

**224-01 MERRICK BLVD.
QUEENS, NEW YORK**

Remedial Action Work Plan

NYC VCP Number: 12CVCP079Q

Prepared for:

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AUGUST 2012

REMEDIAL ACTION WORK PLAN

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LIST OF ACRONYMS

| Acronym | Definition |
|----------------|--|
| AOC | Area of Concern |
| AS/SVE | Air Sparging/Soil Vapor Extraction |
| BOA | Brownfield Opportunity Area |
| CAMP | Community Air Monitoring Plan |
| C/D | Construction/Demolition |
| COC | Certificate of Completion |
| CQAP | Construction Quality Assurance Plan |
| CSOP | Contractors Site Operation Plan |
| DCR | Declaration of Covenants and Restrictions |
| ECs/ICs | Engineering and Institutional Controls |
| HASP | Health and Safety Plan |
| IRM | Interim Remedial Measure |
| BCA | Brownfield Cleanup Agreement |
| MNA | Monitored Natural Attenuation |
| NOC | Notice of Completion |
| NYC VCP | New York City Voluntary Cleanup Program |
| NYC DEP | New York City Department of Environmental Protection |
| NYC DOHMH | New York State Department of Health and Mental Hygiene |
| NYCRR | New York Codes Rules and Regulations |
| NYC OER | New York City Office of Environmental Remediation |
| NYS DEC | New York State Department of Environmental Conservation |
| NYS DEC DER | New York State Department of Environmental Conservation Division of Environmental Remediation |
| NYS DOH | New York State Department of Health |
| NYS DOT | New York State Department of Transportation |
| ORC | Oxygen-Release Compound |
| OSHA | United States Occupational Health and Safety Administration |

| | |
|-------|--|
| PE | Professional Engineer |
| PID | Photo Ionization Detector |
| QEP | Qualified Environmental Professional |
| QHHEA | Qualitative Human Health Exposure Assessment |
| RAOs | Remedial Action Objectives |
| RAR | Remedial Action Report |
| RAWP | Remedial Action Work Plan or Plan |
| RCA | Recycled Concrete Aggregate |
| RD | Remedial Design |
| RI | Remedial Investigation |
| RMZ | Residual Management Zone |
| SCOs | Soil Cleanup Objectives |
| SCG | Standards, Criteria and Guidance |
| SMP | Site Management Plan |
| SPDES | State Pollutant Discharge Elimination System |
| SVOC | Semi-Volatile Organic Compound |
| USGS | United States Geological Survey |
| UST | Underground Storage Tank |
| VOC | Volatile Organic Compound |

CERTIFICATION

I, Jame R Holzmacher P.E., am a Professional Engineer licensed in the State of New York. I have primary direct responsibility for implementation of the remedial action for the 224-01 Merrick Blvd Site, Site No. 12EH-N378Q.

I, James M DeMartinis am a Qualified Environmental Professional as defined in §43-140. I have primary direct responsibility for implementation of the remedial action for the 224-01 Merrick Blvd Site, Site No. 12EH-N378Q.

I certify that this Remedial Action Work Plan (RAWP) has a plan for handling, transport and disposal of soil, fill, fluids and other materials removed from the property in accordance with applicable City, State and Federal laws and regulations. Importation of all soil, fill and other material from off-Site will be in accordance with all applicable City, State and Federal laws and requirements. This RAWP has provisions to control nuisances during the remediation and all invasive work, including dust and odor suppression.

James Robert Holzmacher P.E.

Name

66054

License Number



Signature

8-14-2012

Date

James M. DeMartinis

QEP Name



QEP Signature

8-14-2012

Date

EXECUTIVE SUMMARY

224-01 LLC has enrolled in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate a 10,000-square foot site located at 224-01 Merrick Boulevard in Queens, New York. A remedial investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP). The remedial action described in this document provides for the protection of public health and the environment consistent with the intended property use, complies with applicable environmental standards, criteria and guidance and conforms with applicable laws and regulations.

Site Location and Current Usage

The Site is located at 224-01 Merrick Boulevard in the Laurelton section of Queens, New York and is identified as Block 12963 and Lot 308 on the New York City Tax Map. Figure 1 shows the Site location. The Site is 10,000-square feet and is bounded by residences to the north, Merrick Boulevard to the south, a commercial building to the east, and 224th Street to the west. A map of the site boundary is shown in Figure 2. Currently, the Site is vacant and contains a 7,100 square foot building.

Summary of Proposed Redevelopment Plan

A one story building with no basement, built in 1945 (now vacant), occupies 7,100 square feet of the property. This property has been designated with a Hazardous Materials “E” (E-219) as part of the Laurelton Rezoning Action (CEQR # 08DCP073Q).

The project consists of 7,635 square foot retail building with a partial cellar. The existing slab-on-grade building consists of a retail store and auto repair shop and will be converted into three retail stores while maintaining most of the existing structure. The areas of the three retail spaces are as follows: 3,178 square feet for the proposed retail store number one, 2,563 square feet for the proposed retail store number two, and 1,894 square feet for the proposed retail store number three. The 1,500 square foot proposed cellar will accommodate the mechanical room. The proposed height of the building is 18-feet. The length of the street frontage is approximately 100-feet. There will be approximately 25 linear feet from the front of the finished building to the

property line that will be paved area for parking. The bottom of the cellar footing will be 10 feet below grade.

The proposed construction will require minor demolition and soil disturbance to accommodate the cellar. The soil in the footprint of the proposed cellar will be removed and properly disposed of.

Layout of the proposed site development is presented in Figure 3.

Summary of the Remedy

The preferred remedial action alternative is the Track 1 Alternative. The preferred remedial action alternative achieves protection of public health and the environment for the intended use of the property. The preferred remedial action alternative will achieve all of the remedial action objectives established for the project and addresses applicable SCGs. The preferred remedial action alternative is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants. The preferred remedial action alternative is cost effective and implementable and uses standards methods that are well established in the industry.

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and performance of all required NYC VCP citizen participation activities according to an approved Citizen Participation Plan (CPP) included in RAWP;
2. Performance of a Community Air Monitoring Program for particulates and volatile organic carbon compounds;
3. Establishment of Track 1, Soil Cleanup Objectives (SCOs);
4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas;
5. Excavation and removal of soil/fill exceeding SCOs from proposed cellar area as well as the area of the former hydraulic lift.
6. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID;

7. Removal of underground storage tanks and closure of petroleum spills in compliance with applicable local, State and Federal laws and regulations (if encountered);
8. Transportation and off-Site disposal of all soil/fill material at permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal, and this plan. Sampling and analysis of excavated media as required by disposal facilities. Appropriate segregation of excavated media onsite;
9. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of SCOs;
10. Construction and maintenance of an engineered composite cover consisting of concrete or asphalt pavement, building slab, and limited open space cover and include thickness to prevent human exposure to residual soil/fill remaining under the Site;
11. Installation of sub-slab depressurization system beneath the building slab;
12. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations;
13. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations;
14. Submission of a RAR that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, and describes all Engineering and Institutional Controls to be implemented at the Site, and lists any changes from this RAWP;
15. If Track 1 Unrestricted Use SCOs are not achieved, submission of an approved Site Management Plan (SMP) in the RAR for long-term management of residual historic fill, including plans for inspection and certification of Engineering and Institutional Controls and reporting at a specified frequency; and
16. If Track 1 Unrestricted use SCOs are not achieved, recording of a Declaration of Covenants and Restrictions that includes a listing of Engineering Controls and a

requirement that management of these controls must be in compliance with an approved SMP; and Institutional Controls including prohibition of the following: (1) vegetable gardening and farming; (2) disturbance of residual contaminated material unless it is conducted in accordance with the SMP; and (3) higher level of land usage without OER-approval.

