolonged and/or repeated contact may cause severe dermatitis and/or more serious skin disorders. Chronic symptoms may include drying, swelling, scaling, blistering, cracking, and/or severe tissue damage.

Ingestion

If swallowed, this material may irritate the mouth, throat, and esophagus. It can be absorbed into the blood stream through the stomach and intestinal tract. Symptoms may include a burning sensation of the mouth and esophagus, nausea and vomiting. In addition, it can cause central nervous system effects characterized by dizziness, staggering, drowsiness, delirium and/or loss of consciousness.

Because of the low viscosity, this material can enter the lungs directly by aspiration during swallowing or subsequent vomiting. Aspiration of a small amount of liquid can cause severe lung damage and/or death.

Chronic Health Effects Summary

Secondary effects of ingestion and subsequent aspiration into the lungs may cause pneumatocele (lung cavity) formation and chronic lung dysfunction.

This product contains petroleum middle distillates similar to those shown to produce skin tumors on laboratory rodents following repeated application. All tumors appeared during the latter portion of the typical 2-year lifespan of the animals. Certain studies have shown that washing the exposed skin of the test animal with soap and water between treatments greatly reduces the potential tumorigenic effects. These data suggest that good personal hygiene is effective in reducing the risk of this potential adverse health effect.

This material and/or its components have been associated with developmental toxicity, reproductive toxicity, genotoxicity, immunotoxicity, and/or carcinogenicity. Refer to Section 11 of this MSDS for additional health-related information.

Conditions Aggravated by Exposure

Disorders of the following organs or organ systems that may be aggravated by significant exposure to this material or its components include: Skin, Respiratory System, Liver, Kidneys, Central Nervous System (CNS)

Target Organs

This material may cause damage to the following organs: kidneys, liver, upper respiratory tract, skin, eyes, central nervous system (CNS).

Carcinogenic Potential This material may contain ethylbenzene and naphthalene at concentrations above 0.1%. IARC has identified ethylbenzene and naphthalene as possibly carcinogenic to humans (Group 2B) based on laboratory animal studies. NTP has determined that exposure to diesel exhaust particulates, a complex mixture of combustion products of diesel fuel, is reasonably anticipated to be a human carcinogen.

OSHA Hazard Classification is indicated by an "X" in the box adjacent to the hazard title. If no "X" is present, the product does not exhibit the hazard as defined in the OSHA Hazard Communication Standard (29 CFR 1910.1200).

OSHA Health Hazard Classification				OSHA Physical Hazard Classification					
Irritant	X	Sensitizer		Combustible	X	Explosive		Pyrophoric	
Toxic		Highly Toxic		Flammable		Oxidizer		Water-reactive	
Corrosive		Carcinogenic		Compressed Gas		Organic Peroxide		Unstable	

SECTION 4. FIRST AID MEASURES

Take proper precautions to ensure your own health and safety before attempting rescue or providing first aid. For more specific information, refer to Exposure Controls and Personal Protection in Section 8 of this MSDS.

Inhalation Move victim to fresh air. If victim is not breathing, immediately begin rescue breathing. If breathing is difficult, 100 percent humidified oxygen should be administered by a qualified individual. Seek medical attention immediately. Keep the affected individual warm and at rest.

Eye Contact Check for and remove contact lenses. Flush eyes with cool, clean, low-pressure water for at least 15 minutes while occasionally lifting and lowering eyelids. Do not use eye ointment unless directed to by a physician. Seek medical attention if excessive tearing, irritation, or pain persists.

Skin Contact Remove contaminated shoes and clothing. Flush affected area with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. Do not use ointments. If skin surface is not damaged, clean affected area thoroughly with mild soap and water. Seek medical attention if tissue appears damaged or if pain or irritation persists.

Ingestion Do not induce vomiting. If spontaneous vomiting is about to occur, place victim's head below knees. If victim is drowsy or unconscious, place on the left side with head down. Never give anything by mouth to a person who is not fully conscious. Do not leave victim unattended. Seek medical attention immediately.

Notes to Physician INHALATION: Inhalation overexposure can produce toxic effects. Monitor for respiratory distress. If cough or difficulty in breathing develops, evaluate for upper respiratory tract inflammation, bronchitis, and pneumonitis. Administer supplemental oxygen with assisted ventilation, as required.

INGESTION: If ingested, this material presents a significant aspiration and chemical pneumonitis hazard. Induction of emesis is not recommended. Consider activated charcoal and/or gastric lavage. If patient is obtunded, protect the airway by cuffed endotracheal intubation or by placement of the body in a Trendelenburg and left lateral decubitus position.

SECTION 5. FIRE FIGHTING MEASURES

NFPA Flammability Classification	NFPA Class-II combustible liquid.
Flash Point	Closed cup: AP 52°C (AP 125°F). (Pensky-Martens.)
Lower Flammable Limit	AP 0.6 % **Upper Flammable Limit** AP 7.5 %
Autoignition Temperature	>254°C (>489°F)
Hazardous Combustion Products	Carbon dioxide, carbon monoxide, smoke, fumes, unburned hydrocarbons and oxides of sulfur and nitrogen.
Special Properties	Combustible Liquid! This material releases vapors when heated above ambient temperatures. Vapors can cause a flash fire. Vapors can travel to a source of ignition and flashback. A vapor and air mixture can create an explosion hazard in confined spaces such as sewers. Use only with adequate ventilation. If container is not properly cooled, it can rupture in the heat of a fire.
Extinguishing Media	SMALL FIRE: Use dry chemicals, carbon dioxide, foam, water fog, or inert gas (nitrogen). LARGE FIRE: Use foam, water fog, or water spray. Water fog and spray are effective in cooling containers and adjacent structures. However, water can cause frothing and/or may not extinguish the fire. Water can be used to cool the external walls of vessels to prevent excessive pressure, autoignition or explosion. DO NOT use a solid stream of water directly on the fire as the water may spread the fire to a larger area.
Protection of Fire Fighters	Firefighters must use full bunker gear including NIOSH-approved positive pressure self-contained breathing apparatus to protect against potential hazardous combustion or decomposition products and oxygen deficiencies. Evacuate area and fight the fire from a maximum distance or use unmanned hose holders or monitor nozzles. Cover pooling liquid with foam. Containers can build pressure if exposed to radiant heat; cool adjacent containers with flooding quantities of water until well after the fire is out. Withdraw immediately from the area if there is a rising sound from a venting safety device or discoloration of vessels, tanks, or pipelines. Be aware that burning liquid will float on water. Notify appropriate authorities if liquid enter sewers or waterways.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Take proper precautions to ensure your own health and safety before attempting spill control or clean-up. For more specific information, refer to the Emergency Overview on Page 1, Exposure Controls and Personal Protection in Section 8 and Disposal Considerations in Section 13 of this MSDS.

Combustible Liquid! Release can result in a fire hazard. Evacuate all non-essential personnel from release area. Establish a regulated zone with site control and security. Eliminate all ignition sources. Stop the leak if it can done without risk. A vapor-suppressing foam may be used to reduce vapors. Properly bond or ground all equipment used when handling this material. Avoid skin contact. Do not walk through spilled material. Verify that responders are properly trained and wearing appropriate personnel protective equipment. Dike far ahead of a liquid spills. Do not allow released material to entry waterways, sewers, basements, or confined areas. This material will float on water. Absorb or cover with dry earth, sand or other non-combustible material. Use clean, non-sparking tools to collect absorbed material. Place spent sorbent materials, free liquids and other clean-up debris into proper waste containers for appropriate disposal. Certain releases must be reported to the National Response Center (800/424-8802) and state or regulatory authorities. Comply with all laws and regulations.

SECTION 7. HANDLING AND STORAGE

Handling

Combustible Liquid!
A static electrical charge can accumulate when this material is flowing through pipes, nozzles or filters and when it is agitated. A static spark discharge can ignite accumulated vapors particularly during dry weather conditions. Always bond receiving containers to the fill pipe before and during loading. Always keep nozzle in contact with the container throughout the loading process. Do not fill any portable container in or on a vehicle. Special precautions, such as reduced loading rates and increased monitoring, must be observed during "switch loading" operations (i.e., loading this material in tanks or shipping compartments that previously containing gasoline or similar low flash point products).

Fire hazard increases as product temperature approaches its flash point. Keep container closed and drum bungs in place. Remove spillage immediately from walking areas. Do not handle or store near heat, sparks or other potential ignition sources. Do not handle or store with oxidizing agents. Avoid breathing mist or vapor. Never siphon by mouth. Do not taste or swallow. Avoid contact with eyes, skin and clothing. Use gloves constructed of impervious materials and protective clothing if direct contact is anticipated. Provide ventilation to maintain exposure potential below applicable exposure levels. Avoid water contamination. Wash thoroughly after handling. Prevent contact with food or tobacco products.

When performing repairs and maintenance on contaminated equipment, keep unnecessary persons from hazard area. Eliminate heat, flame and other potential ignition sources. Drain and purge equipment, as necessary, to remove material residues. Remove contaminated clothing. Wash exposed skin thoroughly with soap and water after handling.

Do not use this material as fuel for equipment, such as portable heaters, in enclosed areas. Hazardous combustion products can cause death.

Protect the environment from releases of this material. Prevent discharges to surface waters and groundwater. Maintain handling and transfer equipment in proper working order.

Misuse of empty containers can be dangerous. Empty containers may contain material residues which can ignite with explosive force. Cutting or welding of empty containers can cause fire, explosion, or release of toxic fumes from residues. Do not pressurize or expose empty containers to open flame, sparks, or heat. Keep container closed and drum bungs in place. All label warnings and precautions must be observed. Return empty drums to a qualified reconditioner. Consult appropriate federal, state and local authorities before reusing, reconditioning, reclaiming, recycling, or disposing of empty containers and/or waste residues of this material.

Storage

Store in a cool, dry, well-ventilated place. Keep containers tightly closed. Do not store this product near heat, flame or other potential ignition sources. Do not store with oxidizers. Do not store this product in unlabeled containers. Do not puncture or incinerate containers. Ground all equipment containing this material. All electrical equipment in areas where this material is stored or handled must meet all applicable requirements of the NFPA's National Electrical Code (NEC). Store and transport in accordance with all applicable laws.

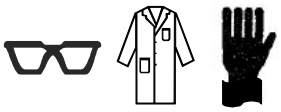
SECTION 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Engineering Controls

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapor or mists below the applicable workplace exposure limits indicated below. All electrical equipment should comply with the National Electric Code. An emergency eye wash station and safety shower should be located near the work-station.

Personal Protective Equipment

Personal protective equipment should be selected based upon the conditions under which this material is used. A hazard assessment of the work area for PPE requirements should be conducted by a qualified professional pursuant to OSHA regulations. The following pictograms represent the minimum requirements for personal protective equipment. For certain operations, additional PPE may be required.



Eye Protection

Safety glasses equipped with side shields are recommended as minimum protection in industrial settings. Chemical goggles should be worn during transfer operations or when there is a likelihood of misting, splashing, or spraying of this material. Suitable eye wash water should be readily available.

Hand Protection

Avoid skin contact. Use gloves (e.g., disposable PVC, neoprene, nitrile, vinyl, or PVC/NBR). Wash hands with plenty of mild soap and water before eating, drinking, smoking, use of toilet facilities or leaving work. DO NOT use gasoline, kerosene, solvents or harsh abrasives as skin cleaners.

Body Protection

Avoid skin contact. Wear long-sleeved fire-retardant garments (e.g., Nomex®) while working with flammable and combustible liquids. Additional chemical-resistant protective gear may be required if splashing or spraying conditions exist. This may include an apron, boots and additional facial protection. If product comes in contact with clothing, immediately remove soaked clothing and shower. Promptly remove and discarded contaminated leather goods.

Respiratory Protection

Airborne concentration will determine the level of respiratiory protection required. Respiratory protection is normally not required unless the product is heated or misted. For known or anticipated vapor or mist concentrations above the occupational exposure guidelines (see below), use a NIOSH-approved organic vapor respirator equipped with a dust/mist prefilter if adequate protection is provided. For unknown vapor concentrations or concentrations exceeding respirator protection factors, use a positive-pressure, pressure-demand, self-contained breathing apparatus (SCBA). Due to fire and explosion hazards, do not enter atmospheres containing concentrations greater than 20% of the lower flammable limit under any circumstances. Protection factors vary depending upon the type of respirator used. Respirators should be used in accordance with OSHA requirements (29 CFR 1910.134).

General Comments

Warning! Use of this material in spaces without adequate ventilation may result in generation of hazardous levels of combustion products and/or inadequate oxygen levels for breathing. Odor is an inadequate warning for hazardous conditions.

Occupational Exposure Guidelines

Substance	Applicable Workplace Exposure Levels
Diesel Fuel No. 2	**ACGIH TLV (United States). Skin** TWA: 100 mg/m^3 8 hour(s).
Kerosene	**NIOSH REL (United States).** TWA: 100 mg/m^3 8 hour(s).
Nonane, all isomers	**ACGIH (United States).** TWA: 200 ppm 8 hour(s).
Trimethylbenzenes, all isomers	**ACGIH (United States).** TWA: 25 ppm 8 hour(s).
Naphthalene	**ACGIH (United States). Skin** TWA: 10 ppm 8 hour(s). STEL: 15 ppm 15 minute(s). **OSHA (United States).** TWA: 10 ppm 8 hour(s).
Biphenyl (Diphenyl)	**ACGIH TLV (United States).**

	TWA: 0.2 ppm 8 hour(s). **OSHA PEL Z2 (United States).** TWA: 0.2 ppm 8 hour(s).
Ethylbenzene	**ACGIH (United States).** TWA: 100 ppm 8 hour(s). STEL: 125 ppm 15 minute(s). **OSHA (United States).** TWA: 100 ppm 8 hour(s).

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES (TYPICAL)

Physical State	Liquid.	**Color**	Transparent, clear to yellow or red.	**Odor**	Characteristic, kerosene-like.
Specific Gravity	0.84 (Water = 1)	**pH**	Not Applicable.	**Vapor Density**	5.1 (Air = 1)
Boiling Range	154º C (309º F) to 371º C (700º F)			**Melting/Freezing Point**	Not available.
Vapor Pressure	0.3 kPa (2.1 mmHg) (at 20°C)			**Volatility**	840 g/l VOC (W/V)
Solubility in Water	Very slightly soluble in cold water.			**Viscosity (cSt @ 40°C)**	AP 3
Additional Properties	Density = 7.2 lbs/gal.				

SECTION 10. STABILITY AND REACTIVITY

Chemical Stability	Stable.	**Hazardous Polymerization**	Not expected to occur.
Conditions to Avoid	Keep away from all ignition sources and strong oxidizing conditions.		
Materials Incompatibility	Strong acids, alkalies, and oxidizers such as liquid chlorine, other halogens, hydrogen peroxide and oxygen.		
Hazardous Decomposition Products	No additional hazardous decomposition products were identified other than the combustion products identified in Section 5 of this MSDS.		

SECTION 11. TOXICOLOGICAL INFORMATION

For other health-related information, refer to the Emergency Overview on Page 1 and the Hazards Identification in Section 3 of this MSDS.

Toxicity Data

Diesel Fuel No. 2:
ORAL LD50, Acute: 12,000 to 17,500 mg/kg or 9.0 ml/kg [Rat]
DERMAL LD50, Acute: >5.0 ml/kg [Rabbit screen level].
DRAIZE EYE, Acute: Mild irritant [Rabbit]
DRAIZE DERMAL, Acute: Severe skin irritant [Rabbit].
BUEHLER DERMAL, Acute: Non-sensitizing [Guinea Pig]
14-Day DERMAL, Sub-chronic: 0% and 67% mortality at 4.0 and 8.0 ml/kg [Rabbit]
62-Week DERMAL, Chronic: 0.05 ml/kg 3x/week [Mouse] - Extreme skin irritation.
97-Week DERMAL, Chronic: 243 g/kg applied 3x/week [Mouse] - Extreme skin irritation.
Moderate increase in contact-point skin tumors.
MUTAGENICITY:
Modified Ames Assay: Negative. [Salmonella typhimurium]

In-vitro SCE Ovary Assay: Negative. [Chinese Hamster]
In-vitro Lymphoma Assay: Negative. [Mouse]
In-vivo Dominant Lethal Assay: Negative. [Mouse]
In-vivo Bone Marrow Assay: Clastogenic at 2.0 ml/kg and 6.0 ml/kg [Rat]

Diesel exhaust particulate:
Lung tumor and lymphomas were identified in rats and mice exposed to unflitered diesel fuel exhaust in chronic inhalation studies. Further, epidemiological studies have identified increase incidences of lung cancer in US railroad workers and bladder cancer in bus and truck drivers possibly associated with exposure to diesel engine exhaust. NTP has determined that exposure to diesel exhaust particulates, a complex mixture of combustion products of diesel fuel, is reasonably anticipated to be a human carcinogen. In addition, NIOSH has identified complete diesel exhaust as a potential carcinogen.

Middle distillates, petroleum:
Long-term repeated (lifetime) skin exposure to similar materials has been reported to result in an increase in skin tumors in laboratory rodents. The relevance of these findings to humans is not clear at this time.

Hydrodesulfurized Middle Distillate (petroleum):
INHALATION LC50, Acute: 4.6 to 7.64 mg/L for four hours [Rat] - Dyspnea, nasal discharge, alopecia and excessive salivation.
ORAL LD50, Acute >500 g/kg [Rat Screening Level] Diarrhea, hyperactivity, ptosis and somnolence.
DERMAL LD50, Acute: >2,000 mg/kg [Rabbit Screening Level]
BUEHLER DERMAL, Acute: Non-sensitizing [Guinea Pig].
14-Day DERMAL, Subchronic: 0.05 ml/kg applied 3 times per week [Mouse, Human skin grafted to Athymic nude Mice] - Irritation and epidermal hyperplasia.
62-Week DERMAL, Chronic: 0.05 ml/kg applied 3 times per week [Mouse] - Extreme skin irritation; moderate increase in contact-point skin tumors.

Straight-run Middle Distillate (Petroleum):
INHALATION, LC50, Acute: 1.72 mg/L for four hours [Male Rat].
INHALATION, LC50, Acute: 1.82 mg/L for 4 hours [Female Rat].
ORAL, LD50, Acute: >5,000 mg/kg [Rat screening level] - Diarrhea, hypoactivity and somnolence.
DERMAL, LD50, Acute: >2,000 mg/kg [Rabbit screen].
BUEHLER DERMAL, Acute: Non-sensitizing [Guinea Pig].
28-Day DERMAL, Subchronic: Moderate irritation at 200 to 2,000 mg/kg with no other treatment-related clinical effects observed.

Kerosene:

ORAL (LD50):	Acute: 2835 mg/kg [Rabbit]. >5000 mg/kg [Rat].
DERMAL (LD50):	Acute: 2000 mg/kg [Rabbit].
INHALATION (LC50):	
(PARTICULATE):	Acute: >5000 mg/m^3 4 hour(s) [Rat].

Trimethylbenzenes, all isomers:
The TCLo for humans is 10 ppm, with somnolence and respiratory tract irritation noted. In inhalation studies with rats, four of ten animals died after exposures of 2400 ppm for 24 hours. An oral dose of 5 mL/kg resulted in death in one of ten rats. Minimum lethal intraperitoneal doses were 1.5 to 2.0 mL/kg in rats and 1.13 to 12 mL/kg in guinea pigs. Levels of total hydrocarbon vapors present in the breathing atmosphere of these workers ranged from 10 to 60 ppm. Mesitylene (1, 3, 5 Trimethylbenzene) inhalation at concentrations of 1.5, 3.0, and 6.0 mg/L for six hours was associated with dose-related changes in white blood cell counts in rats. No significant effects on the complete blood count were noted with six hours per day exposure for five weeks, but elevations of alkaline phosphatase and SGOT were observed. Central nervous system depression and ataxia were noted in rats exposed to 5,100 to 9,180 ppm for two hours.

Naphthalene:
ORAL (LD50): Acute: 1800 mg/kg [Rat]. 533 mg/kg [Mouse].

DERMAL (LD50): Acute: 969 mg/kg [Mouse].
INHALATION (LC50): Acute: >340 mg/m^3 1 hour(s) [Rat].
Naphthalene is a potential irritant to eyes, skin and respiratory system. Ingestion of naphthalene has been associated with severe red blood cell and liver damage. With prolonged or repeated exposures, naphthalene was associated with cataracts, optical neuritis, hemolytic and aplastic anemia, jaundice and possibly neurotoxicity. In animal studies, naphthalene associated with fetal effects and decreased spleen weights in pregnant female mice. In an NTP sponsored study, naphthalene produced a dose related increase in tumors at the 30 and 60 ppm exposure level in both male and female rats. Higher incidences of respiratory epithelial adenomas, olfactory epithelial neuroblastomas and non-neoplastic lesions of the nose were observed as compared to controls. Cytogenic studies with Chinese hamster ovary cells have demonstrated sister chromatid exchanges and chromosomal aberrations. The relevance of these studies to human health is unclear. Based upon this data, IARC has designated naphthalene as possibly carcinogenic to humans (Group 2B).

Biphenyl (Diphenyl):
INHALATION, TCLo, Acute: 4,400 ug/m^3 for 4 hours [Human] - Flaccid paralysis of peripheral nerves without anesthesia and nausea or vomiting.
ORAL, LD50, Acute: >2,600 mg/kg [Cat screening level].
ORAL, LD50, Acute: 2,400 mg/kg [Rat and Rabbit].
ORAL, LD50, Acute: 1,900 mg/kg [Mouse] - Somnolence, hypermotility and diarrhea.
DERMAL, LD50, Acute: >5,010 mg/kg [Rabbit screening level].

Ethylbenzene:
ORAL (LD50): Acute: 3,500 mg/kg [Rat].
DERMAL (LD50): Acute: 17,800 uL/kg [Rabbit].
INTRAPERITONEAL (LD50): Acute: 2,624 mg/kg [Rat].
NTP completed a 2-year inhalation bioassay of ethylbenzene in rodents. The study was conducted in rats and mice at exposure concentrations of 0, 75, 200 and 750 ppm. No significant effects were observed at the 75 and 200 ppm levels. However, compared to chamber controls, the severity of nephropathy was increased in rats at the 750 ppm level; and male rats had higher incidences of renal tubule carcinomas. Step section analyses of the kidneys found a significant increase hyperplasia and renal tubule adenomas in both male and female rats. Also at this 750 ppm level, male mice had a higher incidence of alveolar/bronchiolar adenomas and carcinomas and female mice had increased hepatocellular adenomas and carcinomas when compared to chamber controls. Also, hyperplasia was observed in the thyroid gland of both sexes of mice and in the pituitary gland of female mice. The relevance of these findings to human health is unclear. Based upon this data, IARC has designated ethylbenzene as possibly carcinogenic to humans (Group 2B).

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Freshwater Toxicity:
Concentration: 2400 ppm Exposure: 48 hrs. Species: Juven. Am. Shad (*Squalius cephalus*) Assay: TLM
Concentration: >127 ppm Exposure: 96 hrs. Species: Bluegill (*Lepomis macrochirus*) Assay: LC50

Saltwater Toxicity
Concentration: 10 ppm Exposure: 96 hrs. Species: Menhaden (*Brevoortia patronus*) Assay: LC50
Concentration: 10 ppm Exposure: 96 hrs. Species: Grass Shrimp Assay: LC50

Environmental Fate

If spilled, this material will normally evaporate. Hydrocarbon components may contribute to atmospheric smog. If released to the subsoils, petroleum middle distillate fuels will strongly adsorb to soils. Groundwater should be considered as an exposure pathway. Liquid and vapor can migrate through the subsurface and preferential pathways (such as utility line backfill) to downgradient receptors.

Middle distillates are potentially toxic to freshwater and saltwater ecosystems. Distillate fuels will normally float on water. In stagnant or slow-flowing waterways, a hydrocarbon layer can cover a large surface area. As a result, this oil layer can limit or eliminate natural atmospheric oxygen transport into the water. With time, if not removed, oxygen depletion in the waterway can cause a fish kill or create an anaerobic environment. Also, this coating action can also kill plankton, algae, and water birds.

SECTION 13. DISPOSAL CONSIDERATIONS

Hazard characteristic and regulatory waste stream classification can change with product use. Accordingly, it is the responsibility of the user to determine the proper storage, transportation, treatment and/or disposal methodologies for spent materials and residues at the time of disposition.

Maximize material recovery for reuse or recycling. Recovered non-usable material may be regulated by US EPA as a hazardous waste due to its ignitibility (D001) and/or its toxic (D018) characteristics. In addition, conditions of use may cause this material to become a hazardous waste, as defined by Federal or State regulations. It is the responsibility of the user to determine if the material is a hazardous waste at the time of disposal. Transportation, treatment, storage, and disposal of waste material must be conducted in accordance with RCRA regulations (see 40 CFR Parts 260 through 271). State and/or local regulations might be even more restrictive. Contact the RCRA/Superfund Hotline at (800) 424-9346 or your regional US EPA office for guidance concerning case specific disposal issues.

SECTION 14. TRANSPORT INFORMATION

The shipping description below may not represent requirements for all modes of transportation, shipping methods or locations outside of the United States.

US DOT Status A U.S. Department of Transportation (DOT) regulated material. The following U. S. DOT hazardous materials shipping description applies to bulk packaged material that is transported by highway or rail. Alternate shipping descriptions may be required for product transported by marine vessel, air or other method and for non-bulk packaged material.

Proper Shipping Name Diesel Fuel, Combustible liquid, NA1993, PG III

Hazard Class DOT Class: Combustible liquid with a flash point greater than 37.8°C (100°F).

Packing Group(s) III

UN/NA Number NA 1993 or UN 1202

Reportable Quantity A Reportable Quantity (RQ) has not been established for this material.

Placard(s)

Emergency Response Guide No. 128

HAZMAT STCC No. 49 122 12

MARPOL III Status Not a DOT "Marine Pollutant" per 49 CFR 171.8.

SECTION 15. REGULATORY INFORMATION

TSCA Inventory	This product and/or its components are listed on the Toxic Substances Control Act (TSCA) inventory.
SARA 302/304 Emergency Planning and Notification	The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to Subparts 302 and 304 to submit emergency planning and notification information based on Threshold Planning Quantities (TPQs) and Reportable Quantities (RQs) for "Extremely Hazardous Substances" listed in 40 CFR 302.4 and 40 CFR 355. No components were identified.
SARA 311/312 Hazard Identification	The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to this subpart to submit aggregate information on chemicals by "Hazard Category" as defined in 40 CFR 370.2. This material would be classified under the following hazard categories: Fire, Acute (Immediate) Health Hazard, Chronic (Delayed) Health Hazard
SARA 313 Toxic Chemical Notification and Release Reporting	This product contains the following components in concentrations above de minimis levels that are listed as toxic chemicals in 40 CFR Part 372 pursuant to the requirements of Section 313 of SARA: Naphthalene [CAS No.: 91-20-3] Concentration: 0 - 2% 1, 2, 4 Trimethylbenzene [CAS No.: 95-63-6] Concentration: 0 - 1%
CERCLA	The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) requires notification of the National Response Center concerning release of quantities of "hazardous substances" equal to or greater than the reportable quantities (RQ's) listed in 40 CFR 302.4. As defined by CERCLA, the term "hazardous substance" does not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically designated in 40 CFR 302.4. Chemical substances present in this product or refinery stream that may be subject to this statute are: Naphthalene [CAS No.: 91-20-3] RQ = 100 lbs. (45.36 kg) Concentration: 0 - 2% Cumene [CAS No.: 98-82-8] RQ = 5000 lbs. (2268 kg) Concentration: 0 - 1%
Clean Water Act (CWA)	This material is classified as an oil under Section 311 of the Clean Water Act (CWA) and the Oil Pollution Act of 1990 (OPA). Discharges or spills which produce a visible sheen on waters of the United States, their adjoining shorelines, or into conduits leading to surface waters must be reported to the EPA's National Response Center at (800) 424-8802.
California Proposition 65	This material may contain the following components which are known to the State of California to cause cancer, birth defects or other reproductive harm, and may be subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5): Diesel exhaust particulate (following combustion) Naphthalene: 0 - 2% Toluene: <0.05% Benzene: <0.05%
New Jersey Right-to-Know Label	Diesel Fuel
Additional Regulatory Remarks	As minimum requirements, CITGO recommends that the following advisory information be displayed on equipment used to dispense diesel fuel. Additional warnings specified by various regulatory authorities may be required: "**Diesel Fuel DANGER: Combustible Liquid. Use as a Motor Fuel Only.** DO NOT FILL CONTAINERS THAT HAVE PREVIOUSLY CONTAINED GASOLINE OR OTHER FLAMMABLE LIQUIDS. Sparks From static electricity can ignite flammable vapor residues. PLACE CONTAINER ON GROUND. DO NOT FILL ANY PORTABLE CONTAINER IN OR ON A VEHICLE. Containers must be metal or other material approved for storing diesel fuel. Keep nozzle spout in contact with the container during the entire filling operation. NO SMOKING! Do not leave nozzle unattended during filling. **HARMFUL OR FATAL IF SWALLOWED.** If swallowed, do not induce vomiting. Call Physician Immediately. Keep Out of Reach of Children. Avoid prolonged breathing of vapors.

Never siphon by mouth. Do not store in vehicle or living space. Store and use in a well ventilated area. Do not use near heat, spark or flame. Keep container closed."

SECTION 16. OTHER INFORMATION

Refer to the top of Page 1 for the HMIS and NFPA Hazard Ratings for this product.

REVISION INFORMATION

Version Number	4.0
Revision Date	10/08/2003
Print Date	Printed on 10/08/2003.

ABBREVIATIONS

AP: Approximately EQ: Equal >: Greater Than <: Less Than NA: Not Applicable ND: No Data NE: Not Established

ACGIH: American Conference of Governmental Industrial Hygienists

AIHA: American Industrial Hygiene Association

IARC: International Agency for Research on Cancer

NTP: National Toxicology Program

NIOSH: National Institute of Occupational Safety and Health

OSHA: Occupational Safety and Health Administration

NPCA: National Paint and Coating Manufacturers Association

HMIS: Hazardous Materials Information System

NFPA: National Fire Protection Association

EPA: US Environmental Protection Agency

DISCLAIMER OF LIABILITY

THE INFORMATION IN THIS MSDS WAS OBTAINED FROM SOURCES WHICH WE BELIEVE ARE RELIABLE. HOWEVER, THE INFORMATION IS PROVIDED WITHOUT ANY WARRANTY, EXPRESSED OR IMPLIED REGARDING ITS CORRECTNESS. SOME INFORMATION PRESENTED AND CONCLUSIONS DRAWN HEREIN ARE FROM SOURCES OTHER THAN DIRECT TEST DATA ON THE SUBSTANCE ITSELF. THIS MSDS WAS PREPARED AND IS TO BE USED ONLY FOR THIS PRODUCT. IF THE PRODUCT IS USED AS A COMPONENT IN ANOTHER PRODUCT, THIS MSDS INFORMATION MAY NOT BE APPLICABLE. USERS SHOULD MAKE THEIR OWN INVESTIGATIONS TO DETERMINE THE SUITABILITY OF THE INFORMATION OR PRODUCTS FOR THEIR PARTICULAR PURPOSE.

THE CONDITIONS OR METHODS OF HANDLING, STORAGE, USE, AND DISPOSAL OF THE PRODUCT ARE BEYOND OUR CONTROL AND MAY BE BEYOND OUR KNOWLEDGE. FOR THIS AND OTHER REASONS, WE DO NOT ASSUME RESPONSIBILITY AND EXPRESSLY DISCLAIM LIABILITY FOR LOSS, DAMAGE OR EXPENSE ARISING OUT OF OR IN ANY WAY CONNECTED WITH HANDLING, STORAGE, USE OR DISPOSAL OF THE PRODUCT.

* * * * * END OF MSDS * * * * *

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: Ethylbenzene, 99%
Catalog Numbers:
AC118080000, AC118080010, AC118080025, AC118080250
Synonyms:
Ethylbenzol, phenylethane
Company Identification (Europe): Acros Organics BVBA
Janssen Pharmaceuticalaan 3a
2440 Geel, Belgium
Company Identification (USA): Acros Organics
One Reagent Lane
Fairlawn, NJ 07410
For information in North America, call: 800-ACROS-01
For information in Europe, call: 0032(0) 14575211
For emergencies in the US, call CHEMTREC: 800-424-9300
For emergencies in Europe, call: 0032(0) 14575299

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
100-41-4	Ethylbenzene	99.0	202-849-4

Hazard Symbols: XN F
Risk Phrases: 11 20

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: clear, colorless. Flash Point: 21 deg C.
Warning! Flammable liquid and vapor. Causes skin irritation. Causes eye irritation. May cause central nervous system depression. Aspiration hazard if swallowed. Can enter lungs and cause damage. May be absorbed through intact skin. Causes digestive and respiratory tract irritation.
Target Organs: Central nervous system.

Potential Health Effects

Eye:

Causes moderate eye irritation. Vapors may cause eye irritation.

Skin:

Causes skin irritation. Prolonged and/or repeated contact may cause irritation and/or dermatitis. May be absorbed through the skin. Contact with the liquid may cause erythema (redness), exfoliation and vesiculation (blistering).

Ingestion:

May cause irritation of the digestive tract. May cause gastrointestinal irritation with nausea, vomiting and diarrhea. May cause central nervous system depression, characterized by excitement, followed by headache, dizziness, drowsiness, and nausea. Advanced stages may cause collapse, unconsciousness, coma and possible death due to respiratory failure. Aspiration of material into the lungs

may cause chemical pneumonitis, which may be fatal.

Inhalation:

Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. Causes respiratory tract irritation. Vapors may cause dizziness or suffocation.

Chronic:

Chronic inhalation may cause effects similar to those of acute inhalation.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:

Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.

Skin:

Get medical aid. Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse.

Ingestion:

Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.

Inhalation:

Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician:

Treat symptomatically and

Antidote:

None reported.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

Containers can build up pressure if exposed to heat and/or fire. As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. Use water spray to keep fire-exposed containers cool. Flammable liquid and vapor. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. Containers may explode when heated.

Extinguishing Media:

For small fires, use dry chemical, carbon dioxide, water spray or alcohol-resistant foam. Use water spray to cool fire-exposed containers. Water may be ineffective. For large fires, use water spray, fog or alcohol-resistant foam. Contact professional fire-fighters immediately. Cool containers with flooding quantities of water until well after fire is out.

Autoignition Temperature:810 deg F (432.22 deg C)

Flash Point: 21 deg C (69.80 deg F)

Explosion Limits, lower:0.8

Explosion Limits, upper:6.7

NFPA Rating: (estimated) Health: 3; Flammability: 4; Reactivity: 0

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Absorb spill with inert material (e.g. vermiculite, sand or earth), then place in suitable container. Remove all sources of ignition. A vapor suppressing foam may be used to reduce vapors. Water spray may reduce vapor but may not prevent ignition in closed spaces.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Wash thoroughly after handling. Use with adequate ventilation. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Avoid contact with heat, sparks and flame. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.

Storage:

Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Keep from contact with oxidizing materials. Store in a cool, dry, well-ventilated area away from incompatible substances.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Ethylbenzene	100 ppm; 125 ppm STEL	100 ppm TWA; 435 mg/m3 TWA 800 ppm IDLH (10 percent lower explosive limit)	100 ppm TWA; 435 mg/m3 TWA

OSHA Vacated PELs:

Ethylbenzene:

100 ppm TWA; 435 mg/m3 TWA; 125 ppm STEL; 545 mg/m3 STEL

Personal Protective Equipment

Eyes:

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

Skin:

Wear appropriate protective gloves and clothing to prevent skin exposure.

Clothing:

Wear appropriate protective gloves and clothing to prevent skin exposure.

Respirators:

Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Liquid
Appearance:	clear, colorless
Odor:	aromatic odor
pH:	Not available.
Vapor Pressure:	7.1 mm Hg @ 20 C
Vapor Density:	3.7
Evaporation Rate:	<1 (butyl acetate=1)
Viscosity:	0.63 mPa s 20 C
Boiling Point:	277 deg F
Freezing/Melting Point:	-139 deg F
Decomposition Temperature:	Not available.
Solubility in water:	Insoluble.
Specific Gravity/Density:	0.9
Molecular Formula:	C8H10
Molecular Weight:	106.07

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:
Stable under normal temperatures and pressures.
Conditions to Avoid:
Incompatible materials, ignition sources, excess heat.
Incompatibilities with Other Materials:
Oxidizing agents.
Hazardous Decomposition Products:
Carbon monoxide, carbon dioxide.
Hazardous Polymerization: Has not been reported.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:
CAS# 100-41-4: DA0700000
LD50/LC50:
CAS# 100-41-4: Draize test, rabbit, eye: 500 mg Severe; Oral, rat: LD50 = 3500 mg/kg; Skin, rabbit: LD50 = 17800 uL/kg.
Carcinogenicity:
Ethylbenzene -
OSHA: Possible Select carcinogen
IARC: Group 2B carcinogen
Epidemiology:

No information available.

Teratogenicity:

No information available.

Reproductive Effects:

No information available.

Neurotoxicity:

No information available.

Mutagenicity:

Mutation in mammalian somatic cells (Rodent,mouse) Lymphocyte = 80 mg/L.

Other Studies:

Standard Draize Test: Administration into the eye (rabbit) = 500 mg (Severe). Standard Draize Tes (Rabbit, Skin) = 15 mg/L; Mild.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

Ecotoxicity:

Shrimp (mysidoposis bahia), LC50=87.6 mg/L/96hr. Sheepshead minnow LC50=275 mg/L/96hr. Fathead minnow LC50=42.3 mg/L/96hr in hard water &48.5 mg/L/96hr in softwater.

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste.
US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT

Shipping Name: ETHYLBENZENE
Hazard Class: 3
UN Number: UN1175
Packing Group: II

Canadian TDG

Shipping Name: ETHYLBENZENE
Hazard Class: 3(9.2)
UN Number: UN1175
Other Information: FLASHPOINT 15 C

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL

TSCA

CAS# 100-41-4 is listed on the TSCA inventory.

Health & Safety Reporting List

CAS# 100-41-4: Effective Date: June 19, 1987; Sunset Date: June 19, 19
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Chemical Test Rules

None of the chemicals in this product are under a Chemical Test Rule.

Section 12b

None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA
Section 302 (RQ)
CAS# 100-41-4: final RQ = 1000 pounds (454 kg)
Section 302 (TPQ)
None of the chemicals in this product have a TPQ.
SARA Codes
CAS # 100-41-4: acute, chronic, flammable.
Section 313
This material contains Ethylbenzene (CAS# 100-41-4, 99 0%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 372.
Clean Air Act:
CAS# 100-41-4 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.
Clean Water Act:
CAS# 100-41-4 is listed as a Hazardous Substance under the CWA.
CAS# 100-41-4 is listed as a Priority Pollutant under the Clean Water Act.
CAS# 100-41-4 is listed as a Toxic Pollutant under the Clean Water Act.
OSHA:
None of the chemicals in this product are considered highly hazardous by OSHA.

STATE
Ethylbenzene can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.
California No Significant Risk Level:
None of the chemicals in this product are listed.

European/International Regulations
European Labeling in Accordance with EC Directives
Hazard Symbols: XN F
Risk Phrases:
R 11 Highly flammable.
R 20 Harmful by inhalation.
Safety Phrases:
S 16 Keep away from sources of ignition - No smoking.
S 24/25 Avoid contact with skin and eyes.
S 29 Do not empty into drains.

WGK (Water Danger/Protection)
CAS# 100-41-4: 1

United Kingdom Occupational Exposure Limits
CAS# 100-41-4: OES-United Kingdom, TWA 100 ppm TWA; 441 mg/m3 TWA
CAS# 100-41-4: OES-United Kingdom, STEL 125 ppm STEL; 552 mg/m3 STEL

Canada
CAS# 100-41-4 is listed on Canada's DSL List.
This product has a WHMIS classification of B2, D2B.
CAS# 100-41-4 is listed on Canada's Ingredient Disclosure List.

Exposure Limits
CAS# 100-41-4: OEL-AUSTRALIA:TWA 100 ppm (435 mg/m3);STEL 125 ppm (545 mg/m3)
OEL-BELGIUM:TWA 100 ppm (434 mg/m3);STEL 125 ppm (543 mg/m3)
OEL-CZECHOSLOVAKIA:TWA 200 mg/m3;STEL 1000 mg/m3
OEL-DENMARK:TWA 50 ppm (217 mg/m3)
OEL-FINLAND:TWA 100 ppm (435 mg/m3);STEL 150 ppm (655 mg/m3)

OEL-FRANCE:TWA 100 ppm (435 mg/m3)
OEL-GERMANY:TWA 100 ppm (440 mg/m3);Skin
OEL-HUNGARY:TWA 100 mg/m3;STEL 200 mg/m3;Skin
OEL-JAPAN:TWA 100 ppm (430 mg/m3)
OEL-THE NETHERLANDS:TWA 100 ppm (435 mg/m3)
OEL-THE PHILIPPINES:TWA 100 ppm (435 mg/m3)
OEL-POLAND:TWA 100 mg/m3
OEL-RUSSIA:TWA 100 ppm;STEL 50 mg/m3
OEL-SWEDEN:TWA 50 ppm (200 mg/m3);STEL 100 ppm (450 mg/m3)
OEL-SWITZERLAND:TWA 100 ppm (435 mg/m3);STEL 500 ppm
OEL-TURKEY:TWA 100 ppm (435 mg/m3)
OEL-UNITED KINGDOM:TWA 100 ppm (435 mg/m3);STEL 125 ppm
OEL IN BULGARIA, COLOMBIA, JORDAN, KOREA check ACGIH TLV
OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 4/28/1999 Revision #2 Date: 8/02/2000

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if the company has been advised of the possibility of such damages.

CITGO Gasolines, All Grades Unleaded

Material Safety Data Sheet

CITGO Petroleum Corporation
P.O. Box 4689
Houston, TX 77210

MSDS No. UNLEAD
Revision Date 05/23/2005

IMPORTANT: Read this MSDS before handling or disposing of this product and pass this information on to employees, customers and users of this product.

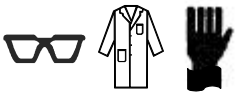
Hazard Rankings

	HMIS	NFPA
Health Hazard	* 2	1
Fire Hazard	3	3
Reactivity	0	0

*** = Chronic Health Hazard**

Protective Equipment

Minimum Recommended
See Section 8 for Details



Emergency Overview

Physical State Liquid.

Color Transparent, clear to amber or red. **Odor** Pungent, characteristic gasoline.

DANGER:
Extremely flammable liquid; vapor may cause flash fire or explosion.
Vapor may travel considerable distance to source of ignition and flash back.
Use Only as a Motor Fuel. Do Not Siphon by Mouth.
Harmful or fatal if swallowed - Can enter lungs and cause damage.
High concentrations of vapor reduce oxygen available for breathing and may cause suffocation.
May be harmful if inhaled or absorbed through the skin.
Mist or vapor may irritate the eyes, mucous membranes, and respiratory tract.
Liquid contact may cause eye and skin irritation.
Overexposures may cause central nervous system (CNS) depression and target organ effects (See Section 3).
Harmful or fatal if swallowed - Can enter lung and cause damage.
Inhalation overexposure can increase the heart's susceptibility to arrhythmias (irregular beats).
Contains Benzene - Cancer Hazard.
Long term exposure to gasoline vapor has caused cancer in laboratory animals.
Avoid Spills. Spills may present both a physical and an environmental hazard.

SECTION 1. PRODUCT IDENTIFICATION

Trade Name	CITGO Gasolines, All Grades Unleaded	**Technical Contact**	(800) 248-4684
Product Number	Various	**Medical Emergency**	(832) 486-4700
CAS Number	Mixture.	**CHEMTREC Emergency (United States Only)**	(800) 424-9300

Product Family Motor fuels.

Synonyms Unleaded Gasolines; Motor Gasolines; Petrol; Automobile Motor Fuels; Finished Gasolines; Gasoline, Regular Unleaded; Gasoline, Mid-grade Unleaded; Gasoline, Premium Unleaded; Reformulated Gasolines (RFG); Reformulated Motor Fuels; Oxygenated Motor Spirits; Gasoline, Regular Reformulated; Gasoline, Mid-grade Reformulated; Gasoline, Premium Reformulated.

SECTION 2. COMPOSITION

Gasoline is a complex and variable mixture that originates from finished refinery streams. These streams can contain the hydrocarbons and oxygenated chemicals (oxygenates) listed below that are regulated or are associated with certain potential health effects. The typical concentration of oxygenates in gasoline does not exceed 18% (v/v).

Component Name(s)	CAS Registry No.	Concentration (%)
Methyl tertiary-Butyl Ether (MTBE)	1634-04-4	0 - 15
Tertiary-Amyl Methyl Ether (TAME)	994-05-8	0 - 15
Ethyl tertiary Butyl Ether (ETBE)	637-92-3	0 - 15
Tertiary-Amyl Ethyl Ether (TAEE)	919-94-8	0 - 15
Diisopropyl Ether (DIPE)	108-20-3	0 - 15
Ethanol	64-17-5	0 - 10
Toluene	108-88-3	<20
Xylene, all isomers	1330-20-7	<18
n-Hexane	110-54-3	<8
Trimethylbenzenes, all isomers	25551-13-7	<5
Benzene	71-43-2	<5
Cumene	98-82-8	<4
Ethylbenzene	100-41-4	<4
Cyclohexane	110-82-7	<3
Naphthalene	91-20-3	<2
Styrene	100-42-5	<1

SECTION 3. HAZARDS IDENTIFICATION

Also see Emergency Overview and Hazard Ratings on the top of Page 1 of this MSDS.

Major Route(s) of Entry Skin contact. Eye contact. Inhalation. Ingestion.

Signs and Symptoms of Acute Exposure

Inhalation Breathing high concentrations may be harmful. Mist or vapor can irritate the throat and lungs. Breathing this material may cause central nervous system depression with symptoms including nausea, headache, dizziness, fatigue, drowsiness, or unconsciousness. Breathing high concentrations of this material, for example, in an enclosed space or by intentional abuse, can cause irregular heartbeats which can cause death.

Eye Contact This product can cause eye irritation with short-term contact with liquid, mists or vapor. Symptoms include stinging, watering, redness, and swelling. In severe cases, permanent eye damage can result.

Skin Contact This material can cause skin irritation. The severity of irritation will depend on the amount of material that is applied to the skin and the speed and thoroughness that it is removed. It is likely that some components of this material are able to pass into the body through the skin and may cause similar effects as from breathing or swallowing it. If the skin is damaged, absorption increases.

Ingestion

If swallowed, this material may irritate the mucous membranes of the mouth, throat, and esophagus. It can be readily absorbed by the stomach and intestinal tract. Symptoms include a burning sensation of the mouth and esophagus, nausea, vomiting, dizziness, staggered gait, drowsiness, loss of consciousness and delirium, as well as additional central nervous system (CNS) effects.

Due to its light viscosity, there is a danger of aspiration into the lungs during swallowing and subsequent vomiting. Aspiration can result in severe lung damage or death. Cardiovascular effects include shallow rapid pulse with pallor (loss of color in the face) followed by flushing (redness of the face). Also, progressive CNS depression, respiratory insufficiency and ventricular fibrillation leads to death.

Chronic Health Effects Summary

Intentional misuse by deliberately concentrating and inhaling gasoline can be harmful or fatal. Altered mental state, drowsiness, peripheral motor neuropathy, irreversible brain damage ("Petrol Sniffers Encephalopathy"), delirium, seizures and sudden death are associated with repeated abuse of gasoline or naphtha.

Chronic effects of ingestion and subsequent aspiration into the lungs may include pneumatocele (lung cavity) formation and chronic lung dysfunction.

Benzene, a component of this product, causes blood disorders and damages the bone marrow (certain types of anemia, leukemia, and lymphoma). It is also capable of causing changes in living cells' genetic material (chromosomes). Benzene is considered to be a mutagen and a cancer-causing agent (leukemogen).

Repeated and prolonged overexposure to n-hexane has been associated with peripheral nerve tissue damage. Adverse effects include numbness, tingling, pain, and loss of muscle control in the extremities, disorientation, impaired vision and reflexes, decline in motor function and paralysis.

Prolonged or repeated overexposure to toluene, a component of this product, has been associated with reproductive effects in experimental animals and in long-term chemical abuse situations. Long-term overexposure to toluene has been associated with impaired color vision. Also, long-term overexposure to toluene in occupational environments have been associated with hearing damage.

Prolonged or repeated overexposure to xylene, a component of this product, has been associated with hearing damage in laboratory animals. Repeated overexposure may cause injury to bone marrow, blood cells, kidney, and liver.

Refer to Section 11 of this MSDS for additional health-related information.

Conditions Aggravated by Exposure

Disorders of the following organs or organ systems that may be aggravated by significant exposure to this material or its components include: Skin, Respiratory System, Liver, Kidneys, Central Nervous System (CNS), Cardiovascular System, Blood-forming system

Target Organs

May cause damage to the following organs: blood, kidneys, lungs, the reproductive system, liver, mucous membranes, heart, peripheral nervous system, cardiovascular system, upper respiratory tract, skin, auditory system, bone marrow, central nervous system (CNS), eye, lens or cornea.

Carcinogenic Potential

This material may contain benzene, ethylbenzene, naphthalene or styrene at concentrations above 0.1%. Benzene is considered to be a known human carcinogen by OSHA, IARC and NTP. IARC has identified ethylbenzene, styrene, naphthalene, gasoline and gasoline engine exhaust as possibly carcinogenic to humans (Group 2B) based on laboratory animal studies.

OSHA Hazard Classification is indicated by an "X" in the box adjacent to the hazard title. If no "X" is present, the product does not exhibit the hazard as defined in the OSHA Hazard Communication Standard (29 CFR 1910.1200).

OSHA Health Hazard Classification				OSHA Physical Hazard Classification					
Irritant	X	Sensitizer		Combustible		Explosive		Pyrophoric	
Toxic		Highly Toxic		Flammable	X	Oxidizer		Water-reactive	
Corrosive		Carcinogenic	X	Compressed Gas		Organic Peroxide		Unstable	

SECTION 4. FIRST AID MEASURES

Take proper precautions to ensure your own health and safety before attempting rescue or providing first aid. For more specific information, refer to Exposure Controls and Personal Protection in Section 8 of this MSDS.