Community Protection Statement

The Office of Environmental Remediation created the New York City Voluntary Cleanup Program (NYC VCP) to provide governmental oversight for the cleanup of contaminated property in NYC. This Remedial Action Work Plan (“cleanup plan”) describes the findings of prior environmental studies that show the location of contamination at the site, and describes the plans to clean up the site to protect public health and the environment.

This cleanup plan provides a very high level of protection for neighboring communities. This cleanup plan also includes many other elements that address common community concerns, such as community air monitoring, odor, dust and noise controls, hours of operation, good housekeeping and cleanliness, truck management and routing, and opportunities for community participation. The purpose of this Community Protection Statement is to explain these community protection measures in non-technical language to simplify community review.

Remedial Investigation and Cleanup Plan. Under the NYC VCP, a thorough cleanup study of this property (called a remedial investigation) has been performed to identify past property usage, to sample and test soils, groundwater and soil vapor, and identify contaminant sources present on the property. The cleanup plan has been designed to address all contaminant sources that have been identified during the study of this property.

Identification of Sensitive Land Uses. Prior to selecting a cleanup, the neighborhood was evaluated to identify sensitive land uses nearby, such as schools, day care facilities, hospitals and residential areas. The cleanup program was then tailored to address the special conditions of this community.

Qualitative Human Health Exposure Assessment. An important part of the cleanup planning for the Site is the performance of a study to find all of the ways that people might come in contact with contaminants at the Site now or in the future. This study is called a Qualitative Human Health Exposure Assessment (QHHEA). A QHHEA was performed for this project. This assessment has considered all known contamination at the Site and evaluated the potential for people to come in contact with this contamination. All identified public exposures will be addressed under this cleanup plan.

Health and Safety Plan. This cleanup plan includes a Health and Safety Plan that is designed to protect community residents and on-Site workers. The elements of this plan are in compliance with safety requirements of the United States Occupational Safety and Health Administration. This plan includes many protective elements including those discussed below.

Site Safety Coordinator. This project has a designated Site safety coordinator to implement the Health and Safety Plan. The safety coordinator maintains an emergency contact sheet and protocol for management of emergencies. The Site safety coordinator is Heather Sonnenberg and can be reached at 631 234-2220.

Worker Training. Workers participating in cleanup of contaminated material on this project are required to be trained in a 40-hour hazardous waste operators training course and to take annual refresher training. This pertains to workers performing specific tasks including removing contaminated material and installing cleanup systems in contaminated areas.

Community Air Monitoring Plan. Community air monitoring will be performed during this cleanup project to ensure that the community is properly protected from contaminants, dust and odors. Air samples will be tested in accordance with a detailed plan called the Community Air Monitoring Plan or CAMP. Results will be regularly reported to the NYC Office of Environmental Remediation. This cleanup plan also has a plan to address any unforeseen problems that might occur during the cleanup (called a 'Contingency Plan').

Odor, Dust and Noise Control. This cleanup plan includes actions for odor and dust control. These actions are designed to prevent off-Site odor and dust nuisances and includes steps to be taken if nuisances are detected. Generally, dust is managed by application of physical covers and by water sprays. Odors are controlled by limiting the area of open excavations, physical covers, spray foams and by a series of other actions (called operational measures). The project is also required to comply with NYC noise control standards.

If you observe problems in these areas, please contact the onsite Project Manager Heather Sonnenberg at 631-234-2220 or NYC Office of Environmental Remediation Project Manager Zach Schreiber at (212) 788-8841.

Quality Assurance. This cleanup plan requires that evidence be provided to illustrate that all cleanup work required under the plan has been completed properly. This evidence will be

summarized in the final report, called the Remedial Action Report. This report will be submitted to the NYC Office of Environmental Remediation and will be thoroughly reviewed.

Storm-Water Management. To limit the potential for soil erosion and discharge, this cleanup plan has provisions for storm-water management. The main elements of the storm water management include physical barriers such as tarp covers and erosion fencing, and a program for frequent inspection.

Hours of Operation. The hours for operation of cleanup will comply with the NYC Department of Buildings construction code requirements or according to specific variances issued by that agency. For this cleanup project, the hours of operation are 7 AM to 4 PM Mondays through Friday.

Signage. While the cleanup is in progress, a placard will be prominently posted at the main entrance of the property with a laminated project Fact Sheet that states that the project is in the NYC Voluntary Cleanup Program, provides project contact names and numbers, and locations of project documents can be viewed.

Complaint Management. The contractor performing this cleanup is required to address all complaints. If you have any complaints, you can call the facility Project Manager Heather Sonnenberg at 631-234-2220, the NYC Office of Environmental Remediation Project Manager Zach Schreiber at (212) 788-8841, or call 311 and mention the Site is in the NYC Voluntary Cleanup Program.

Utility Mark-outs. To promote safety during excavation in this cleanup, the contractor is required to first identify all utilities and must perform all excavation and construction work in compliance with NYC Department of Buildings regulations.

Soil and Liquid Disposal. All soil and liquid material removed from the Site as part of the cleanup will be transported and disposed of in accordance with all applicable City, State and Federal regulations and required permits will be obtained.

Soil Chemical Testing and Screening. All excavations will be supervised by a trained and properly qualified environmental professional. In addition to extensive sampling and chemical testing of soils on the Site, excavated soil will be screened continuously using hand-held

instruments, by sight, and by smell to ensure proper material handling and management, and community protection.

Stockpile Management. Soil stockpiles will be kept covered with tarps to prevent dust, odors and erosion. Stockpiles will be frequently inspected. Damaged tarp covers will be promptly replaced. Stockpiles will be protected with silt fences. Hay bales will be used, as needed to protect storm water catch basins and other discharge points.

Trucks and Covers. Loaded trucks leaving the Site will be covered in compliance with applicable laws and regulations to prevent dust and odor. Trucks will be properly recorded in logs and records and placarded in compliance with applicable City, State and Federal laws, including those of the New York State Department of Transportation. If loads contain wet material that can leak, truck liners will be used. All transport of materials will be performed by licensed truckers and in compliance with all laws and regulations.

Imported Material. All fill materials proposed to be brought onto the Site will comply with rules outlined in this cleanup plan and will be inspected and approved by a qualified worker located on-Site. Waste materials will not be brought onto the Site. Trucks entering the Site with imported clean materials will be covered in compliance with applicable laws and regulations.

Equipment Decontamination. All equipment used for cleanup work will be inspected and washed, if needed, before it leaves the Site. Trucks will be cleaned at a truck inspection station on the property before leaving the Site.

Housekeeping. Locations where trucks enter or leave the Site will be inspected every day and cleaned regularly to ensure that they are free of dirt and other materials from the Site.

Truck Routing. Truck routes have been selected to: (a) limit transport through residential areas and past sensitive nearby properties; (b) maximize use of city-mapped truck routes; (c) limit total distance to major highways; (d) promote safety in entry to highways; (e) promote overall safety in trucking; and (f) minimize off-Site line-ups (queuing) of trucks entering the property. Operators of loaded trucks leaving the Site will be instructed not to stop or idle in the local neighborhood.

Final Report. The results of all cleanup work will be fully documented in a final report (called a Remedial Action Report) that will be available for you to review in the public document repositories located at Queens Borough Public Library: Laurelton.

Long-Term Site Management. To provide long-term protection after the cleanup is complete, the property owner will be required to comply with an ongoing Site Management Plan that calls for continued inspection of protective controls, such as Site covers. The Site Management Plan is evaluated and approved by the NYC Office of Environmental Remediation. Requirements that the property owner must comply with are defined in the property's deed. A certification of continued protectiveness of the cleanup will be required from time to time to show that the approved cleanup is still effective.

REMEDIAL ACTION WORK PLAN

1.0 SITE BACKGROUND

224-01 LLC has enrolled in the New York City Voluntary Cleanup Program (NYC VCP) to investigate and remediate a property located at 224-01 Merrick Boulevard in the Laurelton section of Queens, New York (the Site). A Remedial Investigation (RI) was performed to compile and evaluate data and information necessary to develop this Remedial Action Work Plan (RAWP) in a manner that will render the Site protective of public health and the environment consistent with the contemplated end use. This RAWP establishes remedial action objectives, provides remedial alternatives analysis that includes consideration of a permanent cleanup, and provides a description of the selected remedial action. The remedial action described in this document provides for the protection of public health and the environment, complies with applicable environmental standards, criteria and guidance and applicable laws and regulations.

1.1 SITE LOCATION AND CURRENT USAGE

The Site is located at 224-01 Merrick Boulevard in the Laurelton section of Queens, New York and is identified as Block 12963 and Lot 308 on the New York City Tax Map. Figure 1 shows the Site location. The Site is 10,000-square feet and is bounded by residences to the north, Merrick Boulevard to the south, a commercial building to the east, and 224th Street to the west. A map of the site boundary is shown in Figure 2. Currently, the Site is vacant and contains a 7,100 square foot building.

1.2 PROPOSED REDEVELOPMENT PLAN

A one story building with no basement, built in 1945 (now vacant), occupies 7,100 square feet of the property. This property has been designated with a Hazardous Materials “E” (E-219) as part of the Laurelton Rezoning Action (CEQR # 08DCP073Q).

The project consists of 7,635 square foot retail building with a partial cellar. The existing building consists of a retail store and auto repair shop and will be converted into three retail stores while maintaining most of the existing structure. The following areas of the three retail spaces are as follows: 3,178 square feet for the proposed retail store number one, 2,563 square

feet for the proposed retail store number two, and 1,894 square feet for the proposed retail store number three. The 1,500 square foot proposed cellar will accommodate the mechanical room. The proposed height of the building is 18-feet. The length of the street frontage is approximately 100-feet. There will be approximately 25 linear feet from the front of the finished building to the property line that will be paved area for parking. The bottom of the cellar footing will be 10 feet below grade.

The proposed construction will require minor demolition and soil disturbance to accommodate the cellar. The soil in the footprint of the proposed cellar will be removed and properly disposed of.

Layout of the proposed site development is presented in Figure 3.

1.3 DESCRIPTION OF SURROUNDING PROPERTY

The property is bordered to the north by a residence; to the south by Merrick Boulevard and a transmission repair facility; to the east by a restaurant; and to the west by 224th Street and a truck lot.

Also within a 500 ft. radius of the property there are several religious buildings, one preschool and one daycare facility:

- One Way Church of Christ 216-11 Merrick Boulevard, Jamaica, NY- 447 ft. to the west.
- Queens Church of the Firstborn 226-01 Merrick Boulevard, Laurelton, NY- 496 ft. to the southeast.
- Middletons Early Learning Center 226-02 Merrick Boulevard, Laurelton, NY-394 ft. to the west.
- Middletons DC First Grade 225-16 Merrick Boulevard, Laurelton, NY – 500 ft. to the west.

There are several other religious buildings just outside the 500 ft radius of the site:

- Lebanon Seventh Day Adventist Church Queens, New York, NY – 0.1 mi northeast.

- United Baptist Church of Truth 222-1 Merrick Boulevard, Springfield Gardens, NY 0.1 mi west.
- Evangel Temple 227-10 Merrick Boulevard, Laurelton, NY – 0.15 east.
- Linden Seventh Day Adventist & H. Linden Seventh Day School, 137-01 228th Street, Queens, New York, NY 0.3 mi south.

Figure 4 shows the surrounding land usage.

1.4 REMEDIAL INVESTIGATION

A remedial investigation was performed and the results are documented in a companion document called “*Remedial Investigation Report, 224-01 Merrick Blvd.*”, dated June 2012 (RIR).

Summary of Past Uses of Site and Areas of Concern

The 1926 Sanborn Map shows the site as vacant. The building was constructed in 1945 and is shown on subsequent Sanborn Maps as it is today. The Sanborn Maps designate the building as auto sales and service. Occupants of the site included Geffner Motors (1945 and 1955); Laurel Motors (1965 and 1975); and R&S Strauss a/k/a Strauss Discount Auto (1985-2008).

There was one documented UST on the site. A 1,000 gallon waste oil storage tank was removed on February 1, 2003. A search of the NYSDEC spills database did not indicate any spills associated with this UST or for that matter the site itself.

The AOCs identified for this site include:

1. The area of the former 1,000 gallon waste oil UST.
2. The area where automobile servicing occurred (i.e. hydraulic lifts, drains, etc.).

Summary of the Work Performed under the Remedial Investigation

224-01 Merrick LLC performed the following scope of work:

1. Conducted a Site inspection to identify AOCs and physical obstructions (i.e. structures, buildings, etc.);

2. Drilled 6 soil borings across the entire project Site, and collected 9 soil samples for chemical analysis from the soil borings to evaluate soil quality;
3. Installed 3 groundwater monitoring wells throughout the Site to establish groundwater flow direction and collected 3 groundwater samples for chemical analysis to evaluate groundwater quality;
4. Installed 3 soil vapor probes around Site perimeter and collected 3 samples for chemical analysis to evaluate soil vapor quality.

Summary of Environmental Findings

1. Elevation of the property is approximately 25 feet mean sea level.
2. Depth to groundwater ranges from 19 to 21 feet at the Site.
3. Groundwater flow is generally from north to south beneath the Site.
4. Depth to bedrock is approximately 525 feet at the Site.
5. The stratigraphy of the site, from the surface down, consists of fine to medium grained sand with quartz pebbles. There is very little artificial fill present.
6. Soil/fill samples collected during the RI indicated all constituents below Track 1 Soil Cleanup Objectives (Tables 1 through 5). No PCBs or pesticides were detected in any soil samples. Only one VOC, methylene chloride, was detected in all nine soil samples and ranged from 8 to 13 ppb. A low level of TCE was detected in one deep (15 to 17 feet bgs) soil sample at a concentration of 17 ppb. Similarly, very low levels of SVOCs were detected in one of the nine soil samples. Metals were detected in all soil samples at very low concentrations and were all below Track 1 UUSCOs.
7. PCBs and SVOCs were not detected in groundwater (Tables 6 through 10). One VOC, methylene chloride, was detected in the three groundwater samples to a maximum concentration of 3.5 ppb. These concentrations are below NYSDEC NYCRR Part 375 Groundwater Quality standards (GQS). Methylene chloride was also detected in the laboratory blank. Very low concentrations of several pesticides were detected in the groundwater samples. Aldrin (0.11 ppb) and endosulfan I (0.12ppb) exceeded GQS (0.12

ppb). Four dissolved metals including iron, manganese, mercury, and sodium were detected above GQS. Mercury was detected at 0.00108 ug/l (GQS is 0.0007 ug/l). Mercury was not detected above Track 1 UUSCOs in the 9 soil samples analyzed.