Inhalation

Immediately move victim to fresh air. If victim is not breathing, immediately begin rescue breathing. If heart has stopped, immediately begin cardiopulmonary resuscitation (CPR). If breathing is difficult, 100 percent humidified oxygen should be administered by a qualified individual. Seek medical attention immediately. If exposed to benzene in an emergency situation, a medical evaluation should be completed at the end of the work-shift in accordance with OSHA requirements.

Eye Contact

Flush eyes with cool, clean, low-pressure water for at least 15 minutes. Hold eyelids apart to ensure complete irrigation of the eye and eyelid tissue. If easily accomplished, check for and remove contact lenses. If contact lenses cannot be removed, seek immediate medical attention. Do not use eye ointment. Seek medical attention.

Skin Contact

Remove contaminated shoes and clothing. Flush affected area with large amounts of water. If skin surface is damaged, apply a clean dressing and seek medical attention. Do not use ointments. If skin surface is not damaged, clean affected area thoroughly with mild soap and water. Seek medical attention if tissue appears damaged or if pain or irritation persists.

Ingestion

Do not induce vomiting. If spontaneous vomiting is about to occur, place victim's head below knees. If victim is drowsy or unconscious, place on the left side with head down. Never give anything by mouth to a person who is not fully conscious. Do not leave victim unattended. Seek medical attention immediately.

Notes to Physician

INHALATION: Inhalation overexposure can produce toxic effects. Monitor for respiratory distress. If cough or difficulty in breathing develops, evaluate for upper respiratory tract inflammation, bronchitis, and pneumonitis. Administer supplemental oxygen with assisted ventilation, as required.

This material (or a component) sensitizes the heart to the effects of sympathomimetic amines. Epinephrine and other sympathomimetic drugs may initiate cardiac arrhythmias in individuals exposed to this material. Administion of sympathomimetic drugs should be avoided.

INGESTION: If ingested, this material presents a significant aspiration and chemical pneumonitis hazard. Induction of emesis is not recommended. Consider activated charcoal and/or gastric lavage. If patient is obtunded, protect the airway by cuffed endotracheal intubation or by placement of the body in a Trendelenburg and left lateral decubitus position.

SECTION 5. FIRE FIGHTING MEASURES

NFPA Flammability Classification	NFPA Class-IB flammable liquid.
Flash Point	Closed cup: -43°C (-45°F). (Tagliabue [ASTM D-56])
Lower Flammable Limit	AP 1.4 % **Upper Flammable Limit** AP 7.6 %
Autoignition Temperature	280°C (536°F)
Hazardous Combustion Products	Carbon dioxide, carbon monoxide, smoke, fumes, unburned hydrocarbons, aldehydes and other products of incomplete combustion.
Special Properties	Flammable Liquid! This material releases vapors at or below ambient temperatures. When mixed with air in certain proportions and exposed to an ignition source, its vapor can cause a flash fire. Use only with adequate ventilation. Vapors are heavier than air and may travel long distances along the ground to an ignition source and flash back. A vapor and air mixture can create an explosion hazard in confined spaces such as sewers. If container is not properly cooled, it can rupture in the heat of a fire.
Extinguishing Media	SMALL FIRE: Use dry chemicals, carbon dioxide, foam, or inert gas (nitrogen). Carbon dioxide and inert gas can displace oxygen. Use caution when applying carbon dioxide or inert gas in confined spaces. LARGE FIRE: Use foam, water fog, or water spray. Water May Be Ineffective. Water may not extinguish the fire. Water fog and spray are effective in cooling containers and adjacent structures. However, water can be used to cool the external walls of vessels to prevent excessive pressure, autoignition or explosion. DO NOT use a solid stream of water directly on the fire as the water may spread the fire to a larger area.
Protection of Fire Fighters	Firefighters must use full bunker gear including NIOSH-approved positive pressure self-contained breathing apparatus to protect against potential hazardous combustion or decomposition products and oxygen deficiencies. Evacuate area and fight the fire from a maximum distance or use unmanned hose holders or monitor nozzles. Cover pooling liquid with foam. Containers can build pressure if exposed to radiant heat; cool adjacent containers with flooding quantities of water until well after the fire is out. Withdraw immediately from the area if there is a rising sound from a venting safety device or discoloration of vessels, tanks, or pipelines. Be aware that burning liquid will float on water. Notify appropriate authorities of potential fire and explosion hazard if liquid enter sewers or waterways.

SECTION 6. ACCIDENTAL RELEASE MEASURES

Take proper precautions to ensure your own health and safety before attempting spill control or clean-up. For more specific information, refer to the Emergency Overview on Page 1, Exposure Controls and Personal Protection in Section 8 and Disposal Considerations in Section 13 of this MSDS.

Flammable Liquid! Release causes an immediate fire or explosion hazard. Evacuate all non-essential personnel from immediate area and establish a "regulated zone" with site control and security. A vapor-suppressing foam may be used to reduce vapors. Eliminate all ignition sources. All equipment used when handling this material must be grounded. Stop the leak if it can done without risk. Do not touch or walk through spilled material. Remove spillage immediately from hard, smooth walking areas. Prevent spilled material from entering waterways, sewers, basements, or confined areas. Absorb or cover with dry earth, sand, or other non-combustible material and transfer to appropriate waste containers. Use clean, non-sparking tools to collect absorbed material.

For large spills, secure the area and control access. Prevent spilled material from entering sewers, storm drains, other drainage systems, and natural waterways. Dike far ahead of a

liquid spill to ensure complete collection. Water mist or spray may be used to reduce or disperse vapors; but, it may not prevent ignition in closed spaces. This material will float on water and its run-off may create an explosion or fire hazard. Verify that responders are properly HAZWOPER-trained and wearing appropriate respiratory equipment and fire-resistant protective clothing during cleanup operations. In an urban area, cleanup spill as soon as possible; in natural environments, cleanup on advice from specialists. Pick up free liquid for recycle and/or disposal if it can be accomplished safely with explosion-proof equipment. Collect any excess material with absorbant pads, sand, or other inert non-combustible absorbent materials. Place into appropriate waste containers for later disposal. Comply with all applicable local, state and federal laws and regulations.

SECTION 7. HANDLING AND STORAGE

Handling

FLAMMABLE LIQUID AND VAPOR. **USE ONLY as a motor fuel.** DO NOT siphon by mouth. DO NOT use as a lighter fluid, solvent or cleaning fluid. Prior to handling or refueling, stop all engines and auxillary equipment. Turn off all electronic equipment including cellular telephones. DO NOT leave nozzle unattended during filling or refueling a vehicle. DO NOT re-enter vehicle while refueling. Keep nozzle spout in contact with the container during the entire filling operations.

A static electrical charge can accumulate when this material is flowing through pipes, nozzles or filters and when it is agitated. A static spark discharge can ignite accumulated vapors particularly during dry weather conditions. Always bond receiving containers to the fill pipe before and during loading. Always keep nozzle in contact with the container throughout the loading process. Do not fill any portable container in or on a vehicle. Special precautions, such as reduced loading rates and increased monitoring, must be observed during "switch loading" operations (i.e., loading this material in tanks or shipping compartments that previously contained middle distillates or similar products).

A spill or leak can cause an immediate fire hazard. Keep containers closed and do not handle or store near heat, sparks, or any other potential ignition sources. Do not contact with oxidizable materials. Do not breathe vapor. Use only with adequate ventilation and personal protection. Never siphon by mouth. Avoid contact with eyes, skin, and clothing. Prevent contact with food and tobacco products. Do not take internally.

When performing repairs and maintenance on contaminated equipment, keep unnecessary persons away from the area. Eliminate all potential ignition sources. Drain and purge equipment, as necessary, to remove material residues. Follow proper entry procedures, including compliance with 29 CFR 1910.146 prior to entering confined spaces such as tanks or pits. Use gloves constructed of impervious materials and protective clothing if direct contact is anticipated. Provide ventilation to maintain exposure potential below applicable exposure limits. Use appropriate respiratory protection when concentrations exceed any established occupational exposure level (See Section 8). Promptly remove contaminated clothing. Wash exposed skin thoroughly with soap and water after handling.

Protect the environment from releases of this material. Prevent discharges to surface waters and groundwater. Maintain handling, transfer and storage equipment in proper working order.

Misuse of empty containers can be dangerous. Empty containers may contain material residues which can ignite with explosive force. **Cutting or welding of empty containers can cause fire, explosion, or release of toxic fumes from residues.** Do not pressurize or expose empty containers to open flame, sparks, or heat. Keep container closed and drum bungs in place. All label warnings and precautions must be observed. Return empty drums to a qualified reconditioner. Consult appropriate federal, state and local authorities before reusing, reconditioning, reclaiming, recycling, or disposing of empty containers and/or waste residues of this material.

Storage

Store and transport in accordance with all applicable laws. Keep containers tightly closed. Store in a cool, dry, well-ventilated place. Clearly label all containers. Do not allow containers to be kept in enclosed vehicles. Keep away from all ignition sources. Ground all equipment containing this material. Containers must be able to withstand pressures that are created from changes in product temperature. Product samples and other small containers of this flammable liquid should be stored in a separate safety cabinet or room. All electrical equipment in areas where this material is stored or handled should be installed and operated in accordance with applicable regulatory requirements and the National Electrical Code.

SECTION 8. EXPOSURE CONTROLS AND PERSONAL PROTECTION

Engineering Controls

Provide ventilation or other engineering controls to keep the airborne concentrations of vapor or mists below the applicable workplace exposure limits indicated below. All electrical equipment should comply with the National Electric Code. An emergency eye wash station and safety shower should be located near the work-station.

Personal Protective Equipment

Personal protective equipment should be selected based upon the conditions under which this material is used. A hazard assessment of the work area for PPE requirements should be conducted by a qualified professional pursuant to OSHA regulations. The following pictograms represent the minimum requirements for personal protective equipment. For certain operations, additional PPE may be required.

Eye Protection

Safety glasses equipped with side shields are recommended as minimum protection in industrial settings. Chemical goggles should be worn during transfer operations or when there is a likelihood of misting, splashing, or spraying of this material. A suitable emergency eye wash water and safety shower should be located near the work station.

Hand Protection

Avoid skin contact. Use gloves (e.g., disposable PVC, neoprene, nitrile, vinyl, or PVC/NBR). Wash hands with plenty of mild soap and water before eating, drinking, smoking, use of toilet facilities or leaving work. DO NOT use this material as a skin cleaner.

Body Protection

Avoid skin contact. Wear long-sleeved fire-retardant garments (e.g., Nomex®) while working with flammable and combustible liquids. Additional chemical-resistant protective gear may be required if splashing or spraying conditions exist. This may include an apron, boots and additional facial protection. If product comes in contact with clothing, immediately remove soaked clothing and shower. Promptly remove and discard contaminated leather goods.

Respiratory Protection

For known vapor concentrations above the occupational exposure guidelines (see below), use a NIOSH-approved organic vapor respirator if adequate protection is provided. Protection factors vary depending upon the type of respirator used. Respirators should be used in accordance with OSHA requirements (29 CFR 1910.134). For airborne vapor concentrations that exceed the recommended protection factors for organic vapor respirators, use a full-face, positive-pressure, supplied air respirator. Due to fire and explosion hazards, do not enter atmospheres containing concentrations greater than 10% of the lower flammable limit of this product.

General Comments

Warning! Use of this material in spaces without adequate ventilation may result in generation of hazardous levels of combustion products and/or inadequate oxygen levels for breathing. Odor is an inadequate warning for hazardous conditions.

Occupational Exposure Guidelines

Substance	**Applicable Workplace Exposure Levels**

Gasoline	**ACGIH (United States).** TWA: 300 ppm 8 hour(s). STEL: 500 ppm 15 minute(s).
Toluene	**ACGIH (United States). Skin** TWA: 50 ppm 8 hour(s). **OSHA (United States).** TWA: 200 ppm 8 hour(s). CEIL: 300 ppm PEAK: 500 ppm
Xylene, all isomers	**ACGIH (United States).** TWA: 100 ppm 8 hour(s). STEL: 150 ppm 15 minute(s). **OSHA (United States).** TWA: 100 ppm 8 hour(s).
Tertiary-Amyl Methyl Ether (TAME)	**ACGIH TLV (United States).** TWA: 20 ppm 8 hour(s).
Methyl tertiary-Butyl Ether (MTBE)	**ACGIH (United States).** TWA: 50 ppm 8 hour(s).
Ethyl tertiary Butyl Ether (ETBE)	**ACGIH TLV (United States).** TWA: 5 ppm 8 hour(s).
n-Hexane	**ACGIH (United States). Skin** TWA: 50 ppm 8 hour(s). **OSHA (United States).** TWA: 500 ppm 8 hour(s).
Cumene	**ACGIH (United States).** TWA: 50 ppm 8 hour(s). **OSHA (United States). Skin** TWA: 50 ppm 8 hour(s).
Trimethylbenzenes, all isomers	**ACGIH (United States).** TWA: 25 ppm 8 hour(s).
Benzene	**ACGIH (United States). Skin** TWA: 0.5 ppm 8 hour(s). STEL: 2.5 ppm 15 minute(s). **OSHA (United States). Skin Notes: See Table Z-2 for exclusions in 20 CFR 1910.1028 to the PEL.** TWA: 1 ppm 8 hour(s). STEL: 5 ppm 15 minute(s).
Ethylbenzene	**ACGIH (United States).** TWA: 100 ppm 8 hour(s). STEL: 125 ppm 15 minute(s). **OSHA (United States).** TWA: 100 ppm 8 hour(s).
Cyclohexane	**ACGIH (United States).** TWA: 100 ppm 8 hour(s). **OSHA (United States).** TWA: 300 ppm 8 hour(s).
Naphthalene	**ACGIH (United States). Skin** TWA: 10 ppm 8 hour(s). STEL: 15 ppm 15 minute(s). **OSHA (United States).** TWA: 10 ppm 8 hour(s).
Styrene	**ACGIH (United States).** TWA: 20 ppm 8 hour(s). STEL: 40 ppm 15 minute(s). **OSHA (United States).** TWA: 100 ppm 8 hour(s). STEL: 200 ppm 15 minute(s). PEAK: 600 ppm

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES (TYPICAL)

Physical State	Liquid.	**Color**	Transparent, clear to amber or red.	**Odor**	Pungent, characteristic gasoline.
Specific Gravity	0.72 - 0.77 (Water = 1)	**pH**	Not applicable	**Vapor Density**	3 to 4 (Air = 1)

Boiling Range	38 to 204°C (100 to 400°F)	**Melting/Freezing Point**	Not available.
Vapor Pressure	220 to 450 mm Hg at 20°C (68°F) or 6 to 15 Reid-psia at 37.8°C (100°F).	**Volatility**	720 to 770 g/l VOC (w/v)
Solubility in Water	Hydrocarbon components of gasoline are slightly soluble in water. Oxygenate components, such as MTBE, are more soluble than the hydrocarbon components. Ethanol has greater solubility in water than hydrocarbon components or other oxygenate components.	**Viscosity (cSt @ 40°C)**	<1

Flash Point	Closed cup: -43°C (-45°F). (Tagliabue [ASTM D-56])
Additional Properties	Average Density at 60°F = 6.0 to 6.4 lbs./gal. (ASTM D-2161)

SECTION 10. STABILITY AND REACTIVITY

Chemical Stability	Stable.	**Hazardous Polymerization**	Not expected to occur.
Conditions to Avoid	Keep away from heat, flame and other potential ignition sources. Keep away from strong oxidizing conditions and agents.		
Materials Incompatibility	Strong acids, alkalies and oxidizers such as liquid chlorine, other halogens, hydrogen peroxide and oxygen.		
Hazardous Decomposition Products	No additional hazardous decomposition products were identified other than the combustion products identified in Section 5 of this MSDS.		

SECTION 11. TOXICOLOGICAL INFORMATION

For other health-related information, refer to the Emergency Overview on Page 1 and the Hazards Identification in Section 3 of this MSDS.

Toxicity Data

Gasoline:
VAPOR (TELo) Acute: 140 ppm (Human) (8 hours) - Mild eye irritant.
VAPOR (TELo) Acute: 500 ppm (Human) (1 hour) - Moderate eye irritant.
INHALATION (TCLo) Acute: 900 ppm (Human) (1 hour) - CNS and pulmonary effects.
DERMAL (TDLo) Acute: 53 mg/kg (Human) - Skin allergy effects.
INHALATION (LC50) Acute: 101,200 ppm (Rat, Mouse, & Guinea Pig) (5 minutes).

Gasoline Containing 15% MTBE:
ORAL (LD50) Acute: >5,000 mg/kg (Rat screen level).
DERMAL (LD50) Acute: >2,000 mg/kg (Rabbit screen level).
INHALATION (LC50) Acute: >5,200 ppm (Rat screen level) (8 hours).
DRAIZE EYE Acute: Mild eye irritant. (Rabbit).

DRAIZE DERMAL Acute: Moderate skin irritant. (Rabbit).
BUEHLER DERMAL Acute: Non-sensitizing. (Guinea Pig).
28-Day DERMAL Sub-Chronic: Severe skin irritant. (Rabbit).

A major epidemiological study concluded that there was no increased risk of kidney cancer associated with gasoline exposures for petroleum refinery employees or neighboring residents. Another study identified a slight trend in kidney cancers among service station employees following a 30-year latency period. Two-year inhalation toxicity studies with fully vaporized unleaded gasoline (at concentrations of 67, 292 and 2,056 ppm in air) produced kidney damage and kidney tumors in male rats, but not in female rats or mice of either sex. Results from subsequent scientific studies suggest that the kidney damage, and probably the kidney tumor response, is limited to the male rat. The kidney tumors apparently were the result of the formation of alpha-2u-globulin, a protein unique to male rats. This finding is not considered relevant to human exposure. Under conditions of the study, there was no evidence that exposure to unleaded gasoline vapor is associated with developmental toxicity. Experimental studies with laboratory animals did suggest that overexposure to gasoline may adversely effect male reproductive performance. Also, in laboratory studies with rats, the maternal and developmental "no observable adverse effect level" (NOAEL) was determined to be 9,000 ppm (75% of the LEL value). Female mice developed a slightly higher incidence of liver tumors compared to controls at the highest concentration. In a four week inhalation study of Sprague Dawley® rats, gasoline vapor condensate was determined to induce sister chromatid exchanges in peripheral lymphocytes. IARC has listed gasoline as possibly carcinogenic to humans (Group 2B).

Pentanes, all isomers:
Studies of pentane isomers in laboratory animals indicate exposure to extremely high levels (roughly 10 vol.%) may induce cardiac arrhythmias (irregular heartbeats) which may be serious or fatal.

Toluene:
Effects from Acute Exposure:
Deliberate inhalation of toluene at high concentrations (e.g., glue sniffing and solvent abuse) has been associated with adverse effects on the liver, kidney and nervous system and can cause CNS depression, cardiac arrhythmias and death. Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects.

Effects from Repeated or Prolonged Exposure:
Studies of workers indicate long-term exposure may be related to impaired color vision and hearing. Some studies of workers suggest long-term exposure may be related to neurobehavioral and cognitive changes. Some of these effects have been observed in laboratory animals following repeated exposure to high levels of toluene. Several studies of workers suggest long-term exposure may be related to small increases in spontaneous abortions and changes in some gonadotropic hormones. However, the weight of evidence does not indicate toluene is a reproductive hazard to humans. Studies in laboratory animals indicate some changes in reproductive organs following high levels of exposure, but no significant effects on mating performance or reproduction were observed. Case studies of persons abusing toluene suggest isolated incidences of adverse effects on the fetus including birth defects. Findings in laboratory animals were largely negative. Positive findings include small increases in minor skeletal and visceral malformations and developmental delays following very high levels of maternal exposure. Studies of workers indicate long-term exposure may be related to effects on the liver, kidney and blood, but these appear to be limited to changes in serum enzymes and decreased leukocyte counts. Studies in laboratory animals indicate some evidence of adverse effects on the liver, kidney, thyroid, and pituitary gland following very high levels of exposure. The relevance of these findings to humans is not clear at this time.

Heptane, all isomers:
n-Heptane was not mutagenic in the Salmonella/microsome (Ames) assay and is not considered to be carcinogenic.

Xylene, all isomers:
Effects from Acute Exposure:
ORAL (LD_{50}), Acute: 4,300 mg/kg [Rat].
INHALATION (LC_{50}), Acute: 4,550 ppm for four hours [Rat].
DERMAL (LD_{50}), Acute: 14,100 uL/kg [Rabbit].
Overexposure to xylene may cause upper respiratory tract irritation, headache, cyanosis, blood serum changes, CNS damage and narcosis. Effects may be increased by the use of alcoholic beverages. Evidence of liver and kidney impairment were reported in workers recovering from a gross over-exposure.

Effects from Prolonged or Repeated Exposure:
Impaired neurological function was reported in workers exposed to solvents including xylene. Studies in laboratory animals have shown evidence of impaired hearing following high levels of exposure. Studies in laboratory animals suggest some changes in reproductive organs following high levels of exposure but no significant effects on reproduction were observed. Studies in laboratory animals indicate skeletal and visceral malformations, developmental delays, and increased fetal resorptions following extremely high levels of maternal exposure. Adverse effects on the liver, kidney, bone marrow (changes in blood cell parameters) were observed in laboratory animals following high levels of exposure. The relevance of these observations to humans is not clear at this time.

Ethyl tertiary Butyl Ether (ETBE):
ETBE can cause eye, skin and mucous membrane irritation. In a four week inhalation study, moderate ataxia was observed in rats at the highest dose level (4,000 ppm). The test animals appeared normal within 15 minutes of termination of exposure. A no observed adverse effect level (NOAEL) of 500 ppm was indicated by the study authors based on neurotoxic effects. In two unpublished 90 day inhalation studies, rats and mice were exposed six hour/day, five days/week at concentrations of 0, 500, 1750 and 5000 ppm of ETBE vapor. The male rats exhibited time and concentration-dependent nephropathy consistent with alpha-2µ-globulin formation. An ETBE NOAEL for male rats of 500 ppm was suggested based on a finding of testicular lesions. In human studies with eight males, slight, but significant ($p<0.05$) decreases in objective pulmonary function measures after exposure to ETBE at concentrations of 25 and 50 ppm for two hours.

Tertiary-Amyl Methyl Ether (TAME):
TAME was found to be negative for the induction of structural chromosome aberrations (both metabolically-activated and non-activated) in Chinese hamster ovary (CHO) cells. Inhalation of TAME vapors at concentrations above 250 ppm produced reversible CNS depression in rats and mice. In a four week inhalation study, increases in liver weights with no tissue injury were observed in rats exposed to a TAME concentration of 500 ppm. Birth defects in mice and fetotoxicity in both rats and mice were observed after inhalation exposures to maternally toxic concentrations of TAME.

Methyl tertiary-Butyl Ether (MTBE):
Acute symptoms associated with human exposure to MTBE appear to be mild and transient. In laboratory studies, rats and mice exposed to high doses of MTBE exhibited blood chemistry changes and liver and kidney abnormalities. In laboratory studies, MTBE vapor exposure at the high dose concentration was associated with an increased incidence of liver tumors in female mice. Also, at high dose concentration exposures, MTBE was associated with an increased incidence of kidney and testicular (Leydig cell) tumors in male rats. Additional oncogenicity studies on rats resulted in testicular tumors following administration by ingestion. These data are not generally considered relevant to humans. NTP has not identified MTBE as either a known carcinogen or reasonably anticipated to be carcinogenic to humans. In animal studies, developmental and reproductive toxicity related to MTBE inhalation exposures was observed only at concentrations that were maternally toxic. MTBE was shown to be maternally toxic at 4,000 and 8,000 ppm levels when mice were exposed for six hours per day during their pregnancy. Also, a decrease in the number of successful pregnancies and a reduction in birth weights were observed at these exposure levels. Birth defects (cleft palate) were observed at the high dose level. These data suggest that the risk of developmental and reproductive toxicity in humans is negligible as a result of anticipated

exposures to MTBE.

Diisopropyl Ether (DIPE):
Increased kidney and liver weights were observed in rats and mice in subchronic and chronic inhalation studies of DIPE. Also, evidence of microscopic changes (hyaline droplets) were reported in liver tissue and kidney tubules of rabbits and male rats exposed to DIPE at concentrations of 7,100 ppm. These findings were similar those found in gasoline studies. Overexposure by inhalation of pregnant rats to DIPE at concentrations of 3,095 and 6,745 ppm increased the frequency of rudimentary 14th ribs in the offspring. This effect was not observed at exposure concentrations of 430 ppm. The significance of these findings to human exposure is unclear.

Ethanol:
Inhalation exposure to ethanol vapor at concentrations above applicable workplace exposure levels is expected to produce eye and mucus membrane irritation. Human exposure at concentrations from 1000 to 5000 ppm produced symptoms of narcosis, stupor and unconsciousness. Subjects exposed to ethanol vapor in concentrations between 500 and 10,000 ppm experienced coughing and smarting of the eyes and nose. At 15,000 ppm there was continuous lacrimation and coughing. While extensive acute and chronic effects can be expected with ethanol consumption, ingestion is not expected to be a significant route of exposure to this product.

Butane, all isomers:
Studies in laboratory animals indicate exposure to extremely high levels of butanes (1-10 or higher vol.% in air) may cause cardiac arrhythmias (irregular heartbeats) which may be serious or fatal.

n-Hexane:
This material contains n-hexane. Long-term or repeated exposure to n-hexane can cause permanent peripheral nerve damage. Initial symptoms are numbness of the fingers and toes. Also, motor weakness can occur in the digits, but may also involve muscles of the arms, thighs and forearms. The onset of these symptoms may be delayed for several months to a year after the beginning of exposure. Co-exposure to methylethyl ketone or methyl isobutyl ketone increases the neurotoxic properties of n-hexane. In laboratory studies, prolonged exposure to elevated concentrations of n-hexane was associated with decreased sperm count and degenerative changes in the testicles of rats.

Cumene:
Effects from Acute Exposure:
Overexposure to cumene may cause upper respiratory tract irritation and severe CNS depression.

Effects from Prolonged or Repeated Exposure:
Studies in laboratory animals indicate evidence of adverse effects on the kidney and adrenal glands following high level exposure. The relevance of these findings to humans is not clear at this time.

Trimethylbenzenes, all isomers:
Studies of Workers:
Levels of total hydrocarbon vapors present in the breathing atmosphere of these workers ranged from 10 to 60 ppm. The TCLo for humans is 10 ppm, with somnolence and respiratory tract irritation noted.

Studies in Laboratory Animals:
In inhalation studies with rats, four of ten animals died after exposures of 2400 ppm for 24 hours. An oral dose of 5 mL/kg resulted in death in one of ten rats. Minimum lethal intraperitoneal doses were 1.5 to 2.0 mL/kg in rats and 1.13 to 12 mL/kg in guinea pigs. Mesitylene (1, 3, 5 Trimethylbenzene) inhalation at concentrations of 1.5, 3.0, and 6.0 mg/L for six hours was associated with dose-related changes in white blood cell counts in rats. No significant effects on the complete blood count were noted with six hours per day exposure

for five weeks, but elevations of alkaline phosphatase and SGOT were observed. Central nervous system depression and ataxia were noted in rats exposed to 5,100 to 9,180 ppm for two hours.

Benzene:

ORAL (LD50):	Acute: 930 mg/kg [Rat]. 4700 mg/kg [Mouse].
INHALATION (LC50):	
(VAPOR):	Acute: 10000 ppm 7 hour(s) [Rat]. 9980 ppm 8 hour(s) [Mouse].

Studies of Workers Over-Exposed to Benzene:
Studies of workers exposed to benzene show clear evidence that over-exposure can cause cancer of the blood forming organs (acute myelogenous leukemia) and aplastic anemia, an often fatal disease. Studies also suggest over-exposure to benzene may be associated with other types of leukemia and other blood disorders. Some studies of workers exposed to benzene have shown an association with increased rates of chromosome aberrations in circulating lymphocytes. One study of women workers exposed to benzene suggested a weak association with irregular menstruation. However, other studies of workers exposed to benzene have not demonstrated clear evidence of an effect on fertility or reproductive outcome in humans. Benzene can cross the placenta and affect the developing fetus. Cases of aplastic anemia have been reported in the offspring of persons severely over-exposed to benzene.

Studies in Laboratory Animals:
Studies in laboratory animals indicate that prolonged, repeated exposure to high levels of benzene vapor can cause bone marrow suppression and cancer in multiple organ systems. Studies in laboratory animals show evidence of adverse effects on male reproductive organs following high levels of exposure but no significant effects on reproduction have been observed. Embryotoxicity has been reported in studies of laboratory animals but effects were limited to reduced fetal weight and skeletal variations.

Ethylbenzene:
Effects from Acute Exposure:
ORAL (LD50), Acute: 3,500 mg/kg [Rat].
DERMAL (LD50), Acute: 17,800 uL/kg [Rabbit].
INTRAPERITONEAL (LD50), Acute: 2,624 mg/kg [Rat].

Effects from Prolonged or Repeated Exposure:
Findings from a 2-year inhalation study in rodents conducted by NTP were as follows: Effects were observed only at the highest exposure level (750 ppm). At this level the incidence of renal tumors was elevated in male rats (tubular carcinomas) and female rats (tubular adenomas). Also, the incidence of tumors was elevated in male mice (alveolar and bronchiolar carcinomas) and female mice (hepatocellular carcinomas). IARC has classified ethyl benzene as “possibly carcinogenic to humans” (Group 2B). Studies in laboratory animals indicate some evidence of post-implantation deaths following high levels of maternal exposure. The relevance of these findings to humans is not clear at this time. Studies in laboratory animals indicate limited evidence of renal malformations, resorptions, and developmental delays following high levels of maternal exposure. The relevance of these findings to humans is not clear at this time. Studies in laboratory animals indicate some evidence of adverse effects on the liver, kidney, thyroid, and pituitary gland.

Cyclohexane:
Cyclohexane can cause eye, skin and mucous membrane irritation, CNS depressant and narcosis at elevated concentrations. In experimental animals exposed to lethal concentrations by inhalation or oral route, generalized vascular damage and degenerative changes in the heart, lungs, liver, kidneys and brain were identified.

Cyclohexane has been the focus of substantial testing in laboratory animals. Cyclohexane was not found to be genotoxic in several tests including unscheduled DNA synthesis, bacterial and mammalian cell mutation assays, and in vivo chromosomal aberration. An increase in chromosomal aberrations in bone marrow cells of rats exposed to cyclohexane

was reported in the 1980's. However, a careful re-evaluation of slides from this study by the laboratory which conducted the study indicates these findings were in error, and that no significant chromosomal effects were observed in animals exposed to cyclohexane. Findings indicate long-term exposure to cyclohexane does not promote dermal tumorigenesis.

Naphthalene:
Studies in Humans Overexposed to Naphthalene:
Severe jaundice, neurotoxicity (kernicterus) and fatalities have been reported in young children and infants as a result of hemolytic anemia from over-exposure to naphthalene. Persons with Glucose 6-phosphate dehydrogenase (G6PD) deficiency are more prone to the hemolytic effects of naphthalene. Adverse effects on the kidney have also been reported from over-exposure to naphthalene but these effects are believed to be a consequence of hemolytic anemia, and not a direct effect.

Studies in Laboratory Animals:
Hemolytic anemia has been observed in laboratory animals exposed to naphthalene. Laboratory rodents exposed to naphthalene vapor for 2 years (lifetime studies) developed non-neoplastic and neoplastic tumors and inflammatory lesions of the nasal and respiratory tract. Cataracts and other adverse effects on the eye have been observed in laboratory animals exposed to high levels of naphthalene. Findings from a large number of bacterial and mammalian cell mutation assays have been negative. A few studies have shown chromosomal effects (elevated levels of Sister Chromatid Exchange or chromosomal aberrations) *in vitro.*

Styrene:
Neurological injury associated with chronic styrene exposure include distal hypesthesia, decreased nerve conduction velocity, and altered psychomotor performance. These effects did not occur with exposures to airborne concentrations that were less than 100 ppm. Increased deaths from degenerative neurological disorders were found in a comprehensive epidemiological study of Danish reinforced plastics workers. These workers were reported to have a 2.5-fold increased risk for myeloid leukemia with clonal chromosome aberrations. Also, there are several studies that suggest potential reproductive effects in humans and experimental animals from overexposure to styrene. Styrene was not mutagenic in the standard (liquid phase) Ames Salmonella/microsome assay, but was weakly positive when tested in the vapor phase. IARC has listed styrene as possibly carcinogenic to humans (Group 2B).

SECTION 12. ECOLOGICAL INFORMATION

Ecotoxicity

Unleaded gasoline is potentially toxic to freshwater and saltwater ecosystems. Various grades of gasoline exhibited range of lethal toxicity (LC_{100}) from 40 PPM to 100 PPM in ambient stream water with Rainbow Trout (*Salmo irideus*). A 24-hour TLm (Median Toxic Limit) was calculated to be 90 PPM with juvenile American Shad (*Squalius cephalus*). In Bluegill Sunfish (*Lepomis macrochirus*), Grey Mullet (*Chelon labrosus*) and Gulf Menhaden (*Brevoortia patronus*), gasoline exhibited a 96-hour LC_{50} of 8 PPM, 2 PPM, and 2 PPM, respectively.

The aquatic toxicity of Methyl tertiary-Butyl Ether (MTBE) is considered to be relatively low. In the crustacean Harpacticoid Copepods (*Nitrocra spinipes*), MTBE exhibited an LC_{50} (96-hour) of 1,000 PPM to 10,000 PPM depending upon various water temperatures. In Bleak Fish (*Alburnus alburnus*), MTBE exhibited an LC_{50} (24-hour) of 1,700 PPM and an LC_{50} (96-hour) of 1,000 PPM at 10° C. In Golden Orfe Fish (*Leuciscus idus melanotus*), MTBE exhibited an LC_{50} (48-hour) of 1,000 PPM and an LC_{100} of 2,000 PPM.

Environmental Fate

Avoid spilling gasoline. Spilled gasoline can result in environmental damage. Spilled gasoline can penetrate soil and contaminate ground water. Although gasoline is biodegradable, it may persist for prolonged time periods, particularly where oxygen levels are reduced. The hydrocarbon components of gasoline are slightly soluble in water. Gasoline hydrocarbon components do not readily dissolve in water but can be adsorbed to soils.

Gasoline contains components that are potentially toxic to freshwater and saltwater ecosystems. It will normally float on water. The components of gasoline will evaporate rapidly. Evaporated hydrocarbon components may contribute to atmospheric smog.

MTBE and other oxygenates are more soluble than other gasoline components. In addition, oxygenates such as MTBE do not adsorb to soils, sediments or suspended particulate matter as readily as other gasoline components. MTBE does not degrade as readily as other gasoline components once in ground water or subsoil. MTBE is not expected to bioconcentrate in the aquatic environment.

SECTION 13. DISPOSAL CONSIDERATIONS

Hazard characteristic and regulatory waste stream classification can change with product use. Accordingly, it is the responsibility of the user to determine the proper storage, transportation, treatment and/or disposal methodologies for spent materials and residues at the time of disposition.

Maximize material recovery for reuse or recycling. Recovered non-usable material may be regulated by US EPA as a hazardous waste due to its ignitibility (D001) and/or its toxic (D018) characteristics. Conditions of use may cause this material to become a "hazardous waste", as defined by federal or state regulations. It is the responsibility of the user to determine if the material is a RCRA "hazardous waste" at the time of disposal. Transportation, treatment, storage and disposal of waste material must be conducted in accordance with RCRA regulations (see 40 CFR 260 through 40 CFR 271). State and/or local regulations may be more restrictive. Contact your regional US EPA office for guidance concerning case specfic disposal issues.

SECTION 14. TRANSPORT INFORMATION

The shipping description below may not represent requirements for all modes of transportation, shipping methods or locations outside of the United States.

US DOT Status A U.S. Department of Transportation regulated material.

Proper Shipping Name Gasoline, 3, UN 1203, PG II
Gasohol, 3, NA 1203, PGII (Use only for gasoline blended with less than 20% ethanol)

Hazard Class 3 DOT Class: Flammable liquid.

Packing Group(s) II

UN/NA Number UN1203 or NA1203

Reportable Quantity A Reportable Quantity (RQ) has not been established for this material.

Placard(s)

Emergency Response Guide No. 128

MARPOL III Status Not a DOT "Marine Pollutant" per 49 CFR 171.8.

SECTION 15. REGULATORY INFORMATION

TSCA Inventory

This product and/or its components are listed on the Toxic Substances Control Act (TSCA) inventory.

SARA 302/304 Emergency Planning and Notification

The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to Subparts 302 and 304 to submit emergency planning and notification information based on Threshold Planning Quantities (TPQs) and Reportable Quantities (RQs) for "Extremely Hazardous Substances" listed in 40 CFR 302.4 and 40 CFR 355. No components were identified.

SARA 311/312 Hazard Identification

The Superfund Amendments and Reauthorization Act of 1986 (SARA) Title III requires facilities subject to this subpart to submit aggregate information on chemicals by "Hazard Category" as defined in 40 CFR 370.2. This material would be classified under the following hazard categories:

fire, Acute (Immediate) Health Hazard, Chronic (Delayed) Health Hazard

SARA 313 Toxic Chemical Notification and Release Reporting

This product contains the following components in concentrations above de minimis levels that are listed as toxic chemicals in 40 CFR Part 372 pursuant to the requirements of Section 313 of SARA:
Toluene [CAS No.: 108-88-3] Concentration: <20%
Xylene, all isomers [CAS No.: 1330-20-7] Concentration: <18%
Methyl tertiary-Butyl Ether (MTBE) [CAS No.: 1634-04-4] Concentration: <15%
n-Hexane [CAS No.: 110-54-3] Concentration: <8%
Cumene [CAS No.: 98-82-8] Concentration: <4%
Benzene [CAS No.: 71-43-2] Concentration: <5%
Ethylbenzene [CAS No.: 100-41-4] Concentration: <4%
1, 2, 4 Trimethylbenzene [CAS No.: 95-63-6] Concentration: <4%
Cyclohexane [CAS No.: 110-82-7] Concentration: <3%
Naphthalene [CAS No.: 91-20-3] Concentration: <2%
Styrene [CAS No.: 100-42-5] Concentration: <1%

CERCLA

The Comprehensive Environmental Response, Compensation, and Liability Act of 1980 (CERCLA) requires notification of the National Response Center concerning release of quantities of "hazardous substances" equal to or greater than the reportable quantities (RQ's) listed in 40 CFR 302.4. As defined by CERCLA, the term "hazardous substance" does not include petroleum, including crude oil or any fraction thereof which is not otherwise specifically designated in 40 CFR 302.4. Chemical substances present in this product or refinery stream that may be subject to this statute are:
Toluene [CAS No.: 108-88-3] RQ = 1000 lbs. (453.6 kg) Concentration: <20%
Xylene, all isomers [CAS No.: 1330-20-7] RQ = 100 lbs. (45.36 kg) Concentration: <18%
Methyl tertiary-Butyl Ether (MTBE) [CAS No.: 1634-04-4] RQ = 1000 lbs. (453.6 kg) Concentration: <15%
n-Hexane [CAS No.: 110-54-3] RQ = 5000 lbs. (2268 kg) Concentration: <8%
2,2,4-Trimethylpentane [CAS No.: 540-84-1] RQ = 1000 lbs. (453.6 kg) Concentration: <5%
Benzene [CAS No.: 71-43-2] RQ = 10 lbs. (4.536 kg) Concentration: <5%
Cumene [CAS No.: 98-82-8] RQ = 5000 lbs. (2268 kg) Concentration: <4%
Ethylbenzene [CAS No.: 100-41-4] RQ = 1000 lbs. (453.6 kg) Concentration: <4%
Cyclohexane [CAS No.: 110-82-7] RQ = 1000 lbs. (453.6 kg) Concentration: <3%
Naphthalene [CAS No.: 91-20-3] RQ = 100 lbs. (45.36 kg) Concentration: <2%
Styrene [CAS No.: 100-42-5] RQ = 1000 lbs. (453.6 kg) Concentration: <1%

Clean Water Act (CWA)

This material is classified as an oil under Section 311 of the Clean Water Act (CWA) and the Oil Pollution Act of 1990 (OPA). Discharges or spills which produce a visible sheen on waters of the United States, their adjoining shorelines, or into conduits leading to surface waters must be reported to the EPA's National Response Center at (800) 424-8802.

California Proposition 65

This material may contain the following components which are known to the State of California to cause cancer, birth defects or other reproductive harm, and may be subject to the requirements of California Proposition 65 (CA Health & Safety Code Section 25249.5): Gasoline (Wholly Vaporized and Engine Exhaust), Benzene [CAS No. 71-43-3], Toluene [CAS No. 108-88-3], Ethylbenzene [CAS No.100-41-4] and Naphthalene [CAS No.91-20-3]

New Jersey Right-to-Know Label

Gasoline [NJDEP CAS No. 8006-61-9]

Additional Regulatory Remarks

As minimum requirements, CITGO recommends that the following advisory information be displayed on equipment used to dispense gasoline in motor vehicles. Additional warnings specified by various regulatory authorities may be required: "DANGER: Extremely Flammable. Use as a Motor Fuel Only. No Smoking. Stop Engine. Turn Off All Electronic Equipment including Cellular Telephones. Do Not Overfill Tank. Keep Away from Heat and Flames. Do Not leave nozzle unattended during refueling. **Static Sparks Can Cause a Fire, especially when filling portable containers.** Containers must be metal or other material approved for storing gasoline. PLACE CONTAINER ON GROUND. DO NOT FILL ANY PORTABLE CONTAINER IN OR ON A VEHICLE. Keep nozzle spout in contact with the container during the entire filling operation. **Harmful or Fatal if Swallowed. Long-Exposure Has Caused Cancer in Laboratory Animals.** Avoid prolonged breathing of vapors. Keep face away from nozzle and gas tank. Never siphon by mouth."

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

SECTION 16. OTHER INFORMATION

Refer to the top of Page 1 for the HMIS and NFPA Hazard Ratings for this product.

REVISION INFORMATION

Version Number	7.0
Revision Date	05/23/2005
Print Date	Printed on 05/23/2005.

ABBREVIATIONS

AP: Approximately EQ: Equal >: Greater Than <: Less Than NA: Not Applicable ND: No Data NE: Not Established

ACGIH: American Conference of Governmental Industrial Hygienists
AIHA: American Industrial Hygiene Association
IARC: International Agency for Research on Cancer
NTP: National Toxicology Program
NIOSH: National Institute of Occupational Safety and Health
OSHA: Occupational Safety and Health Administration
NPCA: National Paint and Coating Manufacturers Association
HMIS: Hazardous Materials Information System
NFPA: National Fire Protection Association
EPA: US Environmental Protection Agency

DISCLAIMER OF LIABILITY

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THE CONDITIONS OR METHODS OF HANDLING, STORAGE, USE, AND DISPOSAL OF THE PRODUCT ARE BEYOND OUR CONTROL AND MAY BE BEYOND OUR KNOWLEDGE. FOR THIS AND OTHER REASONS, WE DO NOT ASSUME RESPONSIBILITY AND EXPRESSLY DISCLAIM LIABILITY FOR LOSS, DAMAGE OR EXPENSE ARISING OUT OF OR IN ANY WAY CONNECTED WITH HANDLING, STORAGE, USE OR DISPOSAL OF THE PRODUCT.

* * * * * END OF MSDS * * * * *

Material Safety Data Sheet
Hydrochloric Acid 0.01 to 2.5N

ACC# 40067

Section 1 - Chemical Product and Company Identification

MSDS Name: Hydrochloric Acid 0.01 to 2.5N
Catalog Numbers: S70041-2, S71944, S74855, S74856, S748561, S74856MF, S80036, S80039, S93259, A48520, A4854, EMHX0607-1, FLSA4820LC, GILHYDCHLOR, LC153305, NC9193346, NC9668809, NC9691487, NC9751601, S70041-3, SA50-1, SA50-20, SA50-4, SA52-20, SA52-500, SA54-1, SA54-10, SA54-20, SA54-4, SA55, SA60-1, SA62-1, SA81410, SA81420, SA8144, XX41704L, XX4200LI, XXAVENHCLNF1LI, XXHCL0.5N200LI, XXSA50200LI, XXSLN4426200, XXSLNALL0200
Synonyms: Chlorohydric acid; Hydrogen chloride; Muriatic acid; Spirits of salt; Hydrochloride.
Company Identification:

Fisher Scientific
1 Reagent Lane
Fair Lawn, NJ 07410

For information, call: 201-796-7100
Emergency Number: 201-796-7100
For CHEMTREC assistance, call: 800-424-9300
For International CHEMTREC assistance, call: 703-527-3887

Section 2 - Composition, Information on Ingredients

CAS#	Chemical Name	Percent	EINECS/ELINCS
7732-18-5	Water	>89.1	231-791-2
7647-01-0	Hydrochloric acid	.04-9.12	231-595-7

Section 3 - Hazards Identification

EMERGENCY OVERVIEW

Appearance: colorless to slight yellow clear liquid.
Warning! May cause eye, skin, and respiratory tract irritation. Corrosive to metal.
Target Organs: No data found.

Potential Health Effects

Eye: May cause eye irritation.
Skin: May cause skin irritation.
Ingestion: May cause irritation of the digestive tract. May cause circulatory system failure.
Inhalation: May cause respiratory tract irritation. Exposure to the mist and vapor may erode exposed teeth.
Chronic: Prolonged or repeated skin contact may cause dermatitis. Repeated exposure may cause erosion of teeth. May cause fetal effects. Laboratory experiments have resulted in mutagenic effects. Prolonged exposure may cause conjunctivitis, photosensitization, and possible blindness.

Section 4 - First Aid Measures

Eyes: In case of contact, immediately flush eyes with plenty of water for a t least 15 minutes. Get medical aid.
Skin: In case of contact, immediately flush skin with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid immediately. Wash clothing before reuse.
Ingestion: If swallowed, do NOT induce vomiting. Get medical aid immediately. If victim is fully conscious, give a cupful of water. Never give anything by mouth to an unconscious person.
Inhalation: If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.
Notes to Physician: Do NOT use sodium bicarbonate in an attempt to neutralize the acid. Treat symptomatically and supportively.
Antidote: Do NOT use oils or ointments in eye.

Section 5 - Fire Fighting Measures

General Information: As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Water runoff can cause environmental damage. Dike and collect water used to fight fire. Not flammable, but reacts with most metals to form flammable hydrogen gas. Use water spray to keep fire-exposed containers cool. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. Reaction with water may generate much heat which will increase the concentration of fumes in the air. Containers may explode when heated. Approach fire from upwind to avoid hazardous vapors and toxic decomposition products.
Extinguishing Media: For large fires, use water spray, fog, or alcohol-resistant foam. Substance is nonflammable; use agent most appropriate to extinguish surrounding fire. Do NOT use straight streams of water. Most foams will react with the material and release corrosive/toxic gases. Cool containers with flooding quantities of water until well after fire is out. For small fires, use carbon dioxide (except for cyanides), dry chemical, dry sand, and alcohol-resistant foam.
Flash Point: Not applicable.
Autoignition Temperature: Not applicable.
Explosion Limits, Lower: Not available.
Upper: Not available.
NFPA Rating: (estimated) Health: 1; Flammability: 0; Instability: 1

Section 6 - Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Large spills may be neutralized with dilute alkaline solutions of soda ash (sodium carbonate, Na2CO3), or lime (calcium oxide, CaO). Avoid runoff into storm sewers and ditches which lead to waterways. Clean up spills immediately, observing precautions in the Protective Equipment section. Provide ventilation. Do not get water inside containers. A vapor suppressing foam may be used to reduce vapors. Cover with dry earth, dry sand, or other non-combustible material followed with plastic sheet to minimize spreading and contact with water.

Section 7 - Handling and Storage

Handling: Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Use only in a well-ventilated area. Use with adequate ventilation. Contents may develop pressure upon prolonged storage. Avoid contact with eyes, skin, and clothing. Do not breathe dust, vapor, mist, or gas. Keep container tightly closed. Avoid ingestion and inhalation. Discard contaminated shoes. Use caution when opening. Keep from contact with moist air and steam.
Storage: Do not store in direct sunlight. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances. Corrosives area. Do not store in metal containers. Do not store near flammable or oxidizing substances (especially nitric acid or chlorates). Store away from alkalies.

Section 8 - Exposure Controls, Personal Protection

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.
Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
Water	none listed	none listed	none listed
Hydrochloric acid	2 ppm Ceiling	50 ppm IDLH	5 ppm Ceiling; 7 mg/m3 Ceiling

OSHA Vacated PELs: Water: No OSHA Vacated PELs are listed for this chemical. Hydrochloric acid: No OSHA Vacated PELs are listed for this chemical.
Personal Protective Equipment
Eyes: Wear chemical splash goggles.
Skin: Wear neoprene or polyvinyl chloride gloves to prevent exposure.
Clothing: Wear appropriate protective clothing to prevent skin exposure.
Respirators: A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements or European Standard EN 149 must be followed whenever workplace conditions warrant respirator use.

Section 9 - Physical and Chemical Properties

Physical State: Clear liquid
Appearance: colorless to slight yellow
Odor: strong, pungent
pH: 0.10 (1.0N soln)
Vapor Pressure: 160 mm Hg @ 20 deg C
Vapor Density: 1.26 (air=1)
Evaporation Rate:>1(N-butyl acetate = 1)
Viscosity: Not available.
Boiling Point: 81.5-110 deg C @ 760 mmHg
Freezing/Melting Point:-17 deg C
Decomposition Temperature: Not available.
Solubility: Soluble.
Specific Gravity/Density:1.16 (water=1)
Molecular Formula:HCl
Molecular Weight:36.46

Section 10 - Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.
Conditions to Avoid: Excess heat.
Incompatibilities with Other Materials: Strong oxidizing agents, bases, acetic anhydride, alkali metals, aluminum, amines, copper, copper alloys, fluorine, iron, sodium hydroxide, steel, sulfuric acid, vinyl acetate, zinc, potassium permanganate, cesium acetylene carbide, rubidium acetylene carbide, rubidium carbide, sodium, chlorosulfonic acid, oleum, carbonates, perchloric acid, calcium phosphide, metal oxides, acetates, cesium carbide, beta-propiolactone, ethyleneimine, propylene oxide, lithium silicides, alcohols + hydrogen cyanide, 2-aminoethanol, ammonium hydroxide, calcium carbide, 1,1-difluoroethylene, ethylene diamine, magnesium boride, mercuric sulfate, uranium phosphide.
Hazardous Decomposition Products: Hydrogen chloride.
Hazardous Polymerization: Will not occur.

Section 11 - Toxicological Information

RTECS#:
CAS# 7732-18-5: ZC0110000
CAS# 7647-01-0: MW4025000; MW4031000
LD50/LC50:
CAS# 7732-18-5:
Oral, rat: LD50 = >90 mL/kg;
.

CAS# 7647-01-0:
Inhalation, mouse: LC50 = 1108 ppm/1H;
Inhalation, mouse: LC50 = 20487 mg/m3/5M;
Inhalation, mouse: LC50 = 3940 mg/m3/30M;
Inhalation, mouse: LC50 = 8300 mg/m3/30M;
Inhalation, rat: LC50 = 3124 ppm/1H;
Inhalation, rat: LC50 = 60938 mg/m3/5M;
Inhalation, rat: LC50 = 7004 mg/m3/30M;
Inhalation, rat: LC50 = 45000 mg/m3/5M;
Inhalation, rat: LC50 = 8300 mg/m3/30M;
Oral, rabbit: LD50 = 900 mg/kg;
.

Carcinogenicity:
CAS# 7732-18-5: Not listed by ACGIH, IARC, NTP, or CA Prop 65.
CAS# 7647-01-0: Not listed by ACGIH, IARC, NTP, or CA Prop 65.

Epidemiology: No information found
Teratogenicity: No information found
Reproductive Effects: No information found
Mutagenicity: No information found
Neurotoxicity: No information found
Other Studies:

Section 12 - Ecological Information

Ecotoxicity: Fish: Bluegill/Sunfish: 3.6 mg/L; 48 Hr; Lethal (unspecified)
Fish: Bluegill/Sunfish: LD50; 96 Hr; pH 3.0-3.5

Section 13 - Disposal Considerations

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

Section 14 - Transport Information

	US DOT	Canada TDG
Shipping Name:	HYDROCHLORIC ACID	HYDROCHLORIC ACID SOLUTION
Hazard Class:	8	8
UN Number:	UN1789	UN1789
Packing Group:	II	II

Section 15 - Regulatory Information

US FEDERAL

TSCA
CAS# 7732-18-5 is listed on the TSCA inventory.
CAS# 7647-01-0 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
CERCLA Hazardous Substances and corresponding RQs
CAS# 7647-01-0: 5000 lb final RQ; 2270 kg final RQ
SARA Section 302 Extremely Hazardous Substances
CAS# 7647-01-0: 500 lb TPQ
SARA Codes
CAS # 7647-01-0: immediate.
Section 313
This material contains Hydrochloric acid (CAS# 7647-01-0, .04-9.12%),which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.
Clean Air Act:

CAS# 7647-01-0 is listed as a hazardous air pollutant (HAP).
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

CAS# 7647-01-0 is listed as a Hazardous Substance under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

CAS# 7647-01-0 is considered highly hazardous by OSHA.

STATE

CAS# 7732-18-5 is not present on state lists from CA, PA, MN, MA, FL, or NJ.
CAS# 7647-01-0 can be found on the following state right to know lists: California, New Jersey, Pennsylvania, Minnesota, Massachusetts.

California Prop 65

California No Significant Risk Level: None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols:

Not available.

Risk Phrases:

Safety Phrases:

S 24/25 Avoid contact with skin and eyes.

WGK (Water Danger/Protection)

CAS# 7732-18-5: No information available.
CAS# 7647-01-0: 1

Canada - DSL/NDSL

CAS# 7732-18-5 is listed on Canada's DSL List.
CAS# 7647-01-0 is listed on Canada's DSL List.

Canada - WHMIS

This product has a WHMIS classification of E.
This product has been classified in accordance with the hazard criteria of the Controlled Products Regulations and the MSDS contains all of the information required by those regulations.

Canadian Ingredient Disclosure List

CAS# 7647-01-0 is listed on the Canadian Ingredient Disclosure List.

Section 16 - Additional Information

MSDS Creation Date: 4/14/1999
Revision #6 Date: 4/25/2005

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no event shall Fisher be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if Fisher has been advised of the possibility of such damages.

MATERIAL SAFETY DATA SHEET

SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

MATHESON TRI-GAS, INC.
959 ROUTE 46 EAST
PARSIPPANY, NEW JERSEY USA 07054-0624 OR
530 WATSON STREET
WHITBY, ONTARIO, CANADA L1N 5R9

EMERGENCY CONTACT:
CHEMTREC 1-800-424-9300

INFORMATION CONTACT:
(USA) 973-257-1100
(WHITBY) 905-668-3570
(EDMONTON) 780-471-4036

SUBSTANCE: HYDROGEN CYANIDE, ANHYDROUS, STABILIZED

TRADE NAMES/SYNONYMS:
MTG MSDS 119; HYDROCYANIC ACID; PRUSSIC ACID; FORMONITRILE; CARBON HYDRIDE NITRIDE; HYDROCYANIC ACID, LIQUEFIED; HYDROGEN CYANIDE; RCRA P063; STCC 4920125; NA 1051; CHN; MAT11160; RTECS MW6825000

CHEMICAL FAMILY: inorganic, gas

CREATION DATE: Jan 24 1989
REVISION DATE: Mar 22 2001

SECTION 2 COMPOSITION, INFORMATION ON INGREDIENTS

COMPONENT: HYDROGEN CYANIDE, ANHYDROUS, STABILIZED
CAS NUMBER: 74-90-8
EC NUMBER (EINECS): 200-821-6
EC INDEX NUMBER: 006-006-01-7
PERCENTAGE: 100.0

SECTION 3 HAZARDS IDENTIFICATION

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

EMERGENCY OVERVIEW:
COLOR: colorless
PHYSICAL FORM: liquid
ODOR: almond odor
MAJOR HEALTH HAZARDS: potentially fatal if inhaled or swallowed, respiratory tract irritation, eye irritation
PHYSICAL HAZARDS: Flammable liquid and vapor. Vapor may cause flash fire. May polymerize. Containers may rupture or explode. May react on contact with air, heat, light or water.

POTENTIAL HEALTH EFFECTS:
INHALATION:
SHORT TERM EXPOSURE: irritation, rash, nausea, chest pain, irregular heartbeat, headache, blindness, bluish skin color, suffocation, lung congestion, paralysis, convulsions, coma, death
LONG TERM EXPOSURE: vomiting, digestive disorders, dizziness
SKIN CONTACT:
SHORT TERM EXPOSURE: suffocation

LONG TERM EXPOSURE: same as effects reported in long term inhalation, rash, itching
EYE CONTACT:
SHORT TERM EXPOSURE: irritation, suffocation, death
LONG TERM EXPOSURE: same as effects reported in short term exposure
INGESTION:
SHORT TERM EXPOSURE: suffocation, death
LONG TERM EXPOSURE: no information is available

CARCINOGEN STATUS:
OSHA: No
NTP: No
IARC: No

SECTION 4 FIRST AID MEASURES

INHALATION: When safe to enter area, remove from exposure. Use a bag valve mask or similar device to perform artificial respiration (rescue breathing) if needed. Get medical attention immediately.

SKIN CONTACT: Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.

EYE CONTACT: Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

INGESTION: Contact local poison control center or physician immediately. Never make an unconscious person vomit or drink fluids. When vomiting occurs, keep head lower than hips to help prevent aspiration. If person is unconscious, turn head to side. Get medical attention immediately.

ANTIDOTE: amyl nitrite, inhalation; sodium nitrite, intravenous; sodium thiosulfate, infusion; oxygen.

NOTE TO PHYSICIAN: Consider amyl nitrite inhalation, 1 ampoule (0.2 mL) every 5 minutes, and oxygen. For ingestion, consider gastric lavage. Consider oxygen.

SECTION 5 FIRE FIGHTING MEASURES

FIRE AND EXPLOSION HAZARDS: Severe fire hazard. Containers may rupture or explode if exposed to heat. Vapor/air mixtures are explosive. Gas or vapor is lighter than air. Vapors or gases may ignite at distant ignition sources and flash back.

EXTINGUISHING MEDIA: Let burn unless leak can be stopped immediately. Large fires: Use regular foam or flood with fine water spray.

FIRE FIGHTING: Move container from fire area if it can be done without risk. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. Cool containers with water spray until well after the fire is out. Keep unnecessary people away, isolate hazard area and deny entry. For tank, rail car or tank truck, evacuation radius: Evacuation radius: 800 meters (1/2 mile). Do not attempt to extinguish fire unless flow of material can be stopped first. Flood with

fine water spray. Do not scatter spilled material with high-pressure water streams. Cool containers with water. Apply water from a protected location or from a safe distance. Avoid inhalation of material or combustion by-products. Stay upwind and keep out of low areas.

FLASH POINT: 0 F (-18 C) (CC)
LOWER FLAMMABLE LIMIT: 5.6%
UPPER FLAMMABLE LIMIT: 40%
AUTOIGNITION: 1000 F (538 C)

SECTION 6 ACCIDENTAL RELEASE MEASURES

OCCUPATIONAL RELEASE:
Do not touch spilled material. Stop leak if possible without personal risk. Avoid heat, flames, sparks and other sources of ignition. Remove sources of ignition. Reduce vapors with water spray. Do not get water directly on material. Keep unnecessary people away, isolate hazard area and deny entry. Stay upwind and keep out of low areas. Ventilate closed spaces before entering. Evacuation radius: 150 feet. For tank, rail car or tank truck: 800 meters (1/2 mile). Notify Local Emergency Planning Committee and State Emergency Response Commission for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800)424-8802 (USA) or (202)426-2675 (USA).

SECTION 7 HANDLING AND STORAGE

STORAGE: Store and handle in accordance with all current regulations and standards. Subject to storage regulations: U.S. OSHA 29 CFR 1910.101. Protect from physical damage. Store outside or in a detached building. Store with flammable liquids. Avoid heat, flames, sparks and other sources of ignition. Shelf life is 90 days. Keep separated from incompatible substances. Notify State Emergency Response Commission for storage or use at amounts greater than or equal to the TPQ (U.S. EPA SARA Section 302). SARA Section 303 requires facilities storing a material with a TPQ to participate in local emergency response planning (U.S. EPA 40 CFR 355.30).

SECTION 8 EXPOSURE CONTROLS, PERSONAL PROTECTION

EXPOSURE LIMITS:
HYDROGEN CYANIDE, ANHYDROUS, STABILIZED:
HYDROGEN CYANIDE:
10 ppm (11 mg/m3) OSHA TWA (skin)
4.7 ppm (5 mg/m3) OSHA STEL (skin) (vacated by 58 FR 35338, June 30, 1993)
4.7 ppm(CN) ACGIH ceiling (skin)
4.7 ppm (5 mg/m3) NIOSH recommended STEL (skin)

VENTILATION: Provide local exhaust or process enclosure ventilation system. Ensure compliance with applicable exposure limits.

EYE PROTECTION: Wear splash resistant safety goggles with a faceshield. Provide an emergency eye wash fountain and quick drench shower in the immediate work area.

CLOTHING: Wear appropriate chemical resistant clothing.

GLOVES: Wear appropriate chemical resistant gloves.

RESPIRATOR: The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA.
47 ppm
Any supplied-air respirator.
Any self-contained breathing apparatus.
50 ppm
Any supplied-air respirator.
Any self-contained breathing apparatus with a full facepiece.
Any supplied-air respirator with a full facepiece.
Escape -
Any air-purifying respirator with a full facepiece and a canister providing protection against this substance.
Any appropriate escape-type, self-contained breathing apparatus.
For Unknown Concentrations or Immediately Dangerous to Life or Health -
Any supplied-air respirator with full facepiece and operated in a pressure-demand or other positive-pressure mode in combination with a separate escape supply.
Any self-contained breathing apparatus with a full facepiece.

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL STATE: liquid
COLOR: colorless
ODOR: almond odor
MOLECULAR WEIGHT: 27.03
MOLECULAR FORMULA: H-C-N
BOILING POINT: 79 F (26 C)
FREEZING POINT: 7 F (-14 C)
VAPOR PRESSURE: 620 mmHg @ 20 C
VAPOR DENSITY (air=1): 0.941
SPECIFIC GRAVITY (water=1): 0.699 @ 22 C
WATER SOLUBILITY: soluble
PH: weakly acidic
VOLATILITY: Not available
ODOR THRESHOLD: 2-5 ppm
EVAPORATION RATE: Not available
COEFFICIENT OF WATER/OIL DISTRIBUTION: Not available
SOLVENT SOLUBILITY:
Soluble: alcohol
Slightly Soluble: ether

SECTION 10 STABILITY AND REACTIVITY

REACTIVITY: May react with evolution of heat on contact with water.

CONDITIONS TO AVOID: Avoid heat, flames, sparks and other sources of ignition. Minimize contact with material. Avoid inhalation of material or combustion by-products. Keep out of water supplies and sewers.

INCOMPATIBILITIES: combustible materials, bases, amines, oxidizing materials, acids

HAZARDOUS DECOMPOSITION:
Thermal decomposition products: cyanides

POLYMERIZATION: Polymerizes with evolution of heat. Avoid contact with air, light, water, incompatible material or storage and use above room temperature.

SECTION 11 TOXICOLOGICAL INFORMATION

HYDROGEN CYANIDE, ANHYDROUS, STABILIZED:
TOXICITY DATA:
160 ppm/30 minute(s) inhalation-rat LC50; 3700 ug/kg oral-mouse LD50
LOCAL EFFECTS:
Irritant: inhalation, eye
ACUTE TOXICITY LEVEL:
Highly Toxic: inhalation, ingestion
TARGET ORGANS: blood
MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: blood system disorders, heart or cardiovascular disorders, nervous system disorders

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SECTION 12 ECOLOGICAL INFORMATION

ECOTOXICITY DATA:
FISH TOXICITY: 5 ug/L 12 week(s) (Physiological) Atlantic salmon (Salmo salar)
INVERTEBRATE TOXICITY: 21 ug/L 83 hour(s) NOEC (Reproduction) Scud (Gammarus pseudolimnaeus)

SECTION 13 DISPOSAL CONSIDERATIONS

Dispose in accordance with all applicable regulations. Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): P063.

SECTION 14 TRANSPORT INFORMATION

U.S. DOT 49 CFR 172.101:
PROPER SHIPPING NAME: Hydrogen cyanide, stabilized with less than 3 percent water
ID NUMBER: UN1051
HAZARD CLASS OR DIVISION: 6.1
PACKING GROUP: I
LABELING REQUIREMENTS: Poison; Flammable liquid
QUANTITY LIMITATIONS:
PASSENGER AIRCRAFT OR RAILCAR: Forbidden
CARGO AIRCRAFT ONLY: Forbidden

SECTION 15 REGULATORY INFORMATION

U.S. REGULATIONS:
CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR 302.4):
HYDROGEN CYANIDE: 10 LBS RQ

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.30):
HYDROGEN CYANIDE: 100 LBS TPQ

SARA TITLE III SECTION 304 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR 355.40):
HYDROGEN CYANIDE: 10 LBS RQ

SARA TITLE III SARA SECTIONS 311/312 HAZARDOUS CATEGORIES (40 CFR 370.21):
ACUTE: Yes
CHRONIC: No
FIRE: Yes
REACTIVE: Yes
SUDDEN RELEASE: Yes

SARA TITLE III SECTION 313 (40 CFR 372.65):
HYDROGEN CYANIDE

OSHA PROCESS SAFETY (29CFR1910.119):
HYDROGEN CYANIDE: 1000 LBS TQ

STATE REGULATIONS:
California Proposition 65: Not regulated.

CANADIAN REGULATIONS:
WHMIS CLASSIFICATION: ABD1F

EUROPEAN REGULATIONS:
EC CLASSIFICATION (ASSIGNED):
T+ Very Toxic

EC Classification may be inconsistent with independently-researched data.

DANGER/HAZARD SYMBOL:
[Image]

EC RISK AND SAFETY PHRASES:

R 26/27/28	Very toxic by inhalation, in contact with skin and if swallowed.
S 1/2	Keep locked-up and out of reach of children.
S 7/9	Keep container tightly closed and in a well-ventilated place.
S 16	Keep away from sources of ignition - No smoking.
S 36/37	Wear suitable protective clothing and gloves.
S 38	In case of insufficient ventilation, wear suitable respiratory equipment.
S 45	In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible).

CONCENTRATION LIMITS:
C>=7% T+ R 26/27/28
1%<=C<7% T R 23/24/25
0.1%<=C<1% Xn R 20/21/22

NATIONAL INVENTORY STATUS:
U.S. INVENTORY (TSCA): Listed on inventory.

TSCA 12(b) EXPORT NOTIFICATION: Not listed.

CANADA INVENTORY (DSL): Not determined.

CANADA INVENTORY (NDSL): Not determined.

SECTION 16 OTHER INFORMATION

MSDS SUMMARY OF CHANGES
SECTION 1 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION
SECTION 3 HAZARDS IDENTIFICATION
SECTION 7 HANDLING AND STORAGE
SECTION 14 TRANSPORT INFORMATION
SECTION 15 REGULATORY INFORMATION

PORTAGAS Inc.
P.O. BOX 230039 HOUSTON, TX 77223 (800) 648-2268

Material Safety Data Sheet

PRODUCT NAME
(Description)

MSDS # 1037X/10386XXX
REVISION 2 - APR/1997

25 - 2000ppm vol. Isobutylene
Balance Air

TRADE NAME & SYNONYMS

Calibration Gas -

25 - 2000ppm molar Isobutylene
Balance Air

CHEMICAL NAME & SYNONYMS

25 - 2000ppm vol. Isobutene, or

25 - 2000ppm vol. 2-Methylpropene
Balance Air

FORMULA (minor component)

(iso) C_4H_8, or Iso-C_4=

CAS NUMBERS

Isobutylene 115-11-7
Air N/A

CHEMICAL FAMILY
Compressed Gas (Monolefin Mixture)

PORTAGAS Inc.
P.O. BOX 230039 HOUSTON, TX 77223 (800) 648-2268

Material Safety Data Sheet

HEALTH HAZARD DATA

TIME WEIGHTED AVERAGE (TWA) EXPOSURE LIMITS (ACGIH 1984-85 and later)

Isobutylene is defined as a simple asphyxiant. Oxygen levels should be maintained at greater than 18 molar percent, but less than 23 molar percent at normal atmospheric pressures; however there is an inadequate amount of Isobutylene in this mixture to cause the air to be unfit for human respiration.

SYMPTOMS OF EXPOSURE

Very slight anesthetic effects may cause under prolonged exposure drowsiness, headaches, dizziness loss of coordination, or nausea, plus a slight irritation to the mucous membranes; however there is an insufficient amount of isobutylene in this mixture to manifest most of these symptoms.

TOXICOLOGICAL PROPERTIES

The concentration of Isobutylene and the balance gas of Air present in this mixture are both nontoxic.

RECOMMENDED FIRST AID TREATMENT

Relocate personnel affected to uncontaminated area and inhale fresh air.

POTENTIALLY HAZARDOUS MIXTURES WITH OTHER CHEMICALS

None

PORTAGAS Inc.
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Material Safety Data Sheet

PHYSICAL DATA

MOLECULAR WEIGHT
28.97 - 29.02

SPECIFIC GRAVITY
1 (Air = 1)

VAPOR PRESSURE
@70F, above Critical Temperatures

LIQUID DENSITY AT BOILING POINT
54.7 lb/ft^3 average

GAS DENSITY AT STP
0.075 lb/ft^3 average

FREEZING TEMPERATURE
-318F

SOLUBILITY IN WATER
Slight

APPEARANCE AND ODOR
Shipped in compressed gas cylinders under pressure (typically 240 - 1000 psig). Vapor is colorless and odorless.

FIRE & EXPLOSION HAZARD DATA

FLAMMABLE LIMITS % BY VOLUME
N/A

EXTINGUISHING MEDIA
N/A (Nonflammable gas), use water if involved in a fire.

NFPA 704 NUMBER (HFR)
0 0 0

ELECTRICAL CLASSIFICATION
Nonhazardous

FLASH POINT
N/A

AUTO IGNITION TEMPERATURE
N/A

SPECIAL FIRE FIGHTING PROCEDURES
When the mixture is involved in a fire, the compressed air balance gas at high pressures will accelerate the burning of materials at a greater rate.

UNUSUAL HAZARDS
None

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Material Safety Data Sheet

REACTIVITY DATA

STABILITY
Stable
INCOMPATIBILITY
None
HAZARDOUS DECOMPOSITION PRODUCTS
None
HAZARDOUS POLYMERIZATION PRODUCTS
None
CONDITIONS TO AVOID
Cylinder temperatures should not exceed 130F (54C).

ACTIONS TO BE TAKEN IN THE EVENT OF AN UNINTENDED RELEASE (LEAK)

FOR EMERGENCIES INVOLVING THIS PRODUCT CALL INFOTRAC (800)535-5053

Evacuate all personnel from the affected area. Use appropriate protective equipment. Shut off flow of gas, and purge lines with an inert gas.

WASTE DISPOSAL METHODS
Do not attempt to dispose of any unused quantites of product or their containers without contacting Portagas for instructions.

PERSONAL PROTECTION INFORMATION

RESPIRATORY/VENTILATION
Hood with forced ventilation.

GLOVES
Plastic or Rubber (neoprene, butyl, poly)

EYES AND OTHER
Safety goggles or glasses only, contact lenses are not recommended.

15 minute shower/eyewash, steel toed/metatarsal protection shoes.

PORTAGAS Inc.
P.O. BOX 230039 HOUSTON, TX 77223 (800) 548-2268

Material Safety Data Sheet

SPECIAL SAFETY AND REGULATORY CONSIDERATIONS

LABELING	DOT Shipping name:	Compressed gases, n.o.s.
	Tech. Description:	(Isobutylene, Air)
	Identification No.:	UN 1956
	Hazard Class, Div.:	Nonflammable Gas, 2.2
	IATA Packing Inst.:	200

HANDLING
Use only in well ventilated areas. The cylinder should be secured with a chain, strap on its side or by use of a stand when connected to a regulator. Do not drag, drop or roll the cylinder. Use both hands when carrying the cylinder. Do not heat the cylinder. One-way check valves in the use line are recommended to prevent backflow. Systems should be cleaned "for Oxygen service" before first use.

STORAGE
Protect the cylinders from physical damage. Store the cylinders in a cool (<130F), dry, ventilated, posted "no smoking or open flames" area constructed of non-combustible materials, and away from ailes and other traffic areas. Keep full cylinders separated from empties. Rotate stock first-in, first-out (FIFO).

PACKAGING
Use the cylinders as provided, with the recommended regulator. Do not attempt to refill the cylinder or transfill the product from one container to another.

OTHER PRECAUTIONS
Conduct monitoring of gas exposure to personnel, do not rely on odor as a way to detect the presence of gas.

MSDS List Previous MSDS Next MSDS

MSDS MATERIAL SAFETY DATA SHEET

SECTION 1. PRODUCT AND COMPANY IDENTIFICATION
70% Isopropyl Alcohol

PRODUCT CODE: HH-70% ISO ALCO, REFERENCE #: 77305
PRODUCT NAME: 70% Isopropyl Alcohol CHEMICAL FAMILY: Alcohol Mixture

MANUFACTURER NAME AND ADDRESS:		TELEPHONE NUMBERS:	DATES:
Farnam Companies, Inc.	24 hour emergency number	(602)285-1660	Date Created: 09/08/1994
301 West Osborn Road	Business hours	(602)285-1660	Revision: 04/23/2001
Phoenix, AZ. 85013	Marketing	(602)285-1660	Printed: 01/12/2005

SECTION 2. COMPOSITION/INFORMATION ON INGREDIENTS
70% Isopropyl Alcohol

	HAZARDOUS COMPONENTS (CHEMICAL NAME)	CAS #	OSHA PEL	ACGIH TLV	OTHER LIMITS	PERCENTAGE	RTECS #
1.	Isopropyl alcohol {sec-Propyl alcohol; IPA; 2-Propanol}	67-63-0	400 ppm	400 ppm		70.0 %	NT8050000

SECTION 3. HAZARDS IDENTIFICATION
70% Isopropyl Alcohol

EMERGENCY OVERVIEW

ROUTE(S) OF ENTRY: Inhalation? Yes , Skin? Yes , Eyes? Yes , Ingestion? Yes
POTENTIAL HEALTH EFFECTS (ACUTE AND CHRONIC)

CARCINOGENITICY: NTP? , IARC Monographs? , OSHA Regulated?
CARCINOGENICITY/OTHER INFORMATION

SIGNS AND SYMPTOMS OF EXPOSURE
Early to moderate CNS depression may be evidenced by giddiness, headache, dizziness and nausea; in extreme cases, unconsciousness, respiratory depression and death may occur.
MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE
Pre-existing eye and/or skin irritation, respiratory, and/or digestive disorders.

SECTION 4. FIRST AID MEASURES
70% Isopropyl Alcohol

EMERGENCY AND FIRST AID PROCEDURES
INHALATION = Remove victim to fresh air and provide oxygen if breathing is difficult. Obtain medical attention.
SKIN CONTACT = Flush skin with plenty of water. If irritation occurs, seek medical attention.
INGESTION = Do not give liquids if victim is unconscious or drowsy. Otherwise give no more than 2 glasses of water and induce vomiting. Obtain medical attention.
EYE CONTACT = Immediately flush eyes with plenty of water for at least 15 minutes. Obtain medical attention.
NOTE TO PHYSICIAN

SECTION 5. FIRE FIGHTING MEASURES
70% Isopropyl Alcohol

FLASH PT: 70.00 F METHOD USED: open cup
EXPLOSIVE LIMITS: LEL: 2% UEL: 12%
AUTOIGNITION PT: N.A. EXTINGUISHING MEDIA
Use water spray, water fog, "alcohol" foam, dry chemical or CO2
FIRE FIGHTING INSTRUCTIONS
Warning. Flammable. Clear fire area of unprotected personnel. Do not enter confined fire space without full bunker gear (helmet with face shield, bunker coats, gloves and rubber boots), including a positive pressure NIOSH approved self-contained breathing apparatus. Cool fire exposed containers with water.
FLAMMABLE PROPERTIES AND HAZARDS
Containers exposed to intense heat from fires should be cooled with water to prevent vapor pressure buildup which could result in container rupture. Container areas exposed to direct flame contact should be cooled with large quantities of water as needed to prevent weakening of container structure.
HAZARDOUS COMBUSTION PRODUCTS

SECTION 6. ACCIDENTAL RELEASE MEASURES
70% Isopropyl Alcohol

STEPS TO BE TAKEN IN CASE MATERIAL IS RELEASED OR SPILLED
Keep out of surface waters, sewers, and waterways entering or leading to surface waters. Notify authorities if any exposure to the general public or environment occurs or is likely to occur.

SECTION 7. HANDLING AND STORAGE
70% Isopropyl Alcohol

PRECAUTIONS TO BE TAKEN IN HANDLING
Avoid heat or sparks.
PRECAUTIONS TO BE TAKEN IN STORING

OTHER PRECAUTIONS
None known.

SECTION 8. EXPOSURE CONTROLS/PERSONAL PROTECTION
70% Isopropyl Alcohol

RESPIRATORY EQUIPMENT (SPECIFY TYPE)
A respiratory protection program that meets OSHA's 29 CFR 1910.134 and ANSI Z88.2 requirements must be followed

whenever workplace conditions warrant a respirator's use.
EYE PROTECTION
Wear chemical goggles to protect eyes.
PROTECTIVE GLOVES
Wear chemical resistant gloves.
OTHER PROTECTIVE CLOTHING

ENGINEERING CONTROLS (VENTILATION ETC.)
Provide local exhaust ventilation and supply fresh air to maintain a safe work environment.
WORK/HYGIENIC/MAINTENANCE PRACTICES
Safety showers and eye wash stations should be available.
Odor Threshold; Isopropanol = 43 ppm.

SECTION 9. PHYSICAL AND CHEMICAL PROPERTIES
70% Isopropyl Alcohol

PHYSICAL STATES:	[ ] Gas , [X] Liquid , [ ] Solid
BOILING POINT:	176.00 F to N.A.
MELTING POINT:	N.A. to N.A.
SPECIFIC GRAVITY (WATER = 1):	0.878N.A.
VAPOR PRESSURE (VS. AIR OR MM HG):	
VAPOR DENSITY (VS. AIR = 1):	1.6N.A.
EVAPORATION RATE (VS BUTYL ACETATE=1):	1.7N.A.
SOLUBILITY IN WATER:	
OTHER SOLUBILITY NOTES:	Complete
PERCENT VOLATILE:	
PH:	

APPEARANCE AND ODOR
Appearance = Clear Colorless Liquid
Odor = Mild alcohol odor

SECTION 10. STABILITY AND REACTIVITY
70% Isopropyl Alcohol

STABILITY: Unstable [ ] Stable [X]
CONDITIONS TO AVOID - INSTABILITY
Avoid heat, sparks, and flame.
INCOMPATIBILITY - MATERIALS TO AVOID
Avoid contact with strong oxidizing agents. Do not store or handle in aluminum equipment at temperatures above 120 F.
HAZARDOUS DECOMPOSITION OR BYPRODUCTS
Carbon monoxide, and unidentifed organic compounds may be formed during combustion.
HAZARDOUS POLYMERIZATION: Will occur [ ] Will not occur [X]
CONDITIONS TO AVOID - HAZARDOUS POLYMERIZATION

SECTION 11. TOXICOLOGICAL INFORMATION
70% Isopropyl Alcohol

SECTION 12. ECOLOGICAL INFORMATION
70% Isopropyl Alcohol

SECTION 13. DISPOSAL CONSIDERATIONS
70% Isopropyl Alcohol

WASTE DISPOSAL METHOD
Under EPA-RCRA (40 CFR 261), If this product becomes a waste material, it is not hazardous waste. Refer to latest EPA or state regulations regarding proper disposal.

SECTION 14. TRANSPORT INFORMATION
70% Isopropyl Alcohol

DOT PROPER SHIPPING NAME

DOT HAZARD LABEL: Consumer Commodity ORM-D
UN/NA NUMBER:
ADDITIONAL TRANSPORT INFORMATION

SECTION 15. REGULATORY INFORMATION
70% Isopropyl Alcohol

SECTION 16. OTHER INFORMATION
70% Isopropyl Alcohol

This product contains the following toxic chemicals currently subject to the reporting requirements of SARA Section 313 of the Emergency Planning and Community Right-To-Know Act of 1986 and of 40 CFR 372.

CAS Number 67-63-0 Name Isopropanol Weight <70%
The information and data herein are believed to be accurate and have been compiled from sources believed to be reliable. It is offered for your consideration, investigation and verification.

Material Safety Data Sheet

Infosafe No. A000L	Issue Date: July 2000	ISSUED by:
Product Name:	**METHANOL**	Coogee Energy Pty Ltd

This product is a Hazardous Substance as defined in the *List of Designated Hazardous Substances [NOHSC: 10005 (1994)]*

COMPANY DETAILS

Company Name	Coogee Energy Pty Ltd (A.C.N. 092 473 795 A.B.N. 69 092 473 795)
Address	171 Fitzgerald Road, North Laverton, Vic, 3026
Tel/Fax	Ph: 9360 2000 (24 hours), Fax: 9360 2011

IDENTIFICATION

Product Name	METHANOL
Proper Shipping Name	METHANOL (METHYL ALCOHOL)
Other Names	Methyl Alcohol
UN Number	1230
DG Class	3
Sub.Risk	6.1
Packing Group	II
Hazchem Code	2WE
Poisons Schedule	S6
Product Use	Manufacture of formaldehyde, acetic acid and dimethyl terephthalate; chemical synthesis; antifreeze; solvent; denaturant for ethanol; fuel; feedstock for the manufacture of synthetic proteins.

Physical Data

Appearance	Clear, colourless, very mobile liquid with an alcoholic odour
Melting Point	-97.7°C
Boiling Point	64.7°C
Vapour Pressure	127 mm Hg @ 25°C
Specific Gravity	0.79
Flash Point	12°C
Flamm. Limit LEL	6.7%
Flamm. Limit UEL	36.5%
Solubility in Water	Miscible

Other Properties

Volatile Component	100%
Auto ignition temp.	470°C
Vapour Density	1.11
pH Value	Not applicable
Viscosity	0.541 mPa-S @ 25°C
Specific Properties or Risk	Highly flammable; poisonous
Materials to Avoid	Strong oxidizers
Formula	CH40
Molecular Weight	32.05
Other Information	Miscible with water and most organic solvents. Characteristic pungent odour.

This product is a Hazardous Substance as defined in the *List of Designated Hazardous Substances [NOHSC: 10005 (1994)]*

Burns with a non-luminous, bluish flame.

Ingredients

Name	CAS	Proportion
Methanol	67-56-1	100%

HEALTH HAZARD INFORMATION

Health Effects

Acute - Swallowed
Toxic if swallowed. Ingestion can result in nausea, vomiting, severe abdominal pain, back pain, central nervous system effects including optic nerve damage (hyperemia, etc), convulsions, blindness, loss of consciousness and ultimately proceed to coma and death.
See "chronic" effects.

Acute - Eye
A moderate eye irritant. May cause watering of the eyes, stinging or blurred vision, and sensitivity to light.

Acute - Skin
Contact with skin will result in defatting and moderate irritation. Can be absorbed through the skin in harmful amounts. See "chronic" effects.

Acute - Inhaled
Toxic by inhalation. The vapour is irritating to the mucous membranes and respiratory tract. Inhalation of vapour can cause headache, nausea, central nervous system effects, and visual impairment, possibly blindness. Continued exposure can result in health effects as per ingestion.

Chronic
Prolonged, chronic exposure from skin contact, inhalation or swallowing of methanol can result in dermatitis, systemic effects to the liver, heart and possibly kidneys, permanent blindness and central nervous system effects.

First Aid

Swallowed
If less than 15 minutes from a hospital, give one to two glasses of water to drink and transport patient immediately to hospital/medical centre. Do not induce vomiting.
If medical assistance is not immediately available, carefully induce vomiting, protecting against aspiration or material into the lungs, by placing patient head lower than knees. Use fingers, Ipecac Syrup (APF) or similar emetic. Continue to seek medical assistance.

Eye
Gently rinse the eyes with clean, lukewarm water for at least 15 minutes, holding eyelids open. Have victim remove contact lenses. In all cases of eye contamination it is a sensible precaution to seek medical advice.

Skin
Immediately rinse affected area with mild soap and lukewarm water for 20 minutes. Remove contaminated clothing during rinsing. If irritation or other effects persist, seek medical advice. Separately wash contaminated clothing before re-use.

Inhaled
Remove victim from exposure - avoid becoming a casualty.
If breathing laboured and patient cyanotic (blue), ensure airways are clear and have qualified person give oxygen through a face mask. If breathing has stopped apply artificial respiration at once. In the event of cardiac arrest, apply external cardiac massage.

For all but the most minor symptoms arrange for patient to be seen by a doctor as soon as possible - either on site or at the nearest hospital.

First Aid Facilities Eye wash station, normal washroom and shower facilities must be made available.

Advice to Doctor

Watch for toxic effects which may be delayed, including chemical pneumonitis. Contact Poison Information Centre for antidote treatment with ethyl alcohol. Central nervous system depression, and acidosis from methanol metabolites, including formaldehyde, liver function and optic nerve, and other effects should be treated symptomatically.

OTHER HEALTH HAZARD INFORMATION

Precautions For Use

Exposure Limits Worksafe Australia has assigned the following exposure standards for methanol:
TWA: 200 ppm, 263 mg/m3
STEL: 250 ppm, 328 mg/m3
Notices - Sk
TWA is the time weighted average concentration of the work atmosphere over a normal 8-hour work day and a 40-hour work week. Nearly all workers may be repeatedly exposed to this level, day after day, without adverse effect. A "skin" notation indicates that absorption through the skin may be a significant source of exposure. STEL means a 15 minute exposure which should not be exceeded at any time during a working day. STEL exposures should not be repeated more than four times per day.

Eng. Controls Use sufficient ventilation to maintain air concentration below the exposure standard.
Use with local exhaust ventilation or while wearing appropriate respirator. The performance of the ventilation system should be checked regularly.

Personal Protection

Respirator Type (AS 1716) Where the air concentration approaches the exposure standard the following respiratory protection is recommended:

- ◊ Short elevated exposure - organic filter respirator. If exposures greater than 10 times the TWA use air line respirators.
- ◊ Prolonged elevated exposure - air line respirator.

Eye Protection Safety glasses, goggles or faceshield as appropriate

Glove Type Neoprene or PVC gloves

Clothing PVC splash apron

Work/Hygienic Practices Good work-hygiene practice must be followed when handling this material. That is, always wash hands before eating, drinking, smoking, toilet and work breaks

Flammability

Fire Hazards Highly flammable
Flameproof equipment necessary in area where this chemical is being used.

Nearby equipment must be earthed.
Avoid all ignition sources.
May form explosive mixtures with air.

SAFE HANDLING INFORMATION

Storage and Transport

Storage Precautions

Keep out of reach of children. Store in a well ventilated area away from heat and sources of ignition. Store away from incompatible materials such as materials that support combustion (oxidising materials). Store in suitable, labelled containers. Use approved storage cabinets, tanks, rooms and buildings. Inspect periodically for deficiencies such as damage or leaks. Consider leak detection and alarm systems. Have appropriate fire extinguishers available in and near the storage area. Methanol is a Schedule (S6) poison and must be stored, handled and labelled according to appropriate regulations.

Transport

Class 3 Flammable liquids shall not be loaded in the same vehicle with:

- ◊ Class 1 Explosives
- ◊ Class 2.1 Flammable gases
- ◊ Class 2.3 Poisonous gases
- ◊ Class 4.2 Spontaneously combustible substances
- ◊ Class 5.1 Oxidising agents
- ◊ Class 5.2 Organic peroxides
- ◊ Class 7 Radioactive substances

Proper Shipping Name METHANOL (METHYL ALCOHOL)
EPG Number 3A3
IERG Number 16

Spills and Disposal

Spills

Do not approach without full protective clothing.
Shut off all possible sources of ignition.
Remove any naked lights and strong heat sources.
Evacuate unprotected personnel from danger area. Move them up wind.
Send message to notify emergency services.
For large spills, or tank rupture, consider initial evacuation distance of 200 metres in all directions.
If available use water spray to disperse vapour.
Isolate leaking containers and stop leak if safe to do so.
Small spill: absorb in sand or other non-combustible material. Scoop up and place in labelled drum. Flush area with water.
Large spill: Prevent spilled material from entering drains by banking with sand or earth. Pick up liquid with vacuum truck. Flush area with water.
Contact local waste disposal authority for disposal procedures.

Disposal

Prevent material from entering into drains or waterways.

Dispose in accordance with all relevant local, state and federal legislation.

Fire/Explosion Hazard

	Highly flammable liquid. On burning will emit noxious fumes including carbon monoxide and carbon dioxide. Heating can cause expansion or decomposition leading to violent rupture of containers. Keep containers cool with water spray.
Hazardous Decomposition or By-products	Oxides or carbon and other noxious smoke.
Fire Fighting Procedures	Fire fighters to wear self contained breathing apparatus and full protective clothing in a fire situation.
Extinguishing Media	Water fog, foam or dry agent.
Hazardous Reaction	Stable under normal conditions of use. Incompatible with inorganic acids, aldehydes, alkylene oxides, halogens, acid anhydrides, monomers and polymerizable esters.
Hazchem Code	2WE

OTHER INFORMATION

Toxicology	Oral LD50 (rat): 5628 mg/kg Inhalation LC50 (rat): 64000 ppm/4 hr Eye (rabbit): moderate 100 mg/24 hr Skin (rabbit): moderate 20 mg/24 hr Methanol has shown a variety of effects in animal and in-vitro toxicity testing, including fetal toxicity, developmental abnormalities in rats, effects on mouse sperm development and mutagenic effects on human white blood cells and strains of bacteria. An incomplete rat inhalation study has shown no evidence of carcinogenicity.
Environ. Protection	This substance may be hazardous to the environment. Aquatic toxicity: Arthropoda (Daphnia): no effect at 10 g/L, 48 hours Fish (trout): TLm (48 hr) 8000 mg/L Amphibian (frog): LDLo 59 gm/kg Avoid contaminating waterways.
Risk Statement	R11 Highly flammable. R23/25 Toxic by inhalation and if swallowed.
Safety Statement	S2 Keep out of reach of children. S7 Keep container tightly closed. S16 Keep away from sources of ignition - No smoking. S24 Avoid contact with skin
Packaging and Labelling	Correct Shipping Name: METHANOL (METHYL ALCOHOL) UN 1230, Packaging Group II, Class 3, Subsidiary Risk 6.1, according to the Australian Code for the Transport of Dangerous Goods by Road and Rail. Both the ICAO Rules and the IMDG Code require a Subsidiary Risk 6.1 label for this material and a Subsidiary Risk 6.1 label may be used for land transport if the product is intended for transport by sea or air. Packaging - Drums or Jerricans with non-removable head.
Hazard Category	Toxic

CONTACT POINT

Coogee Energy Pty Ltd
171 Fitzgerald Road
Laverton North VIC 3026
Tel: (03) 9360 2000 (24 hours)
Fax: (03) 9360 2011

The information herein is presented in good faith and believed to be accurate as of the effective date shown above. However, no warranty, express or implied, is given. Regulatory requirements are subject to change and may differ from one location to another. It is the buyer's responsibility to ensure that its activities comply with the relevant laws and regulations.

END OF REPORT

**** SECTION 1 - CHEMICAL PRODUCT AND COMPANY IDENTIFICATION ****

MSDS Name: 2-Methylnaphthalene, 95-97%
Catalog Numbers:
AC127170000, AC127170050, AC127175000
Synonyms:
Company Identification (Europe): Acros Organics BVBA
Janssen Pharmaceuticalaan 3a
2440 Geel, Belgium
Company Identification (USA): Acros Organics
One Reagent Lane
Fairlawn, NJ 07410
For information in North America, call: 800-ACROS-01
For information in Europe, call: 0032(0) 14575211
For emergencies in the US, call CHEMTREC: 800-424-9300
For emergencies in Europe, call: 0032(0) 14575299

**** SECTION 2 - COMPOSITION, INFORMATION ON INGREDIENTS ****

CAS#	Chemical Name	%	EINECS#
91-57-6	2-Methylnaphthalene	95-97.0	202-078-3

Hazard Symbols: XN
Risk Phrases: 22

**** SECTION 3 - HAZARDS IDENTIFICATION ****

EMERGENCY OVERVIEW

Appearance: Not available.
Caution! Causes skin irritation. May cause allergic skin reaction. May be harmful if swallowed. May cause respiratory and digestive tract irritation. Causes eye irritation.
Target Organs: None.

Potential Health Effects

Eye:
Causes eye irritation.

Skin:
Causes skin irritation. May cause photosensitization in certain individuals.

Ingestion:
May be harmful if swallowed.

Inhalation:
Inhalation of dust may cause respiratory tract irritation.

Chronic:
No information found.

**** SECTION 4 - FIRST AID MEASURES ****

Eyes:
Flush eyes with plenty of water for at least 15 minutes,

occasionally lifting the upper and lower eyelids. Get medical aid immediately.

Skin:

Get medical aid. Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes.

Ingestion:

If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Get medical aid immediately.

Inhalation:

Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical aid.

Notes to Physician:

Treat symptomatically and supportively.

**** SECTION 5 - FIRE FIGHTING MEASURES ****

General Information:

As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Dusts at sufficient concentrations can form explosive mixtures with air. During a fire, irritating and highly toxic gases may be generated by thermal decomposition or combustion.

Extinguishing Media:

Use water spray, dry chemical, carbon dioxide, or chemical foam.

Autoignition Temperature:529 deg C (984.20 deg F)

Flash Point: 82 deg C (179.60 deg F)

Explosion Limits, lower:Not available.

Explosion Limits, upper:Not available.

NFPA Rating: (estimated) Health: 1; Flammability: 1; Reactivity: 0

**** SECTION 6 - ACCIDENTAL RELEASE MEASURES ****

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks:

Sweep up, then place into a suitable container for disposal. Avoid generating dusty conditions. Provide ventilation.

**** SECTION 7 - HANDLING and STORAGE ****

Handling:

Wash thoroughly after handling. Remove contaminated clothing and wash before reuse. Minimize dust generation and accumulation. Avoid contact with eyes, skin, and clothing. Keep container tightly closed. Avoid ingestion and inhalation.

Storage:

Keep container closed when not in use. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

**** SECTION 8 - EXPOSURE CONTROLS, PERSONAL PROTECTION ****

Engineering Controls:

Use adequate ventilation to keep airborne concentrations low.

Exposure Limits

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs
2-Methylnaphthalene	none listed	none listed	none listed

OSHA Vacated PELs:

2-Methylnaphthalene:

No OSHA Vacated PELs are listed for this chemical.

Personal Protective Equipment

Eyes:

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

Skin:

Wear appropriate protective gloves to prevent skin exposure.

Clothing:

Wear appropriate protective clothing to prevent skin exposure.

Respirators:

Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

**** SECTION 9 - PHYSICAL AND CHEMICAL PROPERTIES ****

Physical State:	Solid
Appearance:	Not available.
Odor:	None reported
pH:	Not available.
Vapor Pressure:	< 1 mm Hg @25c
Vapor Density:	Not available.
Evaporation Rate:	Not available.
Viscosity:	Not available.
Boiling Point:	241.1 deg C
Freezing/Melting Point:	37-38c
Decomposition Temperature:	
Solubility in water:	Insoluble.
Specific Gravity/Density:	1.0000g/cm3
Molecular Formula:	C11H10
Molecular Weight:	142.20

**** SECTION 10 - STABILITY AND REACTIVITY ****

Chemical Stability:

Stable under normal temperatures and pressures.

Conditions to Avoid:

Incompatible materials, dust generation, strong oxidants.

Incompatibilities with Other Materials:
Strong oxidizing agents.
Hazardous Decomposition Products:
Carbon monoxide, irritating and toxic fumes and gases, carbon dioxide.
Hazardous Polymerization: Has not been reported.

**** SECTION 11 - TOXICOLOGICAL INFORMATION ****

RTECS#:
CAS# 91-57-6: QJ9635000
LD50/LC50:
CAS# 91-57-6: Oral, rat: LD50 = 1630 mg/kg.
Carcinogenicity:
2-Methylnaphthalene -
Not listed by ACGIH, IARC, NIOSH, NTP, or OSHA.

**** SECTION 12 - ECOLOGICAL INFORMATION ****

**** SECTION 13 - DISPOSAL CONSIDERATIONS ****

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste.
US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.
RCRA P-Series: None listed.
RCRA U-Series: None listed.

**** SECTION 14 - TRANSPORT INFORMATION ****

US DOT
No information available
Canadian TDG
Shipping Name: CAESIUM HYDROXIDE SOLUTION
Hazard Class: 8
UN Number: UN2681

**** SECTION 15 - REGULATORY INFORMATION ****

US FEDERAL
TSCA
CAS# 91-57-6 is listed on the TSCA inventory.
Health & Safety Reporting List
None of the chemicals are on the Health & Safety Reporting List.
Chemical Test Rules
None of the chemicals in this product are under a Chemical Test Rule.
Section 12b
None of the chemicals are listed under TSCA Section 12b.
TSCA Significant New Use Rule
None of the chemicals in this material have a SNUR under TSCA.
SARA
Section 302 (RQ)
None of the chemicals in this material have an RQ.
Section 302 (TPQ)

None of the chemicals in this product have a TPQ.

SARA Codes

CAS # 91-57-6: acute.

Section 313

No chemicals are reportable under Section 313.

Clean Air Act:

This material does not contain any hazardous air pollutants.
This material does not contain any Class 1 Ozone depletors.
This material does not contain any Class 2 Ozone depletors.

Clean Water Act:

None of the chemicals in this product are listed as Hazardous Substances under the CWA.
None of the chemicals in this product are listed as Priority Pollutants under the CWA.
None of the chemicals in this product are listed as Toxic Pollutants under the CWA.

OSHA:

None of the chemicals in this product are considered highly hazardous by OSHA.

STATE

2-Methylnaphthalene is not present on state lists from CA, PA, MN, MA, FL, or NJ.

California No Significant Risk Level:

None of the chemicals in this product are listed.

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: XN

Risk Phrases:

R 22 Harmful if swallowed.

Safety Phrases:

WGK (Water Danger/Protection)

CAS# 91-57-6: No information available.

United Kingdom Occupational Exposure Limits

Canada

CAS# 91-57-6 is listed on Canada's DSL List.
This product has a WHMIS classification of D2A.
CAS# 91-57-6 is not listed on Canada's Ingredient Disclosure List.

Exposure Limits

CAS# 91-57-6: OEL-RUSSIA:STEL 20 mg/m3

**** SECTION 16 - ADDITIONAL INFORMATION ****

MSDS Creation Date: 7/15/1998 Revision #1 Date: 8/02/2000

The information above is believed to be accurate and represents the best information currently available to us. However, we make no warranty of merchantability or any other warranty, express or implied, with respect to such information, and we assume no liability resulting from its use. Users should make their own investigations to determine the suitability of the information for their particular purposes. In no way shall the company be liable for any claims, losses, or damages of any third party or for lost profits or any special, indirect, incidental, consequential or exemplary damages, howsoever arising, even if the company has been advised of the possibility of such damages.

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS

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: 703-527-3887

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.

1.1 NAPHTHALENE

MSDS Number: N0090 --- *Effective Date: 11/02/01*

1.2 1. Product Identification

Synonyms: Naphthene; mothballs; tar camphor; naphthaliin; white-tar
CAS No.: 91-20-3
Molecular Weight: 128.16
Chemical Formula: C10H8
Product Codes: J.T. Baker: 2718
Mallinckrodt: 6348

1.3 2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Naphthalene	91-20-3	90 - 100%	Yes

1.4 3. Hazards Identification

Emergency Overview

WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. MAY CAUSE ALLERGIC SKIN REACTION. MAY AFFECT LIVER, KIDNEY, BLOOD AND CENTRAL NERVOUS SYSTEM. COMBUSTIBLE.