8. Low levels of petroleum related compounds were detected in soil vapor samples (Table 11). Acetone was detected at 156 ug/m³ (VP-1). Tetrachloroethene (a/k/a perchloroethylene, PCE) was detected in all samples at a maximum concentration of 406 ug/m³ (VP-1) in undiluted samples. The highest accurate concentration of PCE was measured to be 257 ug/m³.

For more detailed results, consult the RIR. Based on an evaluation of the data and information from the RIR and this RAWP, disposal of significant amounts of hazardous waste is not suspected at this site.

2.0 REMEDIAL ACTION OBJECTIVES

Based on the results of the RI, the following Remedial Action Objectives (RAOs) have been identified for this Site:

Soil

- Prevent direct contact with contaminated soil.

Soil Vapor

- Prevent exposure to contaminants in soil vapor.
- Prevent migration of soil vapor into dwelling and other occupied structures.

3.0 REMEDIAL ALTERNATIVES ANALYSIS

The goal of the remedy selection process is to select a remedy that is protective of human health and the environment taking into consideration the current, intended and reasonably anticipated future use of the property. The remedy selection process begins by establishing RAOs for media in which chemical constituents were found in exceedance of applicable standards, criteria and guidance values (SCGs). A remedy is then developed based on the following nine criteria:

- Protection of human health and the environment;
- Compliance with SCGs;
- Short-term effectiveness and impacts;
- Long-term effectiveness and permanence;
- Reduction of toxicity, mobility, or volume of contaminated material;
- Implementability;
- Cost effectiveness;
- Community Acceptance; and
- Land use.

The following is a detailed description of the alternatives analysis and remedy selection to address impacted media at the Site. As required, a minimum of two remedial alternatives (including a Track 1 scenario) are evaluated, as follows:

Two remedial action alternatives are considered in this alternatives analysis for the site. Alternative 1 is a Track 1 alternative that involves establishment of Track 1 soil cleanup objectives (SCOs) and complete removal of all soil and fill material that exceed the unrestricted Track 1 SCOs. Alternative 2 is a Track 4 alternative that involves establishment of Track 4 SCOs and removal of the soil and fill material that exceed the Track 4 SCOs. Alternative 2 involves the following:

- Establishment of Track 4 Soil Cleanup Objectives (SCOs);

- Removal of soil and fill within the proposed cellar boundary to an approximate depth 10 feet bgs, and will entail the excavation and off-site disposal of approximately 600 cubic yards of soil and fill, which will thereby eliminates contaminated sources;
- Placement of a final cover over the entire Site consisting of the building slab and paved parking area. This cover layer will serve as an engineering control to reduce exposure to any residual historic fill in soils;
- Management of soil vapors from offsite through installation of a sub-slab depressurization system (SSDS) as well as a vapor barrier/waterproofing membrane for the proposed cellar.
- Establishment of a Site Management Plan to ensure long-term management of the Engineering Controls, including performance of periodic inspections and certifications that the controls are performing as they were intended; and
- Placement of deed restriction

3.1 THRESHOLD CRITERIA

Protection of Public Health and the Environment

This criterion is an evaluation of the remedy's ability to protect public health and the environment, and an assessment of how risks posed through each existing or potential pathway of exposure are eliminated, reduced or controlled through removal, treatment, and implementation of Engineering Controls or Institutional Controls. Protection of public health and the environment must be achieved for all approved remedial actions.

The Track 1 alternative would result in removal of soil/fill from the proposed cellar area with contaminant concentrations above Track 1 SCOs. However, in order to prevent the migration of soil vapor from offsite sources into the proposed building and to prevent associated inhalation exposures, institutional and engineering controls are needed. A Track 1 Remedy cannot employ institutional or engineering controls. Therefore, even though Alternative 1 would provide the maximum protection of public health and the environment based on onsite contamination, Alternative 1 would not adequately meet the RAOs of preventing exposure to contaminants in

soil vapor from offsite sources and preventing migration of soil vapor into occupied structures without engineering and institutional controls that can be monitored in the long-term. As such, this alternative would be consistent with the RAOs and provide overall protection of public health and the environment from on-site derived contamination in consideration of current and potential future land use by:

- Eliminating the potential for direct contact with contaminated on-site soils and groundwater; and,
- No engineering or institutional controls can be utilized in a Track 1 cleanup.

Alternative 2 would achieve comparable protections of human health and the environment and would be consistent with the RAOs and would provide overall protection of public health and the environment from both on-site derived contamination, as well as preventing exposure to contaminants in soil vapor from offsite sources in consideration of current and potential future land use by:

- Removing soil/fill with contaminant concentrations above Track 4 SCOs;
- Placement of institutional and engineering controls, including a composite cover system.
- Eliminating the potential for direct contact with contaminated soil by placement of composite cover system and via institutional controls;
- Minimizing the potential for migration of soil vapor into occupied structures and associated inhalation exposures by installation of a vapor barrier/waterproofing barrier system for the proposed cellar.
- Institutional controls would include groundwater use restrictions, a deed notice and a site management plan;
- Minimizing the potential for direct contact with contaminated on-site soils during the remediation by implementing an approved soil and materials management plan and CAMP.

3.2. BALANCING CRITERIA

Compliance with Standards, Criteria and Guidance (SCGs)

Alternative 1 would comply with the SCG, as all soil/fill in excess of Track 1 SCOs would be removed. Soil/fill excavated from the Site would be managed and disposed of in accordance with all applicable regulations.

Alternative 2 would address the chemical-specific SCGs for soil by establishment of Track 4 SCOs. Groundwater is not impacted by site contaminants. Similar to the Track 1 alternative, focused attention on means and methods employed during the remedial action would ensure that handling and management of contaminated material would be in compliance with applicable SCGs.

Short-term effectiveness and impacts

This evaluation criterion assesses the effects of the alternative during the construction and implementation phase until remedial action objectives are met. Under this criterion, alternatives are evaluated with respect to their effects on public health and the environment during implementation of the remedial action, including protection of the community, environmental impacts, time until remedial response objectives are achieved, and protection of workers during remedial actions.

The Track 1 alternative would provide short-term effectiveness with the removal of soil/fill above Track 1 SCOs. All potential exposure pathways for site-derived contaminants would be incomplete following construction. Implementation of this RAWP would prevent unacceptable exposure during remediation and construction activities.

Alternative 2 would result in fewer short-term impacts associated with excavation, handling, load out of materials, and truck traffic than a Track 1 remediation. However, focused attention to means and methods during the remedial action during a Track 1 removal action, including community air monitoring and appropriate truck routing, would minimize or negate the overall impact of these activities.

The Track 1 and Track 4 Alternatives would both employ appropriate measures to prevent short term impacts, including a Community Air Monitoring Plan (CAMP) and a Soil/Materials Management Plan (SMMP), during all on-site soil disturbance activities and would effectively prevent the release of significant contaminants into the environment. Construction workers operating under appropriate management procedures and a Health and Safety Plan (HASP) will

be protected from on-site contaminants (personal protective equipment would be worn consistent with the documented risks within the respective work zones).