J.T. Baker SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 2 - Moderate

Flammability Rating: 2 - Moderate
Reactivity Rating: 0 - None
Contact Rating: 2 - Moderate
Lab Protective Equip: GOGGLES; LAB COAT
Storage Color Code: Red (Flammable)

Potential Health Effects

Inhalation:
Inhalation of dust or vapors can cause headache, nausea, vomiting, extensive sweating, and disorientation. The predominant reaction is delayed intravascular hemolysis with symptoms of anemia, fever, jaundice, and kidney or liver damage.
Ingestion:
Toxic. Can cause headache, profuse perspiration, listlessness, dark urine, nausea, vomiting and disorientation. Intravascular hemolysis may also occur with symptoms similar to those noted for inhalation. Severe cases may produce coma with or without convulsions. Death may result from renal failure.
Skin Contact:
Can irritate the skin and, on prolonged contact, may cause rashes and allergy. "Sensitized" individuals may suffer a severe dermatitis.
Eye Contact:
Vapors and solid causes irritation, redness and pain. Very high exposures can damage the nerves of the eye.
Chronic Exposure:
Has led to cataract formation in eyes. May cause skin allergy.
Aggravation of Pre-existing Conditions:
Persons with pre-existing skin, blood or vascular disorders or impaired respiratory function may be more susceptible to the effects of the substance. Particularly susceptible individuals are found in the general population, most commonly in dark skinned races.

1.5 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:
Give large amounts of water to drink. Never give anything by mouth to an unconscious person. Get medical attention.
Skin Contact:
Wash skin with soap or mild detergent and water for at least 15 minutes while removing contaminated clothing and shoes. Wash clothing before reuse. Call a physician.
Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

1.6 5. Fire Fighting Measures

Fire:
Flash point: 87C (189F) CC
Autoignition temperature: 526C (979F)
Combustible. May be ignited by heat, sparks or flame. May burn rapidly with flare-burning effect. Fire may produce irritating or poisonous gases.
Explosion:
Explosive limits, volume % in air: lel: 0.9; uel: 5.9. Above flashpoint, vapor-air mixtures are explosive within flammable limits noted above. Closed containers exposed to heat may explode. Contact with strong oxidizers may cause fire or explosion.
Fire Extinguishing Media:
Dry chemical, foam, water or carbon dioxide. Foam or direct water spray on molten naphthalene may cause extensive foaming. Molten napthalene spatters in contact with water; apply water from as far a distance as possible.
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.

1.7 6. Accidental Release Measures

Remove all sources of ignition. Ventilate area of leak or spill. Wear appropriate personal protective equipment as specified in Section 8. Spills: Clean up spills in a manner that does not disperse dust into the air. Use non-sparking tools and equipment. Reduce airborne dust and prevent scattering by moistening with water. Pick up spill for recovery or disposal and place in a closed container. 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.

1.8 7. Handling and Storage

Keep in a tightly closed container, stored in a cool, dry, ventilated area. Protect against physical damage. Isolate from any source of heat or ignition. Keep away from moisture and oxidizers. Containers of this material may be hazardous when empty since they retain product residues (dust, solids); observe all warnings and precautions listed for the product.

1.9 8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
- OSHA Permissible Exposure Limit (PEL):
10 ppm, 50 mg/m3.

- ACGIH Threshold Limit Value (TLV):
TWA= 10 ppm, 52 mg/m3
STEL= 15 ppm, 79 mg/m3.

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 exposure limit is exceeded, a half-face respirator with an organic vapor cartridge and particulate filter (NIOSH type P95 or R95 filter) 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 respirator with an organic vapor cartridge and particulate filter (NIOSH P100 or R100 filter) 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. Please note that N series filters are not recommended for this material. 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 full face shield where dusting or splashing of solutions is possible. Maintain eye wash fountain and quick-drench facilities in work area.

1.109. Physical and Chemical Properties

Appearance:
White crystals.

Odor:
Strong coal tar odor (moth balls).

Solubility:
Insoluble in water.

Specific Gravity:
1.2

pH:

No information found.
% Volatiles by volume @ 21C (70F):
No information found.
Boiling Point:
218C (424F)
Melting Point:
80C (176F)
Vapor Density (Air=1):
4.4
Vapor Pressure (mm Hg):
1 @ 53C (127F)
Evaporation Rate (BuAc=1):
< 1

1.1110. Stability and Reactivity

Stability:
Stable at room temperature in sealed containers. Sublimes appreciably at temperatures above melting point.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Strong oxidizers, strong alkalis and strong mineral acids, mixtures of aluminum trichloride and benzoyl chloride. Reacts violently with chromic anhydride. Melted naphthalene will attack some forms of plastics, rubber, and coatings.
Conditions to Avoid:
Avoid heat, sparks, flames and other ignition sources and incompatibles.

1.1211. Toxicological Information

Oral rat LD50: 490 mg/kg;
Inhalation rat LC50: 340 mg/m3, 1 hour;
Skin rabbit LD50: > 20 g/kg;
Irritation data: skin (open Draize) rabbit 495 mg, mild; eye (standard Draize) rabbit 100 mg, mild;
Investigated as a tumorigen, mutagen and reproductive effector.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
Naphthalene (91-20-3)	No	No	None

1.1312. Ecological Information

Environmental Fate:
When released into the soil, this material may biodegrade to a moderate extent. When released into the soil, this material is expected to leach into groundwater. When released into the soil, this material is expected to quickly evaporate. When released to water, this material is expected to quickly evaporate. When released into water, this material may biodegrade to a moderate extent. When released into the water, this material is expected to have a half-life between 1 and 10 days. This material may bioaccumulate to some extent. When released into the air, this material is expected to be readily 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.
Environmental Toxicity:
No information found.

1.1413. 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.

1.1514. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: NAPHTHALENE, REFINED
Hazard Class: 4.1
UN/NA: UN1334
Packing Group: III
Information reported for product/size: 1KG

International (Water, I.M.O.)

Proper Shipping Name: NAPHTHALENE, REFINED
Hazard Class: 4.1
UN/NA: UN1334
Packing Group: III
Information reported for product/size: 1KG

International (Air, I.C.A.O.)

Proper Shipping Name: NAPHTHALENE, REFINED

Hazard Class: 4.1
UN/NA: UN1334
Packing Group: III
Information reported for product/size: 1KG

1.1615. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
Naphthalene (91-20-3)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
Naphthalene (91-20-3)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\--------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313----- List	Chemical Catg.
Naphthalene (91-20-3)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\--------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
Naphthalene (91-20-3)	100	U165	No

Chemical Weapons Convention: No TSCA 12(b): No CDTA: No
SARA 311/312: Acute: Yes Chronic: Yes Fire: Yes Pressure: No
Reactivity: No (Pure / Solid)

Australian Hazchem Code: 2Z
Poison Schedule: S6
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.

1.1716. Other Information

NFPA Ratings: Health: 2 Flammability: 2 Reactivity: 0
Label Hazard Warning:
WARNING! HARMFUL IF SWALLOWED OR INHALED. CAUSES IRRITATION TO SKIN, EYES AND RESPIRATORY TRACT. MAY CAUSE ALLERGIC SKIN REACTION. MAY AFFECT LIVER, KIDNEY, BLOOD AND CENTRAL NERVOUS SYSTEM. COMBUSTIBLE.
Label Precautions:
Avoid contact with eyes, skin and clothing.
Avoid prolonged or repeated contact with skin.
Avoid breathing dust.
Avoid breathing vapor.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep away from heat, sparks and flame.
Label First Aid:
In all cases call a physician. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. If swallowed, give large amounts of water to drink. Never give anything by mouth to an unconscious person.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 8.
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: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

AIR PRODUCTS

MATERIAL SAFETY DATA SHEET

SECTION 1 - MATERIAL IDENTIFICATION

PRODUCT NAME **NITRIC ACID**

PRODUCT CODE NITRI

MSDS REVISION NUMBER 12

MANUFACTURER Air Products and Chemicals, Inc.
7201 Hamilton Blvd.,
Allentown, PA 18195-1501
www.airproducts.com/msds

TELEPHONE NUMBER 800-345-3148

EMERGENCY TELEPHONE NUMBER(S)

800-523-9374 (Continental U.S.)
610-481-7711 (Outside Continental U.S.)

REVISION DATE JUNE 2002

EMERGENCY OVERVIEW

HMIS HEALTH	3	FLAMMABILITY	1	REACTIVITY	0

PHYSICAL FORM Mobile liquid

COLOR Colorless / Light Brown

ODOR Pungent

HAZARDS Corrosive to eyes. Corrosive to respiratory system. Corrosive to skin. Severe eye irritant. Severe respiratory tract irritant. Severe skin irritant.

EXTINGUISHING MEDIA Ignition will give rise to a Class B fire. In case of large fire use: Water streams, alcohol foam. In case of small fire use: carbon dioxide (CO2), dry chemical, dry sand or limestone.

C.A.S. CHEMICAL NAME Mixture

SYNONYMS None

CHEMICAL FAMILY Inorganic Acids

EMPIRICAL FORMULA Mixture

INTENDED USE Solvent

REVISION NOTES None

SECTION 2 - INGREDIENTS

	%	CAS Number and Chemical Name
1.	56.00	7697-37-2 NITRIC ACID
2.	44.00	7732-18-5 Water

OSHA (ACGIH) EXPOSURE LIMITS

		TWA		STEL		CEILING	
		ppm	mg/m3	ppm	mg/m3	ppm	mg/m3
1.	OSHA	2.0000	5.0000	4.0000	10.0000	N/E	N/E
	ACGIH	2.0000	5.2000	4.0000	10.0000	N/E	N/E
2.	OSHA	N/E	N/E	N/E	N/E	N/E	N/E
	ACGIH	N/E	N/E	N/E	N/E	N/E	N/E

N/E = Not Established.

SECTION 3 - HEALTH HAZARDS

ROUTES OF EXPOSURE

Eye Contact
Skin Contact
Ingestion
Inhalation

EXPOSURE STANDARDS

See Section 2 for exposure standards on ingredients. Maintain air contaminant concentrations in the workplace at the lowest feasible levels.

HEALTH HAZARDS

Corrosive to eyes.
Corrosive to respiratory system.
Corrosive to skin.
Severe eye irritant.
Severe respiratory tract irritant.
Severe skin irritant.

TARGET ORGANS

Eye
Skin
Respiratory system

SIGNS AND SYMPTOMS OF EXPOSURE (Acute effects)

Burns of the eye may cause blindness. Contact of undiluted product with the eyes or skin quickly causes severe irritation and pain and may cause burns, necrosis and permanent injury. Nitrogen dioxide (NO2) Inhalation of vapors may severely damage contacted tissue and produce scarring. Inhalation of aerosols and mists may severely damage contacted tissue and produce scarring.

SIGNS AND SYMPTOMS OF EXPOSURE (Possible Longer Term Effects)

Repeated and/or prolonged exposures may result in: adverse respiratory effects (such as cough, tightness of chest or shortness of breath), adverse eye effects (such as conjunctivitis or corneal damage), adverse skin effects (such as rash, irritation or corrosion).

Repeated and/or prolonged exposure to low concentrations of vapor may cause: sore throat which are transient.

MEDICAL CONDITIONS GENERALLY AGGRAVATED BY EXPOSURE

Asthma
Chronic respiratory disease (e.g. Bronchitis, Emphysema)
Eye disease
Skin disorders and Allergies

CARCINOGENS UNDER OSHA, ACGIH, NTP, IARC, OTHER

This product contains no carcinogens in concentrations of 0.1 percent or greater.

SECTION 4 - FIRST AID

EYE CONTACT

Hold eyelids apart and immediately flush eyes with plenty of water for at least 15 minutes. Seek medical advice.

SKIN CONTACT

Remove contaminated clothing and shoes. Remove product and immediately flush affected area with water for at least 15 minutes. Cover the affected area with a sterile dressing or clean sheeting and transport for medical care. Do not apply greases or ointments. Control shock, if present.

INHALATION

Move patient to fresh air. If breathing has stopped or is labored give assisted respiration (e.g. mouth-to-mouth). Supplemental oxygen may be indicated. Seek medical advice. Evidence of damage to the lungs following exposure to oxides of nitrogen characteristically appears after a delay of 4-30 hours. Prevent aspiration of vomit. Turn victim's head to the side.

INGESTION

In the event of ingestion, administer 3-4 glasses of milk or water. Do not induce vomiting. Seek medical advice. Note to physicians: This product is highly injurious to all tissues, similar to that of ammonia or ammonia gas. Chemical pneumonitis, pulmonary edema, laryngeal edema and delayed scarring of the airway or other affected tissues may occur following exposure. There is no specific treatment. Clinical management is based on supportive treatment, which is similar to that for thermal burns.

SECTION 5 - FIRE AND EXPLOSION DATA

FLASH POINT (closed cup)	>200.00 C (>392.00 F)
UPPER EXPLOSION LIMIT (UEL)	No Data
LOWER EXPLOSION LIMIT (LEL)	No Data

AUTOIGNITION TEMPERATURE	No Data
FIRE HAZARD CLASSIFICATION (OSHA/NFPA)	Class IIIB

EXTINGUISHING MEDIA

Ignition will give rise to a Class B fire. In case of large fire use: Water streams, alcohol foam. In case of small fire use: carbon dioxide (CO2), dry chemical, dry sand or limestone.

SPECIAL FIRE FIGHTING PROCEDURES

A face shield should be worn. Firefighters should wear butyl rubber boots, gloves, and body suit and a self-contained breathing apparatus.
Retain expended liquids from fire fighting for later disposal.

UNUSUAL FIRE AND EXPLOSION HAZARDS

May generate toxic or irritating combustion products.
Contact of liquid with skin must be prevented.

Sudden reaction and fire may result if product is mixed with an oxidizing agent.
Personnel in vicinity and downwind should be evacuated.

SECTION 6 - ACCIDENTAL RELEASE MEASURES

CONTAINMENT TECHNIQUES (Removal of ignition sources, diking etc)

Stop the leak, if possible. Ventilate the space involved. Shut off or remove all ignition sources. Construct a dike to prevent spreading (includes molten liquids until they freeze).

CLEAN-UP PROCEDURES

If recovery is not feasible, admix with dry soil, sand or non-reactive absorbent and place in an appropriate chemical waste container. Transfer to containers by suction, preparatory for later disposal. Place in metal containers for recovery or disposal. Flush area with water spray. Clean-up personnel must be equipped with self contained breathing apparatus and butyl rubber protective clothing. For large spills, recover spilled material with a vacuum truck. Spilled material and contaminated surfaces should be covered with sodium bicarbonate or a soda ash-slaked lime mixture (50-50). Mix and add water to form a slurry.

OTHER EMERGENCY ADVICE

Open enclosed spaces to outside atmosphere. Wear protective clothing, boots, gloves, and eye protection.

SECTION 7 - HANDLING AND STORAGE

STORAGE

Keep away from: alkalis, oxidizers, metal powders, carbides, hydrogen sulfide, turpentine. Keep in cool, dry, ventilated storage and in closed containers. Store in stainless steel 55 gallon drums. DOT specification 5C. Tank motor vehicles, DOT specification MC-310, MC-311 and MC-312. Tank cars, DOT specifications 103CW, 111A60W7, 103A-AL2 and 111A60ALW2.

HANDLING

Avoid contact with skin or eyes. Avoid breathing of vapors. Handle in well ventilated work space. When handling, do not eat, drink, or smoke. Avoid using in any spray application without strict conformance to all applicable electrical codes and the OSHA limit for maximum allowable airborne concentrations.

OTHER PRECAUTIONS

Emergency showers and eye wash stations should be readily accessible. Adhere to work practice rules established by government regulations (e.g. OSHA).

SECTION 8 - PERSONAL PROTECTION / EXPOSURE CONTROLS

EYE PROTECTION

Full face shield with goggles underneath.

HAND PROTECTION

Neoprene rubber gloves. Impermeable gloves. The breakthrough time of the selected glove(s) must be greater than the intended use period.

RESPIRATORY PROTECTION

Not required under normal conditions in a well-ventilated workplace. Under the following conditions a respirator may be required: when product vapor concentration exceeds the limits listed in section 2, during repair and cleaning of equipment, during transfer or discharge of the product, sampling, spray applications. Types of respirators that may be used include the following: Chemical Cartridge Respirator with face piece to protect against the organic vapor, Supplied air respirator with full face piece (NIOSH Approved), Self-contained breathing apparatus in pressure demand mode. In emergency conditions use a self-contained breathing apparatus in pressure demand mode.

PROTECTIVE CLOTHING

Impervious clothing. Slicker Suit. Rubber boots. Full rubber suit (rain gear). Butyl or latex protective clothing. If bulk quantities of product are handled, the person who is involved in the transfer operation must wear: hard hat.

ENGINEERING CONTROLS

Maintain air concentrations in work spaces in accord with standards outlined in Sections 2 and 3.

WORK AND HYGIENIC PRACTICES

Provide readily accessible eye wash stations and safety showers. Wash at the end of each workshift and before eating, smoking or using the toilet. Promptly remove clothing that becomes contaminated.

SECTION 9 - TYPICAL PHYSICAL AND CHEMICAL PROPERTIES

PHYSICAL FORM	Mobile liquid
COLOR	Colorless / Light Brown
ODOR	Pungent
pH	ACIDIC
VAPOR PRESSURE (mm Hg at 21C (70F))	6.00
VAPOR DENSITY (Air = 1)	No Data
BOILING POINT	122.00 C (251.60 F)
MELTING POINT	No Data
SOLUBILITY IN WATER	Completely (100%)
SPECIFIC GRAVITY (Water = 1)	1.32
MOLECULAR WEIGHT	Mixture

SECTION 10 - STABILITY AND REACTIVITY

CHEMICAL STABILITY

Stable

CONDITIONS TO AVOID (if unstable)

Not applicable

INCOMPATIBILITY (Materials to Avoid)

Alkalis (i.e. Sodium or Potassium Hydroxide etc.). Reducing agents (i.e. hydrides, sulfites etc.). Oxidizing Agents (i.e. perchlorates, nitrates etc.). Amines. Nitric acid attacks most metals vigorously with evolution of nitric oxide(s) fumes, hydrogen fumes, and formation of metallic nitrate salts. Strong nitric acid may cause spontaneous ignition when mixed with organic materials such as sawdust, shavings, cellulose (cotton) or burlap. Such materials ignite very readily from spark sources. If fire does start, it will burn vigorously. Corrosion rates will be directly dependent upon acid strength. An explosion may occur when nitric acid is contacted with hydrogen sulfide, carbides, metallic powders and turpentine. Nitration reactions evolve heat and may cause spontaneous ignition if confined. Reaction with peroxides may result in violent decomposition of peroxide possibly creating an explosion.

HAZARDOUS DECOMPOSITION PRODUCTS (from burning, heating, or reaction with other materials).

Irritating and toxic fumes at elevated temperatures.

HAZARDOUS POLYMERIZATION

Will not occur

CONDITIONS TO AVOID (if polymerization may occur)

Not applicable

SECTION 11 - TOXICOLOGICAL PROPERTIES

ACUTE ORAL TOXICITY (LD50, RAT)

>2000.00 mg/kg (No deaths) (Estimate)

ACUTE DERMAL TOXICITY (LD50, RABBIT)

>2000.00 mg/kg (No deaths) (Estimate)

ACUTE INHALATION TOXICITY (LC50, RAT)

98.00 mg/l / 1 hr

OTHER ACUTE EFFECTS

No Data

IRRITATION EFFECTS DATA

No irritation data are known for this product.

CHRONIC/SUBCHRONIC DATA

No delayed, subchronic or chronic test data are known.

SECTION 12 - ECOLOGICAL INFORMATION

No Data

SECTION 13 - DISPOSAL CONSIDERATIONS

WASTE DISPOSAL

Comply with all Federal, State and Local Regulations.

SECTION 14 - TRANSPORT INFORMATION

DOT BULK SHIPPING NAME Refer to Bill of Lading.

IMO SHIPPING DATA Refer to Bill of Lading.

SECTION 15 - REGULATORY INFORMATION

US FEDERAL REGULATIONS

TOXIC SUBSTANCES CONTROL ACT (TSCA)-

All components are included in the EPA Toxic Substances Control Act (TSCA) Chemical Substance Inventory.

TOXIC SUBSTANCE CONTROL ACT (TSCA) 12(b) COMPONENT(S)

None

OSHA Hazard Communication Standard (29CFR1910.1200) hazard class(es)

Corrosive.

EPA SARA Title III Section 312 (40CFR370) hazard class

Immediate Health Hazard.

EPA SARA Title III Section 313 (40CFR372) toxic chemicals above "de minimis" level are

NITRIC ACID

STATE REGULATIONS

PROPOSITION 65 SUBSTANCES (component(s) known to the State of California to cause cancer and/or reproductive toxicity and subject to warning and discharge requirements under the "Safe Drinking Water and Toxic Enforcement Act of 1986")

None

NEW JERSEY TRADE SECRET REGISTRY NUMBER(S)

None

SECTION 16 - INTERNATIONAL REGULATIONS

CANADA

DSL

Included on Inventory.

WHMIS HAZARD CLASSIFICATION

Class E Corrosive

WHMIS INGREDIENT DISCLOSURE LIST

NITRIC ACID

WHMIS TRADE SECRET REGISTRY NUMBER(S)

This product has been classified in accordance with the hazard criteria of the CPR and the MSDS contains all the information required by the CPR.

None

WHMIS SYMBOLS

Test tube/hand

EUROPEAN ECONOMIC COMMUNITY (EEC)

EINECS/ELINCS MASTER INVENTORY

Included on EINECS inventory or polymer substance, monomers included on EINECS inventory or no longer polymer.

EEC SYMBOL

CORROSIVE (C)

EEC RISK (R) PHRASES

Causes severe burns (R35).

EEC SAFETY PHRASES

In case of contact with eyes, rinse immediately with plenty of water and seek medical advice (S26). Wear suitable protective clothing, gloves and eye/face protection (S36/37/39). In case of accident or if you feel unwell, seek medical advice immediately (show the label where possible) (S45).

AUSTRALIA

AICS

Included on Inventory.

JAPAN

MITI

Included on Inventory.

PHILIPPINES

PICCS

Included on Inventory.

KOREA

ECL

Included on Inventory.

CHINA

SEPA

Included on Inventory.

MSDS Number: **P1952** * * * * * *Effective Date:* ***11/10/05*** * * * * * *Supercedes:* ***02/03/03***

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS 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: 703-527-3887

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.

PHENOL, LIQUEFIED

1. Product Identification

Synonyms: Carbolic acid; Phenic acid; Phenylic acid; Hydroxybenzene; Monohydroxybenzene
CAS No.: 108-95-2
Molecular Weight: 94.11
Chemical Formula: C6H5OH in H2O
Product Codes:
J.T. Baker: 2856, 2859, 2864, 2865
Mallinckrodt: 0025, 0221, 0276, 0610

2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
Phenol	108-95-2	88 - 92%	Yes
Water	7732-18-5	8 - 12%	No

3. Hazards Identification

Emergency Overview

POISON! DANGER! MAY BE FATAL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. RAPIDLY ABSORBED THROUGH SKIN. CORROSIVE. CAUSES SEVERE BURNS TO EVERY AREA OF CONTACT. AFFECTS CENTRAL NERVOUS SYSTEM, LIVER AND KIDNEYS. COMBUSTIBLE LIQUID AND VAPOR.

SAF-T-DATA(tm) Ratings (Provided here for your convenience)

Health Rating: 3 - Severe (Poison)
Flammability Rating: 2 - Moderate
Reactivity Rating: 1 - Slight
Contact Rating: 4 - Extreme (Corrosive)
Lab Protective Equip: GOGGLES & SHIELD; LAB COAT & APRON; VENT HOOD; PROPER GLOVES; CLASS B EXTINGUISHER
Storage Color Code: White Stripe (Store Separately)

Potential Health Effects

The major hazard of phenol is its ability to penetrate the skin rapidly, particularly when liquid, causing severe injury which can be fatal. Phenol also has a strong corrosive effect on body tissue causing severe chemical burns. Due to its local anesthetizing properties, skin burns may be painless.

Inhalation:
Breathing vapor, dust or mist results in digestive disturbances (vomiting, difficulty in swallowing, diarrhea, loss of appetite). Will irritate, possibly burn respiratory tract. Other symptoms listed under ingestion may also occur.

Ingestion:
Poison. Symptoms may include burning pain in mouth and throat, abdominal pain, nausea, vomiting, headache, dizziness, muscular weakness, central nervous system effects, increase in heart rate, irregular breathing, coma, and possibly death. Acute exposure is also associated with kidney and liver damage. Ingestion of 1 gram has been lethal to humans.

Skin Contact:
Corrosive. Rapidly absorbed through the skin with systemic poisoning effects to follow. Discoloration and severe burns may occur, but may be disguised by a loss in pain sensation.

Eye Contact:
Corrosive. Eye burns with redness, pain, blurred vision may occur. May cause severe damage and blindness.

Chronic Exposure:
Repeated exposure may cause symptoms described for acute poisoning as well as eye and skin discoloration.

Aggravation of Pre-existing Conditions:
Persons with pre-existing skin, eye or central nervous system disorders, or impaired liver, kidney, or pulmonary function may be more susceptible to the effects of this substance.

4. First Aid Measures

IN CASE OF PHENOL POISONING, start first aid treatment immediately, then get medical attention. People administering first aid should take precautions to avoid contact with phenol. A phenol antidote kit (castor oil or other vegetable oil, polyethylene glycol 300) should be available in any phenol work area. Actions to be taken in case of phenol poisoning should be planned and practiced before beginning work with phenol. Castor oil and or polyethylene glycol can be given by a first responder before medical help arrives.

Inhalation:
Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention immediately.

Ingestion:
If swallowed, immediately administer castor oil or other vegetable oil. Never give anything by mouth to an unconscious person. Be ready to induce vomiting at the advice of physician or poison control center. Castor oil (or vegetable oil) dosage should be between 15 and 30 cc. Get medical attention immediately.

Skin Contact:
In case of skin contact, immediately flush skin with large amounts of water while removing contaminated clothing and shoes. As soon as possible, repeatedly apply polyethylene glycol to affected area. Destroy contaminated clothing and shoes. Flush skin with water for at least 30 minutes. It is very important to avoid rubbing or wiping affected parts which would aggravate irritation and cause product dispersion. Continue treatment until the burned area changes color from white to pink. Expect that this can take a long period of time (20 minutes or more). The polyethylene glycol application should be done during transportation to the hospital. If polyethylene glycol is not available, flush with water for at least 30 minutes prior to going to hospital. Get medical attention immediately.

Eye Contact:
Immediately flush eyes with plenty of water for at least 15 minutes, lifting lower and upper eyelids occasionally. Get medical attention immediately.

Note to Physician:
Treat ingestion with gastric lavage using 40% aqueous Bacto-Peptone, milk or water until phenolic odor is eliminated. Then give 15 to 50 cc castor or vegetable oil. Debride necrotic skin. Monitor vital signs, fluid status, electrolytes, BUN, renal and hepatic function, and electrocardiogram. Manage sedation, seizures, renal failure, and fluid electrolyte imbalances symptomatically as indicated.

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5. Fire Fighting Measures

Fire:
Flash point: 79C (174F) CC
Autoignition temperature: 715C (1319F)
Flammable limits in air % by volume:
lel: 1.3; uel: 8.6
Combustible. Contact with strong oxidizers may cause fire.

Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Sealed containers may rupture when heated.

Fire Extinguishing Media:
Water spray, dry chemical, alcohol foam, or carbon dioxide. 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. Structural firefighter's protective clothing is ineffective for fires involving this material. Stay away from sealed containers.

---

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! Dry lime or soda ash may be used on spill for neutralization. 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.

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7. Handling and Storage

Keep in a tightly closed container. Store in a cool, dry, ventilated area away from sources of heat or ignition. Protect against physical damage. Store separately from reactive or combustible materials, and out of direct sunlight. All phenol workers should be properly trained on its hazards and the proper protective measures required. This training should also include emergency actions. All phenol operations should be enclosed to eliminate any potential exposure routes. 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.

---

8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
Phenol:
-OSHA Permissible Exposure Limit (PEL):
5 ppm (TWA) (skin)

-ACGIH Threshold Limit Value (TLV):
5 ppm (TWA) (skin)
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 exposure limit is exceeded, a full facepiece respirator with organic vapor cartridge and dust/mist filter 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-facepiece 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. Butyl rubber and neoprene are suitable materials for personal protective equipment.

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

Congealing Point: 10.5-14C (50.9-57.2F)

Appearance:

Colorless to light pink liquid.

Odor:

Sharp, medicinal, sweet, tarry.

Solubility:

1 g/15 ml of water; very soluble in alcohol.

Specific Gravity:

1.06 @ 20C/4C

pH:

No information found.

% Volatiles by volume @ 21C (70F):

100

Boiling Point:

182C (360F)

Melting Point:

No information found.

Vapor Density (Air=1):

3.2

Vapor Pressure (mm Hg):

0.4 @ 20C (68F)

Evaporation Rate (BuAc=1):

< 0.01

---

10. Stability and Reactivity

Stability:
Stable under ordinary conditions of use and storage. Heat will contribute to instability.
Hazardous Decomposition Products:
Carbon dioxide and carbon monoxide may form when heated to decomposition. Toxic gases and vapors may be released if involved in a fire.
Hazardous Polymerization:
Will not occur.
Incompatibilities:
Oxidizers, aluminum chloride and nitrobenzene, calcium hypochlorite, butadiene, halogens, formaldehyde, mineral oxidizing acids, isocyanates, sodium nitrite and many other materials. Hot liquid phenol will attack aluminum, magnesium, lead, and zinc metals.
Conditions to Avoid:
Heat, flames, ignition sources and incompatibles.

---

11. Toxicological Information

Oral rat LD50: 317 mg/Kg; skin rabbit LD50:630 mg/kg; inhalation rat LC50: 316 mg/m3; irritation data: skin rabbit, standard Draize, 500 mg/24H severe; eye rabbit, standard Draize 5 mg/30S rinse, mild. Investigated as a tumorigen, mutagen, reproductive effector.

--------\Cancer Lists\----------

	---NTP Carcinogen---		
Ingredient	Known	Anticipated	IARC Category
Phenol (108-95-2)	No	No	3
Water (7732-18-5)	No	No	None

---

12. Ecological Information

Environmental Fate:
When released into the soil, this material is expected to readily biodegrade. When released into the soil, this material is not expected to leach into groundwater. When released into the soil, this material may evaporate to a moderate extent. When released into the soil, this material is expected to have a half-life between 1 and 10 days. When released into water, this material is expected to readily biodegrade. When released into water, this material is not expected to evaporate significantly. When released into water, this material is expected to have a half-life between 10 and 30 days. This material has an estimated bioconcentration factor (BCF) of less than 100. This material is not expected to significantly bioaccumulate. When released into the air, this material is expected to be readily degraded by reaction with photochemically produced hydroxyl radicals. When released into the air, this material may be moderately degraded by photolysis. When released into the air, this material is expected to have a half-life of less than 1 day.
Environmental Toxicity:

This material is expected to be toxic to aquatic life. The LC50/96-hour values for fish are between 10 and 100 mg/l.

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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.

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14. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: PHENOL SOLUTIONS
Hazard Class: 6.1
UN/NA: UN2821
Packing Group: II
Information reported for product/size: 50LB

International (Water, I.M.O.)

Proper Shipping Name: PHENOL SOLUTIONS
Hazard Class: 6.1
UN/NA: UN2821
Packing Group: II
Information reported for product/size: 50LB

---

15. Regulatory Information

--------\Chemical Inventory Status - Part 1\---------------------------------

Ingredient	TSCA	EC	Japan	Australia
Phenol (108-95-2)	Yes	Yes	Yes	Yes
Water (7732-18-5)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\---------------------------------

		--Canada--		
Ingredient	Korea	DSL	NDSL	Phil.
Phenol (108-95-2)	Yes	Yes	No	Yes
Water (7732-18-5)	Yes	Yes	No	Yes

```
--------\Federal, State & International Regulations - Part 1\----------------
                                          -SARA 302-    ------SARA 313------
Ingredient                                RQ    TPQ     List  Chemical Catg.
----------------------------------------  ---   -----   ----  --------------
Phenol (108-95-2)                         1000  500*    Yes        No
Water (7732-18-5)                         No    No      No         No

--------\Federal, State & International Regulations - Part 2\----------------
                                                        -RCRA-    -TSCA-
Ingredient                                CERCLA        261.33     8(d)
----------------------------------------  ------        ------    ------
Phenol (108-95-2)                         1000          U188       No
Water (7732-18-5)                         No            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: 2X
Poison Schedule: S6
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.

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16. Other Information

NFPA Ratings: Health: **4** Flammability: **2** Reactivity: **0**
Label Hazard Warning:
POISON! DANGER! MAY BE FATAL IF SWALLOWED, INHALED OR ABSORBED THROUGH SKIN. RAPIDLY ABSORBED THROUGH SKIN. CORROSIVE. CAUSES SEVERE BURNS TO EVERY AREA OF CONTACT. AFFECTS CENTRAL NERVOUS SYSTEM, LIVER AND KIDNEYS. COMBUSTIBLE LIQUID AND VAPOR.
Label Precautions:
Do not breathe vapor.
Do not get in eyes, on skin, or on clothing.
Keep container closed.
Use only with adequate ventilation.
Wash thoroughly after handling.
Keep away from heat, sparks and flame.
Label First Aid:
IN ALL CASES, GET MEDICAL ATTENTION IMMEDIATELY. KEEP A PHENOL ANTIDOTE KIT in area of product use or storage. Administer castor oil and/or polyethylene glycol per pre-planned directions. If swallowed, immediately administer castor oil or other vegetable oil. Never give anything by mouth to an unconscious person. In case of skin contact, immediately flush skin with large amounts of water while removing contaminated clothing and shoes. As soon as possible, repeatedly apply polyethylene glycol to affected area. Destroy contaminated clothing and shoes. If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. In case of eye

contact, immediately flush eyes with plenty of water for at least 15 minutes while lifting lower and upper eyelids.

Product Use:
Laboratory Reagent.

Revision Information:
No Changes.

Disclaimer:
****

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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

Material Safety Data Sheet

for

PORTLAND CEMENT

Section 1 - IDENTIFICATION

Product Names: Mountain Cement Portland Cement - Types I/II, V, Oilwell Class G

MSDS Information

This MSDS was produced in May 1999 and replaces any prior versions.

Product Code

Standard Industrial Classification: 3241

Chemical family

Calcium compounds. Calcium silicate compounds and other calcium compounds containing iron and aluminum make up the majority of this product. Major compounds:

$3CaO \cdot SiO_2$	Tricalcium silicate	CAS#12168-85-3
$2CaO \cdot SiO_2$	Dicalcium silicate	CAS#10034-77-2
$3CaOAl_2O_3$	Tricalcium aluminate	CAS#12042-78-3
$4Ca0 \cdot Ai2O_3 . Fe_2O_3$	Tetracalcium aluminoferrite	CAS#12068-35-8
$CaSO_4 . 2H_2O$	Calcium sulfate dihydrate or Gypsum	CAS#7778-18-9

Chemical name and synonyms

Portland cement. Also known as hydraulic cement.

Formula

This product consists of finely ground portland cement clinker mixed with a small amount of calcium sulfate.*

Supplier/Manufacturer

Mountain Cement Company

5 Sand Creek Road

Laramie, WY 82070

Emergency contact information

Scott Nielson 307-745-4879, Ext. 121

*Trace Elements

Portland cement is made from materials mined from the earth and is processed using energy provided by fuels; and therefore may contain trace amounts of naturally occurring materials which might be detected during chemical analysis. For example: Portland cement may contain up to 0.75% insoluble residue, of which <0.1% may be free crystalline silica. Other trace constituents may include potassium and sodium sulfate compounds, chromium compounds, and nickel compounds.

Section 2 - COMPONENTS

	OSHA PEL	**ACGIF TLV-TWA**	**NIOSH REL**
Hazardous Substances	**(8-hour TWA)**	**(1995-1996)**	**(8-Hour TWA**
Portland Cement Clinker (CAS #65997-15-1)	50 million particles/ft^3	10mg total dust/m^3	
Nominal 95% by weight			
Calcium sulfate (CAS #7778-18-9)	5mg respirable dust/m^3	10mg total dust/m^3	
[Gypsum (CAS #13397-24-5)]	10mg total dust/m^3		
Nominal 5% weight			
Calcium oxide (CAS #1306-78-8)	5mg/m^3	2mg/m^3	
(Free Lime)			
< 4% by weight			
Magnesium Oxide (CAS #1309-48-4)	15mg total dust/ m^3	10mg total dust/m^3	
< 5% by weight			

Section 3 - HAZARDS IDENTIFICATION/TOXICOLOGICAL INFORMATION

Emergency Overview:

Portland cement is a light gray powder that poses little immediate hazard. A single short-term exposure to the dry powder is not likely to cause serious harm. However, exposure of sufficient duration to wet portland cement can cause serious, potentially irreversible tissue (including skin or eye) destruction in the form of chemical (caustic) burns, including third degree burns. The same type of tissue destruction can occur if wet or moist areas of the body are exposed for sufficient duration to dry portland cement.

Potential Health Effects:

Potential effects resulting from **eye contact:**

Exposure to airborne dust may cause immediate or delayed irritation or inflammation.

Eye contact by larger amounts of dry powder or splashes of wet portland cement may cause effects ranging from moderate eye irritation to chemical burns and blindness. Such exposures require immediate first aid (see Section 4) and medical attention to prevent significant damage to the eye.

Potential effects resulting from **skin contact:**

Discomfort or pain cannot be relied upon to alert a person to a hazardous skin exposure. Consequently, the only effective means of avoiding skin injury or illness involves minimizing or avoiding skin contact, particularly contact with wet cement. Persons exposed to wet cement may not feel discomfort until hours after the exposure has ended and significant injury has occurred.

Exposure to dry portland cement may cause drying of the skin with consequent mild irritation or more significant effects attributable to aggravation of other conditions. Dry portland cement contacting wet skin or exposure to moist or wet portland cement may cause more severe skin effects including thickening, cracking, or fissuring of the skin. Prolonged exposure can cause severe skin damage in the form of (caustic) chemical burns.

Some individuals may exhibit an allergic response upon exposure to portland cement, possibly due to trace amounts of chromium. The response may appear in a variety of forms ranging from a mild rash to severe skin ulcers. Persons already sensitized may react to their first contact with the product. Other persons may experience this effect after years of contact with hydraulic cement products.

Potential effects resulting from **inhalation:**

Portland cement may contain trace amounts (<0.1%) of free crystalline silica. Prolonged exposure to respirable free crystalline silica may aggravate other lung conditions. It may also cause delayed lung injury including silicosis, a disabling and potentially fatal lung disease.

Exposure to portland cement may cause irritation to the moist mucous membranes of the nose, throat, and upper respiratory system. It may also leave unpleasant deposits in the nose.

Potential effects resulting from **ingestion:**

Although small quantities of dust are not known to be harmful, ill effects are possible if larger quantities are consumed. Portland cement should not be eaten under any circumstances.

Carcinogenic Potential:

Portland cement is not listed as a carcinogen by IARC, NTP, or OSHA. It may, however, contain trace amounts (<0.1%) of substances listed as carcinogens by these organizations. Crystalline silica is now classified by IARC as a known human carcinogen (Group I). NTP had characterized respirable crystalline silica as "reasonably anticipated to be (a) carcinogen."

Medical Conditions Which May Be Aggravated By Inhalation or Dermal Exposure:

- Pre-existing upper respiratory and lung diseases.

- Unusual (hyper) sensitivity to hexavalent chromium (chromium +6) salts.

Section 4 - FIRST AID

Eyes

Immediately flush eyes thoroughly with water. Continue flushing eye for at least 15 minutes, including under lids, to remove all particles. Call physician immediately.

Skin

Wash skin with cool water and pH-neutral soap or a mild detergent intended for use on skin. Seek medical treatment in all cases of prolonged exposure to wet cement, cement mixtures, liquids from fresh cement products, or prolonged wet skin exposure to dry cement.

Inhalation of Airborne Dust

Remove to fresh air. Seek medical help if coughing and other symptoms do not subside. (Inhalation of gross amounts of portland cement requires immediate medical attention.)

Ingestion

Do not induce vomiting. If conscious, have the victim drink plenty of water and call a physician immediately.

Section 5 - FIRE & EXPLOSION DATA

Flash Point	None
Lower Explosive Limit	None
Upper Explosive Limit	None
Auto Ignition Temperature	Not combustible
Extinguishing Media	Not combustible
Special Fire Fighting Procedures	None. (Although portland cement poses no fire-related hazards, a self-contained breathing apparatus is recommended to limit exposure to combustion products when fighting any fire.)
Hazardous Combustion Products	None
Unusual Fire and Explosion Hazards	None

Section 6 - ACCIDENTAL RELEASE MEASURES

Collect dry material using a scoop. Avoid actions that cause dust to become airborne. Avoid inhalation of dust and contact with skin. Wear appropriate personal protective equipment as described in Section 8.

Scrape up wet material and place in an appropriate container. Allow the material to "dry" before disposal. Do not attempt to wash portland cement down drains.

Dispose of waste material according to local, state, and federal regulations.

Section 7 - HANDLING AND STORAGE

Keep portland cement dry until used. Normal temperature and pressure do not affect the material.

Promptly remove dusty clothing or clothing which is wet with cement fluids and launder before reuse. Wash thoroughly after exposure to dust or wet cement mixtures or fluids.

Section 8 - EXPOSURE CONTROLS/PERSONAL PROTECTION

Skin Protection

Prevention is essential to avoiding potentially severe skin injury. Avoid contact with unhardened (wet) portland cement products. If contact occurs, promptly wash affected area with soap and water. Where prolonged exposure to unhardened portland cement products might occur, wear impervious clothing and gloves to eliminate skin contact.

Respiratory Protection

Avoid actions that cause dust to become airborne. Use local or general ventilation to control exposures below applicable exposure limits. Use NIOSH/MSHA-approved respirators in poorly ventilated areas when dust causes discomfort or irritation, or where there is an applicable exposure limit (Advisory: Respirators and filters purchased after July 10, 1998 must be certified under 42 CFR 84).

Ventilation

Use local exhaust or general dilution ventilation to control exposure within applicable limits.

Eye Protection

When engaged in activities where cement dust or wet cement or concrete could contract the eye, wear safety glasses with side shields or goggles. In extremely dusty environments and unpredictable environments, wear unvented or indirectly vented goggles to avoid eye irritation or injury. Contact lenses should not be worn when working with portland cement or fresh cement products.

Section 9 - PHYSICAL AND CHEMICAL PROPERTIES

Appearance	Gray or White powder
Odor	No distinct odor
Physical state	Solid (powder)
pH (in water) (ASTM D 1293-95)	12 to 13
Solubility in water	Slightly soluble (0.1 to 1.0%)
Vapor pressure	Not applicable
Vapor density	Not applicable
Boiling point	Not applicable (i.e., > 1000° C)
Melting point	Not applicable
Specific gravity (H_2O = 1.0)	3.15
Evaporation rate	Not applicable

Section 10 - STABILITY AND REACTIVITY

Stability

Stable

Conditions To Avoid

Unintentional contact with water

Incompatibility

Wet portland cement is alkaline. As such, it is incompatible with acids, ammonium salts, and aluminum metal.

Hazardous Decomposition

Will not spontaneously occur. Adding water results in hydration and produces (caustic) calcium hydroxide.

Hazardous Polymerization

Will not occur.

Section 11 - TOXICOLOGICAL INFORMATION – See Section 3

Section 12 - ECOLOGICAL INFORMATION

Ecotoxicity

No recognized unusual toxicity to plants or animals.

Relevant Physical and Chemical Properties

(See Sections 9 and 10.)

Section 13 - DISPOSAL

Dispose of waste material, including bags, according to local, state and federal regulations.

Section 14 - TRANSPORTATION DATA

Hazardous Materials Description/Proper Shipping Name

Portland cement is not hazardous under U.S. Department of Transportation (DOT) regulations.

Section 15 - OTHER REGULATORY INFORMATION

Status Under USDOL-OSHA Hazard Communication Rule, 29 CFR 1910.1200

Portland cement is considered a "hazardous chemical" under this regulation, and should be part of any hazard communication program.

Status Under CERCLA/Superfund 40 CFR 117 and 302 (v)

Not listed.

Hazard Category Under SARA (Title III) Section 311 and 312

Portland cement qualifies as a "hazardous substance" with delayed health effects.

Status Under SARA (Title III) Section 313

Not subject to reporting requirements under Section 313.

Status Under TSCA (as of May 1997)

Some substances in portland cement are on the TSCA inventory list.

Status Under the Federal Hazardous Substances Act

Portland cement is a "hazardous substance" subject to the statutes promulgated under the subject act.

Status Under WHMIS

Portland cement is considered to be a hazardous material under the Hazardous Products Act as defined by the Controlled Products regulations (Class E - corrosive material) and is therefore subject to the labeling and MSDS requirements of the workplace hazardous information system (WHMIS).

Section 16 - OTHER INFORMATION

Prepared By

Mountain Cement Company

5 Sand Creek Rd.

Laramie, WY 82070

Revision Date

May 1999

Other Important Information

Portland cement should only be used by knowledgeable persons. Inexperienced product users must obtain proper training before using this product. A key to using the product safely requires the user to recognize that portland cement chemically reacts with water, and that some of the intermediate products of this reaction (that is, those present while a portland cement product is "setting") pose a far more severe hazard than does portland cement itself.

While the information provided in this material safety data sheet is believed to provide a useful summary of the hazards of portland cement as it is commonly used, the sheet cannot, and does not, anticipate and provide all of the information that might be needed in every situation. In particular, the data furnished in this sheet do

not address hazards that may be posed by other materials mixed with portland cement products. Users, therefore, should review other applicable material safety data sheets before working with this portland cement or working on portland cement products, for example, portland cement concrete.

MOUNTAIN CEMENT MAKES NO WARRANTY, EXPRESS OR IMPLIED, CONCERNING THE PRODUCT OR THE MERCHANTABILITY OR FITNESS THEREOF FOR ANY PURPOSE OR CONCERNNG THE ACCURACY OF ANY INFORMATION PROVIDED BY MOUNTAIN CEMENT COMPANY, EXCEPT THAT THE PRODUCT SHALL CONFORM TO CONTRACTED SPECIFICATIONS. THE INFORMATION PROVIDED HEREIN WAS BELIEVED BY MOUNTAIN CEMENT COMPANY TO BE ACCURATE AT THE TIME OF PREPARATION OR PREPARED FROM SOURCES BELIEVED TO BE RELIABLE, BUT IT IS THE RESPONSIBILITY OF THE USER TO INVESTIGATE AND UNDERSTAND OTHER PERTINENT SOURCES OF INFORMATION, TO COMPLY WITH ALL LAWS AND PROCEDURES APPLICABLE TO THE SAFE HANDLING AND USE OF THE PRODUCT, AND TO DETERMINE THE SUITABILITY OF THE PRODUCT FOR ITS INTENDED USE. BUYER'S EXCLUSIVE REMEDY SHALL BE FOR DAMAGES AND NO CLAIM OF ANY KIND, WHETHER AS TO PRODUCT DELIVERED OR NON-DELIVERY OF PRODUCT, AND WHETHER BASED ON CONTRACT, BREACH OF WARRANTY, NEGLIGENCE, OR OTHERWISE SHALL BE GREATER IN AMOUNT THAN THE PURCHASE PRICE OF THE QUANTITY OF PRODUCT IN RESPECT OF WHICH DAMAGES ARE CLAIMED. IN NO EVENT SHALL MOUNTAIN CEMENT BE LIABLE FOR INCIDENTAL OR CONSEQUENTIAL DAMAGES, WHETHER BUYER'S CLAIM IS BASED ON CONTRACT, BREACH OF WARRANTY, NEGLIGENCE OR OTHERWISE.

Back to Product Information

MATERIAL SAFETY DATA SHEET: SIMPLE GREEN®

I. PRODUCT & COMPANY INFORMATION

PRODUCT NAME: SIMPLE GREEN® CLEANER / DEGREASER

COMPANY NAME: SUNSHINE MAKERS, INC.
15922 Pacific Coast Highway
Huntington Harbour, CA 92649 USA
Telephone: 800-228-0709 • 562-795-6000
Fax: 562-592-3034
Website: www.simplegreen.com

Version No. 1006
Issue Date: March, 1999

For 24-hour emergency, call Chem-Tel, Inc.: 800-255-3924

USE OF PRODUCT: An all purpose cleaner and degreaser used undiluted or diluted in water for direct, spray, and dip tank procedures.

II. INGREDIENT INFORMATION

The only ingredient of Simple Green® with established exposure limits is undiluted 2-butoxyethanol (<6%) (Butyl Cellosolve; CAS No. 111-76-2): the OSHA PEL and ACGIH TLV is 25 ppm (skin). Note, however, that Butyl Cellosolve is only one of the raw material ingredients that undergo processing and dilution during the manufacture of Simple Green®. Upon completion of the manufacturing process, Simple Green® does not possess the occupational health risks associated with exposure to undiluted Butyl Cellosolve. Verification of this is contained in the independent test results detailed under "Toxicological Information" on Page 3 of this MSDS.

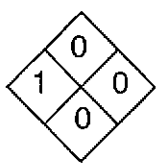
The Butyl Cellosolve in Simple Green® is part of a chemical category (glycol ethers) regulated by the Emergency Planning and Community Right-to-Know Act (SARA, Title III, section 313); therefore, a reporting requirement exists. Based upon chemical analysis, Simple Green® contains no known EPA priority pollutants, heavy metals, or chemicals listed under RCRA, CERCLA, or CWA. Analysis by TCLP (Toxicity Characteristic Leaching Procedure) according to RCRA revealed no toxic organic or inorganic constituents.

All components of Simple Green® are listed on the TSCA Chemical Substance Inventory.

III. HAZARDS IDENTIFICATION

UN Number: Not required
Dangerous Goods Class: Nonhazardous

Hazard Rating (NFPA/HMIS)
Health = 1* Reactivity = 0
Fire = 0 Special = 0



Rating Scale
0 = minimal 1 = slight
2 = moderate 3 = serious
4 = severe

*Mild eye irritant, non-mutagenic and non-carcinogenic. **None of the ingredients in Simple Green® are regulated or listed as potential cancer agents by Federal OSHA, NTP, or IARC.**

IV. FIRST AID MEASURES

SYMPTOMS OF OVEREXPOSURE AND FIRST AID TREATMENT

Eye contact: Reddening may develop. Immediately rinse the eye with large quantities of cool water; continue 10-15 minutes or until the material has been removed; be sure to remove contact lenses, if present, and to lift upper and lower lids during rinsing. Get medical attention if irritation persists.

Skin contact: Minimal effects, if any; rinse skin with water, rinse shoes and launder clothing before reuse. Reversible reddening may occur in some dermal-sensitive users; thoroughly rinse area and get medical attention if reaction persists.

Swallowing: Essentially non-toxic. Give several glasses of water to dilute; do not induce vomiting. If stomach upset occurs, consult physician.

Inhalation: Non-toxic. Exposures to concentrate-mist may cause mild irritation of nasal passages or throat; remove to fresh air. Get medical attention if irritation persists.

V. FIRE FIGHTING MEASURES

Simple Green® is stable, not flammable, and will not burn.

Flash Point/Auto-Ignition:	Not flammable.
Flammability Limits:	Not flammable.
Extinguishing Media:	Not flammable/nonexplosive. No special procedures required.
Special Fire Fighting Procedures:	None required.

VI. ACCIDENTAL RELEASE MEASURES

Recover usable material by convenient method; residual may be removed by wipe or wet mop. If necessary, unrecoverable material may be washed to drain with large quantities of water.

VII. HANDLING, STORAGE & TRANSPORT INFORMATION

No special precautions are required. **This product is non-hazardous for storage and transport according to the U.S. Department of Transportation Regulations.** Simple Green® requires no special labeling or placarding to meet U.S. Department of Transportation requirements.

UN Number:	Not required
Dangerous Goods Class:	Nonhazardous

VIII. EXPOSURE CONTROLS

Exposure Limits: The Simple Green® formulation presents no health hazards to the user when used according to label directions for its intended purposes. Mild skin and eye irritation is possible (please see Eye contact and Skin contact in Section IV.).

Ventilation: No special ventilation is required during use.

Human Health Effects or Risks from Exposure: Adverse effects on human health are not expected from Simple Green®, based upon twenty years of use without reported adverse health incidence in diverse population groups, including extensive use by inmates of U.S. Federal prisons in cleaning operations.

Simple Green® is a mild eye irritant; mucous membranes may become irritated by concentrate-mist.

Simple Green® is not likely to irritate the skin in the majority of users. Repeated daily application to the skin without rinsing, or continuous contact of Simple Green® on the skin may lead to temporary, but reversible, irritation.

Medical Conditions Aggravated by Exposure: No aggravation of existing medical conditions is expected; dermal-sensitive users may react to dermal contact by Simple Green®.

IX. PERSONAL PROTECTION

Precautionary Measures:	No special requirements under normal use conditions.
Eye Protection:	Caution, including reasonable eye protection, should always be used to avoid eye contact where splashing may occur.
Skin Protection:	No special precautions required; rinse completely from skin after contact.
Respiratory Protection:	No special precautions required.
Work and Hygienic Practices:	No special requirements. Wash or rinse hands before touching eyes or contact lenses.

X. PHYSICAL AND CHEMICAL PROPERTIES

Appearance/odor: Translucent green liquid with characteristic sassafras odor.
Specific Gravity: 1.0257 **Vapor Pressure:** 17 mm Hg @ 20 °C; 22 mm Hg @ 25 °C
pH of concentrate: 9.5 **Vapor Density:** 1.3 (air = 1)
Evaporation: >1 (butyl acetate = 1) **Density:** 8.5 lbs./gallon
Boiling Point: 110 °C (231 °F)
Freezing Point: -9 °C (16 °F) If product freezes, it will reconstitute without loss of efficacy when brought back to room temperature and agitated.

VOC Composite Partial Pressure: 0.006 mm Hg @ 20 °C
Volatile Organic Compounds (VOCs): 7.96 g/L per ASTM Method 3960-90. Per California AQMD's VOC test method, product must be diluted at least 2 parts of water to 1 part Simple Green® in order to meet SCAQMD Rule 1171 & Rule 1122 and BAAQMD Regulation 8-16 VOC requirements for solvent cleaning operations.

Water Solubility: Completely soluble in water. The higher salt concentrations in marine ecosystems will lead to complexes with Simple Green® that may become visible at ratios above one part Simple Green® to 99 parts seawater.

Ash Content: At 600 °F: 1.86% by weight.
Nutrient Content: Nitrogen: <1.0% by weight (fusion and qualitative test for ammonia).
Phosphorus: 0.3% by formula.
Sulfur: 0.6% by weight (barium chloride precipitation method).

Detection: Simple Green® has a characteristic sassafras odor that is not indicative of any hazardous situation.

XI. STABILITY AND REACTIVITY INFORMATION

Nonreactive. Simple Green® is stable, even under fire conditions, and will not react with water or oxidizers. Hazardous polymerization will not occur.

XII. TOXICOLOGICAL INFORMATION

Nonhuman Toxicity

Acute Mortality Studies:
Oral LD_{50} (rat): >5.0 g/kg body weight
Dermal LD_{50} (rabbit): >2.0 g/kg body weight

Dermal Irritation: Only mild, but reversible, irritation was found in a standard 72-hr test on rabbits. A value of 0.2 (non-irritating) was found on a scale of 8.

Eye Irritation: With or without rinsing with water, the irritation scores in rabbits at 24 hours did not exceed 15 (mild irritant) on a scale of 110.

Subchronic dermal effects: No adverse effects, except reversible dermal irritation, were found in rabbits exposed to Simple Green® (up to 2.0 g/kg/day for 13 weeks) applied to the skin of 25 males and 25 females. Only female body weight gain was affected. Detailed microscopic examination of all major tissues showed no adverse changes.

Fertility Assessment by Continuous Breeding: The Simple Green® formulation had no adverse effect on fertility and reproduction in CD-1 mice with continuous administration for 18 weeks, and had no adverse effect on the reproductive performance of their offspring.

XIII. BIODEGRADABILITY AND ENVIRONMENTAL TOXICITY INFORMATION

Biodegradability:

Simple Green® is readily decomposed by naturally occurring microorganisms. The biological oxygen demand (BOD), as a percentage of the chemical oxygen demand (COD), after 4, 7, and 11 days was 56%, 60%, and 70%, respectively. Per OECD Closed Bottle Test, Simple Green® meets OECD and EPA recommendations for ready biodegradability.

In a standard biodegradation test with soils from three different countries, Butyl Cellosolve reached 50% degradation in 6 to 23 days, depending upon soil type, and exceeded the rate of degradation for glucose which was used as a control for comparison.

Environmental Toxicity Information:

Simple Green® is considered practically non-toxic per EPA's aquatic toxicity scale. Simple Green® is non-lethal to any of the marine and estuarine test animals listed in the following table at concentrations below 200 mg/L (0.02%). This table shows the Simple Green® concentrations that are likely to be lethal to 50% of the exposed organisms.

	LC_{50} in mg/L (ppm)	
	48-hour	96-hour
Marine Fish:		
Mud minnow *(Fundulus heteroclitus)*	1690	1574
Whitebait *(Galaxias maculatus)*	210	210
Marine/Estuarine Invertebrates:		
Brine Shrimp *(Artemia salina)*	610	399
Grass Shrimp *(Palaemonetes pugio)*	270	220
Green-lipped Mussel *(Perna canaliculus)*	220	220
Mud Snail *(Potamopyrgus estuarinus)*	410	350

XIV. DISPOSAL CONSIDERATIONS

Simple Green® is fully water soluble and biodegradable and will not harm sewage-treatment microorganisms if disposal by sewer or drain is necessary. Dispose of in accordance with all applicable local, state, and federal laws.

XV. OTHER INFORMATION

Containers:	Simple Green® residues can be completely removed by rinsing with water; the container may be recycled or applied to other uses.
Electrical Wiring Compatibility:	Polyimide insulated wiring is not affected by exposure to Simple Green®. After immersion in Simple Green® for 14 days at 74°F, the 61 cm piece of polyimide insulated wire passed a one minute dielectric proof test at 2500 volts (ASTM D-149).
Contact Point:	Sunshine Makers, Inc., Research and Development Division: 562-795-6000.

***** NOTICE *****

1.1 MATERIAL SAFETY DATA SHEET

TOLUENE (AMOCO/TOTAL)

MSDS No. 11699000 ANSI/ENGLISH

1.1.1 1.0 CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

PRODUCT NAME: TOLUENE (AMOCO/TOTAL)

MANUFACTURER/SUPPLIER:

Amoco Chemical Company
200 East Randolph Drive
Chicago, Illinois 60601 U.S.A.

EMERGENCY HEALTH INFORMATION:
1 (800) 447-8735
EMERGENCY SPILL INFORMATION:
1 (800) 424-9300 CHEMTREC (USA)
OTHER PRODUCT SAFETY INFORMATION:
(312) 856-3907

1.1.2 2.0 COMPOSITION/INFORMATION ON INGREDIENTS

Component	CAS#	Range % by Wt.
Toluene	108-88-3	80
C9 Isoparaffins		9
C8 Isoparaffins		5
Benzene	71-43-2	2
Xylenes		2
Ethylbenzene	100-41-4	2

(See Section 8.0, "Exposure Controls/Personal Protection", for exposure guidelines)

1.1.3 3.0 HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW: Warning! Flammable. Causes eye irritation. Prolonged or repeated contact can defat the skin and lead to irritation and/or dermatitis. Inhalation causes headaches, dizziness, drowsiness, nausea, and respiratory irritation. If swallowed, causes headaches, dizziness, drowsiness and nausea, and may lead to unconsciousness. Harmful or fatal if liquid is aspirated into lungs. Danger! Contains Benzene. Cancer hazard. Can cause blood disorders. Harmful when absorbed through the skin.

POTENTIAL HEALTH EFFECTS:

EYE CONTACT: Causes mild eye irritation.

SKIN CONTACT: Prolonged or repeated contact can defat the skin and lead to irritation and/or dermatitis. Harmful when absorbed through the skin. Cancer hazard. Can cause blood disorders.
INHALATION: Inhalation causes headaches, dizziness, drowsiness, nausea, and respiratory irritation. See "Toxicological Information" section (Section 11.0).
INGESTION: If swallowed, causes headaches, dizziness, drowsiness and nausea, and may lead to unconsciousness. Harmful or fatal if liquid is aspirated into lungs.
HMIS CODE: (Health:2) (Flammability:3) (Reactivity:0)
NFPA CODE: (Health:2) (Flammability:3) (Reactivity:0)

1.1.4 4.0 FIRST AID MEASURES

EYE: Immediately flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.
SKIN: Wash exposed skin with soap and water. Remove contaminated clothing and thoroughly clean and dry before reuse.
INHALATION: If adverse effects occur, remove to uncontaminated area. Give artificial respiration if not breathing. Get immediate medical attention.
INGESTION: If swallowed, drink plenty of water, do NOT induce vomiting. Get immediate medical attention.

1.1.5 5.0 FIRE FIGHTING MEASURES

FLASHPOINT: 40°F(4°C)
UEL: 6.8%
LEL: 1.3%
AUTOIGNITION TEMPERATURE: 997°F (536°C)
FLAMMABILITY CLASSIFICATION: Flammable Liquid.
EXTINGUISHING MEDIA: Agents approved for Class B hazards (e.g., dry chemical, carbon dioxide, foam, steam) or water fog.
UNUSUAL FIRE AND EXPLOSION HAZARDS: Flammable liquid. Vapor may explode if ignited in enclosed area.
FIRE-FIGHTING EQUIPMENT: Firefighters should wear full bunker gear, including a positive pressure self-contained breathing apparatus.
PRECAUTIONS: Keep away from sources of ignition (e.g., heat and open flames). Use with adequate ventilation. Keep container closed.
HAZARDOUS COMBUSTION PRODUCTS: Incomplete burning can produce carbon monoxide and/or carbon dioxide and other harmful products.

1.1.6 6.0 ACCIDENTAL RELEASE MEASURES

Remove or shut off all sources of ignition. Remove mechanically or contain on an absorbent material such as dry sand or earth. Keep out of sewers and waterways.

1.1.7 7.0 HANDLING AND STORAGE

HANDLING: Do not breathe vapors. Do not get in eyes. Do not get on skin or clothing.

STORAGE: Store in flammable liquids storage area. Store away from heat, ignition sources, and open flame in accordance with applicable regulations. Keep container closed.

1.1.8 8.0 EXPOSURE CONTROLS / PERSONAL PROTECTION

EYE: Do not get in eyes. Wear chemical goggles.
SKIN: Avoid skin contact. Wear protective clothing and gloves.
INHALATION: Do not breathe mist or vapor. Use with adequate ventilation. If ventilation is inadequate, use NIOSH certified respirator that will protect against organic vapor and dust/mist.
ENGINEERING CONTROLS: Control airborne concentrations below the exposure guidelines.
EXPOSURE GUIDELINES:

Component	CAS#	Exposure Limits
Toluene	108-88-3	OSHA PEL: 100 ppm (1989); 200 ppm (1971) OSHA STEL: 150 ppm (1989); Not established. (1971) OSHA Ceiling: 300 ppm (1971) ACGIH TLV-TWA: 50 ppm (skin)
C9 Isoparaffins		No exposure limit established
C8 Isoparaffins		No exposure limit established
Benzene	71-43-2	OSHA PEL: 1 ppm OSHA STEL: 5 ppm ACGIH TLV-TWA: 10 ppm
Xylenes		No exposure limit established
Ethylbenzene	100-41-4	OSHA PEL: 100 ppm (1989)(1971) OSHA STEL: 125 ppm(1989); Not established. (1971) ACGIH TLV-TWA: 100 ppm ACGIH TLV-STEL: 125 ppm

1.1.9 9.0 CHEMICAL AND PHYSICAL PROPERTIES

APPEARANCE AND ODOR: Liquid. Clear. Colorless. Aromatic odor.
pH: Not determined.
VAPOR PRESSURE: 26 mm Hg at 25 °C
VAPOR DENSITY: 3.2
BOILING POINT: 231°F(111°C)
MELTING POINT: Not determined.
SOLUBILITY IN WATER: Negligible, below 0.1%.
SPECIFIC GRAVITY (WATER=1): 0.87
EVAPORATION RATE:

1.1.10 10.0 STABILITY AND REACTIVITY

STABILITY: Burning can be started easily.

CONDITIONS TO AVOID: Keep away from ignition sources (e.g. heat, sparks, and open flames).
MATERIALS TO AVOID: None identified.
HAZARDOUS DECOMPOSITION: Burning can produce carbon monoxide and/or carbon dioxide and other harmful products.
HAZARDOUS POLYMERIZATION: Will not occur.

1.1.11 11.0 TOXICOLOGICAL INFORMATION

ACUTE TOXICITY DATA:

EYE IRRITATION: Testing not conducted. See Other Toxicity Data.
SKIN IRRITATION: Testing not conducted. See Other Toxicity Data.
DERMAL LD50: Testing not conducted. See Other Toxicity Data.
ORAL LD50: Testing not conducted. See Other Toxicity Data.
INHALATION LC50: Testing not conducted. See Other Toxicity Data.

OTHER TOXICITY DATA: Specific toxicity tests have not been conducted on this product. Our hazard evaluation is based on information from similar products, the ingredients, technical literature, and/or professional experience.
This stream contains benzene, toluene, xylene and ethylbenzene.
Toluene: Toluene is readily absorbed via inhalation, ingestion, and somewhat through skin contact. In the liquid form, it causes mild skin irritation with a single exposure (PDIS: 4.8/8.0) and dermatitis following repeated exposures. Toluene also produces mild eye irritation (Draise score at 1.0 hour 13.7/110.0) which includes reversible corneal opacity and iritis. It is not a dermal sensitizer. Inhalation in humans has caused mild respiratory irritation (200 ppm), mild eye irritation (400 ppm), and lassitude and slight nausea (600 ppm). Drowsiness occurs at 800 ppm. Very high concentrations may result in paresthesia, dizziness, disturbances of vision, nausea, narcosis, and collapse. It does not induce the hematopoietic effects seen with benzene exposure. Rat oral LD50: 5000 mg/kg; rat inhalation LC50: 4000 ppm (4 hours).
Acute toxicity of benzene results primarily from depression of the central nervous system (CNS). Inhalation of concentrations over 50 ppm can produce headache, lassitude, weariness, dizziness, drowsiness, or excitation. Exposure to very high levels can result in unconsciousness and death.
Long-term overexposure to benzene has been associated with certain types of leukemia in humans. In addition, the International Agency for Research on Cancer (IARC) and OSHA consider benzene to be a human carcinogen. Chronic exposures to benzene at levels of 100 ppm and below have been reported to cause adverse blood effects including anemia. Benzene exposure can occur by inhalation and absorption through the skin.
Inhalation and forced feeding studies of benzene in laboratory animals have produced a carcinogenic response in a variety of organs, including possibly leukemia, other adverse effects on the blood, chromosomal changes and some effects on the immune system. Exposure to benzene at levels up to 300 ppm did not produce birth defects in animal studies; however, exposure to the higher dosage levels (greater than 100 ppm) resulted in a reduction of body weight of the rat pups (fetotoxicity). Changes in the testes have been observed in mice exposed to benzene at 300 ppm, but reproductive performance was not altered in rats exposed to benzene at the same level.
This product contains xylene. Xylene is readily absorbed through the skin. It is also absorbed when inhaled or ingested. Overexposure to xylene can cause eye and respiratory irritation, drowsiness, headache, fatigue, irritability, and gastrointestinal disturbances. Some liver damage and lung inflammation were seen in chronic studies in guinea pigs but not in rats. In rat reproduction studies, xylenes did not produce birth defects but were toxic to the embryo when

toxicity to the mother was produced. In a mouse study, xylenes caused birth defects at doses that threatened the life of the mother. The doses which produced these effects were greatly in excess of the TLV. Rat oral LD50: 4300 mg/kg; rat inhalation LC50: 5000 ppm/4 hours.
Aspiration of this product into the lungs can cause chemical pneumonia and can be fatal. Aspiration into the lungs can occur while vomiting after ingestion of this product. Do not siphon by mouth.

1.1.12 12.0 ECOLOGICAL INFORMATION

Ecological testing has not been conducted on this product.

1.1.13 13.0 DISPOSAL INFORMATION

Disposal must be in accordance with applicable federal, state, or local regulations. Residues and spilled material are hazardous waste due to ignitability. Incineration at an EPA-permitted hazardous waste management facility as required by law. Do not landfill.

1.1.14 14.0 TRANSPORTATION INFORMATION

U.S. DEPT OF TRANSPORTATION

Shipping Name Toluene
Hazard Class 3
Identification Number UN1294
Packing Group II
RQ RQ

INTERNATIONAL INFORMATION:
Sea (IMO/IMDG)

Shipping Name Not determined.

Air (ICAO/IATA)

Shipping Name Not determined.

European Road/Rail (ADR/RID)

Shipping Name Not determined.

Canadian Transportation of Dangerous Goods

Shipping Name Not determined.

1.1.15 15.0 REGULATORY INFORMATION

CERCLA SECTIONS 102a/103 HAZARDOUS SUBSTANCES (40 CFR Part 302.4): This product is reportable under 40 CFR Part 302.4 because it contains the following substance(s):

Component/CAS Number	Weight %	Component Reportable Quantity (RQ)
Benzene 71-43-2	2	10 lbs.
Ethylbenzene 100-41-4	2	1,000 lbs.

Xylenes	2	100 lbs.
Toluene 108-88-3	80	1,000 lbs.

SARA TITLE III SECTION 302 EXTREMELY HAZARDOUS SUBSTANCES (40 CFR Part 355): This product is not regulated under Section 302 of SARA and 40 CFR Part 355.
SARA TITLE III SECTIONS 311/312 HAZARDOUS CATEGORIZATION (40 CFR Part 370): This product is defined as hazardous by OSHA under 29 CFR Part 1910.1200(d).
SARA TITLE III SECTION 313 (40 CFR Part 372): This product contains the following substance(s), which is on the Toxic Chemicals List in 40 CFR Part 372:

Component/CAS Number	Weight Percent
Benzene 71-43-2	2
Ethylbenzene 100-41-4	2
Xylenes	2
Toluene 108-88-3	80

U.S. INVENTORY (TSCA): Listed on inventory.
OSHA HAZARD COMMUNICATION STANDARD: Flammable liquid. CNS Effects.
EC INVENTORY (EINECS/ELINCS): In compliance.
JAPAN INVENTORY (MITI): Not determined.
AUSTRALIA INVENTORY (AICS): Not determined.
KOREA INVENTORY (ECL): Not determined.
CANADA INVENTORY (DSL): Not determined.
PHILIPPINE INVENTORY (PICCS): Not determined.

1.1.16 16.0 OTHER INFORMATION

Prepared by:

Environment, Health and Safety Department
Issued: April 14, 1997
Supersedes: April 10, 1997

This material Safety Data Sheet conforms to the requirements of ANSI Z400.1.
This material safety data sheet and the information it contains is offered to you in good faith as accurate. We have reviewed any information contained in this data sheet which we received from sources outside our company. We believe that information to be correct but cannot guarantee its accuracy or completeness. Health and safety precautions in this data sheet may not be adequate for all individuals and/or situations. It is the user's obligation to evaluate and use this product safely and to comply with all applicable laws and regulations. No statement made in this data sheet shall be construed as a permission or recommendation for the use of any product in a manner that might infringe existing patents. No warranty is made, either express or implied.

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

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: 703-527-3887

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.

1.1 M-XYLENE

MSDS Number: X2400 --- *Effective Date: 11/02/01*

1.2 1. Product Identification

Synonyms: m-Dimethylbenzene; 1,3 dimethylbenzene; 1,3-xylene; m-xylol
CAS No.: 108-38-3
Molecular Weight: 106.18
Chemical Formula: C6H4(CH3)2
X523

1.3 2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
m-Xylene	108-38-3	90 - 100%	Yes

1.4 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. 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 B EXTINGUISHER.
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.

1.5 4. First Aid Measures

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:
Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately. If vomiting occurs, keep head below hips to

prevent aspiration into lungs.
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.

1.6 5. Fire Fighting Measures

Fire:
Flash point: 25C (77F) CC
Autoignition temperature: 527C (981F)
Flammable limits in air % by volume:
lel: 1.1; uel: 7.0
Flammable Liquid and Vapor!
Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with strong oxidizers may cause fire. 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.

1.7 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® solvent adsorbent is recommended for spills of this product.

1.8 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.

1.9 8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limit
100 ppm (TWA)

-ACGIH Threshold Limit Value (TLV):
100 ppm (TWA) 150 ppm (STEL) m-xylene

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 and engineering controls are not feasible, 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.

1.109. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.
Odor:
Characteristic odor.
Solubility:
Insoluble in water.
Specific Gravity:
0.86 @15C / 4C
pH:
Not applicable.
% Volatiles by volume @ 21C (70F):
100
Boiling Point:
138C (280F)
Melting Point:
-48C (-54F)
Vapor Density (Air=1):
3.7
Vapor Pressure (mm Hg):
9 @ 20C (68F)
Evaporation Rate (BuAc=1):
0.7

1.1110. 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.

1.1211. Toxicological Information

Toxicological Data:
Oral rat LD50: 5000 mg/Kg; skin rabbit LD50: 14,100 mg/Kg; irritation eye rabbit: 5 mg / 24 Hrs severe (Std. Draize); irritation skin rabbit 20 mg / 24 Hrs moderate (Std. Draize); investigated as a tumorigen, mutagen, reproductive effector.

Reproductive Toxicity:
May cause teratogenic effects.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
m-Xylene (108-38-3)	No	No	3

1.1312. 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:
This material is expected to be toxic to aquatic life. The LC50/96-hour values for fish are between 1 and 10 mg/l.

1.1413. 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.

1.1514. 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: 500ML

International (Water, I.M.O.)

Proper Shipping Name: XYLENES
Hazard Class: 3
UN/NA: UN1307
Packing Group: III
Information reported for product/size: 500ML

International (Air, I.C.A.O.)

Proper Shipping Name: XYLENES
Hazard Class: 3
UN/NA: UN1307
Packing Group: III
Information reported for product/size: 500ML

1.1615. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
m-Xylene (108-38-3)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
m-Xylene (108-38-3)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\--------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313----- List	Chemical Catg.
m-Xylene (108-38-3)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\--------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
m-Xylene (108-38-3)	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 (Pure / Liquid)

Australian Hazchem Code: 3[Y]
Poison Schedule: S6
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.

1.1716. 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. 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:
MSDS Section(s) changed since last revision of document include: 8.
Disclaimer:
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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS | 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: 703-527-3887

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.

1.1 O-XYLENE

MSDS Number: X2200 --- *Effective Date: 12/08/96*

1.2 1. Product Identification

Synonyms: o-Dimethyl benzene; 1,2 dimethyl benzene; 1,2 xylene; o-xylol
CAS No.: 95-47-6
Molecular Weight: 106.18
Chemical Formula: C6H4(CH3)2
Product Codes: X518

1.3 2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
o-Xylene	95-47-6	90 - 100%	Yes

1.4 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. 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.

1.5 4. First Aid Measures

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.

Ingestion:
Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately. If vomiting occurs, keep head below hips to prevent aspiration into lungs.

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.

1.6 5. Fire Fighting Measures

Fire:
Flash point: 32C (90F) CC Autoignition temperature: ca. 463C (ca. 865F)
Flammable limits in air % by volume: lel: 1.0; uel: 7.0 Flammable.

Explosion:
Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with strong oxidizers may cause fire. 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.

1.7 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.

1.8 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.

1.9 8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limits (Xylene) 100 ppm (TWA) -ACGIH Threshold Limit Value (TLV): 100 ppm (TWA), 150 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. 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.

1.109. Physical and Chemical Properties

Appearance:
Clear, colorless liquid.

Odor:
Characteristic odor.

Solubility:
Insoluble in water.

Specific Gravity:
0.88 @ 20C / 4 C

pH:
Not applicable.

% Volatiles by volume @ 21C (70F):
100

Boiling Point:
144C (291F)

Melting Point:
-25C (-13F)

Vapor Density (Air=1):
3.7

Vapor Pressure (mm Hg):
7 @ 20C (68F)

Evaporation Rate (BuAc=1):
1

1.1110. 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.

1.1211. Toxicological Information

Toxicological Data:
O-Xylene:investigated as a reproductive effector. Mixed Xylenes: Oral rat LD50: 4300 mg/kg; Inhalation rat LC50: 5000 ppm/4H; Skin Rabbit LD50: > 1700 mg/kg; Irritation, skin rabbit: 500 mg/24-hour, moderate (Standard Draize); Irritation, eye rabbit 87 mg, mild (Standard Draize). Investigated as a tumorigen, mutagen, reproductive effector.

Reproductive Toxicity:
May cause teratogenic effects.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
o-Xylene (95-47-6)	No	No	3

1.1312. 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.

1.1413. 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.

1.1514. Transport Information

Domestic (Land, D.O.T.)

Proper Shipping Name: XYLENES
Hazard Class: 3
UN/NA: UN1307
Packing Group: II
Information reported for product/size: 20L

International (Water, I.M.O.)

Proper Shipping Name: XYLENES
Hazard Class: 3.2
UN/NA: UN1307
Packing Group: II

Information reported for product/size: 20L

International (Air, I.C.A.O.)

Proper Shipping Name: XYLENES
Hazard Class: 3.2
UN/NA: UN1307
Packing Group: II
Information reported for product/size: 20L

1.1615. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
o-Xylene (95-47-6)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
o-Xylene (95-47-6)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\--------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313----- List	Chemical Catg.
o-Xylene (95-47-6)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\--------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
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 (Pure / Liquid)

Australian Hazchem Code: 3[Y]
Poison Schedule: S6

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.

1.1716. 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. 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, 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. Call a physician. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. Call a physician.

Product Use:
Laboratory Reagent.

Revision Information:
Pure. New 16 section MSDS format, all sections have been revised.

Disclaimer:
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****

Prepared by: Strategic Services Division
Phone Number: (314) 539-1600 (U.S.A.)

MSDS Material Safety Data Sheet

From: Mallinckrodt Baker, Inc.
222 Red School Lane
Phillipsburg, NJ 08865

Mallinckrodt CHEMICALS 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: 703-527-3887

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.

1.1 P-XYLENE

MSDS Number: X2600 --- *Effective Date: 01/18/01*

1.2 1. Product Identification

Synonyms: p-Dimethylbenzene; 1,4 dimethylbenzene; 1,4 xylene; p-xylol
CAS No.: 106-42-3
Molecular Weight: 106.18
Chemical Formula: C6H4(CH3)2
Product Codes:
J.T. Baker: 9498, X528
Mallinckrodt: 1949, 5450

1.3 2. Composition/Information on Ingredients

Ingredient	CAS No	Percent	Hazardous
p-Xylene	106-42-3	90 - 100%	Yes

1.4 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. 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 B EXTINGUISHER.
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.

1.5 4. First Aid Measures

Inhalation:
If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Call a physician.
Ingestion:
Aspiration hazard. If swallowed, DO NOT INDUCE VOMITING. Give large

quantities of water. Never give anything by mouth to an unconscious person. Get medical attention immediately. If vomiting occurs, keep head below hips to prevent aspiration into lungs.

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.

1.6 5. Fire Fighting Measures

Fire:

Flash point: 27.2C (81F) CC

Autoignition temperature: ca. 528C (ca. 982F)

Flammable limits in air % by volume:

lel: 1.1; uel: 7.0

Flammable.

Explosion:

Above flash point, vapor-air mixtures are explosive within flammable limits noted above. Contact with strong oxidizers may cause fire. 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.

1.7 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(R) solvent adsorbent is recommended for spills of this product.

1.8 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.

1.9 8. Exposure Controls/Personal Protection

Airborne Exposure Limits:
-OSHA Permissible Exposure Limits (Xylene)
100 ppm (TWA)
-ACGIH Threshold Limit Value (TLV):
100 ppm (TWA), 150 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. 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.

1.109. Physical and Chemical Properties

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:
138C (280F)
Melting Point:
12 - 15C (54 - 59F)
Vapor Density (Air=1):
3.7
Vapor Pressure (mm Hg):
9 @ 20C (68F)
Evaporation Rate (BuAc=1):
0.7

1.1110. 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.

1.1211. Toxicological Information

Toxicological Data:
P-Xylene: oral rat LD50: 5000 mg/kg; inhalation rat LC50: 4550 ppm/4H; investigated as a reproductive effector.
Reproductive Toxicity:
May cause teratogenic effects.

--------\Cancer Lists\----------

Ingredient	---NTP Carcinogen--- Known	Anticipated	IARC Category
p-Xylene (106-42-3)	No	No	3

1.1312. 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:
This material may be toxic to aquatic life. The LC50/96-hour values for fish are between 1 and 10 mg/l. The LC50/96-hour values for fish are between 10 and 100 mg/l.

1.1413. 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.

1.1514. 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: 4L

International (Water, I.M.O.)

Proper Shipping Name: XYLENES
Hazard Class: 3
UN/NA: UN1307
Packing Group: III
Information reported for product/size: 4L

1.1615. Regulatory Information

--------\Chemical Inventory Status - Part 1\--------

Ingredient	TSCA	EC	Japan	Australia
p-Xylene (106-42-3)	Yes	Yes	Yes	Yes

--------\Chemical Inventory Status - Part 2\--------

Ingredient	Korea	--Canada-- DSL	NDSL	Phil.
p-Xylene (106-42-3)	Yes	Yes	No	Yes

--------\Federal, State & International Regulations - Part 1\--------

Ingredient	-SARA 302- RQ	TPQ	------SARA 313----- List	Chemical Catg.
p-Xylene (106-42-3)	No	No	Yes	No

--------\Federal, State & International Regulations - Part 2\--------

Ingredient	CERCLA	-RCRA- 261.33	-TSCA- 8(d)
p-Xylene (106-42-3)	100	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]
Poison Schedule: S6

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.

1.1716. 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. 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, 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. Call a physician. In case of contact, immediately flush eyes or skin with plenty of water for at least 15 minutes. Remove contaminated clothing and shoes. Wash clothing before reuse. Call a physician.
Product Use:
Laboratory Reagent.
Revision Information:
MSDS Section(s) changed since last revision of document include: 9.
Disclaimer:
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Prepared by: Environmental Health & Safety
Phone Number: (314) 654-1600 (U.S.A.)

Appendix H

EHS Field Forms

H-1 Air Quality Monitoring Record

Air Quality Monitoring Record

Client: _____ **Project Number:** _____

Location: _____ **Site Engineer:** _____

Project Mgr.: _____ **Site EHS Officer:** _____

Date	Initial	Time	Location	PID/FID PPM	O_2%	LEL%	Dräeger Tubes			Other
							_____	_____	_____	

H-2 Field Equipment Calibration/Maintenance Log

Field Equipment Calibration/Maintenance Log

Client: _____ **Project Number:** _____

Location: _____ **Site Engineer:** _____

Project Mgr.: _____ **Site EHS Officer:** _____

Date	Type of Equipment[1]	Equipment ID Number	Procedure[2]	Reference Standards[3]	Initials of Individual	Company	Calibration OK Yes/No

Maintenance Required/Procedures:

_____

_____

_____

_____

[1] Certifications or statements of manufacturer calibration can be obtained from RETEC office files.

[2] Use space below if necessary

[3] Type of calibration gas used and concentration; buffer solutions, etc.

H-3 Confined Space Entry Permit

Confined Space Entry Permit

Client:	**Project Number:**
Location:	**Date:**
Project Manger:	**Site Engineer:**
Site EHS Officer:	
Location and Description of Confined Space:	
Purpose of Entry:	
Date of Entry:	**Termination Date:**
Description of Hazards of the Permit Space:	
Authorized Entrants:	
Authorized Attendants:	
Rescue Team Personnel/Outside Agency (Name and Address):	

Special Requirements	Yes	No
Lockout/Tagout		
Lines Broken-Capped or Blanked		
Purge-Flush or Vent		
Ventilation		
Secure Area		
SCBA or APRs		
Escape Harness		
Tripod Emergency Escape Harness		
Lifelines		
Fire Extinguishers		
Lighting		
PPE		
Level A, B, C, or D		
Modifications		
Communication System		

Required Air Monitoring	PEL	Yes	No	Frequency (times/day)
% Oxygen	19.5 to 21%			
% LEL	0 to 10%			
Benzene	1 ppm			
Carbon Monoxide	50 ppm			
Aromatic Hydrocarbon	10 ppm			
Other:				
Note: If any reading exceeds the PEL designated, appropriate actions must be implemented before allowing anyone to enter the confined space.				
Name of Person Conducting Monitoring:				

Note: Continuous/periodic tests shall be established prior to initiation of site activities. Any questions pertaining to testing, contact Jim Colbert, Corp. EHS Manager (970) 493-3700.

Instruments Used	Type	Yes	No	Calibration Date
PID	Photoionization			
Portable GC	Flame ionization			
LEL	Explosimeter			
Oxygen	% Oxygen			
Combustible Gas Indicator	LEL/O_2/H_2S/CO			
Sampling Tubes	Dräeger or equivalent			NA

Immediately prior to entry, conduct these tests three times at five-minute intervals at all levels of the confined space:

	Test 1 Time	Test 2 Time	Test 3 Time
Oxygen Content (%)			
Flammability (% LEL)			
Toxic Gases (ppm)			

Describe in detail any ventilation systems to be used:_____

On-site individual responsible for authorizing entry:
Name (please type):
Signature:

Confined Space Entry Permit Approval: _____

Name (please type): _____

Signature: _____

Date of Approval: _____

Duration of Permit Validity: _____

H-4 EHS Incident Report

First Report of Occupational Injury, Illness, or Exposure

Reported by: _____ **Incident Date/Time:** _____

Date/Time Reported _____ **Client Name/Site:** _____

Supervisor: _____ **RETEC Office:** _____

*Did incident occur at one of the following client sites? ☐ BP ☐ BNSF

Description:
Describe the operation in progress, body part affected, witness names, client notifications made, potential non-work related causes, and any contributing conditions. Use additional sheets as necessary.

Response and Care Provided:

☐ Taken to medical facility (provide facility name and phone):

☐ First aid provided(describe):

Incident Resulted from (check all that apply):

☐ Body mechanics/ergonomics	☐ Hand safety	☐ Road/vehicle
☐ Chemical exposure/release	☐ Mechanical	☐ Security Lapse
☐ Drowning/engulfment	☐ Noise	☐ Sharp/broken object
☐ Electrical	☐ Pinch point	☐ Slip/trip/fall
☐ Equipment/tools	☐ Plants/animals	☐ Weather
☐ Fire/explosion	☐ Pressure/heat	☐ Other:

Possible Causal Factors (as identified by employee):

1. Immediate Cause		2. Root Cause
☐ Engineering design – inadequate		☐ Behavior – rushing or frustration
☐ Inattentiveness/awareness – inadequate		☐ Behavior – fatigue or complacency
☐ Protective Systems/Equip. – inadequate		☐ Change in condition/scope of work
☐ Pre-planning – inadequate	**DUE TO:** →	☐ Procedure – inadequate or not present
☐ Procedure – not followed		☐ Staffing – insufficient number of staff
☐ Tool/Equipment– wrong for the job		☐ Staffing – inadequate physical state
☐ Tool/Equipment – inadequate insp./maint.		☐ Staffing – inadequate supervision
☐ Worksite layout or control – inadequate		☐ Training – inadequate
☐ Other:		☐ Other:

Corrective Action Taken and Lesson Learned:

Submit immediately to all of the following:

☐ Your supervisor ☐ Project Manager (if applicable) ☐ EHS Coordinator ☐ Corporate EHS

[1] Incidents on BP or BNSF sites require additional reporting. Contact Corporate EHS for details.

H-5 Near-Miss Incident Report

ENSR

EHS Opportunity or Near Miss Report

Reported by: _____ Incident Date/Time: _____

Date Reported: _____ Site Location: _____

Report Type (please check one):

☐ EHS Opportunity (*suggestion for improvement, good EHS idea to share, or EHS observation*)

☐ EHS Near-Miss (*event that could have resulted in an incident under different circumstances)*

Description:

Describe key aspects such as the operation in progress, worker experience, potential outcome of event, and any contributing conditions. Use additional sheets as necessary.

Possible Outcome (check all that apply):

☐ Injury/illness ☐ Property damage ☐ Environmental release ☐ Regulatory Violation

Hazard Category (check all that apply):

☐ Body mechanics/ergonomics	☐ Hand safety	☐ Road/vehicle
☐ Chemical exposure/release	☐ Mechanical	☐ Security lapse
☐ Drowning/engulfment	☐ Noise	☐ Sharp/broken object
☐ Electrical	☐ Pinch point	☐ Slip/trip/fall
☐ Equipment/tools	☐ Plants/animals	☐ Weather