Long-term effectiveness and permanence

This evaluation criterion addresses the results of a remedial action in terms of its permanence and quantity/nature of waste or residual contamination remaining at the Site after response objectives have been met, such as permanence of the remedial alternative, magnitude of remaining contamination, adequacy of controls including the adequacy and suitability of ECs/ICs that may be used to manage contaminant residuals that remain at the Site and assessment of containment systems and ICs that are designed to eliminate exposures to contaminants, and long-term reliability of Engineering Controls.

Alternative 1 would provide the highest level of long-term effectiveness with the removal of soil/fill above Track 1 SCOs.

Alternative 2 would also be effective over the long-term by attaining Track 4 SCOs through the placement of a concrete slab under the building, establishing use restrictions, establishing a Site Management Plan to ensure long-term management of Institutional and Engineering Controls, and placing a deed restriction to memorialize these controls for the long term. Groundwater use restrictions will eliminate potential exposure to groundwater and establishment of an SMP and a deed restriction will ensure that this protection remains effective for the long-term. The SMP will ensure long-term effectiveness of all Engineering and Institutional Controls by requiring periodic inspection and certification that these controls and use restrictions continue to be in place and functioning as they were intended assuring that protections designed into the remedy will provide continued high level of protection in perpetuity. Migration of soil vapor from offsite into occupied structures and associated inhalation exposures would be prevented by installation of a SSDS and vapor barrier/waterproofing barrier system (proposed cellar).

Reduction of toxicity, mobility, or volume of contaminated material

This evaluation criterion assesses the remedial alternative's use of remedial technologies that permanently and significantly reduce toxicity, mobility, or volume of contaminants as their principal element. The following is the hierarchy of source removal and control measures that are to be used to remediate a Site, ranked from most preferable to least preferable: removal

and/or treatment, containment, elimination of exposure and treatment of source at the point of exposure. It is preferred to use treatment or removal to eliminate contaminants at a Site, reduce the total mass of toxic contaminants, cause irreversible reduction in contaminants mobility, or reduce of total volume of contaminated media.

The following is the hierarchy of source removal and control measures that are to be used to remediate a Site, ranked from most preferable to least preferable: removal and/or treatment, containment, elimination of exposure, and treatment of source at the point of exposure. It is preferred to use treatment or removal to eliminate contaminants at a Site, reduce the total mass of toxic contaminants, cause irreversible reduction in contaminants mobility, or reduce the total volume of contaminated media.

Alternative 1 will provide maximum reduction of toxicity, mobility, and the volume of contaminants from on-site soil by removing soil in excess of unrestricted use SCOs. Alternative 2 would greatly reduce the toxicity, mobility, and volume of contaminants from on-site soil because it would include removal of contaminants that exceed Track 4 SCOs. For Alternative 2, placement of a SDDS and cellar vapor barrier will eliminate potential exposures to remaining soil, groundwater, and vapor contamination. Groundwater use restrictions will reduce toxicity by ensuring that there is no use of on-site groundwater for potable purposes.

Implementability

This evaluation criterion addresses the technical and administrative feasibility of implementing an alternative and the availability of various services and materials required during its implementation, including technical feasibility of construction and operation, reliability of the selected technology, ease of undertaking remedial action, monitoring considerations, administrative feasibility (e.g. obtaining permits for remedial activities), and availability of services and materials.

The Track 1 cleanup is feasible and implementable. The remedial methods used are easily implemented using standard construction technologies.

Similarly, the Track 4 alternative is also both feasible and implementable. It uses standard materials and services and well established technology. The reliability of the remedy is also high. There are no special difficulties associated with any of the activities proposed, which

utilize standard industry methods. Installation of the SSDS and cellar waterproofing/vapor barrier system will be conducted in accordance with standard methods utilized to install waterproofing membranes.

For implementation of both remedies, standard construction equipment utilized for the overall earthwork would be used. OSHA trained personnel will complete all activities that include excavation and handling of impacted soils. No special permits other than earthwork permits required for completion of the required site redevelopment scope are required for implementation of the remedy.

Cost effectiveness

This evaluation criterion addresses the cost of alternatives, including capital costs (such as construction costs, equipment costs, and disposal costs, engineering expenses) and site management costs (costs incurred after remedial construction is complete) necessary to ensure the continued effectiveness of a remedial action.

The capital costs associated with the Track 1 alternative are higher than the Track 4 alternative in that a higher volume of soil/fill will be excavated for off-site disposal to achieve a Track 1 status over the entire site. In both cases, appropriate public health and environmental protections are achieved.

Both cleanup alternatives provide appropriate public health and environmental protections, satisfy the threshold balancing criterion and other criteria listed here and are cost effective. Further, both alternatives will control migration of contaminants, will comply with SCGs, are effective for the short-term and long-term, are implementable, and reduces both mobility and toxicity.

Community Acceptance

This evaluation criterion addresses community opinion and support for the remedial action. Observations here will be supplemented by public comment received on the RAWP.

Based on the overall goals of the remedial program and initial permitting associated with the proposed site development, no adverse community opinion is anticipated for either alternative. Cleanup to the most stringent Track 1 cleanup criteria is anticipated to be a preferred remedial

option for the community. This RAWP will be subject to and undergo public review under the NYC VCP and will provide the opportunity for detailed public input on the remedial alternatives and the selected remedial action. This public comment will be considered by OER prior to approval of this plan.

Land use

This evaluation criterion addresses the proposed use of the property. This evaluation has considered reasonably anticipated future uses of the Site and takes into account: current use and historical and/or recent development patterns; applicable zoning laws and maps; NYS Department of State's Brownfield Opportunity Areas (BOA) pursuant to section 970-r of the general municipal law; applicable land use plans; proximity to real property currently used for residential use, and to commercial, industrial, agricultural, and/or recreational areas; environmental justice impacts, Federal or State land use designations; population growth patterns and projections; accessibility to existing infrastructure; proximity of the site to important cultural resources and natural resources, potential vulnerability of groundwater to contamination that might emanate from the site, proximity to flood plains, geography and geology; and current Institutional Controls applicable to the site.

Both Alternatives are appropriate with respect to the proposed use and to land uses in the vicinity of the Site. The proposed use is consistent with the existing zoning designation for the property and is consistent with recent development patterns. The Site is surrounded by commercial and mixed-use commercial/residential properties and the proposed cleanup provides comprehensive protection of public health and the environment for these uses. Improvements in the current condition of the property achieved by both cleanup alternatives are also consistent with the City's goals for cleanup of contaminated land and bringing such properties into productive reuse and is protective of natural resources and cultural resources. This RAWP will undergo public review under the NYC VCP and will provide the opportunity for detailed public input on the land use factors described in this section. This public comment will be considered by OER prior to approval of this plan.

Sustainability of the Remedial Action

This criterion evaluates the overall sustainability of the remedial action alternatives and the degree to which sustainable means are employed to implement the remedial action including those that take into consideration NYC's sustainability goals defined in *PlaNYC: A Greener, Greater New York*. Sustainability goals may include: maximizing the recycling and reuse of non-virgin materials; reducing the consumption of virgin and non-renewable resources; minimizing energy consumption and greenhouse gas emissions; improving energy efficiency; and promotion of the use of native vegetation and enhancing biodiversity during landscaping associated with Site development.