☐ Fire/explosion	☐ Pressure/heat	☐ Other:

Possible Causal Factors (as identified by employee):

1. Immediate Cause		2. Root Cause
☐ Engineering design – inadequate		☐ Behavior – rushing or frustration
☐ Inattentiveness/awareness – inadequate		☐ Behavior – fatigue or complacency
☐ Protective systems/equip. – inadequate		☐ Change in condition/scope of work
☐ Pre-planning – inadequate	**DUE TO:** →	☐ Procedure – inadequate or not present
☐ Procedure – not followed		☐ Staffing – insufficient number of staff
☐ Tool/Equipment– wrong for the job		☐ Staffing – inadequate physical state
☐ Tool/Equipment – inadequate insp./maint.		☐ Staffing – inadequate supervision
☐ Worksite layout or control – inadequate		☐ Training – inadequate
☐ Other:		☐ Other:

Corrective Action Taken and Lesson Learned:

Submit to: ☐ Your supervisor or PM (review for quality then send to:)
☐ EHS Coordinator (review, enter in monthly report, then send to:)
☐ Corporate EHS

H-6 Hot Work Permit

Hot Work Permit

Permit Valid For 1 Work Day

Site Name: _____ **Project Number:** _____

EHS Officer: _____ **Client:** _____

Hot Work Description: _____

_____

_____

Workers/Welders Conducting Hot Work: _____

Permits MUST be completed in its Entirety Before Hot Work Begins

	Yes	No
Has project supervisor been notified of intended Hot Work?		
Does client representative need to be notified of the intended Hot Work?		
Will Hot Work impact the general public, clients, or operation employees?		
Will the intended Hot Work need to be coordinated with other contractors who may be working on the site to make them aware of any hazards and the scope of work to be performed?		
Have hazardous energy sources been identified, isolated, and locked out/tagged out before the start of the project?		
Will Hot Work be conducted within a confined space?		
All testing equipment (*i.e.,* CGI, oxygen meter, etc.) and firefighting equipment (*i.e.*, extinguisher, etc.) have been checked to ensure proper operation and calibration before the start of this project?		
Has a fire watch been designated and on station?		
Have coatings on metal surfaces been tested for ignitability and flame spread?		
Has the area been cleared of all flammable materials?		
Have all fuel sources been identified and protected?		
Has the area been restricted with proper barriers and signs?		
Has the area been tested to be certain that atmosphere is 0% LEL before starting Hot Work?		
Have flame sensitive areas and equipment (including cylinders and gas delivery lines) exposed to slag and sparks been protected by flame resistant blankets or removed from the area?		
Have all equipment and hoses been protected from falling metal structures and debris?		
Have escape routes been identified before starting work?		
Is ventilation equipment needed? Type needed:		

The Following Protective Equipment Will be Required:

	Yes	No		Yes	No
Welding Goggles/Shield Tint			Supplied Air Respirator		
Safety Boots			Head Protection		
Leather gloves			Safety Harness		
Hearing Protection			Welding Leathers – Top		
APR Cartridge			Welding Leathers - Bottom		

Permit Valid for 1 Work Day
The following procedures will be applicable prior to Hot Work on tanks or other types of enclosed structures. (Check all that apply and fill in appropriate information)

☐ Ventilate to 0% LEL

☐ Confined Space Entry Permit

☐ Mechanical Ventilation Required

☐ Cold Cut Only Method Allowed:

☐ Hot Cutting Permitted Method Allowed:

Inert to < % Oxygen

Approvals:

_____

Date

_____

Client Representative

_____

RETEC Site Safety Officer

_____

Fire Watch

_____

Performed Hot Work Employee

File Permit in Project Work File and Environmental Health and Safety Department

H-7 Drill Rig Inspection Log

Drill Rig Inspection Log

Project Name: _____ Project Number: _____

Date: _____ Subcontractor Audited: _____

Auditor: _____

General Safety		
Safety Officer Designated for Job:	☐ Yes	☐ No
Name:		
Safety Meeting Performed (Daily)	☐ Yes	☐ No
Personal Protective Equipment (PPE)		
Hard Hats	☐ Yes	☐ No
Safety Glasses	☐ Yes	☐ No
Steel Toed Boots	☐ Yes	☐ No
Hearing Protection	☐ Yes	☐ No
Work Gloves	☐ Yes	☐ No
Orange Work Vests	☐ Yes	☐ No
Traffic Cones and Signs	☐ Yes	☐ No
Other	☐ Yes	☐ No
Disposal of PPE in Proper Waste Containers (if applicable)	☐ Yes	☐ No
Comments:		
Daily Inspections of Drill Rig:		
Structural Damage, Loose Bolts	☐ Yes	☐ No
Proper Tension in Chain Drives	☐ Yes	☐ No
Loose or Missing Guards, Fluid Leaks	☐ Yes	☐ No
Damaged Hoses and/or Damaged Pressure	☐ Yes	☐ No
Gages and Pressure Relief Valves	☐ Yes	☐ No
Comments:		

Check and test all safety devices such as:		
Emergency shutdown switches, at least daily	☐ Yes	☐ No
All gages and warning lights and ensure control levers are functioning properly	☐ Yes	☐ No
First Aid and fire extinguishers on drill rig	☐ Yes	☐ No
Back up alarm functioning properly	☐ Yes	☐ No
Comments:		
Drill Crew Training Requirements:		
40-hour OSHA Training	☐ Yes	☐ No
8-hour Annual Refresher Training	☐ Yes	☐ No
Drill Rig Training/Safe Operating Practices	☐ Yes	☐ No
First Aid/CPR	☐ Yes	☐ No
Emergency Procedures	☐ Yes	☐ No
Emergency Phone Numbers Posted	☐ Yes	☐ No
Site Orientation	☐ Yes	☐ No
Health and Safety Plan Review	☐ Yes	☐ No
Comments:		
Housekeeping:		
Suitable storage for tools, materials, and supplies	☐ Yes	☐ No
Pipes, drill rods, casing, and augers stacked on racks to prevent rolling and sliding	☐ Yes	☐ No
Platforms and other work areas free of debris materials and obstructions	☐ Yes	☐ No
Comments:		
Hand Tools:		
Tools in good condition	☐ Yes	☐ No
Broken tools discarded and replaced	☐ Yes	☐ No
Right tool used for the right job	☐ Yes	☐ No
Comments:		

Drilling Operations:		
Mast or derrick down when moving rig	☐ Yes	☐ No
Overhead obstructions identified before mast is raised	☐ Yes	☐ No
Drill rig stabilized using leveling jacks or solid cribbing	☐ Yes	☐ No
Secure and lock derrick	☐ Yes	☐ No
Comments:		
Overhead and Buried Utilities:		
Buried utilities identified and marked	☐ Yes	☐ No
Safe distance of drill rig from overhead power lines	☐ Yes	☐ No
Comments:		
Wire Line Hoists Wire Rope and Hardware:		
Inspection for broken wires where reduction in rope diameter, wire diameter, fatigue, corrosion, damage from gear jamming, crushing, bird caging, kinking	☐ Yes	☐ No
Inspect and lubricate parts daily	☐ Yes	☐ No
Comments:		

Auger Operations - What to look for:

- A system of responsibility between the operator and the tool handler when connecting and disconnecting auger sections and inserting and removing auger fork.
- During connecting and disconnecting auger sections and inserting auger for the tool, handler should position himself away from the auger column while it is rotating.
- When securing the auger to the power coupling, pin should be inserted and tapped into place using a hammer or other similar device.
- Tool hoist should be used to lower second section of auger into place.
- Both operators should be clear of auger as it is being lifted into place.
- Long-handled shovel should be used to move dirt away from auger.

Overall Summary:

H-8 Safety Task Analysis Review (STAR) Form

Identify Potential Hazards

☐ Abrasions
☐ Biological Hazards (Plants, Animals, Insects)
☐ Cave-in (Trench/Excavation Work)
☐ Chemical/Thermal Burn
☐ Cuts
☐ Dermatitis
☐ Dropping Materials/Tools to Lower Level
☐ Drowning/Flowing Water
☐ Dust
☐ Electrical Shock
☐ Elevated/Overhead Work
☐ Energized Equipment
☐ Fire
☐ Flammability
☐ Foreign Body in Eye
☐ Hazardous Materials (Exposure or Release)
☐ Heat or Cold Stress
☐ Heavy Equipment Operation
☐ Heavy Lifting
☐ High Noise Levels
☐ Impact Noise
☐ Inability to Maintain Communication
☐ Inclement Weather
☐ Overhead Work
☐ Overhead Utilities
☐Underground Utilities
☐ Pinch Points
☐ Pressurized Lines
☐ Slips, Trips, Falls
☐ Sprains/Strains
☐ Traffic
☐ Underground Utilities
☐ Confined Space
☐ New or Rental Equipment
☐ Surface Water Run-On/Run-Off
☐ Odor/VOC Emissions
☐ Compressed Gas Cylinders
☐ Generated Wastes (Solids/Liquids)
☐ Known/Unknown Visitors
☐ Visibility
☐ New Personnel
☐ Hoists/Rigging/Slings/Wire Rope
☐ Special Operations/Instructions (Attach)
☐ Ergonomics

Identify Controls

☐ Air Monitoring
☐ Barricades/Fencing/Silt Fencing
☐ Buddy System
☐ Appropriate Clothing/Monitoring of Weather
☐ Confined Space Procedures
☐ Decontamination
☐ Drinking Water/Fluids
☐ Dust abatement Measures
☐ Equipment Inspection
☐ Exclusion Zones
☐ Exhaust Ventilation
☐ Fall Protection
☐ Fire Extinguisher/Fire Watch
☐ Flotation Devices/Lifelines
☐ Grounds on Equipment/Tanks
☐ Ground Fault Interrupter
☐ Ground Hydraulic Attachments
☐ Hand Signal Communication
☐ Hazardous/Flammable Material Storage
☐ Hazardous Plant/Animal Training
☐ Hearing Protection (Specify)
☐ Hoses, Access to Water
☐ Hot Work Procedures
☐ Insect Repellent or Precautions
☐ Isolation of Equipment or Process (LO/TO)
☐ Stormwater Control Procedures/Methods
☐ Machine/Equipment Guarding
☐ Manual Lifting Equipment (Chain Falls)
☐ Protective Equipment (Specify)
☐ Proper Lifting Techniques
☐ Proper Tool for Job
☐ Radio Communication
☐ Respirator, (Specify Type)
☐ Safety Harness/Lanyard/Scaffold
☐ Sloping, Shoring, Trench Box
☐ Vehicle Inspection
☐ Spill Prevention Measures/Spill Kits
☐ Equipment Manuals/Training
☐ Emergency Procedures/Incident Management Plan
☐ Appropriate Labels/Signage
☐ Derived Waste Management Plan
☐ Visitor Escort/Orientation/Security
☐ Window Cleaning/Defrost
☐ Proper Work Position/Tools

Pre-Task Review (Yes/No/NA)

1. Has Job Hazard Analysis been completed and reviewed? _____
2. Is Job Scope understood by all Personnel? _____
3. Proper Safety Equipment on job site? ___
4. Permit Issued?

What type? ☐ Hot Work
☐ Confined Space ☐ Excavation
☐ Other:__

5. Proper Tools for Job on site? _____
6. Oxygen/Flammability checked? _____
7. Reviewed MSDSs for any hazardous substance that might be present? _____
8. Proper training for all personnel? _____
9. Are there any planned deviations from set procedures for equipment modifications? __ If so, contact supervisor to check applicability of MOC procedures.
10. Is there any work planned that could cause activation of emergency procedures? ___ If so, have these procedures been discussed and communicated?

Post-Task Review

1. Work area cleaned up?_____
2. All locks and tags removed and signed off by individuals?_____
3. Have Permits been turned in? _____
4. STAR submitted to EHS Department? _____
5. Were there any unplanned deviations from set procedures or equipment modifications? _____

If so, contact supervisor to check applicability of MOC procedures.

The RETEC Group, Inc.
Safety Task Analysis Review (STAR)

Task Description:

_____

List Tasks:

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

Company: _____

Completed By: _____

Date: _____

Job Location:

_____

List Additional Hazards (Hazards Not Shown with Check Box)

_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____
_____

List Additional Controls (Controls Not Shown with Check Box)

_____
_____

Tailgate Meeting Topic

_____
_____
_____

Signatures of Personnel on Task Analysis Review/Tailgate Meeting:

_____
_____
_____

Mentor Assigned to Work

_____
_____
_____

Lessons Learned (Based on changes in conditions, EHS Near- Incidents/ Observations, Potential Emergencies)

Is there a better/safer way to perform the work/task?

_____
_____
_____

Supervisor Review (date/Time): _____

EHS Review (date/time): _____

Comments: _____
_____
_____

H-9 Job Hazard Analysis (JHA) Form

Job Hazard Analysis

JHA Type: ☐ Investigation ☐ O&M ☐Office ☐ Construction	☐ New ☐ Revised	Date:
Work Activity:		
Personal Protective Equipment (PPE):		

Development Team	Position/Title	Reviewed By	Position/Title	Date

❶ Job Steps 1	❷ Potential Hazards 2	❸ Critical Actions 3
		•
		•
		•
		•
		•
		•
		•
		•
		•
		•
		•
		•

Notes

1 – Target number of job steps: six to ten

2 – Codes for Potential Hazards:

Caught Between (CBT)	Contacted By (CB)	Caught On (CO)	Fall To Below (FB)	Overexertion (O)	Struck Against (SA)
Caught In (CI)	Contact With (CW)	Exposure (E)	Fall - Same Level (FS)	Release To (R)	Struck By (SB)

3 – Types of Critical Actions: Administrative Controls, Engineering Controls, PPE, and/or Safe Work Practice / SOP

Form Version 4/3/06

H-10 Field Equipment/Tool Inspection Checklist

Field Equipment/Tool Inspection Checklist

Equipment/Tool Inspected: _____

Site: _____ **Inspected by:** _____

Date: **Title:**

Item #	Item Inspected	Description	Pass	Fail	N/A
1	Equipment Operator	Equipment operator has had proper training and is familiar with equipment and operational features.			
2	Hydraulic Lines	Hydraulic lines are secure and no leaks. Hoses are in good condition with no cracks or breaks.			
3	Pipe, Hoses, and Fittings	Discharge hoses and pipes are secure and no leaks. Fittings are tight, secure, and not leaking.			
4	Power/Extension Cords	Power/extension cords are in one piece with no frays or breaks. Plug ends are in good working order.			
5	GFI and Grounding	A ground fault interrupter is in place for electrical equipment and is in good working order. Grounding cable in place and operable for drilling or liquids transfer.			
6	Safety Guards	All equipment/tool safety guards are in place and in operation. Rotating and thermal guards.			
7	Windows and Mirrors	Equipment windows and mirrors are in good condition to ensure operator visibility.			
8	Wheels and Tires	Equipment wheels and tires are in good working order. Proper inflation.			
9	Engine Oil Fluids	Engines or motors are properly lubricated and cooled. No leaks are present. Oil and coolant levels full.			
10	Tool Handles	Tool handles are secure and not broken. Grips are not worn or missing.			
11	Blades	Cutting blades are sharp and securely fastened to the equipment or tool.			
12	Fall Protection	Harnesses and lifelines are secure and in good condition. Buckles and fasteners in good condition.			
13	Ingress and Egress to Equipment	Steps, handrails, etc. are secured and functioning properly. Steps are free of ice and mud.			
14	Lights and Signals, Alarms	Lights and signals operate properly. Backup alarm working properly.			
15	Lockout/Tagout	Battery disconnect switch in place to prevent unauthorized use. Lockout/tagout system in place to prevent energizing.			
16	Fire Extinguishers	Fire extinguisher in place, or available close by, for emergency fire protection.			
17	Ignition and Controls	Ignition and controls intact with no loose wiring.			

Notes (Reference Item#)

Appendix I

Completed Site-Specific Job Hazard Analysis (JHA)

Complete Site Specific Job Safety Analysis (JHA)

As detailed Job Hazard Analysis (JHA) will be completed as part of the HASP preparation for the scope of work covered described in Table 1-1 of the HASP. Instruction for the completion of the JHA is outlined in Section 2.1.1 of the HASP. Previously completed JHAs are available for use on this project on the RETEC EHS Forum Database at "T-EHS\Job Hazard Analysis\Completed Example JHAs\. If the scope of work expands following field mobilization, JHAs for these additional tasks must be completed in the field using the JHA form included in Appendix H-9.

Job Hazard Analysis

JHA Type: ☒ Investigation ☐ O&M ☐Office ☐ Construction	☐ New ☒ Revised	**Date**: 6/13/2007
Work Activity: ***Aquifer Slug Testing***		
Personal Protective Equipment (PPE): Level D: Hard hat, safety glasses or splash guard, safety toe boots, gloves. **Optional**: reflective orange or yellow safety vest, metatarsal guards, hearing protection, & Tyvek® coveralls.		

Development Team	Position/Title	Reviewed By	Position/Title	Date
Neeraj Ghai	Engineer	Jennifer Atkins	EHS Office Coordinator	6/14/07

❶ Job Steps[1]	❷ Potential Hazards[2]	❸ Critical Actions[3]
Mobilization/Preparation of Job Site	***Exposure to*** Heat/Cold Stress/Adverse Weather	• Check weather forecast before heading to site. (SPO) • Wear clothing appropriate for temperatures and wind effects. (PPE) • Wear sunscreen if needed and set up a shade tent if no other shade is available. (PPE) • Provide liquids (water/electrolytes) when potential for heat stress is present. (SOP) • Monitor personnel for fatigue and heat stress or high wind. (SOP) • Be aware of cold and/or rain. Stop work if conditions become too cold and severe or lightning is observed. (SOP)
	Contact with, Struck By, Heavy Equipment or Railroads	• Check with facility supervisor and discuss work areas where heavy equipment use creates a hazard, especially haul roads, heavy equipment crossings, and pedestrian crossing areas. (ADM) • Ground personnel are to establish eye contact with operators prior to approaching equipment or entering the work area. (SOP) • When working around heavy equipment, personnel should wear orange or yellow reflective safety vests. (PPE) • Maintain all Rail Road safety procedures.(SOP) • Follow all restrictions and regulations presented in HASP (SOP)
	Contact with, Exposure to Biological Hazards	• Be aware of potential biological hazards at site. (*i.e.*, poisonous vegetation, insects, snakes, animals.) (ADM) • Apply insect repellant prior to arriving at site. (PPE) • Wear light color clothing, long pants with high socks. (PPE) • Check for ticks or spider bites immediately after leaving the site, take a shower to remove any possible plant residue. Put clothing inside of plastic bags to prevent insects from crawling. (SOP)
	Fall to same level or below	• Look over site for special hazards in your work area. Additional, make sure area surrounding well is recently mowed. (SOP) • Maintain a clean and organized work area. (SOP) • Do not work after dusk or before dawn. (ADM)
Calibrating Equipment	***Exposure to*** Calibration Fluids	• Wear PPE, safety glasses or face shield, disposable sampling gloves. (PPE) • Have decontamination material available if you are splashed. (SOP) • Have an eye-wash and first aid kit available. (SOP) • Have phone available to contact emergency personnel if required. (ADM)
Setting Up Equipment (DataLogger)	***Exposure to, Contact with*** Electricity	• Make sure electrical cords and equipment are in good condition. (SOP) • Avoid contact of electrical equipment with water, if it is not designed for it. (SOP)
	Fall to same level or below	• Look over site for special hazards in your work area. Additional, make sure area surrounding well is recently mowed. (SOP) • Maintain a clean and organized work area. (SOP) • Do not work after dusk or before dawn. (ADM)

1 – Target number of job steps: six to ten
2 – Codes for Potential Hazards:

Caught Between (CBT)	Contacted By (CB)	Caught On (CO)	Fall To Below (FB)	Overexertion (O)	Struck Against (SA)
Caught In (CI)	Contact With (CW)	Exposure (E)	Fall - Same Level (FS)	Release To (R)	Struck By (SB)

3 – Types of Critical Actions: Administrative Controls, Engineering Controls, PPE, and/or Safe Work Practice / SOP

Job Hazard Analysis

JHA Type: ☒ Investigation ☐ O&M ☐Office ☐ Construction	☐ New ☒ Revised	**Date**: 6/13/2007
Work Activity: ***Aquifer Slug Testing***		
Personal Protective Equipment (PPE): Level D: Hard hat, safety glasses or splash guard, safety toe boots, gloves. **Optional**: reflective orange or yellow safety vest, metatarsal guards, hearing protection, & Tyvek® coveralls.		

Development Team	Position/Title	Reviewed By	Position/Title	Date
Neeraj Ghai	Engineer	Jennifer Atkins	EHS Office Coordinator	6/14/07

❶ Job Steps[1]	❷ Potential Hazards[2]	❸ Critical Actions[3]
Opening Well to Place DataLogger	***Contact with, Exposure to*** Insects and Snakes/Animals	• Approach well slowly, watch for bees, spiders, snakes in well casing and around well. (SOP) • Open lid slowly. (SOP) • Consult PM on how to remove any nests encountered. (SOP) • Repair or modify well casing to prevent future infestations. (ENG) • Wear work gloves. (PPE)
	Contact with, Exposure to Poisonous Plants	• Be aware of poison plants that may cause dermal reactions in your area (SOP) • Wear work gloves, long sleeved clothing, and pants to minimize contact with cut debris. (PPE) • Wash exposed body parts immediately after clearing brush with soap and warm water. Make sure to shower entire body immediately after days work is done. (SOP) • If you have a severe reaction to certain plants in the past, plan accordingly and allow another employee who might not be allergic to the same plants to cut brush. (ADM)
	Caught between, Caught in, Struck by Bolts & Well Cover, Datalogger	• Wear work gloves. (PPE) • Use the proper tools, (AMD)
Installing DataLogger in Well	***Overexertion***	• Use proper ergonomic lifting technique.(SOP) • Lift and lower slowly. (SOP) • Get help in lifting heavy or awkward objects. (ADM) • Establish and maintain clear work area/path. (ADM)
	Exposure to, Contact with Electricity	• Make sure electrical cords and equipment are in good condition. (ADM) • Avoid contact of electrical equipment with water, if it is not designed for it. (SOP)
Removing Datalogger from Well	***Overexertion***	• Use proper ergonomic lifting technique.(SOP) • Lift and lower slowly. (SOP) • Get help in lifting heavy or awkward objects. (SOP) • Establish and maintain clear work area/path. (SOP)
	Contact with, Exposure to Water from Well	• Wear PPE, safety glasses or face shield, disposable gloves. (PPE)

1 – Target number of job steps: six to ten

2 – Codes for Potential Hazards:

Caught Between (CBT)	Contacted By (CB)	Caught On (CO)	Fall To Below (FB)	Overexertion (O)	Struck Against (SA)
Caught In (CI)	Contact With (CW)	Exposure (E)	Fall - Same Level (FS)	Release To (R)	Struck By (SB)

3 – Types of Critical Actions: Administrative Controls, Engineering Controls, PPE, and/or Safe Work Practice / SOP

Job Hazard Analysis

JHA Type: ☒ Investigation ☐ O&M ☐Office ☐ Construction	☐ New ☒ Revised	**Date**: 6/13/2007
Work Activity: ***Drilling***		
Personal Protective Equipment (PPE): Level D: Hard hat, safety glasses, safety toed boots, gloves, Tyvek coveralls, reflective orange or yellow safety vest, hearing protection as needed, dust control measures as needed.		

Development Team	Position/Title	Reviewed By	Position/Title	Date
Neeraj Ghai	Engineer	Jennifer Atkins	EHS Office Coordinator	6/14/07

❶ Job Steps[1]	❷ Potential Hazards[2]	❸ Critical Actions[3]
Mobilization to Site and Site Preparation	***Fall to same level***	• Maintain clean and organized work area. • Use approved lighting units if work must be performed after dusk. • If drilling is performed during cold weather use sand, salt or other material to prevent/ minimize icing hazards.
	Exposure to Severe weather (Cold/Heat Stress)	• Wear clothing appropriate for temperatures and wind effects. • Provide liquids (water/electrolytes) when potential for heat stress is present. • Monitor personnel for fatigue and heat/cold stress. • Personnel are to be aware of changing weather conditions at and near the site. • When work is halted due to inclement weather (i.e. thunderstorms), personnel are to seek shelter in vehicles or the administrative buildings. • Personnel should use appropriate weather gear (i.e. rain coats, etc.).
	Contact with, Contact by, Struck against equipment and vehicles	• Equipment operators are to be trained/ certified. • Riding on or in equipment without seats and seat belts is prohibited. • Personnel are to wear orange/yellow reflective vests to maximize visibility. • Vehicle/equipment operators are to be aware of personnel in the work area. • Limit personnel in the work are to those required to perform the work. • Ground personnel are to establish eye contact with operators prior to approaching equipment or entering the work area. • Hydraulic components of equipment are to be in the down position when the equipment is not in use. • Use head lamps if working after dusk.
Material Handling	***Overexertion to*** Muscle Strain/Injury	• Avoid manual handling of heavy objects. • Utilize mechanical methods when possible (e.g., drum dolly, hydraulic equipment, etc.). • Get help in lifting heavy or awkward objects. • Establish and maintain clear work area/path.
	Contact with Liquid from Drilling/Sampling	• Wear proper PPE. • Use caution when working with potentially contaminated fluids. • Use portable eyewash station in the event of splashes to the head/upper torso as needed. Contact emergency personnel if required. • Decontaminate personnel as needed.

1 – Target number of job steps: six to ten
2 – Codes for Potential Hazards:

Caught Between (CBT)	Contacted By (CB)	Caught On (CO)	Fall To Below (FB)	Overexertion (O)	Struck Against (SA)
Caught In (CI)	Contact With (CW)	Exposure (E)	Fall - Same Level (FS)	Release To (R)	Struck By (SB)

3 – Types of Critical Actions: Administrative Controls, Engineering Controls, PPE, and/or Safe Work Practice / SOP

Job Hazard Analysis

JHA Type: ☒ Investigation ☐ O&M ☐Office ☐ Construction	☐ New ☒ Revised	**Date**: 6/13/2007
Work Activity: ***Drilling***		
Personal Protective Equipment (PPE): Level D: Hard hat, safety glasses, safety toed boots, gloves, Tyvek coveralls, reflective orange or yellow safety vest, hearing protection as needed, dust control measures as needed.		

Development Team	Position/Title	Reviewed By	Position/Title	Date
Neeraj Ghai	Engineer	Jennifer Atkins	EHS Office Coordinator	6/14/07

❶ Job Steps[1]	❷ Potential Hazards[2]	❸ Critical Actions[3]
Material Handling (continued)	***Release to*** environment	• Inspect drums/ containers for integrity prior to use. • Place soil and other material into drums/ containers as soon as practicable. • Store drums/containers in a designated storage area, using plywood raisers and plastic liners around the area • Have containment, spill clean-up materials on hand and notify RETEC PM, regulatory agencies and local authorities as necessary.
Geoprobe/HSA Subsurface Soil Sampling	***Contact with, Contact by, Struck against*** equipment and vehicles	• Fill out a drill rig inspection form • Go over any concerns with driller
	Exposure to noise	• Implement the three (3) feet rule, if shouting is required to be heard within three (3) feet of another then hearing protection is required. • Impulsive or impact noise must not exceed 140 db peak sound level. • Use engineering controls where applicable. • Use of hearing protection during drilling operations is required.
	Exposure to , Contact with chemicals	• Position the drill rig and personnel upwind of drilling location, as practicable. • Provide air monitoring in the work area. • Upgrade PPE to use of respirator as needed. • Place drill cuttings into drums/containers and keep drums/containers closed as practicable during drilling. • Wear safety glasses.
	Contact with, Struck by Flying Dust or Debris	• Wear protective eyewear. • Keep away from air rotary sample collection ports (e.g. cyclone samplers or diverters).
	Contact with Fire	• Have fire extinguishers on equipment. • Obtain a hot work permit when using an external air compressor.
	Caught by, Caught between, Struck by Moving Parts and Pinch Points	• Work at a safe distance from moving parts of the drill rig and geoprobe. • Ensure that equipment guards (whip guards) are in place and secure. • Ensure that personnel are aware of and familiar with the potential hazards of rotary equipment being used.
	Contact with Overhead/Underground Utilities	• Review available maps and have utilities located. Move drill rig location a safe distance from marked utilities. • If location can not be moved, inform the PM and post hole the locations using soft digging techniques (air knife, vactron, non-conductive pribars and shovels). • Ensure that overhead clearances for rig masts and drill string are within required limitations.
Decontamination	***Contact with*** High Pressure Water	• Direct pressure spray wand away from people and keep hands and feet away from discharge. • Personnel performing decon to wear full-face shield, gloves, rubber boots and Tyvek or polycoated Tyvek.

1 – Target number of job steps: six to ten

2 – Codes for Potential Hazards:

Caught Between (CBT)	Contacted By (CB)	Caught On (CO)	Fall To Below (FB)	Overexertion (O)	Struck Against (SA)
Caught In (CI)	Contact With (CW)	Exposure (E)	Fall - Same Level (FS)	Release To (R)	Struck By (SB)

3 – Types of Critical Actions: Administrative Controls, Engineering Controls, PPE, and/or Safe Work Practice / SOP

Job Hazard Analysis

JHA Type: ☒ Investigation ☐ O&M ☐Office ☐ Construction	☐ New ☒ Revised	**Date**: 6/13/2007
Work Activity: ***Well Installation***		
Personal Protective Equipment (PPE): Level D: Hard hat, safety glasses, safety toed boots, gloves, tyvek coveralls, reflective orange or yellow safety vest, hearing protection as needed, dust control measures as needed.		

Development Team	Position/Title	Reviewed By	Position/Title	Date
Neeraj Ghai	Engineer	Jennifer Atkins	EHS Office Coordinator	6/14/07

❶ Job Steps[1]	❷ Potential Hazards[2]	❸ Critical Actions[3]
Mobilization to Site and Site Preparation	***Fall to same level***	• Maintain clean and organized work area. • Use approved lighting units if work must be performed after dusk. • If drilling is performed during cold weather use sand, salt or other material to prevent/ minimize icing hazards.
	Contact with, Struck by objects	• Wear appropriate clothing while working. • Use appropriate work gloves for the task to protect hands. • Avoid manual handling of heavy objects. • Utilize mechanical methods when possible (e.g., drum dolly, hydraulic equipment, etc.). • Get help in lifting heavy or awkward objects. • Establish and maintain clear work area/path. • Make sure the work area is clearly marked by using caution tape and cones • Signage may also be used when appropriate.
	Exposure to, Contact with Adverse weather	• Wear clothing appropriate for temperatures and wind effects. • Provide liquids (water/electrolytes) when potential for heat stress is present. • Monitor personnel for fatigue and heat/cold stress. • Personnel are to be aware of changing weather conditions at and near the site. • When work is halted due to inclement weather (i.e. thunderstorms), personnel are to seek shelter in vehicles or the administrative buildings. • Personnel should use appropriate weather gear (i.e. rain coats, etc.).
	Struck by, contact with Motor Vehicles and Heavy Equipment	• Equipment operators are to be trained/ certified. • Riding on or in equipment without seats and seat belts is prohibited. • Personnel are to wear orange/yellow reflective vests to maximize visibility. • Vehicle/equipment operators are to be aware of personnel in the work area. • Limit personnel in the work are to those required to perform the work. • Ground personnel are to establish eye contact with operators prior to approaching equipment or entering the work area. • Hydraulic components of equipment are to be in the down position when the equipment is not in use. • Use head lamps if working after dusk.
Material Handling	***Exposure to, Contact with*** Drilling/Sampling liquids	• Wear proper PPE. • Use caution when working with potentially contaminated fluids. • Use portable eyewash station in the event of splashes to the head/upper torso as needed. Contact emergency personnel if required. • Decontaminate personnel as needed.

1 – Target number of job steps: six to ten
2 – Codes for Potential Hazards:

Caught Between (CBT)	Contacted By (CB)	Caught On (CO)	Fall To Below (FB)	Overexertion (O)	Struck Against (SA)
Caught In (CI)	Contact With (CW)	Exposure (E)	Fall - Same Level (FS)	Release To (R)	Struck By (SB)

3 – Types of Critical Actions: Administrative Controls, Engineering Controls, PPE, and/or Safe Work Practice / SOP

Job Hazard Analysis

JHA Type: ☒ Investigation ☐ O&M ☐Office ☐ Construction	☐ New ☒ Revised	**Date**: 6/13/2007
Work Activity: ***Well Installation***		
Personal Protective Equipment (PPE): Level D: Hard hat, safety glasses, safety toed boots, gloves, tyvek coveralls, reflective orange or yellow safety vest, hearing protection as needed, dust control measures as needed.		

Development Team	Position/Title	Reviewed By	Position/Title	Date
Neeraj Ghai	Engineer	Jennifer Atkins	EHS Office Coordinator	6/14/07

❶ Job Steps[1]	❷ Potential Hazards[2]	❸ Critical Actions[3]
Material Handling (continued)	***Release to*** environment	• Inspect drums/ containers for integrity prior to use. • Place soil and other material into drums/ containers as soon as practicable. • Store drums/containers in a designated storage area, using plywood raisers and plastic liners around the area • Have containment, spill clean-up materials on hand and notify RETEC PM, regulatory agencies and local authorities as necessary.
Well Installation using HSA Drill Rig	***Rig Condition***	• Fill out a drill rig inspection form • Go over any concerns with driller
	Exposure to Noise	• Implement the three (3) feet rule, if shouting is required to be heard within three (3) feet of another then hearing protection is required. • Impulsive or impact noise must not exceed 140 db peak sound level. • Use engineering controls where applicable. • Use of hearing protection during drilling operations is required.
	Exposure to, Contact with chemicals	• Position the drill rig and personnel upwind of drilling location, as practicable. • Provide air monitoring in the work area. • Upgrade PPE to use of respirator as needed. • Place drill cuttings into drums/containers and keep drums/containers closed as practicable during drilling. • Wear safety glasses.
	Struck by, Contact with Flying Dust or Debris	• Wear protective eyewear. • Keep away from air rotary sample collection ports (e.g. cyclone samplers or diverters).
	Exposure to, Contact with Fire	• Have fire extinguishers on equipment. • Obtain a hot work permit when using an external air compressor.
	Contact with, Caught between, Struck by Moving Parts and Pinch Point***s***	• Work at a safe distance from moving parts of the drill rig and geoprobe. • Ensure that equipment guards (whip guards) are in place and secure. • Ensure that personnel are aware of and familiar with the potential hazards of rotary equipment being used.
	Contact with Overhead/Underground Utilities	• Review available maps and have utilities located. Move drill rig location a safe distance from marked utilities. • If location can not be moved, inform the PM and post hole the locations using soft digging techniques (air knife, vactron, non-conductive pribars and shovels). • Ensure that overhead clearances for rig masts and drill string are within required limitations.
Decontamination	***Contact with*** High Pressure Water	• Direct pressure spray wand away from people and keep hands and feet away from discharge. • Personnel performing decon to wear full-face shield, gloves, rubber boots and Tyvek or polycoated Tyvek.

1 – Target number of job steps: six to ten
2 – Codes for Potential Hazards:

Caught Between (CBT)	Contacted By (CB)	Caught On (CO)	Fall To Below (FB)	Overexertion (O)	Struck Against (SA)
Caught In (CI)	Contact With (CW)	Exposure (E)	Fall - Same Level (FS)	Release To (R)	Struck By (SB)

3 – Types of Critical Actions: Administrative Controls, Engineering Controls, PPE, and/or Safe Work Practice / SOP

Job Hazard Analysis

JHA Type: ☒ Investigation ☐ O&M ☐Office ☐ Construction	☐ New ☒ Revised	**Date**: 6/13/2007
Work Activity: ***Well Installation***		
Personal Protective Equipment (PPE): Level D: Hard hat, safety glasses, safety toed boots, gloves, tyvek coveralls, reflective orange or yellow safety vest, hearing protection as needed, dust control measures as needed.		

Development Team	Position/Title	Reviewed By	Position/Title	Date
Neeraj Ghai	Engineer	Jennifer Atkins	EHS Office Coordinator	6/14/07

❶ Job Steps[1]	❷ Potential Hazards[2]	❸ Critical Actions[3]
Well Completion	***Contact with, Struck by, Caught between*** moving parts of the Grouting/Concrete mixing	• Wear leather gloves, safety glasses and other PPE as required. • Keep hands from moving parts inside mixers • Inspect grout hoses and fittings prior to use • Use heavy equipment to move mixers. • Mix grout to specification and completely fill the hole (when using chips, hydrate completely).
	Exposure to Cement dust	• Do not allow cement to come in contact with skin and avoid breathing cement dust.

1 – Target number of job steps: six to ten
2 – Codes for Potential Hazards:

Caught Between (CBT)	Contacted By (CB)	Caught On (CO)	Fall To Below (FB)	Overexertion (O)	Struck Against (SA)
Caught In (CI)	Contact With (CW)	Exposure (E)	Fall - Same Level (FS)	Release To (R)	Struck By (SB)

3 – Types of Critical Actions: Administrative Controls, Engineering Controls, PPE, and/or Safe Work Practice / SOP

Job Hazard Analysis

JHA Type: ☒ Investigation ☐ O&M ☐Office ☐ Construction	☐ New ☒ Revised	**Date**: 6/13/2007
Work Activity: ***Well Gauging, Purging and Sampling***		
Personal Protective Equipment (PPE): Level D: Hard hat, safety glasses or splash guard, safety toe boots, gloves. **Optional**: reflective orange or yellow safety vest, metatarsal guards, hearing protection, & Tyvek® coveralls.		

Development Team	Position/Title	Reviewed By	Position/Title	Date
Neeraj Ghai	Engineer	Jennifer Atkins	EHS Office Coordinator	6/14/07

❶ Job Steps[1]	❷ Potential Hazards[2]	❸ Critical Actions[3]
Mobilization/Preparation of Job Site	***Exposure to*** Heat/Cold Stress/Adverse Weather	• Check weather forecast before heading to site. (SPO) • Wear clothing appropriate for temperatures and wind effects. (PPE) • Wear sunscreen if needed and set up a shade tent if no other shade is available. (PPE) • Provide liquids (water/electrolytes) when potential for heat stress is present. (SOP) • Monitor personnel for fatigue and heat stress or high wind. (SOP) • Be aware of cold and/or rain. Stop work if conditions become too cold and severe or lightning is observed. (SOP)
	Contact with, Struck By, Heavy Equipment or Railroads	• Check with facility supervisor and discuss work areas where heavy equipment use creates a hazard, especially haul roads, heavy equipment crossings, and pedestrian crossing areas. (ADM) • Ground personnel are to establish eye contact with operators prior to approaching equipment or entering the work area. (SOP) • When working around heavy equipment, personnel should wear orange or yellow reflective safety vests. (PPE) • Maintain all Rail Road safety procedures.(SOP) • Follow all restrictions and regulations presented in HASP (SOP)
	Contact with, Exposure to Biological Hazards	• Be aware of potential biological hazards at site. (*i.e.*, poisonous vegetation, insects, snakes, animals.) (ADM) • Apply insect repellant prior to arriving at site. (PPE) • Wear light color clothing, long pants with high socks. (PPE) • Check for ticks or spider bites immediately after leaving the site, take a shower to remove any possible plant residue. Put clothing inside of plastic bags to prevent insects from crawling. (SOP)
	Fall to same level or below	• Look over site for special hazards in your work area. Additional, make sure area surrounding well is recently mowed. (SOP) • Maintain a clean and organized work area. (SOP) • Do not work after dusk or before dawn. (ADM)
Calibrating Equipment	***Exposure to*** Calibration Fluids	• Wear PPE, safety glasses or face shield, disposable sampling gloves. (PPE) • Have decontamination material available if you are splashed. (SOP) • Have an eye-wash and first aid kit available. (SOP) • Have phone available to contact emergency personnel if required. (ADM)
Setting Up Equipment	***Exposure to, Contact with*** Electricity	• Make sure electrical cords and equipment are in good condition. (SOP) • Avoid contact of electrical equipment with water, if it is not designed for it. (SOP)
	Fall to same level or below	• Look over site for special hazards in your work area. Additional, make sure area surrounding well is recently mowed. (SOP) • Maintain a clean and organized work area. (SOP) • Do not work after dusk or before dawn. (ADM)

1 – Target number of job steps: six to ten

2 – Codes for Potential Hazards:

Caught Between (CBT)	Contacted By (CB)	Caught On (CO)	Fall To Below (FB)	Overexertion (O)	Struck Against (SA)
Caught In (CI)	Contact With (CW)	Exposure (E)	Fall - Same Level (FS)	Release To (R)	Struck By (SB)

3 – Types of Critical Actions: Administrative Controls, Engineering Controls, PPE, and/or Safe Work Practice / SOP

Job Hazard Analysis

JHA Type: ☒ Investigation ☐ O&M ☐Office ☐ Construction	☐ New ☒ Revised	**Date**: 6/13/2007
Work Activity: ***Well Gauging, Purging and Sampling***		
Personal Protective Equipment (PPE): Level D: Hard hat, safety glasses or splash guard, safety toe boots, gloves. **Optional**: reflective orange or yellow safety vest, metatarsal guards, hearing protection, & Tyvek® coveralls.		

Development Team	Position/Title	Reviewed By	Position/Title	Date
Neeraj Ghai	Engineer	Jennifer Atkins	EHS Office Coordinator	6/14/07

❶ Job Steps[1]	❷ Potential Hazards[2]	❸ Critical Actions[3]
Opening Well	***Contact with, Exposure to*** Insects and Snakes/Animals	• Approach well slowly, watch for bees, spiders, snakes in well casing and around well. (SOP) • Open lid slowly. (SOP) • Consult PM on how to remove any nests encountered. (SOP) • Repair or modify well casing to prevent future infestations. (ENG) • Wear work gloves. (PPE)
	Contact with, Exposure to Poisonous Plants	• Be aware of poison plants that may cause dermal reactions in your area (SOP) • Wear work gloves, long sleeved clothing, and pants to minimize contact with cut debris. (PPE) • Wash exposed body parts immediately after clearing brush with soap and warm water. Make sure to shower entire body immediately after days work is done. (SOP) • If you have a severe reaction to certain plants in the past, plan accordingly and allow another employee who might not be allergic to the same plants to cut brush. (ADM)
	Caught between, Caught in, Struck by Bolts & Well Cover	• Wear work gloves. (PPE) • Use the proper tools, (AMD)
Pumping/Purging Well	***Overexertion***	• Use proper ergonomic lifting technique.(SOP) • Lift and lower slowly. (SOP) • Avoid manual handling of heavy objects. Utilize mechanical methods when possible (e.g., drum dolly, hydraulic equipment, etc.). (SOP) • Get help in lifting heavy or awkward objects. (ADM) • Establish and maintain clear work area/path. (ADM)
	Exposure to, Contact with Electricity	• Make sure electrical cords and equipment are in good condition. (ADM) • Avoid contact of electrical equipment with water, if it is not designed for it. (SOP)
Handling and Filling Sample Bottles	***Exposure to, Contact with*** Sample and Preservative Chemical	• Wear PPE, safety glasses or face shield, disposable gloves. (PPE) • Avoid splashing preservatives when filling bottles. (SOP) • Avoid inhaling acids and preservatives. (SOP) • Make sure lids are secure.(SOP) • Have decontamination material available if you are splashed. (SOP) • Have an eye-wash and first aid kit available. (SOP) • Have phone available to contact emergency personnel if required. (ADM)
	Contact with, Exposure to Broken Glass	• Wear PPE, safety glasses or face shield, disposable gloves. (PPE) • Don't touch broken glass with bare hands. (SOP) • Secure broken glass for disposal. (ADM)

1 – Target number of job steps: six to ten
2 – Codes for Potential Hazards:

Caught Between (CBT)	Contacted By (CB)	Caught On (CO)	Fall To Below (FB)	Overexertion (O)	Struck Against (SA)
Caught In (CI)	Contact With (CW)	Exposure (E)	Fall - Same Level (FS)	Release To (R)	Struck By (SB)

3 – Types of Critical Actions: Administrative Controls, Engineering Controls, PPE, and/or Safe Work Practice / SOP

Job Hazard Analysis

JHA Type: ☒ Investigation ☐ O&M ☐Office ☐ Construction	☐ New ☒ Revised	**Date**: 6/13/2007
Work Activity: ***Well Gauging, Purging and Sampling***		
Personal Protective Equipment (PPE): Level D: Hard hat, safety glasses or splash guard, safety toe boots, gloves. **Optional**: reflective orange or yellow safety vest, metatarsal guards, hearing protection, & Tyvek® coveralls.		

Development Team	Position/Title	Reviewed By	Position/Title	Date
Neeraj Ghai	Engineer	Jennifer Atkins	EHS Office Coordinator	6/14/07

❶ Job Steps[1]	❷ Potential Hazards[2]	❸ Critical Actions[3]
Packing Coolers	***Overexertion***	• Use proper ergonomic lifting technique.(SOP) • Lift and lower slowly. (SOP) • Avoid manual handling of heavy objects. Utilize mechanical methods when possible (e.g., drum dolly, hydraulic equipment, etc.). (SOP) • Get help in lifting heavy or awkward objects. (SOP) • Establish and maintain clear work area/path. (SOP)
	Contact with, Exposure to Broken Glass	• Wear PPE, safety glasses or face shield, disposable gloves. (PPE) • Use sufficient ice and packing material to prevent breakage. (SOP) • If broken glass or acid is observed in the cooler, carefully remove the broken glass and place it in an appropriate container. (SOP) • Use paper towels to absorb the acid and to wipe the acid off the surface of bottles or packing material that must be retained for use. (SOP) • Secure broken glass used paper towels in an appropriate container for appropriate disposal. (SOP).
Disposing of Purge Water	***Overexertion***	• Use proper ergonomic lifting technique.(SOP) • Lift and lower slowly. (SOP) • Avoid manual handling of heavy objects. Utilize mechanical methods when possible (e.g., drum dolly, hydraulic equipment, etc.). (SOP) • Get help in lifting heavy or awkward objects. (ADM) • Establish and maintain clear work area/path. (ADM)
	Exposure to, Contact with Purge Water	• Wear proper PPE (Level D, Tyvek, gloves, face shield) (PPE) • Do not over fill bucket or drum. (SOP) • Pour water slowly from bucket into drum or other container to avoid splashing. (SOP) • Have decontamination material available if you are splashed (SOP) • Clean yourself as soon as you are splashed.(SOP) • Have an eye-wash and first aid kit available. (SOP) • Have phone available to contact emergency personnel if required. (ADM)
	Fall to same level or below	• Maintain a clean and organized work area. (ADM) • Do not work after dusk or before dawn. (SOP) • Do not over fill bucket or drum. (SOP) • Pour water slowly from bucket into drum or other container to avoid splashing. (SOP) • Have spill clean up materials on hand. (SOP) • Place bucket firmly on ground to avoid it falling. (SOP) • Inspect drums/ containers for integrity prior to use. (SOP) • Place water and other material into drums/ containers as soon as practicable. (SOP) • Store drums/containers in a designated storage area. (SOP)

1 – Target number of job steps: six to ten

2 – Codes for Potential Hazards:

Caught Between (CBT)	Contacted By (CB)	Caught On (CO)	Fall To Below (FB)	Overexertion (O)	Struck Against (SA)
Caught In (CI)	Contact With (CW)	Exposure (E)	Fall - Same Level (FS)	Release To (R)	Struck By (SB)

3 – Types of Critical Actions: Administrative Controls, Engineering Controls, PPE, and/or Safe Work Practice / SOP

Job Hazard Analysis

JHA Type: ☒ Investigation ☐ O&M ☐Office ☐ Construction	☐ New ☒ Revised	**Date**: 6/13/2007
Work Activity: ***Well Gauging, Purging and Sampling***		
Personal Protective Equipment (PPE): Level D: Hard hat, safety glasses or splash guard, safety toe boots, gloves. **Optional**: reflective orange or yellow safety vest, metatarsal guards, hearing protection, & Tyvek® coveralls.		

Development Team	Position/Title	Reviewed By	Position/Title	Date
Neeraj Ghai	Engineer	Jennifer Atkins	EHS Office Coordinator	6/14/07

❶ Job Steps[1]	❷ Potential Hazards[2]	❸ Critical Actions[3]
	Caught between, Caught in, Struck by Drum Cover	• Wear work gloves. (PPE) • Use Proper tools (*i.e.*, Drum wrench) (SOP)

1 – Target number of job steps: six to ten
2 – Codes for Potential Hazards:

Caught Between (CBT)	Contacted By (CB)	Caught On (CO)	Fall To Below (FB)	Overexertion (O)	Struck Against (SA)
Caught In (CI)	Contact With (CW)	Exposure (E)	Fall - Same Level (FS)	Release To (R)	Struck By (SB)

3 – Types of Critical Actions: Administrative Controls, Engineering Controls, PPE, and/or Safe Work Practice / SOP

Job Hazard Analysis

JHA Type: ☒ Investigation ☐ O&M ☐Office ☐ Construction	☐ New ☒ Revised	**Date**: 6/13/2007
Work Activity: ***Soil Vapor Survey***		
Personal Protective Equipment (PPE): Level D: Hard hat, safety glasses or splash guard, safety toe boots, gloves. **Optional**: reflective orange or yellow safety vest, metatarsal guards, hearing protection, & Tyvek® coveralls.		

Development Team	Position/Title	Reviewed By	Position/Title	Date
Neeraj Ghai	Engineer	Jennifer Atkins	EHS Office Coordinator	6/14/07

❶ Job Steps[1]	❷ Potential Hazards[2]	❸ Critical Actions[3]
Mobilization/Preparation of Job Site	***Exposure to*** Heat/Cold Stress/Adverse Weather	• Check weather forecast before heading to site. (SPO) • Wear clothing appropriate for temperatures and wind effects. (PPE) • Wear sunscreen if needed and set up a shade tent if no other shade is available. (PPE) • Provide liquids (water/electrolytes) when potential for heat stress is present. (SOP) • Monitor personnel for fatigue and heat stress or high wind. (SOP) • Be aware of cold and/or rain. Stop work if conditions become too cold and severe or lightning is observed. (SOP)
	Fall to same level or below	• Look over site for special hazards in your work area. Additional, make sure area surrounding well is recently mowed. (SOP) • Maintain a clean and organized work area. (SOP) • Do not work after dusk or before dawn. (ADM)
Chemical Inventory Check of Buildings	***Exposure to*** Chemicals	• Wear PPE, safety glasses or face shield, disposable sampling gloves. (PPE) • Have decontamination material available if you are splashed. (SOP) • Have an eye-wash and first aid kit available. (SOP) • Have phone available to contact emergency personnel if required. (ADM)
	Fall to same level or below	• Look over site for special hazards in your work area. • Maintain a clean and organized work area. (SOP)
Drilling sampling implants in concrete slab	***Contact with, Exposure to*** Utilities	• Contact Dig-Safe and get utility clearance prior to sample collection
	Caught between, Caught in, Struck by *: Drill, teflon tubing*	• Wear work gloves. (PPE) • Use the proper tools, (AMD) • Follow manufacturer instructions
Collect sub slab surface samples	***Overexertion***	• Use proper ergonomic lifting technique.(SOP) • Lift and lower slowly. (SOP) • Get help in lifting heavy or awkward objects. (ADM) • Establish and maintain clear work area/path. (ADM)
	Caught Between, Caught in, Struck by: Helium Meter, Sample Canister	• Make sure equipment are in good condition. (ADM) • Avoid puncturing helium meter and canister, follow manufacturer directions. (SOP)
Seal Concrete Coring Holes	***Overexertion***	• Use proper ergonomic lifting technique.(SOP) • Lift and lower slowly. (SOP) • Establish and maintain clear work area/path. (ADM)
	Caught in, Struck by: Coring Hole	• Avoid pinch points (ADM)
	Contact with, Exposure to cement mix	• Wear PPE, safety glasses or face shield, disposable gloves. (PPE)

1 – Target number of job steps: six to ten
2 – Codes for Potential Hazards:

Caught Between (CBT)	Contacted By (CB)	Caught On (CO)	Fall To Below (FB)	Overexertion (O)	Struck Against (SA)
Caught In (CI)	Contact With (CW)	Exposure (E)	Fall - Same Level (FS)	Release To (R)	Struck By (SB)

3 – Types of Critical Actions: Administrative Controls, Engineering Controls, PPE, and/or Safe Work Practice / SOP

Job Hazard Analysis

JHA Type: ☒ Investigation ☐ O&M ☐Office ☐ Construction		☐ New ☒ Revised	**Date**: 6/13/2007
Work Activity: ***Soil Vapor Survey***			
Personal Protective Equipment (PPE): Level D: Hard hat, safety glasses or splash guard, safety toe boots, gloves. **Optional**: reflective orange or yellow safety vest, metatarsal guards, hearing protection, & Tyvek® coveralls.			

Development Team	Position/Title	Reviewed By	Position/Title	Date
Neeraj Ghai	Engineer	Jennifer Atkins	EHS Office Coordinator	6/14/07

❶ Job Steps[1]	❷ Potential Hazards[2]	❸ Critical Actions[3]
Packing Coolers	***Overexertion***	• Use proper ergonomic lifting technique.(SOP) • Lift and lower slowly. (SOP) • Avoid manual handling of heavy objects. Utilize mechanical methods when possible (e.g., drum dolly, hydraulic equipment, etc.). (SOP) • Get help in lifting heavy or awkward objects. (SOP) • Establish and maintain clear work area/path. (SOP)

1 – Target number of job steps: six to ten
2 – Codes for Potential Hazards:

Caught Between (CBT)	Contacted By (CB)	Caught On (CO)	Fall To Below (FB)	Overexertion (O)	Struck Against (SA)
Caught In (CI)	Contact With (CW)	Exposure (E)	Fall - Same Level (FS)	Release To (R)	Struck By (SB)

3 – Types of Critical Actions: Administrative Controls, Engineering Controls, PPE, and/or Safe Work Practice / SOP

Job Hazard Analysis

JHA Type: ☒ Investigation ☐ O&M ☐Office ☐ Construction	☐ New ☒ Revised	**Date**: 6/13/2007
Work Activity: ***Surface Soil Sampling***		
Personal Protective Equipment (PPE): Level D: Hard hat, safety glasses or splash guard, safety toe boots, gloves. **Optional**: reflective orange or yellow safety vest, metatarsal guards, hearing protection, & Tyvek® coveralls.		

Development Team	Position/Title	Reviewed By	Position/Title	Date
Neeraj Ghai	Engineer	Jennifer Atkins	EHS Office Coordinator	6/14/07

❶ Job Steps[1]	❷ Potential Hazards[2]	❸ Critical Actions[3]
Mobilization/Preparation of Job Site	***Exposure to*** Heat/Cold Stress/Adverse Weather	• Check weather forecast before heading to site. (SPO) • Wear clothing appropriate for temperatures and wind effects. (PPE) • Wear sunscreen if needed and set up a shade tent if no other shade is available. (PPE) • Provide liquids (water/electrolytes) when potential for heat stress is present. (SOP) • Monitor personnel for fatigue and heat stress or high wind. (SOP) • Be aware of cold and/or rain. Stop work if conditions become too cold and severe or lightning is observed. (SOP)
	Contact with, Struck By, Heavy Equipment or Railroads	• Check with facility supervisor and discuss work areas where heavy equipment use creates a hazard, especially haul roads, heavy equipment crossings, and pedestrian crossing areas. (ADM) • Ground personnel are to establish eye contact with operators prior to approaching equipment or entering the work area. (SOP) • When working around heavy equipment, personnel should wear orange or yellow reflective safety vests. (PPE) • Maintain all Rail Road safety procedures.(SOP) • Follow all restrictions and regulations presented in HASP (SOP)
	Contact with, Exposure to Biological Hazards	• Be aware of potential biological hazards at site. (*i.e.*, poisonous vegetation, insects, snakes, animals.) (ADM) • Apply insect repellant prior to arriving at site. (PPE) • Wear light color clothing, long pants with high socks. (PPE) • Check for ticks or spider bites immediately after leaving the site, take a shower to remove any possible plant residue. Put clothing inside of plastic bags to prevent insects from crawling. (SOP)
	Fall to same level or below	• Look over site for special hazards in your work area. Additional, make sure area surrounding well is recently mowed. (SOP) • Maintain a clean and organized work area. (SOP) • Do not work after dusk or before dawn. (ADM)
Collecting Samples	***Contact with, Exposure to*** MGP Residual	• Use hand shovel and disposable trowel • Wear work gloves or latex/nitrile gloves. (PPE)
	Overexertion	• Use proper ergonomic lifting technique.(SOP) • Lift and lower slowly. (SOP) • Avoid manual handling of heavy objects. Utilize mechanical methods when possible (e.g., drum dolly, hydraulic equipment, etc.). (SOP) • Establish and maintain clear work area/path. (SOP)

1 – Target number of job steps: six to ten

2 – Codes for Potential Hazards:

Caught Between (CBT)	Contacted By (CB)	Caught On (CO)	Fall To Below (FB)	Overexertion (O)	Struck Against (SA)
Caught In (CI)	Contact With (CW)	Exposure (E)	Fall - Same Level (FS)	Release To (R)	Struck By (SB)

3 – Types of Critical Actions: Administrative Controls, Engineering Controls, PPE, and/or Safe Work Practice / SOP

Job Hazard Analysis

JHA Type: ☒ Investigation ☐ O&M ☐Office ☐ Construction	☐ New ☒ Revised	**Date**: 6/13/2007
Work Activity: ***Surface Soil Sampling***		
Personal Protective Equipment (PPE): Level D: Hard hat, safety glasses or splash guard, safety toe boots, gloves. **Optional**: reflective orange or yellow safety vest, metatarsal guards, hearing protection, & Tyvek® coveralls.		

Development Team	Position/Title	Reviewed By	Position/Title	Date
Neeraj Ghai	Engineer	Jennifer Atkins	EHS Office Coordinator	6/14/07

❶ Job Steps[1]	❷ Potential Hazards[2]	❸ Critical Actions[3]
Handling and Filling Sample Bottles	***Exposure to, Contact with*** Sample and Preservative Chemical	• Wear PPE, safety glasses or face shield, disposable gloves. (PPE) • Avoid splashing preservatives when filling bottles. (SOP) • Avoid inhaling acids and preservatives. (SOP) • Make sure lids are secure.(SOP) • Have decontamination material available if you are splashed. (SOP) • Have an eye-wash and first aid kit available. (SOP) • Have phone available to contact emergency personnel if required. (ADM)
	Contact with, Exposure to Broken Glass	• Wear PPE, safety glasses or face shield, disposable gloves. (PPE) • Don't touch broken glass with bare hands. (SOP) • Secure broken glass for disposal. (ADM)
Packing Coolers	***Overexertion***	• Use proper ergonomic lifting technique.(SOP) • Lift and lower slowly. (SOP) • Avoid manual handling of heavy objects. Utilize mechanical methods when possible (e.g., drum dolly, hydraulic equipment, etc.). (SOP) • Get help in lifting heavy or awkward objects. (SOP) • Establish and maintain clear work area/path. (SOP)
	Contact with, Exposure to Broken Glass	• Wear PPE, safety glasses or face shield, disposable gloves. (PPE) • Use sufficient ice and packing material to prevent breakage. (SOP) • If broken glass or acid is observed in the cooler, carefully remove the broken glass and place it in an appropriate container. (SOP) • Use paper towels to absorb the acid and to wipe the acid off the surface of bottles or packing material that must be retained for use. (SOP) • Secure broken glass used paper towels in an appropriate container for appropriate disposal. (SOP).

1 – Target number of job steps: six to ten
2 – Codes for Potential Hazards:

Caught Between (CBT)	Contacted By (CB)	Caught On (CO)	Fall To Below (FB)	Overexertion (O)	Struck Against (SA)
Caught In (CI)	Contact With (CW)	Exposure (E)	Fall - Same Level (FS)	Release To (R)	Struck By (SB)

3 – Types of Critical Actions: Administrative Controls, Engineering Controls, PPE, and/or Safe Work Practice / SOP

Appendix J

Roadway Worker Protection

Requirements for On-Track Safety/Roadway Worker Protection on Railroad Sites

This appendix describes the implementation plan The RETEC Group, Inc. (RETEC) has established to achieve and maintain compliance with On-Track Safety/Roadway Worker Protection requirements established by the Federal Railroad Administration (FRA). RETEC has adopted the BNSF Maintenance of Way (MOW) Safety Rules, Maintenance of Way Operating Rules and BNSF Engineering Instruction No. 1.1, but the intent of this document is to use these requirements on all client railroad sites.