Both alternatives achieve cleanup of impacts on the site and are equally capable of utilizing green remedial methods. A complete list of green remedial activities considered as part of the VCP is included in the Sustainability Statement, included as Appendix 2

4.0 REMEDIAL ACTION

4.1 SUMMARY OF PREFERRED REMEDIAL ACTION

The preferred remedial action alternative is the Track 1 Alternative. The preferred remedial action alternative achieves protection of public health and the environment for the intended use of the property. The preferred remedial action alternative will achieve all of the remedial action objectives established for the project and addresses applicable SCGs. The preferred remedial action alternative is effective in both the short-term and long-term and reduces mobility, toxicity and volume of contaminants. The preferred remedial action alternative is cost effective and implementable and uses standards methods that are well established in the industry.

The proposed remedial action will consist of:

1. Preparation of a Community Protection Statement and performance of all required NYC VCP citizen participation activities according to an approved Citizen Participation Plan (CPP) included in RAWP;
2. Performance of a Community Air Monitoring Program for particulates and volatile organic carbon compounds;
3. Establishment of Track 1, Soil Cleanup Objectives (SCOs);
4. Site mobilization involving Site security setup, equipment mobilization, utility mark outs and marking & staking excavation areas;
5. Excavation and removal of soil/fill exceeding SCOs from proposed cellar area as well as the area of the former hydraulic lift.
6. Screening of excavated soil/fill during intrusive work for indications of contamination by visual means, odor, and monitoring with a PID;
7. Removal of underground storage tanks and closure of petroleum spills in compliance with applicable local, State and Federal laws and regulations (if encountered);
8. Transportation and off-Site disposal of all soil/fill material at permitted facilities in accordance with applicable laws and regulations for handling, transport, and disposal,

- and this plan. Sampling and analysis of excavated media as required by disposal facilities. Appropriate segregation of excavated media onsite;
9. Collection and analysis of end-point samples to determine the performance of the remedy with respect to attainment of SCOs;
 10. Construction and maintenance of an engineered composite cover consisting of concrete or asphalt pavement, building slab, and limited open space cover and include thickness to prevent human exposure to residual soil/fill remaining under the Site;
 11. Installation of sub-slab depressurization system beneath the building slab;
 12. Implementation of storm-water pollution prevention measures in compliance with applicable laws and regulations;
 13. Performance of all activities required for the remedial action, including permitting requirements and pretreatment requirements, in compliance with applicable laws and regulations;
 14. Submission of a RAR that describes the remedial activities, certifies that the remedial requirements have been achieved, defines the Site boundaries, and describes all Engineering and Institutional Controls to be implemented at the Site, and lists any changes from this RAWP;
 15. If Track 1 Unrestricted Use SCOs are not achieved, submission of an approved Site Management Plan (SMP) in the RAR for long-term management of residual historic fill, including plans for inspection and certification of Engineering and Institutional Controls and reporting at a specified frequency; and
 16. If Track 1 Unrestricted use SCOs are not achieved, recording of a Declaration of Covenants and Restrictions that includes a listing of Engineering Controls and a requirement that management of these controls must be in compliance with an approved SMP; and Institutional Controls including prohibition of the following: (1) vegetable gardening and farming; (2) disturbance of residual contaminated material unless it is conducted in accordance with the SMP; and (3) higher level of land usage without OER-approval.

4.2 SOIL CLEANUP OBJECTIVES AND SOIL/FILL MANAGEMENT

Track 1, Soil Cleanup Objectives (SCOs) are proposed for this project. The SCOs for this Site are listed in Table 12. Soil and materials management on-Site and off-Site, including excavation, handling and disposal, will be conducted in accordance with the Soil/Materials Management Plan in Appendix 3. The location of planned excavations is shown as the cellar in Figure 3.

Discrete contaminant sources (such as hotspots) identified during the remedial action will be identified by GPS or surveyed. This information will be provided in the Remedial Action Report.

Estimated Soil/Fill Removal Quantities

The total quantity of soil/fill expected to be excavated and disposed off-Site is approximately 720 tons.

Disposal facilities will be reported to OER when they are identified and prior to the start of remedial action.

End-Point Sampling

Removal actions under this plan will be performed in conjunction with remedial end-point sampling. Figure 5 shows the locations of the proposed end-point soil samples as well as previous samples collected to date.

End-point sampling frequency will consist of the following:

1. For excavations less than 20 feet in total perimeter, at least one bottom sample and one sidewall sample biased in the direction of surface runoff.
2. For excavations 20 to 300 feet in perimeter:
 - For surface removals, one sample from the top of each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area.

- For subsurface removals, one sample from each sidewall for every 30 linear feet of sidewall and one sample from the excavation bottom for every 900 square feet of bottom area.

3. For sampling of volatile organics, bottom samples should be taken within 24 hours of excavation, and should be taken from the zero to six-inch interval at the excavation floor. Samples taken after 24 hours should be taken at six to twelve inches.

4. For contaminated soil removal, post remediation soil samples for laboratory analysis should be taken immediately after contaminated soil removal. If the excavation is enlarged horizontally, additional soil samples will be taken pursuant to bullets 1-3 above.

Post-remediation sample locations and depth will be biased towards the areas and depths of highest contamination identified during previous sampling episodes unless field indicators such as field instrument measurements or visual contamination identified during the remedial action indicate that other locations and depths may be more heavily contaminated. In all cases, post-remediation samples should be biased toward locations and depths of the highest expected contamination.

New York State ELAP certified labs will be used for all end-point sample analyses. Labs for end-point sample analyses will be reported in the RAR. The RAR will provide a tabular and map summary of all end-point sample results and will include all data including non-detects and applicable standards and/or guidance values. End-point samples will be analyzed for trigger analytes (those for which SCO exceedence is identified) utilizing the following methodology:

Soil analytical methods will include:

- Volatile organic compounds by EPA Method 8260;
- Semi-volatile organic compounds by EPA Method 8270;
- Target Analyte List metals; and
- Pesticides/PCBs by EPA Method 8081/8082.

Quality Assurance/Quality Control

Quality assurance (duplicate and trip blanks) and quality control (field blanks) samples will be incorporated into the sampling events as required by NYCOER and will consist of one duplicate soil sample and one field blank per 20 end-point soil samples collected. Soil field blanks will be analyzed for VOCs and soil duplicate samples will be analyzed for VOCs and SVOCs.

Import and Reuse of Soils

Although not anticipated, any import of soils onto the property and reuse of soils already onsite will be performed in conformance with the Soil/Materials Management Plan in Appendix 3.

4.3 ENGINEERING CONTROLS

Engineering Controls were employed in the remedial action to address residual contamination remaining at the site. The Site has three primary Engineering Control Systems.

These are:

- composite cover system consisting of asphalt covered parking area, concrete covered sidewalks, and concrete building slab;
- sub-slab depressurization system;

Composite Cover System

Exposure to residual soil/fill will be prevented by a concrete building slab to be built on part of the Site and paving over the remainder of the Site. The composite cover system is a permanent engineering control for the Site. The system will be inspected and reported at specified intervals as required by this RAWP and the SMP. A Soil Management Plan will be included in the Site Management Plan and will outline the procedures to be followed in the event that the composite cover system and underlying residual soil/fill is disturbed after the remedial action is complete. Maintenance of this composite cover system will be described in the Site Management Plan in the RAR.