This document constitutes the track safety standards that RETEC and its subcontractors will adhere to while performing project activities for all our railroad clients. RETEC recognizes the importance of, and accepts the responsibility for, On-Track Safety/Roadway Worker Protection for its employees and subcontractors. All railroad project employees are required to read this document annually and know how to obtain On-Track Safety/Roadway Worker Protection information from the documents referenced above (see the Summary in Attachment 1).

RETEC understands that these requirements must be followed throughout all of our regional offices when conducting work on railroad property. As discussed below, this document should always be used as a supplement and appendix to a site-specific Health and Safety Plan (HASP) for each individual site. As such, health and safety procedures and the training specified in this document will be utilized in addition to those procedures specified in the site-specific HASP at every site. This document does not represent a stand-alone health and safety program or document. Further, all office, regional, and corporate responsibilities existing at RETEC remain in-place.

Specific requirements of the implementation On-Track Safety/Roadway Worker Protection plan include the following:

These requirements are appended to all railroad project site-specific HASPs.

- All RETEC employees and subcontractors are required to successfully receive orientation training on the railroad-sponsored website www.contractororientation.com.
- Upon successful completion of website training, a wallet card will be issued to certify that the training has been received. This is orientation training only and is the first step in being in compliance with the RETEC On-Track safety training program and must be completed annually.
- No employee, either RETEC or RETEC subcontractor, will be permitted to work on a railroad site without a current (within the last year) wallet card or a print out of the training roster off the website during the interim period when the employee is waiting for their wallet card.
- RETEC employees and subcontractors must be registered by the Corporate EHS Secretary or the Corporate Administrative Manager in RETEC's Monroeville office at 412-380-0140, ext. 29 or ext. 28, from Monday to Friday 8 a.m. to 3 p.m. EDT/EST. From Monday to Friday, 3 p.m. to 8 p.m., EDT/EST registration may be obtained by calling 412-370-7458. Registration is not available at any other time. Note that if you do not register and take the website training, it will not be valid and you will be required to re-take the website training after obtaining authorized registration.
- RETEC personnel who have completed the course and have received a wallet card are tracked on the Health and Safety Medical Surveillance and Training Database in the Monroeville office.
- All RETEC employees and subcontractors must also read "Requirements for On-Track Safety/Road Worker Protection on Railroad Sites" as the second part of the On-Track safety training program. You will have attested that you understand and will abide by these requirements when you sign the acknowledgement form of this site-specific HASP. Prior to work on a railroad site and annually, at a minimum, RETEC employees and subcontractors working at railroad sites must receive this training.

- A Lotus Notes-based application is available for RETEC employees only, which includes a copy of these requirements, a short quiz to verify that the training has been received and understood, and a tracking database.
- Other methods of providing this training will include a module at the annual 8-hour HAZWOPER refresher-training course.
- RETEC subcontractors who have received the website orientation training but have not received this part of the On-Track Safety/Roadway Worker Training will be briefed on the job site by the designated health and safety officer and required to sign an acknowledgement form.
- In addition, all RETEC employees and subcontractors must be generally familiar with the following four (4) documents as part of the On-Track Safety/Roadway Worker Training Program:
  - FRA Railroad Administration Regulations
  - BNSF Engineering Instruction No. 1.1
  - BNSF Maintenance of Way Operating Rules
  - BNSF Maintenance of Way Safety Rules
- A summary of these documents is attached for use in becoming generally familiar with them. Consult this summary for requirements that are specific to your project or for any Roadway Worker Protection information you may require. Complete copies of these documents for any section you find specifically applicable to your site work can then be obtained under the reference section of the railroad training website www.contractororientation.com.

Federal Railroad Administration Regulations

In December 1996, FRA codified rules and regulations for work at railroad sites in the Federal Register (49 CFR 214). The rule became effective January 15, 1997. The FRA regulations address Roadway Worker Protection, a term which will be used interchangeably with On-Track Safety. The requirements outlined in this document specifically address the requirements of the FRA regulations. Note that BNSF has published the requirements for On-Track safety in BNSF Engineering Instruction No. 1.1 (See Attachment 1).

In an effort to promote uniformity and safety and to minimize the burden on contractors, the FRA concluded that contractors would be expected to comply with compliance programs established by the railroads. To this end, this document reviews the requirements established by FRA and BNSF, as presented to RETEC and our contractors on the BNSF website (www.contractororientation.com).

In summary, the Roadway Worker Protection regulation requires that each railroad devise and adopt a program of on-track safety to provide employees working along the railroad with protection from the hazards of being struck by a train or other on-track equipment. As previously stated, RETEC has adopted BNSF's program documentation. Elements of the on-track program include this document and the summary of references, a clear delineation of RETEC's responsibilities for providing on-track safety (including employee rights), well-defined procedures for communication and protection, and annual on-track safety training.

Basic On-Track Safety Program Requirements

The On-Track Safety Program must be in place when work is to be performed within 25 feet of active tracks, siding, or spurs. As such, the following requirements apply:

- Complete a Contractor Safety Action Plan (see Contractor Safety Action Plan section below) and *submit a copy to the website Webmaste*r and a hard copy to the appropriate BNSF Representative.

- The primary purpose of this document is to establish and document the contact information necessary for responding to emergency situations. Those contacts include medical, police, and fire. An on-line form is available for use, which may be modified for site-specific requirements. The plan should be developed taking into account the following information:
  - Recent Accident History/Goals
  - Employee Training
  - Emergency Preparedness Plan
  - Job Safety Briefings
  - Work Practices/Facility Assessments
  - Safety Communications Plan
  - Process for Addressing Safety Issues
- Notify the Roadmaster, facility manager, or designee in advance of your visit and your plans for work to be conducted, and provide a copy of the Contractor Safety Action Plan to the on-site contact. A copy of the plan should also be maintained by all work groups (notification requirements are clearly identified below). The Roadmaster, or designee, shall be notified prior to performing work within 25 feet of any active tracks, sidings, or spurs.
- In the Contractor Safety Action Plan, establish a protection method within a 25-foot zone (within 25 feet from centerline of the tracks). The method of protection must be approved by the Roadmaster, documented, and carried with the crew performing the work. The established Roadway Worker Protection method may consist of one of the following:
  - No protection
  - Lookout protection (may not be a Contractor or RETEC employee)
  - Lone Worker (may not be a Contractor or RETEC employee)
  - Flagman
  - Derail
  - Flag
- The following types of protection establish a Roadway Worker Protection method if work is to be completed in the foul zone (within 4 feet of the near rail). The method of protection must be approved by the Roadmaster, documented, and carried with the crew performing the work.
  - Derail
  - Flag
  - Flagman
  - Authority
- Personnel on the property must be able to produce a Certificate of Safety Training Card demonstrating that they are current in the Contractor Safety Orientation and that they have read and are familiar with the requirements specified in this document.
- Personnel must participate in a Job Safety Briefing.
- Personnel must follow applicable MOW Safety Rules.

- Personnel must follow applicable MOW Operating Rules.
- Personnel must comply with the Contractor General Safety Requirements.
- Personnel must comply with OSHA and FRA regulations.
- Personnel must obey all traffic control signs, including stop signs (All RETEC and subcontractor personnel must come to a complete stop at ALL STOP SIGNS) and comply with posted speed limits.
- Personnel must operate all vehicles with headlights on and seat belts fastened.
- Personnel must wear hard hats (6-point suspension preferred) for any activities outside the office or vehicles. It is recommended that contractor's supervisory personnel wear hard hats with orange retro-reflective strips to distinguish them from other contractor employees.
- Personnel must wear safety glasses meeting ANSI-Z87.1 standards with side protection, no amber/yellow lenses, no mirrored lenses, and only clear lenses inside buildings. Wrap-around glasses meeting ANSI-Z87.1 standards are permitted.
- Safety toe boots must be worn at all times while on site. Boots must be Class 75, 6-inch, over the ankle, lace-up, safety toe boots with a defined heel, meeting ANSI Z41 PT91 standard.
- Personnel must wear high-visibility, orange retro-reflective vests for any activities outside the office or vehicles (excluding walking to and from vehicles in an established parking lot). Only orange is permitted within 25 feet of the centerline of any active tracks, sidings, or spurs.
- Finger rings, hoop type earrings, and loose jewelry are not permitted on site.

Any questions regarding On-Track Safety/Roadway Worker Protection may be directed to the RETEC EHS Department (978-371-1422 or 412-380-0140) or your local EHS coordinator.

Attachment 1: Summary of Maintenance of Way (MOW) Engineering Instruction 1.1 and FRA Regulation

Reference:	Safety Topic:	Requirement:	Section:
MOW	Core Rules	Job safety briefing	1.1
MOW		Aware of rights and responsibilities	1.2
MOW		PPE understood	1.3
MOW		Tools inspected	1.4.1
MOW		Familiar with tools	1.4.2
MOW		Vehicle trained	1.4.8-9
MOW		Work environment clean, orderly and inspected	1.5.1-2
MOW		Personnel aware of track right-of-way	1.6
MOW	Chem. Safety	Prevention of spills, discharges to environment	2.1-2
MOW		Chemical Spill and Release Emergency Procedures, and Reporting	2.1-2
MOW		Chemical containers labeled	2.3
MOW		Safe atmosphere ventilation	2.4
MOW		Proper cleansing equipment	2.5
MOW		Spill containment and prevention measures	2.6
MOW		Protection from lead, asbestos, manganese, and silica dust	2.7-10
MOW		All chemicals brought on site approved	2.11
MOW	Electrical Safety	Electrical safety followed	3.0
MOW		Clearing and jumping batteries	3.3
MOW	Fire	Area emergency plans and special instructions understood	5.1
MOW		Notification of all personnel effected	5.1
MOW		Aisles, exits, and fire doors clear	5.1
MOW		Fire extinguishers up-to-date and easily accessible	5.3
MOW		Open flames, gasoline/oil-burning devices always attended with extinguisher on hand	5.3.3-4
MOW		Use of highly flammable liquids to start or intensity fire prohibited	5.4
MOW		Fueling only done in safe manner	5.5
MOW		Electrical circuits handled only by those that are experienced	5.6
MOW		HazMat storage and dispensing to be done in groups or by distance using grounding and bonding as needed	5.7
MOW		Use and handling liquefied petroleum gas	5.8
MOW	Hot Work	Welding, cutting, heating, & arc welding done safely	6.0
MOW	Hand Tools	Personnel using hand tools understand use and care	7.0
MOW	Aerial Work	Personnel working aerially understand specific dangers and how to avoid them	9.0
MOW	Material Handling	Storage set up safely, equipment used wisely, regulations and BNSF policies followed	11.1
MOW	Motor Vehicles and Trailers	Know and obey local, state, and federal laws and regulations on and off company property	12.1.1
MOW	On or near tracks	Personnel aware of track right-of-way, and working with the RR equipment they will work with	13.0
MOW	On-Track Machines or Vehicles	Personnel aware of how to use the On-Track equipment they will work with	14.0

Reference:	Safety Topic:	Requirement:	Section:
MOW	Oxygen and fuel gas	Gas cylinders must be tested, handled, and transported safely	15.0
MOW	Power Tools and Machinery	Only authorized personnel who have inspected, insulated, grounded, and understand the equipment may use it	16.0
MOW	Rigging, Cranes, & Hoists	Those working with the equipment understand operation and maintenance	17.0
MOW	Thermite Welding	Only those that are qualified or under the direct supervision of a qualified thermite welder may assist in the process	19.0
MOW	Work Environment	Make certain that all openings in the ground are covered or guarded; do not step or walk over openings	20.1
MOW		Work place clear of obstructions	20.2
MOW		Unauthorized persons must not be on hoists, machines, or any shop machinery, or distract personnel operating those	20.4
MOW		Offices are neat, and equipment not in the way	20.5
MOW		Trenching and shoring must be done under direct supervision of a competent person	20.6
MOW		When working on a tower, personnel follow BNSF rules	20.7-9
MOW		Fall protection equipment should be inspected, cleaned, and stored according to BNSF rules	20.10-11
MOW		Tools and equipment are set up in a secure manner	20.12
MOW		Personnel working in rigging & installation know 3 knots	20.13
MOW	PPE and clothing	All PPE follows BNSF criteria	21.0
MOW	Train and Engine movement	Inspect passing trains	22.0
MOW	Job Tools	Job Safety Briefing, and stretching done by personnel	25.0
MOW	Policies	BNSF policies followed for personnel interactions and work practices	26.0
MOW	Programs	Personnel understand programs that pertain to their work	27.0
MOW	Glossary	Personnel understand those RR words that they may need	40.0
Eng 1.1	Fouling the Track	All personnel must determine if on-track safety is provided when track may be fouled	1.1.1
Eng 1.1	MOW Operating Rules Training	Personnel working <25 feet must have received on-track safety training	1.1.2 C. Contractors
Eng 1.1		Personnel working >25 ft. away must have received on-track safety training if:	1.1.2 C. Contractors
Eng 1.1		Excavation activities could affect the integrity of the track structure	1.1.2 C. Contractors
Eng 1.1		Equipment, such as cranes, could cause fouling of track	1.1.2 C. Contractors
Eng 1.1		Overhead activities, such as stringing power lines, could result in material being dropped on or across the track	1.1.2 C. Contractors
Eng 1.1		When specifically authorized by the BNSF Project Representative, personnel may perform a routing inspection or minor worker without a railroad employee present when:	1.1.2 C. Contractors
Eng 1.1		Personnel working alone is trained/qualified as a lone worker	1.1.2 C. Contractors

Reference:	Safety Topic:	Requirement:	Section:
Eng 1.1		Personnel are protected by a qualified lookout	1.1.2 C. Contractors
Eng 1.1		Although not preferred and must not be done on a routine basis, job safety briefing may be considered as Roadway Worker Protection/on-track safety training when approved by the BNSF Project Representative	1.1.2 C. Contractors
Eng 1.1		Personnel must attend a BNSF Eng./MOW Contractor Safety Orientation class prior to beginning on-site work	1.1.2 C. Contractors
Eng 1.1		Contractor must meet with BNSF Project Representative and establish a project-specific protection/safety strategy	1.1.2 C. Contractors
Eng 1.1	Job Briefing	A briefing must be conducted before anyone fouls a track, when working conditions or procedures change, or when the method of on-track safety is changed, extended, or about to be released	1.1.3
Eng 1.1		Minimum on-track safety information must include:	1.1.3
Eng 1.1		Designation of the employee in charge	1.1.3
Eng 1.1		Method of on-track safety being applied	1.1.3
Eng 1.1		Track limits & time limits of authority	1.1.3
Eng 1.1		Track(s) that may be fouled	1.1.3
Eng 1.1		Operational controls of movements on adjacent tracks, if any	1.1.3
Eng 1.1		Procedure to arrange for on-track safety on adjacent tracks, if necessary	1.1.3
Eng 1.1		Means of providing a warning when a lookout is used	1.1.3
Eng 1.1		Designated place of safety where workers will be clear for trains	1.1.3
Eng 1.1		Designated work zones around machines	1.1.3
Eng 1.1		Safe working & traveling distances between machines	1.1.3
Eng 1.1		There are briefing specifics for lone workers as well	1.1.3
Eng 1.1	On-Track Safety Procedures	MWOR Rules 6.3.1-5 cover authority, responsibilities, and protection for main tracks, controlled sidings, and other tracks	1.1.4 A-C
Eng 1.1		Lone worker & lookouts must use the "Statement of On-Track Safety" as described in MWOR Rule 6.3.3, "Visual Detection of Trains"	1.1.4 D.
Eng 1.1		When large-scale maintenance & construction crews are within <25 ft. from another live track, this section must be reviewed	1.1.4 E.
Eng 1.1	Audible Warning From Trains	General Code of Operating Rules (GCOR) Rule 5.8.2, "Sounding Whistle," requires trains & engines to sound whistle & ring bell when approaching roadway workers	1.1.5
Eng 1.1	On-Track Safety Procedures in Effect	Management & individual roadway workers share the responsibility for ensuring that proper on-track safety procedures are followed when workers are fouling the track	1.1.6
Eng 1.1		Contractors must create & implement procedures as stringent as the BNSF Program	1.1.6 C. Responsibilities of Contractors
Eng 1.1		All roadway workers have the right to challenge, in good faith, the on-track safety procedures applied at their work location	1.1.6 D. Challenges to Procedures

Reference:	Safety Topic:	Requirement:	Section:
Eng 1.1	Requirement for Operating Roadway Machines	Personnel operating roadway machines must understand and comply with requirements	1.1.7
Eng 1.1	Spacing of On-Track Equipment	If on-track equipment is used, workers and machine operators must follow the guidelines for maintaining safe distances	1.1.8
Eng 1.1	Traveling On-Track Equipment	Personnel operating roadway machines must understand and comply with requirements	1.1.9
Eng 1.1	On-Track Safety Program Documentation	All employees subject to these rules are required to have a current copy they can refer to while on duty	1.1.10
Eng 1.1		All MWOR-qualified employees shall be provided with and must maintain copy of Eng. Instruction 1 Safety	1.1.10
Eng 1.1		MWOR-qualified employees will take annual written exams to help monitor their compliance with the program	1.1.10
49 CFR 214	RR On-Track Safety Programs generally	RRs shall adopt and implement their own program for on-track safety, which meets federal minimum standards	214.303
49 CFR 214	On-Track Safety Program Documents	RR must have all on-track safety rules in one place, easily accessible to roadway workers	214.309
49 CFR 214		Contractors must provide a manual to its employees and know its employees are knowledgeable about its contents	214.309
49 CFR 214		The manual must be at the work site available for reference by all roadway workers	214.309
49 CFR 214	Responsibility of Employers	Personnel must be trained & supervised to work with the on-track safety rules at the work site	214.311
49 CFR 214		Personnel may challenge, in good faith, on-track safety rules compliance, without censure, punishment, harm or loss	214.311
49 CFR 214	Responsibility of Individual Roadway Workers	Personnel may not foul a track unless necessary to accomplish their duties	214.313
49 CFR 214		Personnel must know that on-track safety is being provided before fouling a track, remain clear of the track, and inform the employer when their required level of protection is not provided	214.313
49 CFR 214		Personnel must inform employer of good faith concerns they may have with on-track safety	214.313
49 CFR 214	Supervision & Communication	Personnel must know and acknowledge understanding of on-track safety methods prior to commencing duties on or near the track	214.315
49 CFR 214		A job briefing must occur at the beginning of each work period, where personnel acknowledge understanding	214.315
49 CFR 214		At least one roadway worker must provide on-track safety while a group is working together, either for the job or the specific work condition	214.315
49 CFR 214		The on-track safety responsible worker must conduct a safety briefing prior to the beginning of work, near track, or before changing on-track methods during a work period	214.315
49 CFR 214		Personnel must also be briefed to immediately leave the fouling space and not return until on-track safety is reestablished	214.315

Reference:	Safety Topic:	Requirement:	Section:
49 CFR 214		Lone workers must also have a safety briefing with a supervisor or another designated employee to advise them of their itinerary and the means by which they plan to protect themselves	214.315
49 CFR 214		The lone worker briefing must include geographical location, period of time at that location, different locations planned that day, and planned method of protection	214.315
49 CFR 214		The lone worker must be capable of determining their proper means to achieve their safety	214.315
49 CFR 214		If channels of communication are disabled, the briefing must be conducted as soon as possible after communication is restored	214.315
49 CFR 214	On-track Safety Procedures Generally	One or more of these types of procedures should be used when personnel foul a track	214.317
49 CFR 214		Fouling: distance limit of 4 ft. from the outer side of the running rail nearest to the roadway worker, or outside of that distance if expected or potential activities or surroundings could cause movement into the space that would be occupied by a train, or if components of a moving train could extend outside the 4-foot zone	214.317
49 CFR 214	On-track Safety Procedure: Working Limits	Procedure described in subpart	214.319
49 CFR 214	On-track Safety Procedure: Exclusive Track Occupancy	Procedure described in subpart	214.321
49 CFR 214	On-track Safety Procedure: Foul Time	Procedure described in subpart	214.323
49 CFR 214	On-track Safety Procedure: Train Coordination	Procedure described in subpart	214.325
49 CFR 214	On-track Safety Procedure: Inaccessible Track	Procedure described in subpart	214.327
49 CFR 214	On-track Safety Procedure: Train Approach Warning Provided by Watchmen/ Lookouts	Procedure described in subpart	214.329
49 CFR 214	On-track Safety Procedure: Definite Train Location	Procedure described in subpart	214.331
49 CFR 214	On-track Safety Procedure: Informational Lineups of Trains	Procedure described in subpart	214.333
49 CFR 214	On-track Safety Procedures for Roadway Work Groups	Employers shall not require or permit roadway work groups to foul a track unless they have established on-track safety through working limits, train approach warning, or definite train location	214.335
49 CFR 214		Personnel should not foul a track without having been informed by the roadway worker in charge that on-track safety is being provided	214.335

Reference:	Safety Topic:	Requirement:	Section:
49 CFR 214		When risk of distraction is significant and there is a need to provide on-track safety on adjacent tracks, train approach warning must be used on adjacent tracks that are not within working limits	214.335
49 CFR 214		Adjacent track: <25 ft between track centers, those tracks at 25 ft are not	214.335
49 CFR 214	On-track Safety Procedures for Lone Workers	The decision to not use individual train detection should rest solely with the lone worker, and may not be reversed by any other person	214.337
49 CFR 214		There is a method where the lone worker is capable of visually detecting the approach of a train & moving to a previously determined location of safety at least 15 seconds before the train arrives, but this method is only used under strict circumstances	214.337
49 CFR 214	Roadway Maintenance Machines	There is a general requirement for on-track safety around roadway maintenance machines that requires that the details be provided by RR management, conferring with their employees, and industry suppliers	214.341
49 CFR 214	Training & Qualification, General	Personnel must be given on-track safety training once every calendar year, with the designation of personnel determining what training that entails; this training must be documented written or electronically	214.341
49 CFR 214		Personnel must be able to show sufficient understanding of the subject, and that they can perform their duties	214.341
49 CFR 214	Training for All Roadway Workers	Personnel must have the basic training set forth in this rule, as well as specialized training required for particular functions called for in 214.347-214.355	214.345
49 CFR 214	Training for Lone Workers	This section requires a higher degree of qualification, as the worker is fully responsible for their own safety	214.347
49 CFR 214	Training for Watchmen/ Lookouts	This section details the standards for qualification of a lookout, who is responsible for the protection of others	214.349
49 CFR 214	Training for Flagmen	This section requires that flagmen be qualified on the operating rules of the RR on which they are working	214.351
49 CFR 214	Training & Qualification of Roadway Workers who provide on-track safety for Roadway Work Groups	Individual must be able to apply the proper on-track safety rules and procedures in various circumstances, to communicate with other RR employees regarding on-track safety procedures, and to supervise other roadway workers in the performance of their on-track safety responsibilities	214.353
49 CFR 214		A recorded examination is also part of the qualification process for providing on-track safety for roadway work groups	214.353
49 CFR 214	Training & Qualification in On-track safety for operators of roadway maintenance machines	Operators of roadway maintenance machines must have been trained with the type of machine to be operated, and their circumstances and conditions under which it is to be operated	214.355

Attachment 2: Additional On-Track Safety Information

On-track safety is an important part of our work as it relates to all railroads throughout the U.S. The following sections will outline some general topics of discussion and a synopsis of the different forms of protection offered by the railroad to its employs and contractors.

When working on railroad property, it is important to determine the following information.

General Topics

Where are you going to be working on the railroad? The following information needs to be determined:

- Line segment
- Mile Post (MP)
- Track segment
- Nearest crossing
- Railroad name for the location
- Track designation (Track One is mainline, etc.)
- Railroad direction (North, South, East, and West in railroad terms does not necessarily correspond to compass points)
- Nearest two switch points in both directions
- If in a switchyard (flat or hump), determine specific track number designations
- What Valuation Map numbers cover the segment of track you are working on (this may be difficult to determine and may have to be determined in follow up conversations)

You have now arrived at a point where you know where you are on the railroad. Why is this important?

- Communication with railroad personnel
- Standardizes communication
- Pinpoints your location such that the railroad can now protect you while on the property. (THIS IS FOR YOUR SAFETY.)
- Reduces potential liability for inappropriate actions that can interfere with railroad operations

Communication with railroad employees is one of the single most important and compelling needs to be accomplished while working on railroad property. **Documentation in "field notes" and Record of Communications are VERY important.** Prior to departure to a railroad job site, know whom you are working for, their phone numbers, cell numbers, and specific title at the railroad. This information may be critical if you are questioned by other railroad employees as to why you are on the property and for whom you are working. Upon arrival at a job site, identify yourself to the designated contact and exchange communication information. Every situation will be different. If your contact is a Roadmaster, find out his/her specific office location; ask what his/her territory limits are. Ask him/her to identify any other railroad employee that you will be working with and how you can communicate with them. Log in your "field notes" these introductions, time, and date. Always alert railroad employees as to when you are on the property and when you are leaving, even for lunch. Ask the railroad employees what their normal scheduled start and stop times are for work. Ask who their replacement will be, if you are scheduled to work past their shut-off time. Make sure, through some form of general conversation, that multiple departments within the railroad know you are on the property. Railroads are

compartmentalized similar to other companies and some times the right hand does not know what the left is doing. Knowledge of the general operating structure of the railroad is important and can keep you safe.

Protection Offered by the Railroad
Now that you know where you are on the railroad property and you have established lines of communication with "in-field" railroad employees, you need to tell them exactly what you are going to do and the duration.

"I will be excavating within 25 feet of centerline of the track between milepost 165.1 and 165 on the High Line at various locations. This location is railroad east of Blacktail Mountain and railroad west of East Glacier. I understand that this is dual line main track with DTC (Direct Terminal Control). The nearest crossing is approximately 11.5 miles railroad east at East Glacier. I will be excavating small test pits approximately 6 feet in depth and 10 feet long to take samples. I will not excavate any closer than the end of the tie. We will not cross any tracks, all excavation activities will occur on the geographic south side of the track. Upon completion of sampling, the hole will be backfilled and field compacted. We will work from 7.00 am MST and finish at 5.00 pm MST. There will be four employees involved with the work, one will operate a Case 560 backhoe, two will be taking samples and the other employee will provide safety watch. I am under contract to BNSF for Mr. Mike Perridone, Manager of Environmental Remediation with BNSF at Havre, MT.; we anticipate this work will take 3 days." Now you have established the, who, what, when, where, and why. First you are on dual main line track. This line handles not only 30 general commodities train units per day, but 6 high-speed Amtrak trains. This is a remote location, depending on the time of year; weather conditions access and communications will be difficult. The railroad now has to take the information you provided and will determine what level of protection you will need.

General Code of Operating Rules
Fourth Edition, Effective April 2, 2000
General Code of Operating Rules Committee

This section provides an overview of the specific sections of the General Code of Operating Rules that explain the different levels of protection offered for accepting railroads. It does not evaluate the specific forms of protection offered by BNSF that may vary from this General Code. Some sections may contradict, overlap, and amplify other sections. The most important information to extract from this is the various forms of protection. As an individual contractor/consultant, you will have little, if any, input on the form of protection that the railroad provides. Many factors have to go into this decision, which include traffic patterns, work schedules, manpower, union operating rules, and other financial considerations. Use this as a general level of guidance to educate and protect you (crews) from potential safety-related issues while on railroad property.

Section 5.4 Flags for Temporary Track Conditions

This section outlines the specific flagging protection offered for "Temporary Track Conditions". In general, this can be a Yellow Flag or Yellow/Red Flag, which is a not specified by track bulletin, track warrant or general order. In essence, once a train crew observes the flags, they must proceed with caution and/or stop. This means trains will still move, although slower, and must visually watch out for your work areas.

Section 5.13 Blue Signal Protection of Workmen

This rule outlines the requirements for protecting railroad workmen (and contractors) who are inspecting, testing, repairing, and servicing rolling equipment. In particular, because these tasks require the workmen to work on, under, or between rolling equipment, workmen are exposed to potential injury from moving equipment. In most railroads, this can be a blue light or flag. The railroad employee locks out the switch points leading to this section of track. In most cases, you will find this applied in a yard, industrial track, or siding.

Section 6.31 Train Coordination

Employees may use a train's authority to establish working limits for track maintenance. To establish the working limits, the train must be in view and stopped. The employee in charge of working limits will communicate with a member of the train crew and determine its movement and authority to be released.

In essence, the track section is protected by the fact that there is a train on the track and it is stopped in view. The train crew and its train effectively protect this section. Sub-section B effectively creates a track permit authority within the train's limits.

Section 7.13 Protection of Employees in Bowl Tracks

During humping operations, before a train or yard crew member goes between engines or cars on a bowl track to couple air hoses, adjust coupling devices, or maintenance; protection must be provided against cars released from the hump into the tracks.

This is a very dangerous situation in railroad work. Working in a hump yard can be deadly. Cars released into a bowl will be silent as they move and can strike without a sound. Notification must be made to the Yardmaster, follow up with the Terminal Superintendent and, most importantly, the Tower Operator. Make sure tracks are taken out of service and lined against a movement.

Section 9.15 Track Permits

On track designated in the timetable, a track permit will authorize a train, track car, machine, or employee to occupy the main tracks between specific points. The track permit must be issued by a designated control operator under the direction of the train dispatcher. Within these limits, movements may be made in either direction.

This may be the highest level of track protection, insofar as it is a scheduled occupancy of the track and no movement will take place without specific instructions. Note that even with the permit, some movements could occur.

Section 10.3 Track and Time

The control operator may authorize a train (equipment and/or people) to occupy a track or tracks within specified limits for a certain time period. Authority must include track designation, track limits, and time limit. The train (equipment and/or people) may use the track in either direction within the specified limits, until the limits are verbally released. This is a high end of protection; it gives you a specified time and duration. Remember the railroad is a dynamic world and situations change; keep in close contact with your flagman.

Section 14.0 Rules Applicable Only Within Track Warrant Control (TWC) Limits

Where designated by the timetable, a track warrant will authorize use under the direction of the train dispatcher or as prescribed by Rule 6.13 (Yard Limits) or Rule 6.14 (Restricted Limits). Track warrant instructions must be followed where yard limits or restricted limits are in effect. A track warrant is a written form filled out and is posted notifying railroad employees of the conditions under which operations are to be/or not conducted on this track segment. Strict speed conditions are set for train traffic and the train crew must contact crews working in this area before entering the limits of the warrant.

Section 15.1 Track Bulletins

Contain information on all conditions that affect safe train or engine movement. A Track Bulletin is somewhat similar to a Track Warrant.

Section 15.2 Track Bulletin Form B

A Form B is a combination of Rule 5.4 and, to a degree, Section 10.3. It is a verbal radio message that protects the track and has very specific format for transmittal of information. It is a verbal form of communication and authorization, which although provides a good level of protection, train traffic is still permitted in the work area. The use of a Form B is prevalent and again close coordination with the flagman is paramount. In all these situations where permission, authorizations and/or changes are made to the operations by verbal communication, it is occurring on a railroad radio. Document in field notes communication with the flagman and what his/her specific instructions are.

Appendix C

RETEC Field Methods

Table of Contents

1.0 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
    - Media sampled (soil, sediment, groundwater, etc.)
    - Sample collection method
    - 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)
- Information pertaining to sample documentation such as:
  - Bottle lot numbers
  - Dates and method of sample shipments
  - Chain-of-Custody (COC) Record numbers
  - Federal Express Air Bill Number

2.0 Field Equipment Decontamination and Management of Investigation Derived Wastes

2.1 Decontamination Area

A temporary decontamination area lined with polyethylene sheeting will be constructed on-site for decontaminating the drilling equipment. Water generated from the decontamination activities will be collected in 55-gallon drums and managed as Investigation Derived Waste (IDW).

2.2 Equipment Decontamination

The following procedures will be used to decontaminate equipment:

- 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 or hot water pressure washing unit, as appropriate, before beginning work.
- Tools, drill rods, and augers will be placed on sawhorses or polyethylene plastic sheets following steam cleaning or pressure washing. Direct contact with the ground will be avoided.
- All augers, rods, and tools will be decontaminated as needed between sampling locations to ensure collection of representative samples.
- The back and tires 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.

2.3 Sampling Equipment Decontamination

2.3.1 Suggested Materials:

- Potable water
- Phosphate-free detergent (e.g., Alconox™)
- Reagent-grade methanol or isopropanol
- Distilled water
- Aluminum foil
- Plastic/polyethylene sheeting
- Plastic buckets and brushes
- Personal protective equipment in accordance with the HASP

2.3.2 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 (such as Alconox™). 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.

2.4 Management of Investigation Derived Wastes

2.4.1 Decontamination Fluids

Steam-cleaning and decontamination fluids will be collected in 55-gallon drums. The drums will be labeled as investigation derived wastewater and subsequently characterized and properly disposed.

2.4.2 Drill Cuttings

Visibly impacted drill cuttings will be contained in 55-gallon drums. The drums will be labeled as investigation derived waste soils and subsequently characterized and properly disposed.

2.4.3 Well Development and Purge Water

All well development and purge water will be contained in 55-gallon drums. The drums will be labeled as investigation derived wastewater and subsequently characterized and properly disposed.

2.4.4 Personal Protective Equipment

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

2.4.5 Non-Reusable Sampling Equipment

All non-reusable groundwater sampling equipment, if used, will be placed in 55-gallon drums for proper disposal.

3.0 Drilling, Well Installation and Development, and Soil Sampling Procedures

3.1 Introduction

Drilling activities potentially include:

- Soil borings using direct push drilling with continuous sampling.
- Soil boring using hollow stem augers (HSAs) and continuous split spoon sampling

These procedures are described in the following section.

3.2 Soil Borings and Subsurface Soil Sampling

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

3.2.1 Suggested Equipment

- Field book
- Project plans
- Personal protective equipment in accordance with the HASP
- Metal detector
- Stakes and flagging
- One pint containers for lithology samples
- Tape measure
- Decontamination supplies
- Water level indicator
- Photoionization detector (PID) with a 10.2 or 10.6 eV lamp
- Camera
- Clear tape, duct tape
- Aluminum foil
- Laboratory sample bottles
- Coolers and ice
- Shipping supplies (i.e. packing materials, tape)

3.2.2 Drilling and Geologic Logging Method

- Soil borings will be advanced using a direct push and or hollow stem auger drilling methods.
- Soil samples will be collected continuously to the bottom of the borings using 5 to 10-foot long 4-inch diameter sonic sample bags or 4-foot long, 2-inch diameter macro core samplers or 2-foot long by 2-inch diameter split spoon samplers.

- Soil samples retrieved from the borehole will be visually described for:
    - Percent recovery
    - Soil type
    - Color
    - Moisture content
    - Texture
    - Grain size and shape
    - Consistency
    - Visible evidence of staining
    - Any other observations
- The descriptions will be in accordance with the Unified Soil Classification System (USCS), American Society for Testing and Materials (ASTM) guidelines, or the modified Burmeister system.
- Soil samples will be immediately screened for the volatilization 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. Aluminum foil will be placed on the top of the jar and the cap will be screwed on tightly.
- After a minimum of 10 minutes, the lid will be unscrewed and the tip of the PID will be inserted through the aluminum foil across 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 the procedure for the management of IDW.
- All borings will be completed as monitoring wells, backfilled with cuttings if soil is not impacted, or sealed with bentonite or cement/bentonite grout following completion.
- All drilling equipment will be decontaminated between each boring in accordance with methods specified in the procedure for field equipment decontamination.
- The designated field geologist will log borehole geology and headspace measurements in the field book and the drilling record along with any other observations (e.g. odors, NAPL, soil staining, etc.).

3.2.3 Soil Sampling

- Samples for VOC analyses will be collected directly from the macro cones or split spoons, placed into appropriate containers, and compacted to minimize head space and pore space. The remaining sample volume will be placed into a stainless steel bowl or plastic bag, 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.
- The sampling equipment will be decontaminated between samples in accordance with procedures described in the procedure for field equipment decontamination.
- Excess soil remaining after sampling will be contained in accordance with methods specified in the procedure for the management of IDW.
- The sample locations, descriptions, and depths will be recorded in the field book.

3.3 Monitoring Well Installation and Development

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

3.3.1 Suggested Equipment

- Field book
- Project plans
- Personal protective equipment in accordance with the HASP
- Tape measure
- Decontamination supplies
- Water level indicator
- PID
- Camera
- Polyethylene disposable bailers (for development)
- Polypropylene rope (for development)
- Waterra pump or other purge pump (for development)
- Stainless steel or glass beakers (for development)
- Turbidity meter (for development)
- Temperature, conductivity, pH meter (for development)

3.3.2 Monitoring Well Installation

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.
- Wells will be constructed with two-inch, inside diameter (ID), threaded, flush-joint, PVC casings and screens.
- Screens will be 10 feet long with 0.01-inch or 0.02-inch slot openings with a 2-foot sump at the base. Alternatives may be used at the discretion of the field geologist and approval of KeySpan, 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 ground surface. The grout will be pumped through a tremie pipe 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 locking expandable gas-tight cap and will be either contained in a flush-mounted vault or protected with a steel stickup outer protective casing and bollards.

- The concrete seal or pad will be sloped to channel water away from the well, and be deep enough to remain stable during freezing and thawing of the ground.
- 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 a construction log.

3.3.3 Monitoring Well Development

- After a minimum of 24 hours after completion, the monitoring wells will be developed by surging and pumping. Pumping methods may include using a centrifugal or peristaltic pump and dedicated polyethylene tubing, using 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 turbidity meter will be used to make this measurement.
- Development water will be contained in accordance with methods specified in the procedure for the management of IDW.
- Following development, wells will be allowed to recover for at least 14 days before groundwater is purged and sampled. All monitoring well development will be overseen by a field geologist and recorded in the field book.

4.0 Groundwater Sampling Procedures

4.1 Introduction

Groundwater sampling will be conducted at the site. Procedures for obtaining samples of groundwater are described in this section.

4.2 Suggested Equipment and Supplies

- Field book
- Project plans
- Personal protective equipment in accordance with the HASP
- Water level indicator
- Disposable polyethylene bailers or low flow sampling pump
- Polypropylene rope
- Plastic tubing
- Temp, conductivity, pH meters
- Turbidity meter
- Dissolved oxygen meter
- 250-mL glass beaker
- Flow through cell (if low flow sampling pump is used)
- Decontamination supplies
- Plastic sheeting
- PID
- Clear tape, duct tape
- Coolers and ice
- Laboratory sample bottles
- Federal Express labels

4.3 Groundwater Sampling Method

4.3.1 Purging

- The number and frequency of groundwater samples to be collected and the associated analytical parameters are summarized in the RI 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. NAPL thickness will be confirmed using a clear bailer or a weighted string. The measurements will be recorded in the field book.

- The probe will be decontaminated according to procedures outlined in the procedures for field equipment decontamination.
- The well will be purged by removing groundwater until field parameters stabilize to within 10% of previous reading or 1 hour of purging is performed. Purging will be conducted using a low-stress sampling technique consistent with the USEPA Region 1 Low-Stress sampling guidance.
- 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 parameters are met, and sampled when it recovers sufficiently, in accordance with low flow sampling protocol.
- Purge water will be managed and disposed of in accordance with procedures described in the management of IDW.

4.3.2 Sampling

- Samples will be collected using dedicated ¼" polyethylene tubing and micro purging techniques consistent with low flow sampling protocol.
- Prior to filling the sample bottles, one 250-mL beaker will be filled with water. The temperature, pH, conductivity will oxidation reduction potential, dissolved oxygen, and turbidity will be measured with a pre-calibrated probes and recorded in the field book. If low flow sampling methods are used, these parameters (except turbidity) will be measured within a flow through cell.
- 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.
- Well sampling data will be recorded on groundwater sampling records.

5.0 Aquifer Slug Test

5.1 Introduction

Slug tests are performed to obtain hydraulic conductivity estimates from groundwater monitoring wells on a site. These tests involve the instantaneous injection or withdrawal of a small volume of water followed by monitoring the time and water-level recovery back to the static pre-test condition.

5.2 Suggested Equipment and Supplies

Following is a list of conventional field equipment needed to perform a slug test:

- A solid pipe slug, or bailer and cord
- A pressure transducer and data logger, or manual electric water-level indicator
- Wrist watch or stop watch to note starting time and elapsed time
- Decontamination equipment and solutions
- Slug test form or field book

The following considerations should be made based upon site conditions:

- The fluid-level measuring device will be dependent on site conditions. The presence of NAPL will require the use of an electric-interface probe capable of measuring depths to the top of each fluid.
- When testing wells completed in highly transmissive aquifers, a transducer and data logger should be used in order to measure rapid changes in the water level after starting the test. Inserting the transducer probe will initiate a change in the water level, which should be allowed to re-equilibrate to static before starting the test. The transducer must have the right resolution for the anticipated maximum change in water level.
- If the well is expected to respond very slowly to the initial change in water level, a manual system of measurement should be used.
- A slug should be selected that is large enough to create the most change in static- water level and short enough to be completely submerged. If the slug is to remain in the well, position it to one side so that it does not interfere with later water-level measurements or the static height of the transducer. If a solid slug is to be removed, allow time after insertion of the slug for the pre-test water level to re-equilibrate to static before starting the test.

5.3 Methods and Procedures

This section describes methods and procedures for conducting a slug test.

5.3.1 Types of Slug Tests

- A “rising head” slug test is one in which the initial change serves to lower the water level or hydraulic head in the well.
- A “falling head” slug test is one in which the initial change serves to raise the water level or hydraulic head.

- When the initial change in water level occurs entirely within the blank well casing above the well screen or open hole, either test should provide the same analytical results.
- When the initial change is entirely within the well screen or open hole zone, the two different test methods will produce results that will likely differ. On wells with this condition, perform both a rising and falling head test, and compare the analytical results of each method.
- Pouring clean water into a well from the top of casing is not considered standard practice, but can be used in the absence of a solid slug or bailer. If water is used as a slug, it can be removed with a clean bailer. Use of a pump to instantaneously remove the water is not considered standard practice, but could be considered if the well and static-water levels are so deep that use of a slug is impractical. The use of equipment to instantaneously pressurize a sealed well, or to release water from a shut-in artesian well are acceptable, but are also not considered part of the standard practice described here.

5.3.2 Pre-Test Information

The following steps are to be followed when performing a slug test on a non-flowing well. These steps pertain to both transducer/data logger tests and manual tests.

- Note of the well construction information: diameter, depth, depth of screen interval and filter pack or open rock hole, composition and thickness of the filter pack, age of the well.
- General aquifer conditions such as confined or unconfined, total thickness, and percent of penetration by the test well are optional for the slug test form but will be needed for data analysis
- Observe and make note of the static pre-test water levels, date of the test, and clock time of the static-water level. Make a note of the weather conditions at the start of the test. Also note any major changes in the weather that occur in longer term tests since these are an indirect measure of barometric pressure changes, which may affect water levels.
- Provide information on the slug test form regarding type, dimensions, and volume of the slug to be used in the test. Using a specific volume-per-foot ratio for the given inside diameter of the test well, estimate about how much water-level change will occur when the slug is introduced or removed.

5.3.3 Slug Testing - Transducer/Data Logger

The following steps are for the use of a transducer and data logger system.

- Insert the transducer probe in the well approximately 0.5 feet off the bottom of the well. Secure the probe cable to the protective well casing and turn on the data logger. Calibrate the data logger reading to an equivalent static-water level depth equal to that measured manually. The data logger can also be set to read zero, in which case negative numbers will relate to a lowering of the static head and positive numbers will relate to a raising of the static head. Program the frequency of measurements and the density of the fluid in the data logger.
- Start the logging program and take a final depth-to-water measurement just prior to starting the test. Note the measurement and clock time on the slug test form. Start the test by smoothly removing or inserting the slug, so as not to disturb the transducer elevation. Make note of the start time on the slug test form.
- Check periodically to see if the initial water level or data logger reading is being approached. Stop the test when the pre-test water level has been reached for wells that recover within one day, or after about 80 percent of the initial change has recovered if several days or weeks have elapsed since starting the test.
- When using a transducer/data logger system, take periodic manual measurements of the water level as a check on the transducer readings.

5.3.4 Slug Testing - Manual

The following steps are for a manual test using an electronic water-level probe.

- Take a final depth-to-water measurement just prior to starting the test. Note the measurement and clock time on the slug test form. Start the test by removing or inserting the slug making note of the start time on the slug test form.
- Observe manual water levels at increasing time intervals and make note of these along with the clock time of each measurement on the slug test form. Make manual observations at least as frequently as follows:
    - Time zero to 5 minutes -- every 30 seconds
    - 5 to 15 minutes -- every minute
    - 15 to 60 minutes -- every 5 minutes
    - 60 to 120 minutes -- every 15 minutes
    - 120 minutes to 10 hours -- every hour
    - 10 to 48 hours -- every 12 hours
    - 48 hours to completion -- every 2 days
- Make elapsed time calculations in the field and observe the general rate of recovery back to the pre-test static water level. Stop the test when the pre-test water level has been reached for wells that recover within one day, or after about 80 percent of the initial change has recovered if several days or weeks have elapsed since starting the test.

5.4 Documentation

The slug test form and or the project field book will be maintained as a part of the slug test results. These documents will provide a summary of the slug test method, site and weather conditions, and the slug test data. These documents will be kept in the project files for reference.

6.0 Soil Gas and Ambient Air Sampling Procedures

The following methods will be used for collecting soil gas and ambient air samples.

6.1 Suggested Equipment

- Field book
- Project plans
- Personal protective equipment in accordance with the HASP
- Metal detector
- Tape Measure
- Decontamination supplies
- Water level indicator
- Hand Auger
- Geoprobe hammer and rods
- Disposable (Teflon or polyethylene) ¼-inch tubing
- Photoionization detector (PID) with a 10.2 or 10.6 eV lamp
- Helium
- Helium meter
- Tedlar bags and/or plastic sheeting
- Bentonite
- Camera
- Clear tape, duct tape
- Laboratory sample canisters
- Shipping supplies

6.2 Soil Gas Sampling Protocols

6.2.1 Soil Gas Sample Collection Documentation Requirements

When soil gas samples are collected, the following actions will be taken to document local conditions during sampling that may influence interpretation of the results:

- outdoor plot sketches will be drawn that include the site, area streets, paved areas, neighboring commercial or other facilities (with estimated distance to the site)
- outdoor ambient air sample locations, and compass orientation (north)
- weather conditions (e.g., precipitation, outdoor temperature, barometric pressure, wind speed and direction) will be noted for the past 24 to 48 hours
- any pertinent observations should be recorded, such as odors and readings from field instrumentation, significant activities in the area, etc.

The field sampling team will maintain a sample log sheet summarizing the following:

- sample identification
- date and time of sample collection
- sampling depth
- identity of samplers
- sampling methods and devices
- purge volumes
- volume of soil vapor extracted
- the vacuum before and after samples collected
- apparent moisture content (dry, moist, saturated, etc.) of the sampling zone
- chain-of-custody protocols and records used to track samples from sampling point to analysis

6.2.2 Soil Gas Probe Installation

- Soil gas probe installations will be temporary and will be constructed in the same general manner at all sampling locations to minimize possible discrepancies.
- Following utility clearance procedures, a ¾-inch diameter hole will be drilled through the concrete slab. Teflon tubing will be placed in the hole and an air-tight seal will be created by filling the space between the tubing and the concrete with hydrated bentonite clay or modeling clay.