- The site building slab is a permanent engineering control for the Site. The system will be inspected and reported at specified intervals as required by this RAWP and the Site Management Plan (SMP). A Soil Management Plan will be included in the Site Management Plan and will outline the procedures to be followed in the event that the composite cover system and underlying residual soil/fill is disturbed after the remedial action is complete. Engineering drawing will be included in the Stip List. Maintenance of this composite cover system will be described in the Site Management Plan in the RAR.

Sub-Slab Depressurization System

A sub-slab depressurization system (SSDS) will be installed below the foundation of the slab-on-grade first floor of the building as well as beneath the newly installed cellar slab as part of the proposed construction. The SSDS is designed to maintain negative pressure beneath the entire area of the building slab addressed by this RAP. An SSDS is currently being designed for the project.

Waterproofing (and Vapor Barrier) System

- A VaporBlock Plus VBP 20-mil vapor barrier, manufactured by Raven Industries, will be installed beneath the cellar slab and along sidewalls. Installation details (penetrations, joints, etc.) with respect to the proposed building foundation, footings, slab, and sidewalls are provided in Appendix 8. Product specification sheets are provided in Appendix 8. A Raven Industries pre-approval letter supporting the proposed product specifications can be found in Appendix 8. The Raven Industries letter also summarizes dates (month/year) for all reports and analytical data sets for all media collected from the site reviewed to support the pre-approval.

The RCR will include photographs (maximum of two photos per page) of the installation process, Professional Engineer/Registered Architect (PE/RA) certified letter (on company letterhead) from the primary contractor responsible for installation oversight and field inspections. Additionally, a copy of the Raven Industries warrantee of the waterproofing/vapor barrier system will be included in the P.E. Certified Closure report.

4.4 INSTITUTIONAL CONTROLS

Track 1 remedy is proposed; therefore Engineering and Institutional Controls are not required.

4.5 SITE MANAGEMENT PLAN

Site Management is the last phase of remediation and begins with the approval of the Remedial Action Report and issuance of the Notice of Completion (NOC) for the Remedial Action. The Site Management Plan (SMP) describes appropriate methods and procedures to ensure implementation of all ECs and ICs that are required by the DCR and this RAWP. The Site Management Plan is submitted as part of the RAR but will be written in a manner that allows its use as an independent document. Site Management continues until terminated in writing by OER. The property owner is responsible to ensure that all Site Management responsibilities defined in the DCR and the Site Management Plan are implemented.

The SMP will provide a detailed description of the procedures required to manage residual soil/fill left in place following completion of the remedial action in accordance with the Brownfield Cleanup Agreement with OER. This includes a plan for: (1) implementation of EC's and ICs; (2) implementation of monitoring programs; (3) operation and maintenance of EC's; (4) inspection and certification of EC's; and (5) reporting.

Site management activities, reporting, and EC/IC certification will be scheduled on an periodic basis to be established in the SMP and will be subject to review and modification by OER. The Site Management Plan will be based on a calendar year and certification reports will be due for submission to OER by March 31 of the year following the reporting period.

4.6 QUALITATIVE HUMAN HEALTH EXPOSURE ASSESSMENT

Investigations reported in the Remedial Investigation Report (RIR) are sufficient to complete a Qualitative Human Health Exposure Assessment (QHHEA).

Known and Potential Sources

Soil:

- Soil/fill samples collected during the RI indicated all constituents below Track 1 Soil Cleanup Objectives.

Groundwater:

- There is no groundwater contamination.

Soil Vapor:

- Low levels of petroleum related compounds were detected in soil vapor samples. Acetone was detected at 156 ug/m³ (VP-1). Tetrachloroethene (a/k/a perchloroethylene, PCE) was detected in all samples at a maximum concentration of 406 ug/m³ (VP-1) in undiluted samples. The highest accurate concentration of PCE was measured to be 257 ug/m³. PCE was not found in site soil or groundwater above its respective UUSCO, groundwater protection standards for soil or GQSs.

Nature, Extent, Fate and Transport of Contaminants

Concentrations of metals, pesticides, and SVOCs do not exceed the Track 1 SCOs and there is very little historic fill at the Site.

The groundwater at the site is not contaminated with the exception of very low levels of dissolved mercury that exceeded GQS. Mercury was not observed above Track 1 SCOs in site soils.

PCE was identified in all three soil vapor probes. Neither PCE nor gasoline related compounds were found in site soil or groundwater above their respective UUSCO, groundwater protection standards for soil or GQSs. As part of the site development a waterproofing layer will be installed in the cellar and will act as a barrier to soil vapor migration into the building.

Potential Routes of Exposure

The five elements of an exposure pathway are: (1) a contaminant source; (2) contaminant release and transport mechanisms; (3) a point of exposure; (4) a route of exposure; and (5) a receptor population.

An exposure pathway is considered complete when all five elements of an exposure pathway are documented. A potential exposure pathway exists when any one or more of the five elements comprising an exposure pathway cannot be ruled out. An exposure pathway may be eliminated from further evaluation when any one of the five elements comprising an exposure pathway has not existed in the past, does not exist in the present, and will never exist in the future. Three potential primary routes exist by which chemicals can enter the body:

- Ingestion of water, fill, or soil;
- Inhalation of vapors and particulates; and
- Dermal contact with water, fill, soil, or building materials.

Existence of Human Health Exposure

Removal of soil will be performed and these pathways are eliminated for long term use of the use and only have to be considered during construction. Low concentrations of detected contaminants in soil are below Track 1 SCOs and have not been detected in groundwater therefore, the leaching pathway has not been completed and is not a concern. Potential exposure to contaminants through direct contact with impacted material will occur; however, this exposure route is addressed by the implementation of the CHASP and Community Air Monitoring Plan.

Current Conditions: Currently, there are no potential migration pathways for absorption or ingestion, since the Site is securely locked and/or paved. The soil at the site contains isolated and low level contaminants below Track 1 SCOs. Groundwater is not exposed at the site, and because the site is served by the public water supply, groundwater is not used at the site. Additionally, the groundwater at the site is not contaminated with the exception of low levels of dissolved mercury that exceeded GQS.

Construction/ Remediation Activities: The potential exposure pathways to onsite contamination are by ingestion, dermal, or inhalation exposure by onsite workers during the

remedial action. The work performed at the site will include excavation of soil/fill material and general construction activities that could affect the on-site construction/remediation workers and the off-site local population. The construction and excavation work at the site will expose on-site workers to site soils via direct contact (during excavation), and ingestion or inhalation of the soil (by means of dust), and soil vapors. The construction work at the site has potential to expose off-site local residents to contaminants via inhalation of soil (by means of dust) and soil vapors. Potential exposure routes are addressed by the implementation of the Construction Health and Safety Plan (CHASP) and Community Air Monitoring Plan (CAMP), requiring personal protective equipment, implementing provisions for upgrading the level of personal protective equipment when needed, and applying dust and vapor suppression measures where applicable and needed.

Proposed Future Conditions: The proposed site redevelopment includes partial removal of the slab in the existing building, excavation to a depth of approximately 10 feet below grade in the area of the proposed cellar, and rehabilitation of the existing on-site structure and construction of a partial basement. The remaining areas of the site will be used for parking. The Site will be entirely covered by either building or pavement. The composite cover (building slab or paved areas) will eliminate the potential for direct contact with underlying soil. Engineering controls will prevent potential for inhalation via soil vapor intrusion. Upon the completion of remediation, it will be confirmed that no soils exceed Track 1. A waterproofing/vapor barrier system will be installed in the area of the proposed cellar, which will prevent direct exposure of humans to the soil and soil vapors at the site.