- The tubing will be attached to the sampling canister with Swagelok™ fittings.

6.2.3 Soil Gas Purge and Sample Collection Procedures

- Helium will be used as a tracer gas to verify that adequate sampling techniques are being implemented. Plastic sheeting or a tedlar bag will be adhered to the surface around the soil gas probe point (with tape or clay) into which helium will be introduced.
- Shortly after the installation of temporary probes and introduction of the tracer gas, one to three sample probe volumes will be purged using a PID as a vacuum pump prior to collecting the samples to ensure samples collected are representative. Flow rates for both purging and collecting will not exceed 0.2 liters per minute to minimize outdoor air infiltration during sampling;
- Purge samples will be collected in Tedlar® bags and screened with a helium meter to assess the integrity of the seal. If greater than 2% helium is detected in the purge sample, the seal will be modified to prevent outside air infiltration. Ideally, soil gas samples will not be collected until purge samples are shown to contain less than 2% helium. In no instances will soil gas samples be collected if purge samples are shown to contain greater than 20% helium.
- Samples will be collected in laboratory-certified clean 6-liter Summa canisters over a two-hour time period following verification of seal integrity.

6.3 Ambient Air Sampling Protocols

Ambient air samples will be collected from inside the buildings where the soil gas samples are being collected and from an outside upwind location. They will be collected concurrently with subsurface soil gas samples.

6.3.1 Outdoor Air Sample Collection Documentation Requirements

When ambient air samples are collected, the following actions will be taken to document local conditions during sampling that may influence interpretation of the results.

- outdoor plot sketches will be drawn that include the building site, area streets, outdoor air sample locations (if applicable), the location of potential interferences (e.g., gasoline stations, factories, lawn movers, etc.);
- weather conditions (e.g., precipitation, temperature, and barometric pressure) wind direction (compass orientation); and
- any pertinent observations, such as odors, readings from field instrumentation, and significant activities in the vicinity (e.g., operation of heavy equipment or dry cleaners)

The field sampling team will maintain a sample log sheet summarizing the following:

- sample identification
- date and time of sample collection
- sampling height
- identity of samplers
- sampling methods and devices
- volume of outside air soil vapor sampled
- the vacuum before and after samples collected
- chain-of-custody protocols and records used to track samples from sampling point to analysis

6.3.2 Ambient and Inside Air Sample Collection

- Ambient air samples will be collected from a representative upwind location and from inside areas where the soil gas samples are collected.
- The outside sample will be collected away from wind obstructions (e.g., trees or bushes), and at a height above the ground to represent breathing zones (3 to 5 feet).
- Samples will be collected using laboratory certified clean 6-liter Summa canisters over a two-hour time period concurrent with the time period that the soil gas samples are collected.

6.4 Sample Handling and Shipment

All sample canisters will be handled with gloves in a clean environment. The sample canisters will be properly labeled and kept at ambient temperature. Chain-of-custody procedures will be followed and canisters will be shipped to an ELAP-certified laboratory for appropriate analyses.

7.0 Air Monitoring

7.1 Introduction

Two types of real-time air monitoring will be performed during the investigation:

- breathing zone monitoring for protection of the workers performing the investigation
- community air monitoring at the perimeter of the work site for protection of the community.

7.2 Breathing Zone Air Monitoring During Drilling and Sampling

Air monitoring of the breathing zone within the work site will be conducted periodically during all drilling and sampling activities to assure proper health and safety protection for the team.

- An organic vapor meter equipped with a photoionization detector (PID) will be used to monitor for volatile organic compounds or other organic vapors in the breathing zone and borehole.
- Additional air monitoring (i.e. Draeger tube sampling for benzene) may be required as specified in the site-specific health and safety plan.

The PID readings will be recorded in the field book and on the boring log during drilling activities. The procedure for the PID operation and calibration is included in the field instrument calibration procedures and the HASP. Note that equipment calibration will be performed as often as needed to account for changing conditions or instrument readings. The minimum frequency of calibration is specified in the field instrument calibration procedures; more frequent calibration will be performed if spurious readings are observed or there are other problems with the instruments.

7.3 Community Air Monitoring

Community air monitoring requires real-time monitoring for volatile organic compounds (VOCs), particulates (i.e., dust), and MGP related odors at the downwind perimeter of each designated work area when certain activities are in progress at contaminated sites. The community air monitoring is not intended for use in establishing action levels for worker respiratory protection. Rather, its intent is to provide a measure of protection for the downwind community (i.e., off-site receptors including residences and businesses and on-site workers not directly involved with the subject work activities) from potential airborne contaminant releases as a direct result of investigative and remedial work activities. The action levels for community air monitoring require increased monitoring, corrective actions to abate emissions, and/or work shutdown. Additionally, community air monitoring helps to confirm that work activities do not spread contamination off-site through the air.

The procedures and action levels for community air monitoring are outlined in detail in the HASP.

8.0 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 Quality Assurance Officer (QAO). Copies of all of the instrument manuals will be maintained on-site by the Field Team Leader. All changes to instrumentation will be noted in the field log book.

The following field instruments may be used during the investigation and subsequent activities:

- PID
- pH probe
- Mini-RAM dust meter
- Dissolved oxygen probe
- Oxidation-reduction potential
- Specific conductivity probe
- Temperature probe
- Turbidity meter

Probes used to measure pH, dissolved oxygen, specific conductivity, oxidation-reduction potential, and temperature are all housed in a single instrument and parameters are measured in a sealed flow-through cell.

8.1 Portable Photoionization Detector

- The photoionization detector (PID) will be a Thermo 580B (or equivalent), equipped with a minimum 10.2 or 10.6 eV lamp. The PID 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 and end 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 field notebooks 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.
- All changes to the PID will be noted in the field notes (such as bulb or filter cleaning or replacement).

8.2 pH

- 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 (NIST) 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 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.

8.3 Dissolved Oxygen

- Calibration of the dissolved oxygen meter must be performed at the start of each day of use, after very high or low readings (approaching or outside of the theoretical dissolved oxygen range at a given temperature), and after bubbles or spurious readings are observed.
- Calibrate the meter to a prepared standard or other method in accordance with manufacturer's instructions and note the scale and units on the meter.

8.4 Specific Conductivity and Temperature

- 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 ohms/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.

8.5 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.

9.0 Field Sample Custody

9.1 Chain-of-custody

- A chain-of-custody (COC) record 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 rinsate 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.
- 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. The other copy and the original will be sealed in a plastic bag and taped inside the lid of the shipping cooler.
- 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 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 seals 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, or delivered by the field personnel to the laboratory.
- 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 24 hours of collection (maximum 48 hours).

9.2 Sample Documentation

The field team leader will retain 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
- Shipping information:
    - Dates and method of sample shipments
    - Chain-of-Custody Record numbers
    - Federal Express Air Bill numbers
    - Sample recipient (e.g., laboratory name)

Appendix D

Community Air Monitoring Plan (CAMP)

ENSR | AECOM

Prepared for:
KeySpan Corporation
175 East Old Country Road
Hicksville, New York 11801

Community Air Monitoring Plan Remedial Investigation

Far Rockaway Former Manufactured Gas Plant Site
Far Rockaway, Queens County, New York

Order on Consent D1-0001-99-05
NYSDEC Site Number 2-41-032

The RETEC Group, Inc.
June 2007
Document No.: KED04-20370

Merged with ENSR in 2007
RETEC

Prepared for:
KeySpan Corporation
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Hicksville, New York 11801

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Remedial Investigation

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The RETEC Group, Inc.
June 2007
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1.0 Introduction

This document provides the Community Air Monitoring Plan (CAMP) that will be implemented during the Remedial Investigation (RI) of the KeySpan Corporation (KeySpan) former manufactured gas plant (MGP) site, located in Far Rockaway, Queens County, New York. It has been prepared by ENSR Corporation (d/b/a, The RETEC Group, Inc. [RETEC]) on behalf of KeySpan.

The former MGP site is located in a mixed industrial and residential area. This CAMP presents methods and procedures that will be used to provide protection to potential receptors by assuring that the investigation work activities do not spread constituents offsite through the air.

This CAMP specifically applies to the RI phase of work for the former MGP site. The RI fieldwork is scheduled to be performed in the fall of 2007, as described in the document "Remedial Investigation Work Plan, Far Rockaway Former MGP Site, Far Rockaway, New York", dated June 2007.

The RI fieldwork involves the completion of subsurface soil borings; the installation of monitoring wells; the collection of surface soil, subsurface soil, and groundwater samples; aquifer hydraulic conductivity testing; and soil gas, indoor air, and ambient air sampling.

The objectives of this CAMP are to:

- Ensure that the airborne concentrations of constituents of concern (COC) are minimized to protect human health and the environment;
- Provide an early warning system so that potential emissions can be controlled on site at the source; and
- Measure and document the concentrations of airborne COC to confirm compliance with regulatory limits.

The community air monitoring will be performed around the site perimeter, and will measure the concentrations of organic vapors and dust during all ground-intrusive activities (soil boring and well installations).

This CAMP is a companion document to the site-specific Health and Safety Plan (HASP) developed for this project. The HASP is a separate document and is directed primarily toward protection of onsite workers within the designated work zones.

2.0 Constituents of concern and action levels

The former MGP site is known to have impacts dating from the site's historical use as a MGP. As such, the constituents of concern are volatile organic compounds (VOCs) and semivolatile organic compounds (SVOCs). The primary VOCs of concern are benzene, ethylbenzene, toluene, and xylene (BTEX compounds). VOCs are more volatile than SVOCs and are generally of greater concern when monitoring the air quality during MGP site investigations.

Airborne dust is also a concern and must be monitored and controlled due to its ability to co-transport adsorbed constituents and because of its nuisance properties.

Odors, though not necessarily indicative of high constituent concentrations, could create a nuisance and will be monitored and controlled to the extent practicable.

State and federal regulatory agencies have provided action levels for many of these constituents. The action levels are the allowable airborne concentrations above which respiratory protection or other health and safety controls are required. For work at the former MGP site, the following levels should not be exceeded for more than 15 consecutive minutes at the downwind perimeter of the site:

- Benzene 1 part per million (ppm)
- Total VOCs 5 ppm
- Dust 100 micrograms per cubic meter ($\mu g/m^3$)

The action levels cited here are above (in addition to) the background ambient (upwind) concentration.

3.0 Air monitoring equipment and methods

Air quality monitoring will be performed for total VOCs, benzene, and dust as outlined below.

Two perimeter locations will be established each day and an air monitoring technician will check the instrumentation at each of these locations frequently during the work. Typically there will be monitoring locations at one upwind site perimeter location and one downwind perimeter location. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. Field personnel will be prepared to monitor multiple locations in the event that there is little wind or if the wind direction changes frequently.

The monitoring instruments will be calibrated at the start of each workday and again during the day if the performance of an instrument is in question.

3.1 VOC and benzene monitoring

3.1.1 Ambient air monitoring

VOC monitoring will be performed using three field photoionization detectors (PIDs) (RAE Systems MiniRAE or equivalent). The monitoring instruments will be checked by a technician every 15 minutes and the real-time measurements recorded. The PIDs will be equipped with an audible alarm to indicate exceedance of the action level.

If requested by the NYSDEC, 15-minute running average concentrations may be calculated, which can then be compared to the action levels. If real-time measurements of total VOCs indicates that the action level is exceeded, then the benzene concentration will also be determined at that location using benzene-specific colorimetric tubes.

PID measurements will be made at one upwind and one downwind location around the work area. The locations of the instruments may be changed during the day to adapt to changing wind directions.

3.2 Particulate (dust) monitoring

Particulate (dust) monitoring will be performed during drilling activity at the site. Two particulate monitors (TSI DustTrak or equivalent) will be used for continuous real-time dust monitoring. The monitoring instruments will be checked by a technician every 15 minutes and the real-time measurements recorded. If requested by the on-site NYSDEC representative, a 15-minute average concentration may be determined.

In addition, fugitive dust migration will be visually assessed during all work activities and the observations recorded.

Measurements will be made at one upwind and one downwind location around the work area. The locations of the instruments may be changed during the day to adapt to changing wind directions.

4.0 Emission control plan

4.1 Ambient air

Odor, vapor, and dust control will be required for this project due to the close proximity commercial and residential buildings and public roadways and sidewalks. The attached Table 1 provides a response chart for the monitoring and control of vapor emissions. Table 2 provides a list of emergency contacts.

- If the ambient air concentration of total VOC levels at the downwind perimeter of the work area or exclusion zone exceeds 5 ppm (or the benzene level exceeds 1 ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm (and the benzene level drops below 1 ppm) over background, work activities can resume with continued monitoring.
- If total VOC levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm (or the benzene level persists over 1 ppm) over background but less than 25 ppm, work activities must be halted, the source of vapors identified, corrective actions taken to abate emissions until the concentrations drop below the action levels, and monitoring continued. After these steps, work activities can resume provided that the total organic vapor level 200 feet downwind of the exclusion zone or half the distance to the nearest potential receptor or residential/commercial structure, whichever is less - but in no case less than 20 feet, is below 5 ppm over background for the 15-minute average.
- If the organic vapor level is above 25 ppm at the perimeter of the work area, activities will be shutdown.

Site perimeter particulate concentrations will also be monitored continuously. In addition, dust migration will be visually assessed during all work activities.

- If the downwind particulate level is 150 µg/m^3 greater than the background (upwind perimeter) level for a 15-minute period, or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work may continue with dust suppression techniques provided that downwind particulate levels do not exceed 150 µg/m^3 above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind particulate levels are greater than 150 µg/m^3 above the upwind level, work must be stopped and a re-evaluation of activities initiated. Work can resume provided that dust suppression measures and other controls are successful in reducing the downwind particulate concentration to within 150 µg/m^3 of the upwind level and in preventing visible dust migration.

Typical emission control measures may include:

- Apply water for dust suppression
- Relocate operations, if applicable
- Reassess the existing control measures

5.0 Odor control procedures

This section outlines the procedures to be used to control odors that may be generated during the RI field activities. The investigation program will be conducted using one principal remedial investigation techniques that may generate odors: subsurface soil borings. The remainder of this section is intended to provide site managers, representatives of NYSEC and NYSDOH, and the public with information summarizing typical odor control options, and to provide some guidance for their implementation. A description of potential sources of odors and methods to be used for odor control is presented in the following sections.

5.1 Potential sources of odors

Generally, the residuals encountered at former MGP sites are well defined. They are related to residual coal tar-like materials and petroleum, and principally contain VOCs, polynuclear aromatic hydrocarbons (PAHs), and a number of inorganic constituents, including metal-complexed cyanide compounds and metals. Constituents of MGP tar or petroleum products can produce odor emissions during investigation activities when they are unearthed during soil borings. When this occurs, VOCs and light-end SVOCs can volatilize into the ambient air. Some MGP residuals can cause distinctive odors that are similar to mothballs, roofing tar, or asphalt driveway sealer. However, the constituent concentrations generally associated with these odors are typically significantly less than levels that might pose a potential health risk. It is important to note that the CAMP will provide for continual monitoring of VOCs and dust during the fieldwork to monitor for any potential release of constituents which may pose a threat to health.

5.2 Odor monitoring

The field investigation personnel will record observations of odors generated during the implementation of the RI Work Plan. When odors attributable to the uncovering of impacted media are generated in the work area during intrusive activities such as soil borings, observations will also be made at the down-wind limit of the former MGP site, in order to assess the potential for offsite odors. The down-wind odor monitoring will be performed in conjunction with the PID and dust monitoring program described in this CAMP.

Upon detection of odors at the site perimeter, site controls, starting in the work area, will be implemented. The site controls described in the following sections will be used to assist with odor mitigation. Note that the goal of the Odor Mitigation Plan is to minimize, and to prevent where practicable, the offsite migration of odors. Due to the short distances between any work area at the site and the property line, site controls will be implemented proactively when odors are detected in the breathing zone at any work area.

5.3 General site controls

Several general drilling procedure site controls that will be implemented include:

- Every effort will be made to minimize the amount of time that impacted material is exposed to ambient air at the site.
- Drill cuttings from the soil borings will be containerized as soon as possible during completion of each soil boring.
- Meteorological conditions are also a factor in the generation and migration of odors. Some site activities may be limited to times when specific meteorological conditions prevail, such as when winds are blowing away from a specific receptor.

5.4 Secondary site controls

If substantial odors still present an issue following implementation of the above procedures, secondary controls will be enacted. The field representative will work through the applicable list of secondary controls until the perimeter odor issues are resolved. The field representative will work closely with KeySpan and NYSDEC during this task if present. Final selection of controls will be dependent on field conditions encountered. Secondary controls include the following:

- The placement of portable barriers close to small active source areas can elevate the discharge point of emissions to facilitate dispersion and minimize the effect on downwind receptors. The barriers can be constructed using materials such as plastic "Jersey barriers", or fence poles and visual barrier fabric/plastic. The barriers are placed as temporary two or three-sided structures around active intrusive investigation areas, oriented such that the barriers are placed on the upwind and downwind sides of the source. If only one side of the source can be accessed, then the barrier should be placed on the downwind side.
- Two agents that can be sprayed over impacted soil have been determined to be effective in controlling emissions. They include odor suppressant solution (BioSolve™), and hydro-mulch. These agents may be used where tarps cannot be effectively deployed over the source material, or where tarps are ineffective in controlling odors:
  - BioSolve™ can provide immediate, localized control of odor emissions. Information regarding the preparation and use of BioSolve™ is provided in Appendix A.
  - Hydromulch - Although it is unlikely that it will be necessary, a modified hydromulch slurry may be used to cover inactive sources for extended periods of time (up to several days). The hydromulch, typically cellulose fibers (HydroSealR) is modified by mixing a tackifier (glue) with the mulch and water to form a slurry. It is applied using a standard hydroseed applicator to a thickness of ¼ inch. The material forms a sticky, cohesive, and somewhat flexible cover. Reapplication may be necessary if the applied layer becomes desiccated or begins to crack.

5.5 Record keeping and communication

Similar to readings recorded during the monitoring specified in the CAMP, all odor monitoring results will be recorded in the field log book or other air monitoring forms, and be available for review by the agencies.

The field representative, in consultation with KeySpan, will also provide information on odor monitoring and odor management to residents of the neighborhood should they inquire. In the event that odors persist after these efforts, work will be temporarily discontinued until a mutually agreeable solution with KeySpan, NYSDEC, and NYSDOH staff can be worked out which allows the work to be completed while minimizing the offsite transport of nuisance odors.

6.0 Documentation and reporting

Data generated during perimeter air monitoring will be recorded in field logs and summarized daily in spreadsheets. The electronic measurements from the PIDs and dust meters will be downloaded each day, reviewed, and archived. Exceedances of the action levels, if any, and the actions to be taken to mitigate the situations, will be discussed immediately with the onsite representatives. Summaries of all air monitoring data will be provided to NYSDEC as requested.

Table 1 Vapor Emission Response Chart

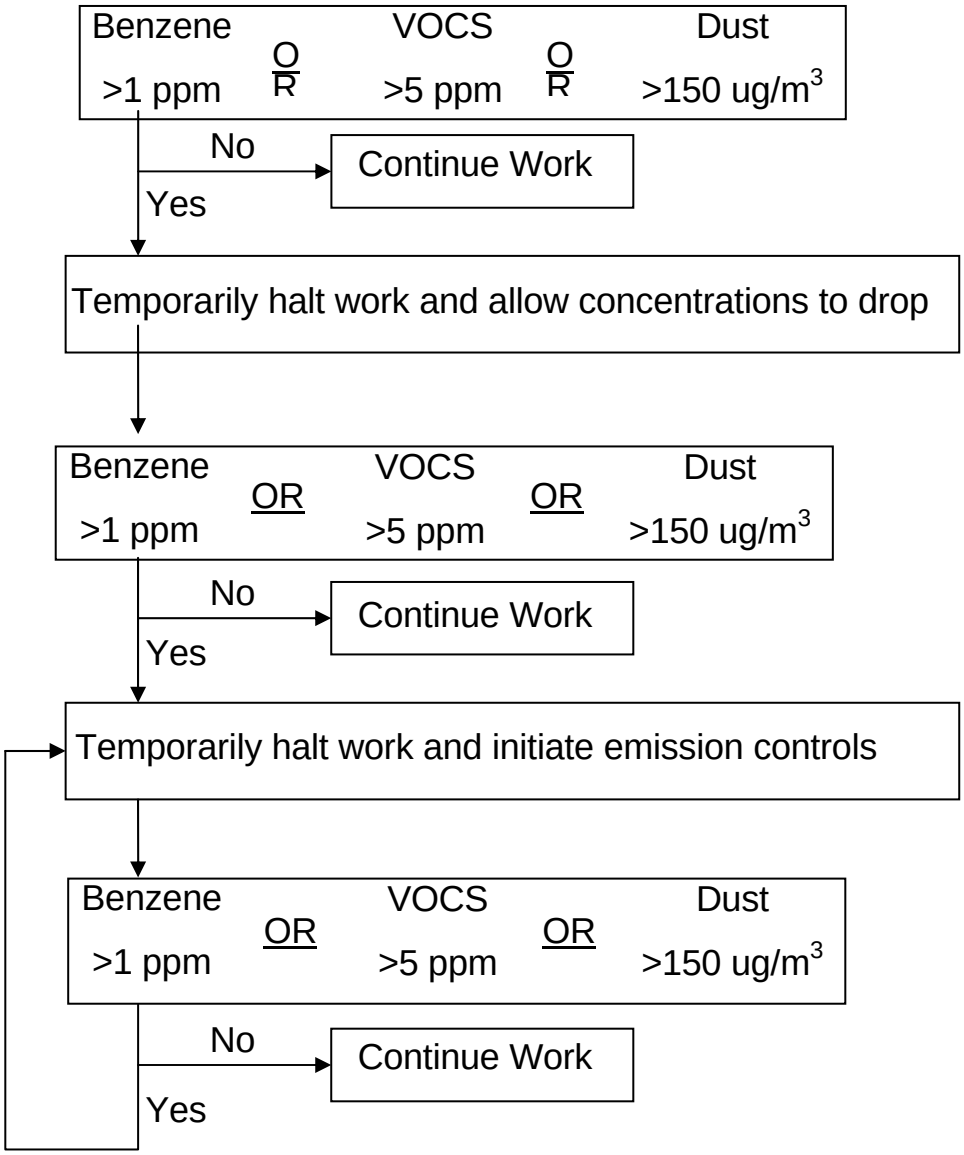

Table 2 Emergency Contacts and Telephone Numbers

Fire:	911
Police:	911
Ambulance:	911
RETEC Contacts	Peter Cox (978) 764-4257 (cellular) Julia Shackford (914) 227-5432 (cellular) Jennifer Koch (914) 227-3779 (cellular)
KeySpan Contact	Tom Campbell (917) 734-3395 (cellular) Ted Leissing (917) 734-3244 (cellular)

Appendix A

Vapor Suppression Information

BioSolve®
Hydrocarbon Mitigation Technology

...Is Making A Difference!

VAPOR SUPPRESSION / ODOR CONTROL

BioSolve® offers a relatively simple and cost effective method of suppressing Odors and VOC release from soils, during excavation, loading, stockpiling, etc. The following guidelines will apply to the most common situations encountered on site.

In most cases a 3% BSW solution (1 part **BioSolve®** concentrate to 33 parts water) will be adequate to keep vapor emissions within acceptable limits and control fugitive odor problems on contact. Although, some sites may only require a 2% solution, up to a 6% solution may be recommended on sites with elevated levels or particularly difficult/ mixed stream contaminants are present.

The **BioSolve®** solution should be applied evenly to the soil surface in sufficient quantity to saturate the surface area. As a general rule, use 1-3 litres of **BioSolve®** solution to 1 square metre of surface area. (1 gallon of **BioSolve®** per solution will cover approximately 4-sq. yd. of soil surface area) **BioSolve®** is a water-based surfactant that will apply like water.

BioSolve®, in its concentrated form, is a viscous liquid material that must be diluted with water. A fluorescent red tracing dye is present in the formula allowing **BioSolve®** to be detected during application. Once diluted, **BioSolve®** can be applied with virtually any equipment that can spray water. **BioSolve®** will not harm equipment or clog pipes. For large sites, applicators such as water truck, portable agricultural sprayers, foam inductors & pressure sprayers can be used. For smaller jobs, garden sprayers, water extinguishers or a garden hose with a fertiliser attachment on the nozzle can be used effectively. This characteristic makes **BioSolve®** very adaptable and much most convenient to use in almost any situation. **BioSolve®** is equally effective when used with all types of water (soft, hard, salt or potable).

On stockpiled soil or other soil that will be left undisturbed, a single application of **BioSolve®** to the exposed surfaces may last up to 10 to 14 days or more (depending on environmental conditions). **BioSolve®,** when applied, will form a "cap" of clean soil. If the soil is not disturbed, via weather, movement, etc. this "cap" will remain functional. During excavation, loading or other movement of the soil, it may be required to spray an additional amount of **BioSolve®** to the freshly exposed surface area to keep emissions at an acceptable level.

In case of an extremely high level of emissions, or if the soil is heavily contaminated, it may be necessary to increase the strength of the **BioSolve®** solution or apply more solution per square metre to reduce emissions adequately. It is important that the site be monitored regularly and that the **BioSolve®** solution be reapplied if and when necessary to insure that VOC emissions and odors remain under control.

BioSolve® is packaged and readily available in 55 gallon (208 liter) drums, 5 gallon (19 liter) pails and in 4X1 gallon (3.8 liter X 4) cases. Contact The Westford Chemical Corporation® Toll Free @ 1-800-225-3909, via e-mail at info@biosolve.com or your Local BioSolve distributor for pricing.

BioSolve® should only be used in accordance with all regulatory rules and regulations.

SOIL VAPOR SUPPRESSION UTILIZING BIOSOLVE

BioSolve is being utilized by numerous environmental consultants, response contractors, and fire departments to suppress VOC's & LEL's as well as problem odors. BioSolve encapsulates the source of the vapor rather than temporarily blanketing it like a foam or other physical barrier. Vapor reduction is so fast and effective that BioSolve is used to comply with the tough emission standards regulated by each State.

BioSolve offers a relatively simple and cost effective method of suppressing VOC vapor release from soils during excavation, loading, stockpiling… The following guidelines will apply to the most common situations encountered on site.

In most cases a 3% solution of BioSolve will be adequate to keep vapor emissions within acceptable limits. Dilute BioSolve concentrate with water at a ratio of 1 part BioSolve to 33 parts water to make a 3% solution.

The BioSolve solution should be applied evenly to the soil surface in sufficient quantity to dampen the surface well, (as a general rule, 1 gallon of BioSolve solution will cover approximately 4 sq. yd. of soil surface area). BioSolve is not a foam, it is a surfactant based product that will apply like water. The solution may be applied with a hand sprayer, high pressure power sprayer, water truck, etc., whichever method best suits the site and/or conditions.

NOTE: In the case of extremely high emission levels and/or very porous soil it may be necessary to increase the strength of the BioSolve solution (6%) or apply more per sq. yd. to reduce emissions adequately. On stockpiled soil or other soil that will be undisturbed, a single application of BioSolve to the exposed surfaces may last 10-14 days or more. During excavation, loading, or other movement of soil it may be necessary or required to spray each freshly exposed surface to keep emissions below acceptable

levels.It is important that the site be monitored regularly and the BioSolve solution be reapplied if/when necessary to insure that vapor emissions remain at or below acceptable standards.

MATERIAL SAFETY DATA SHEET

THE WESTFORD CHEMICAL CORPORATION®
P.O. Box 798
Westford, Massachusetts 01886 USA

Ref. No.: 2001
Date: 1/1/2002

Phone: (978) 392-0689
Phone: (508) 878-5895
Emergency Phone-24 Hours: 1-800-225-3909

Fax: (978) 692-3487
Web Site: http://www.BioSolve.com
E-Mail: info@BioSolve.com

SECTION I - IDENTITY

Name:	**BioSolve®**
CAS #:	138757-63-8
Formula:	Proprietary
Chemical Family:	Water Based, Biodegradable, Wetting Agents & Surfactants
HMIS Code:	Health 1, Fire 0, Reactivity 0
HMIS Key:	4 = Extreme, 3 = High, 2 = Moderate, 1 = Slight, 0 = Insignificant

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SECTION II - HAZARDOUS INGREDIENTS

Massachusetts Right to Know Law or 29 C.F.R. (Code of Federal Regulations) 1910.1000 require listing of hazardous ingredients.

This product does not contain any hazardous ingredients as defined by CERCLA, Massachusetts Right to Know Law and California's Prop. 65.

SECTION III - PHYSICAL - CHEMICAL CHARACTERISTICS

Boiling Point	: 265°F	Specific Gravity	: 1.00 +/-.01
Melting Point	: 32°F	Vapor Pressure mm/Hg	: Not Applicable
Surface Tension- 6% Solution	: 29.1 Dyne/cm at 25°C	Vapor Density Air = 1	: Not Applicable
Reactivity with Water	: No	Viscosity - Concentrate	: 490 Centipoise
Evaporation Rate	: >1 as compared to Water	Viscosity - 6% Solution	: 15 Centipoise
Appearance	: Clear Liquid unless Dyed	Solubility in Water	: Complete
Odor	: Pleasant Fragrance	pH	: 9.1+/-.3
Pounds per Gallon	: 8.38		

SECTION IV - FIRE AND EXPLOSION DATA

Special Fire Fighting Procedures	: None	Flammable Limit	: None
Unusual Fire and Explosion Hazards	: None	Auto Ignite Temperature	: None
Solvent for Clean-Up	: Water	Fire Extinguisher Media	: Not Applicable
Flash Point	: None		

SECTION V - SPECIAL PRECAUTIONS AND SPILL/LEAK PROCEDURES

Precautions to be taken in Handling and Storage: Use good normal hygiene.
Precautions to be taken in case of Spill or Leak -

Small spills, in an undiluted form, contain. Soak up with absorbent materials.
Large spills, in an undiluted form, dike and contain. Remove with vacuum truck or pump to storage/salvage vessel. Soak up residue with absorbent materials.

Waste Disposal Procedures -

Dispose in an approved disposal area or in a manner which complies with all local, state, and federal regulations.

SECTION VI - HEALTH HAZARDS

Threshold Limit Values: Not applicable
Signs and Symptoms of Over Exposure-

Acute : Moderate eye irritation. Skin: Causes redness, edema, drying of skin.
Chronic: Pre-existing skin and eye disorders may be aggravated by contact with this product.

Medical Conditions Generally Aggravated by Exposure: Unknown
Carcinogen: No
Emergency First Aid Procedures -

Eyes: Flush thoroughly with water for 15 minutes. Get medical attention.
Skin: Remove contaminated clothing. Wash exposed areas with soap and water. Wash clothing before reuse. Get medical attention if irritation develops.
Ingestion: Get medical attention.
Inhalation: None considered necessary.

SECTION VII - SPECIAL PROTECTION INFORMATION

Respiratory Protection	: Not necessary	Local Exhaust Required	: No
Ventilation Required	: Normal	Protective Clothing	: Gloves, safety glasses Wash clothing before reuse.

SECTION VIII - PHYSICAL HAZARDS

Stability	: Stable	Incompatible Substances	: None Known
Polymerization	: No	Hazardous Decomposition Products	: None Known

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SECTION IX - TRANSPORT & STORAGE

DOT Class	: Not Regulated/Non Hazardous		
Freeze Temperature	: 28°F	Storage	: 35°F-120°F
Freeze Harm	: None (thaw & stir)	Shelf Life	: Unlimited Unopened

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SECTION X - REGULATORY INFORMATION

The Information on this Material Safety Data Sheet reflects the latest information and data that we have on hazards, properties, and handling of this product under the recommended conditions of use. Any use of this product or method of application, which is not described on the Product label or in this Material Safety Data Sheet, is the sole responsibility of the user. This Material Safety Data Sheet was prepared to comply with the OSHA Hazardous Communication Regulation and Massachusetts Right to Know Law.

Appendix E

Citizen Participation Plan

CITIZEN PARTICIPATION PLAN

FOR THE

FORMER MANUFACTURED GAS PLANT AT FAR ROCKAWAY, QUEENS, NY

Prepared by

KEYSPAN CORPORATION

June 2007

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1.0 INTRODUCTION

Citizen participation is an integral component of remedial programs in New York State. Input from affected or interested individuals and organizations on the remedial program helps ensure outcomes that account for both technical and human concerns for protecting public health and the environment. A project-specific plan is needed to inform and involve community residents, public and private leaders, and other stakeholders. This Citizen Participation Plan (CPP) documents the planned project-specific public outreach activities and resources organized for the remedial program associated with the former Manufactured Gas Plant (MGP) site.

The primary purpose of this CPP plan is to outline a variety of communication methods that, based on applicable New York State law and New York State Department of Environmental Conservation (NYSDEC) regulations and guidance, provide for constructive communication of program activities between the stakeholders and other interested parties. This CPP includes methods intended to inform interested parties of program developments, elicit responses and public involvement, and provide a central point of contact for inquiries regarding the remedial program for the former Far Rockaway MGP Project. Given this context, this CPP presents the planned communication and outreach activities, describes how interested individuals and groups can participate in the remedial program, and provides a variety of reference materials to facilitate gaining access to project-specific information and management personnel.

Both the NYSDEC and KeySpan are committed to the implementation of this CPP as required by Title 6 of the New York Code of Rules and Regulations (NYCRR) Part 375, applicable NYSDEC guidance (e.g., Citizen Participation in New York's Hazardous Waste Site Remediation Program: A Guidebook, dated June 1998), the Administrative Order on Consent (Index # A2-0552-0606) and the statewide Inactive Hazardous Waste Site Citizen Participation Plan (NYSDEC, 1988). As required by 6 NYCRR Part 375-1.10, NYSDEC and KeySpan will review and update this CPP to account for significant changes in the Far Rockaway Project's remedial program.

2.0 BASIC SITE INFORMATION

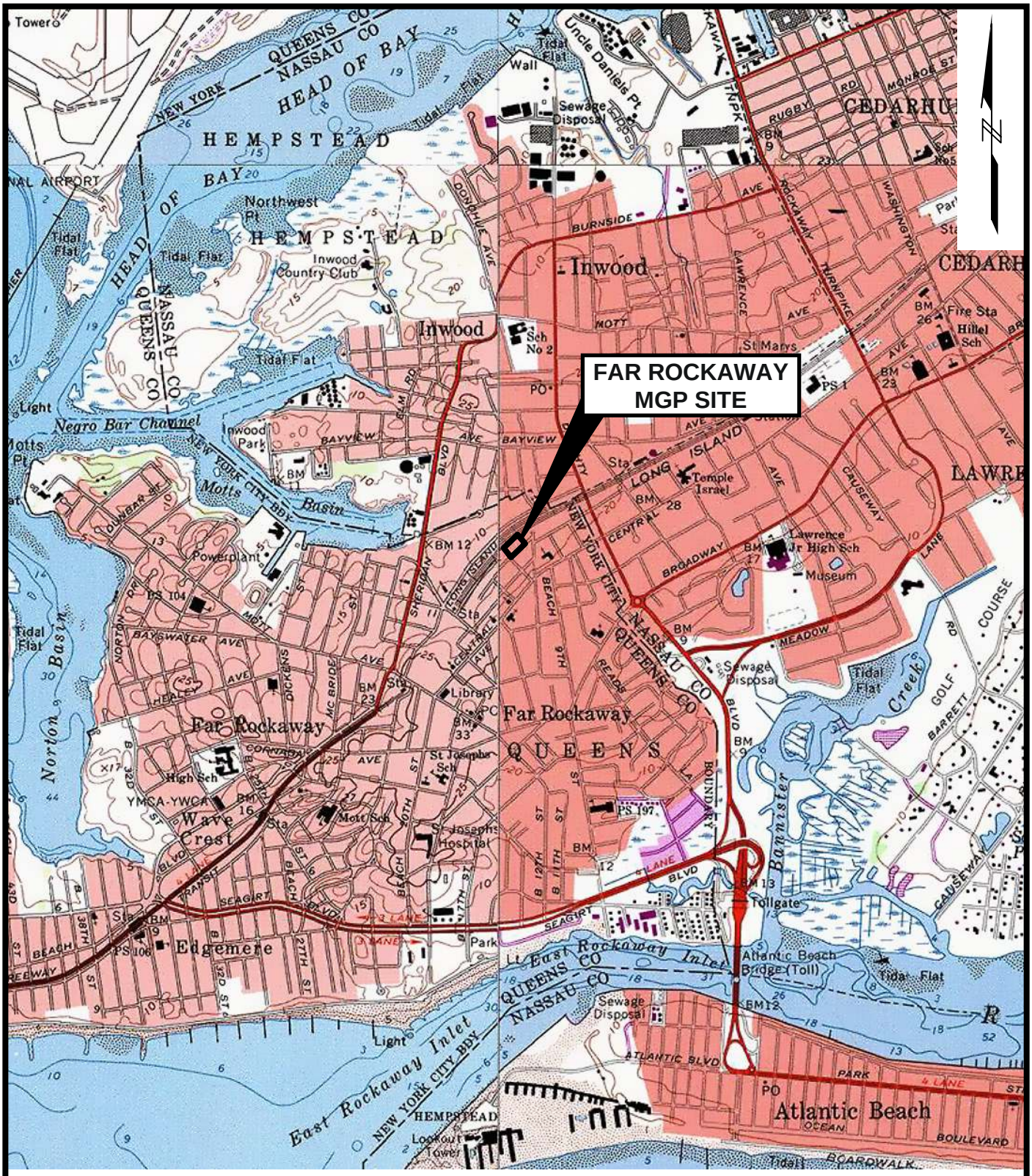
In February 2007, KeySpan signed an Administrative Order on Consent (Index # A2-0552-0606) with the NYSDEC to investigate and remediate hazardous substances believed to exist at the Far Rockaway site. The Far Rockaway site is located on Brunswick Avenue in Far Rockaway, Queens, NY. (See Site Location Map).

The site is owned by multiple private parties.

History and Operations

The Manufactured Gas Plant was constructed approximately in the mid-1890's and operated until circa 1909. The manufacture of gas, in general terms, consisted of heating coal and recovering the vapors to produce raw gas. Byproducts, such as coal tar, sludge, oils, ashes, contaminated wood chips used for gas purification and other chemicals, were produced from the scrubbing systems used to clean impurities from the raw gas, and these were either recycled for energy recovery and chemical feedstocks, or disposed.

The Long Island Lighting Company (LILCO) acquired the site in 1923. In the early 1970s the property was subdivided and sold to third parties. The current land use of the site is commercial/industrial.



SOURCE: Map created with TOPO! ® ©2001 National Geographic (www.nationalgeographic.com/topo)

NYSDEC BCP APPLICATION FAR ROCKAWAY MGP QUEENS, NEW YORK	GEI Consultants	**SITE LOCATION MAP**
KEYSPAN CORPORATION BROOKLYN, NEW YORK	PROJECT 982482	AUGUST 2004 FIGURE 1

KEYSPAN\BCP-APPLICATION\FIGURES\BCPAPP-LOC.PPT

Current Site Description

The Site is on a rectangular tract of land covering approximately 1 acre, from 1200 to 1224 Brunswick Avenue. Neither KeySpan nor its predecessor companies have owned the land for many years, and it is presently used by multiple owners and tenants of owners.

A Preliminary Site Assessment accepted by the NYSDEC in 2003 found materials expected on a former MGP site as well as other wastes associated with industrial use. The holder base was discovered approximately four feet below the surface. There are indications of off-site migration of contaminants associated with MGP operations, even though such operations apparently were terminated as far back as 1909. KeySpan was unable to complete all of the PSA work scope due to a Long Island Rail Road (LIRR) access limitation. The LIRR borders the northern side of the site.

While MGP operations ended at the site almost 100 years ago, the site still bears the residues associated with such operations. Based on the PSA, the residues include volatile aromatic hydrocarbons such as benzene, toluene, ethylbenzene and xylenes (BTEX) and Polycyclic Aromatic Hydrocarbons (PAHs).

3.0 REMEDIAL PROGRAM OVERVIEW

3.1 New York State Remedial Program Overview

KeySpan entered into an Administrative Order on Consent covering the Far Rockaway site in February 2007. The Order requires a Remedial Investigation of the Site, followed by a Feasibility Study of remedial options, a Remedial Action Plan, a Remedial Design and then construction and operation of a remedy to eliminate, to the extent possible, environmental hazards detected at the site The Consent Order also permits KeySpan to perform one or more partial Interim Remedial Measures to more quickly remediate contamination prior to adoption of a Remedial Action Plan. Once the Remedial Design is approved by NYSDEC, KeySpan will commence construction. Finally, KeySpan will submit to NYSDEC a detailed Post-Remedial Operations and Maintenance Plan (O&M Plan). The O&M Plan provides the means to track the effectiveness of the completed remedial work.

For more information on the remedial program and process in New York State, interested parties can contact any of the state representatives listed in Appendix D.

3.2 Project Area Investigation History

An Administrative Consent Order for a Preliminary Site Assessment of the site was issued in September 1999. The Work Plan was issued in April 2002 and the final PSA was accepted by the NYSDEC in March 2003. The PSA found that additional investigative work would be required, which is the subject of the current ACO.

4.0 CITIZEN PARTICIPATION ACTIVITIES

This section presents the specific citizen participation and outreach activities planned for implementation during the remedial program and to be implemented in accordance with 6 NYCRR Part 375. Operating under project-specific citizen participation goals, clearly defined objectives will be achieved by implementing a range of communication tools and methods. The planned activities are geared toward making project-specific information (e.g., work plans, technical reports, information sheet summaries) available to the public; facilitating communication among stakeholders including the creation of contact lists; scheduling and conducting public meetings; establishing comment periods; and notifying the public of document availability, public meetings, comment periods and major program milestones.

4.1 Goals and Objectives

The central goal of this CPP is to achieve effective, open communication among stakeholders and interested parties, KeySpan and the NYSDEC. Common goals include:

- Communicate program goals and major milestones, actions and outcomes;
- Inform citizens and others of ongoing project activities, status and progress;
- Provide citizens (and all stakeholders) a forum for input and comment; and
- Engender a public understanding of constituents of interest, their potential effects on human health and the environment, and appropriate responses to mitigate those effects.

In order to accomplish these goals, the following specific objectives will be pursued through the implementation of this CPP:

- Consistently communicate goals, accomplishments and status of the project to the contact list (including community leaders, public officials and the wider community, as necessary) through appropriate means;

- Establish, maintain, update and utilize the contact lists;

- Educate the community, in lay terms, about the nature and magnitude of potential site risks, including instructions for mitigating risk (if appropriate) and assurances that the environment and worker/public health and safety are protected;

- Provide interested parties the opportunity to review and comment on technical reports generated through the remedial program (e.g., public comment periods and document repository as required by 6 NYCRR Part 375);

- Provide interested parties the opportunity to present opinions and ideas during the remedial program (e.g., conduct public meeting/comment period and availability session as required by 6 NYCRR Part 375);

- Provide responses to public review and comment (e.g., prepare a responsiveness summary as required by 6 NYCRR Part 375);

- Provide the news media with interviews or press releases of KeySpan authorized spokespersons, as available, to ensure accurate coverage of remedial program activities;

- Provide a designated project spokesperson as point of contact through which community inquiries regarding the project can be addressed consistently and effectively; and

- Periodically review the effectiveness of the citizen participation and outreach activities during the remedial program and make adjustments in this CPP's methods and/or activities, if necessary.

The community contact list is provided in Appendix C and the Far Rockaway former MGP Site Project management contacts (NYSDEC, NYSDOH and KeySpan representatives) are provided in Appendix D.

4.2 Tools and Methods

There are many ways to reach and communicate with the community and other interested parties as this CPP is implemented over the course of the remedial program. A variety of outreach tools and methods will be used to ensure proper communication with the interested parties that include various organizations, public and business leaders, and a diverse assemblage of individuals of all ages, education backgrounds and cultures.

Interested parties will be informed and invited to participate in the planned citizen participation activities through appropriate means such as mailings to the contact list, legal notice in newspapers, press releases, information sheets and other documents made available in the document repository.

The following specific public participation activities will be implemented as required by 6 NYCRR Part 375 and current NYSDEC guidance.

4.2.1 Document Repository

A Document Repository has been established at the offices of Community Board 14, which has agreed to maintain in one file all of the relevant documents related to the Site. KeySpan will be provided access to

The Document Repository is located at:

- Community Board 14
  1931 Mott Avenue
  Far Rockaway, NY 11691
  (718) 471-7300

The following documents, as available, will be placed in the Repository:

- Administrative Order on Consent
- Citizen Participation Plan
- Fact Sheet Announcing the Start of the Remedial Investigation
- Remedial Investigation Work Plan

- Remedial Investigation Report
- Reports of any Interim Remedial Measures
- Feasibility Study Report;
- Proposed Remedial Action Plan;
- Record of Decision (ROD);
- Remedial Design;
- Post-Remedial O&M Plan; and
- Other Materials (e.g., Information Sheets, Notices, etc.).

4.2.2 Meetings, Meeting Fact Sheets and Comment Period

After completion of the RI Report a Public Meeting will be held to discuss its findings. After the Feasibility Study Report is completed, the preferred remedy for the site will be presented in a Proposed Remedial Action Program (PRAP) and will be subject to public review and comment at a Public meeting. Legal notice of the Meetings will be published in the local newspaper, and Fact Sheets announcing the meetings and summarizing the documents will be prepared and disseminated to interested parties and the community. During the RI Public Meeting, NYSDEC, NYSDOH and KeySpan project managers will summarize the findings of the RI Report and of any IRMs completed to date, and answer questions regarding project area characterization, data and activities. At the PRAP Public Meeting, remedial alternatives presented in the Feasibility Study, the preferred remedy presented in the Proposed Remedial Action Program, costs, implementation schedules and criteria used in evaluating the preferred remedy will be discussed. After the PRAP comment period ends, NYSDEC and NYSDOH will review all public comments from the Public Meeting and submitted during the comment period and, where applicable, incorporate the comments into the Remedial Action Program.

Fact Sheets will be distributed to the interested parties and proximate community at the time of the beginning of the Remedial Investigation, the acceptance of the RI Report (including announcement of Public Meeting) and the announcement of the PRAP (also including announcement of the Public Meeting).

KeySpan has already held meetings with the Site's current property owners or their representatives to brief them on the process and the need for access to conduct the RI and has met with available proximate neighbors to present the Site's status and the Remedial Investigation process.

4.2.3 Information Newsletters

Information newsletters will be prepared and distributed to the contact list in order to announce major project milestones and accomplishments throughout the remedial program (e.g., start of construction, major report completion, etc.). Written in lay terms, information newsletters will describe and summarize the project area's history, review the goals of the project, update the status of project plans and/or results, list opportunities for citizen involvement, list key contacts and list the location of the document repositories.

4.2.4. Telephone Hotline

KeySpan has established a Telephone Hotline for neighbors of the Far Rockaway MGP site. The phone number is 718 403 3007. There will be occasional news updates about the investigation, and the Hotline can be used at any time to leave questions about the investigation.

4.2.5 Responsiveness Summary

Public questions, comments and concerns voiced during the public meeting and collected during the comment period after the PRAP meeting will be addressed by the NYSDEC and published in the Remedial Action Program's Responsiveness Summary. Agency responses are to address both the broad general concerns and the significant questions communicated by the interested parties.

4.3 Roles and Responsibilities

The specific roles and associated responsibilities for implementing this CPP are:

- NYSDEC Remedial Project Manager - The NYSDEC Project Manager is responsible for enforcement, oversight and management of the overall remedial program. Typical citizen participation-related activities include making presentations at public meetings, reviewing project documents such as information sheets and providing technical assistance in preparing the responsiveness summary or answering public inquiries.

- NYSDEC Citizen Participation Specialist - The Citizen Participation Specialist assists the project managers in implementing the CPP. Typical activities include preparation and/or review of information sheets and the responsiveness summary and coordination of public meetings and availability sessions.

- KeySpan Project Manager - The KeySpan Project Manager, in cooperation with the NYSDEC Project Manager, is responsible for implementing the overall remedial program at the site. Typical citizen participation-related activities include management of CPP implementation, presentations at public meetings and technical assistance to the NYSDEC Project Manager and Citizen Participation Specialist.

4.4 Schedule for Implementing Elements of the CPP

Implementing elements of this CPP will depend upon completion by KeySpan and final approval by the NYSDEC of various plans and reports required by the Consent Order governing the Far Rockaway Site, such as the RI Work Plan, RI Report, FS Report, Remedial Design, etc. KeySpan will establish the Document Repository as soon as the RI Work Plan is approved and will place all completed documents in the Repository for public review. Public comments and hearings will be scheduled on NYSDEC acceptance of the Remedial Investigation Report and NYSDEC completion of the Proposed Remedial Action Program. The Responsiveness Summary will be completed shortly after close of the public comment period. Distribution of Fact Sheets or information sheets will also occur after completion of significant remedial or IRM construction activities at the Far Rockaway Site.

5.0 SUMMARY

Guided by the goals and objectives of this CPP, implementation of the planned public outreach and citizen participation activities will ensure the timely communication of important program information of interest to the local community. Citizen involvement and interaction in the remedial program will be facilitated through specific opportunities such as public meetings, public comment periods, availability sessions and use of the Document Repository. Throughout the remedial program, this CPP and its specific outreach tools and methods will be monitored and, as required and agreed by the NYSDEC and KeySpan will be adjusted to improve its effectiveness in responding to community needs.

Appendix A

GLOSSARY OF KEY CITIZEN PARTICIPATION TERMS AND MAJOR PROGRAM ELEMENTS

Citizen Participation Plan (CPP) - A document that describes the project-specific citizen participation and outreach activities that will take place alongside the technical components of the remedial program. The CPP also provides project information, citizen participation goals and objectives, and lists of contact persons and document repositories.

Citizen Participation Specialist - An NYSDEC staff member whose duty it is to provide guidance and assistance in carrying out the CPP. The Citizen Participation Specialist is the key contact for public inquiries about the project and the remedial activities.

Contact List - A list in the CPP (Appendix B) containing names and addresses of individuals, groups, organizations, news media and public representatives interested and/or affected by the project. The contact list is used to distribute important information and notices about the project and the remedial program.

Document Repository - Project documents and other information are placed in the Document Repository to facilitate convenient public access to these materials. Documents are available for public reference and review at the offices of Community Board 14 in Far Rockaway. Refer to Appendix B for more information about the Document Repository location and hours of operation.

Feasibility Study (FS) - Based on information gathered during the Remedial Investigation (RI), the FS is a process for developing, evaluating and selecting appropriate Remedial Action (RAs) for limiting or eliminating the potential human and environmental hazards of a site. The FS sets out the goals of the remedial actions to be taken, evaluates the most appropriate alternatives and selects the best alternative based on several criteria. The selected remedy is then recommended for implementation in the Proposed Remedial Design Plan, which is subject to public review and comment.

Interim Remedial Measure (IRM) - A discrete action which can be conducted at a site relatively quickly to reduce the risk to people's health and the environment from a well defined waste problem. An IRM can involve cutting and plugging waste conduits, removing contaminated soil and securing a site.

Polycyclic Aromatic Hydrocarbons (PAHs) - Contaminants typically found at MGP sites and associated with coal tar residues.

Remedial Design (RD) - This report will include a detailed description of the remedial objectives and the means by which each essential element of the selected remedial alternative will be implemented to achieve those objectives. It incorporates the findings of the FS Report to provide a remedial design which will be implemented during the performance of the cleanup activities at the site.

Remedial Investigation (RI) - A process to determine the nature and extent of contamination at a site by analyzing data collected from sampling (e.g., water, soil, air, etc.) at a site. Information gathered throughout the RI is then used to conduct a Focussed Feasibility Study (FFS), which proposes and evaluates various remedial alternatives for the site.

Responsiveness Summary - The Responsiveness Summary is prepared by the NYSDEC to address public comments, questions and concerns regarding the proposed remedial action to be taken at a site. The Responsiveness Summary is issues as part of the Remedial Action Program.

Volatile Aromatic Hydrocarbons - Benzene, Toluene, Ethylbenzene, Xylene (BTEXs) - Volatile aromatic hydrocarbons and are typical contaminants found at MGP sites and other sites where coal, oil, refined products and other hydrocarbons were burned or used.

Appendix B

IDENTIFICATION OF DOCUMENT REPOSITORY

Community Board 14
1931 Mott Avenue
Far Rockaway, NY 11691
(718) 471-7300
Call for Appointment

Appendix C

IDENTIFICATION OF AFFECTED AND/OR INTERESTED PARTIES

Site Owners:

12-00 Brunswick Avenue	Frank Molfetta 207 Meadow Road Edison NJ 08817
12 - 16 Brunswick Avenue	M&S Equities Assoc, 1216 Brunswick Avenue Far Rockaway, NY 11691
12-24 Brunswick Avenue	Rainbow Land Development/ Brunswick Realty 1224 Brunswick Avenue Queens, NY 11691

Government Officials

City Council Member	James Sanders, Jr. 226-18 Merrick Blvd Laurelton, New York 11413 (718) 527-4356
Assemblywoman	Audrey I. Pheffer 108-14 Cross Bay Blvd. Ozone Park, NY 11417 718-945-9550
State Senator	Smith, Malcolm A. 205-19 Linden Blvd Saint Albans, NY 11412 718-528-4290
Congress Member	Gregory Meeks 196-06 Linden Blvd St. Albans, NY 11412
Assembly Member	Michele Titus 1931 Mott Ave Rm. 301 Far Rockaway, NY 11691

Community Groups

Community Board	Ms. Dolores Orr Jonathan Gaska Queens Community Board 14 1931 Mott Avenue Far Rockaway, NY 11691 (718) 471-7300

Other Community Groups

Rockaway Beach Civic Association
Dolores Orr, President
P.O. Box 930134
Rockaway Beach, NY 11693
(718) 318-1973

Rockaway Peninsula Civic Assoc.
Hinda Gross, President
1848 Cormaga Avenue
Far Rockaway, NY 11691
(718) 471-4818

Gateway Council Organization
Barbara Walker, President
1430 Gateway Blvd.
Far Rockaway, NY 11691
(718) 337-7640

Red Fern Tenant Association
Doris Jacobs, President
1430 Redfern Avenue, # 6 B
Far Rockaway, NY 11691
(718) 868-4079

Local Newspaper Covering Area

The Long Island Wave

Howard Schwach, Editor
8808 Rockaway Beach Blvd
Rockaway Beach, NY 11693-1608
(718) 634-4000

Appendix D

IDENTIFICATION OF PROJECT MANAGEMENT CONTACTS

New York State Department of Environmental Conservation
Charles Post
NYSDEC - Div. of Environmental Remediation
625 Broadway
Albany, New York 12233-7017
(518) 402-9662

New York State Department of Health
Stephanie Selmer
NYSDOH
Bureau of Environmental Exposure Investigation
547 River Street
Troy, NY 12180-2216
(518) 402-7880

KeySpan
Renee McClure
Community Relations Representative
1 MetroTech
Brooklyn NY 11201

Far Rockaway Project Hotline Telephone – 718 403 3007

Please leave a message on the Hotline and your call will be promptly returned.