Receptor Populations

The receptors identified under the proposed remedy include:

- On-site workers: adult (remediation and construction workers); and,
- Temporary worker: adult (utility worker/inspector, subcontractors, sampler/remediation inspector). Off-site receptors: Potential off-site receptors within a 0.25-mile radius of the Site include: adult and child residents, and commercial and construction workers, pedestrians, trespassers, and cyclists, based on the following:

1. Commercial Businesses – existing and future
2. Residential Buildings – existing and future
3. Building Construction/Renovation – existing and future
4. Pedestrians, Trespassers, Cyclists– existing and future
5. Schools– existing and future

The receptors identified under the proposed remedy and future site use as a commercial development include:

- Adult and child patrons of commercial and retail properties;
- On-site workers: adult retail/commercial office/maintenance workers; and
- Temporary worker: adult (utility worker/inspector, landscape worker, construction worker).

The receptors identified above are believed to be the primary receptors of interest.

Overall Human Health Exposure Assessment

Complete on-site exposure pathways appear to be present only during the current unremediated phase and the construction and remediation phase. Under current conditions, on-site exposure pathways are limited by preventing access to the site.

Exposure of both on-site workers and the off-site local population to site contaminated media (soil and soil vapor) is most likely to occur during the remedial and construction work. In order to eliminate or greatly reduce the possible exposure levels, a CHASP and CAMP will be implemented in order to monitor dust and vapor emissions, set personal protective equipment requirements for on-site personnel, have provisions to increase the level of personal protective equipment as needed, and apply dust and vapor suppression measures where applicable and needed.

After the remedial action is complete, there will be no remaining exposure pathways. The proposed development requires excavation to a depth of **10 feet b.g.s. over 15% of the site**. The Site will also be fully covered with the building foundation as well as a paved parking area eliminating any direct exposures and threat to human health or the environment. The

waterproofing/vapor barrier will be installed as part of construction at the site and will address any residual and off-site sources of soil vapor.

5.0 REMEDIAL ACTION MANAGEMENT

5.1 PROJECT ORGANIZATION AND OVERSIGHT

Principal personnel who will participate in the remedial action include James M. DeMartinis and Heather Sonnenberg. The Professional Engineer (PE) and Qualified Environmental Professionals (QEP) for this project are James R. Holzmacher P.E and James M DeMartinis P.G.

5.2 SITE SECURITY

Site access will be controlled by gated entrances to the fenced property.

5.3 WORK HOURS

The hours for operation of remedial construction will conform to the New York City Department of Buildings construction code requirements or according to specific variances issued by that agency.

5.4 CONSTRUCTION HEALTH AND SAFETY PLAN

The Health and Safety Plan is included in Appendix 4. The Site Safety Coordinator will be Heather Sonnenberg. Remedial work performed under this RAWP will be in full compliance with applicable health and safety laws and regulations, including Site and OSHA worker safety requirements and HAZWOPER requirements. Confined space entry, if any, will comply with OSHA requirements and industry standards and will address potential risks. The parties performing the remedial construction work will ensure that performance of work is in compliance with the HASP and applicable laws and regulations. The HASP pertains to remedial and invasive work performed at the Site until the issuance of the Notice of Completion.

All field personnel involved in remedial activities will participate in training required under 29 CFR 1910.120, including 40-hour hazardous waste operator training and annual 8-hour refresher training. Site Safety Officer will be responsible for maintaining workers training records.

Personnel entering any exclusion zone will be trained in the provisions of the HASP and be required to sign an HASP acknowledgment. Site-specific training will be provided to field personnel. Additional safety training may be added depending on the tasks performed. Emergency telephone numbers will be posted at the site location before any remedial work begins. A safety meeting will be conducted before each shift begins. Topics to be discussed include task hazards and protective measures (physical, chemical, environmental); emergency procedures; PPE levels and other relevant safety topics. Meetings will be documented in a log book or specific form.

An emergency contact sheet with names and phone numbers is included in the HASP. That document will define the specific project contacts for use in case of emergency.

5.5 COMMUNITY AIR MONITORING PLAN

Real-time air monitoring for volatile organic compounds (VOCs) and particulate levels at the perimeter of the exclusion zone or work area will be performed. Continuous monitoring will be performed for all ground intrusive activities and during the handling of contaminated or potentially contaminated media. Ground intrusive activities include, but are not limited to, soil/waste excavation and handling, test pit excavation or trenching, and the installation of soil borings or monitoring wells.

Periodic monitoring for VOCs will be performed during non-intrusive activities such as the collection of soil and sediment samples or the collection of groundwater samples from existing monitoring wells. Periodic monitoring during sample collection, for instance, will consist of taking a reading upon arrival at a sample location, monitoring while opening a well cap or overturning soil, monitoring during well baling/purging, and taking a reading prior to leaving a sample location. Depending upon the proximity of potentially exposed individuals, continuous monitoring may be performed during sampling activities. Examples of such situations include groundwater sampling at wells on the curb of a busy urban street, in the midst of a public park, or adjacent to a school or residence. Exceedences of action levels observed during performance of the Community Air Monitoring Plan (CAMP) will be reported to the OER Project Manager and included in the Daily Report.

VOC Monitoring, Response Levels, and Actions

Volatile organic compounds (VOCs) will be monitored at the downwind perimeter of the immediate work area (i.e., the exclusion zone) on a continuous basis during invasive work. Upwind concentrations will be measured at the start of each workday and periodically thereafter to establish background conditions. The monitoring work will be performed using equipment appropriate to measure the types of contaminants known or suspected to be present. The equipment will be calibrated at least daily for the contaminant(s) of concern or for an appropriate surrogate. The equipment will be capable of calculating 15-minute running average concentrations, which will be compared to the levels specified below.

- If the ambient air concentration of total organic vapors at the downwind perimeter of the work area or exclusion zone exceeds 5 parts per million (ppm) above background for the 15-minute average, work activities will be temporarily halted and monitoring continued. If the total organic vapor level readily decreases (per instantaneous readings) below 5 ppm over background, work activities will resume with continued monitoring.
- If total organic vapor levels at the downwind perimeter of the work area or exclusion zone persist at levels in excess of 5 ppm over background but less than 25 ppm, work activities will be halted, the source of vapors identified, corrective actions taken to abate emissions, and monitoring continued. After these steps, work activities will resume provided that the total organic vapor level 200 feet downwind of the 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.

All 15-minute readings must be recorded and be available for OER personnel to review. Instantaneous readings, if any, used for decision purposes will also be recorded.

Particulate Monitoring, Response Levels, and Actions

Particulate concentrations will be monitored continuously at the upwind and downwind perimeters of the exclusion zone at temporary particulate monitoring stations. The particulate

monitoring will be performed using real-time monitoring equipment capable of measuring particulate matter less than 10 micrometers in size (PM-10) and capable of integrating over a period of 15 minutes (or less) for comparison to the airborne particulate action level. The equipment will be equipped with an audible alarm to indicate exceedance of the action level. In addition, fugitive dust migration should be visually assessed during all work activities.

- If the downwind PM-10 particulate level is 100 micrograms per cubic meter (mcg/m^3) greater than background (upwind perimeter) for the 15-minute period or if airborne dust is observed leaving the work area, then dust suppression techniques will be employed. Work will continue with dust suppression techniques provided that downwind PM-10 particulate levels do not exceed $150 \text{ mcg}/\text{m}^3$ above the upwind level and provided that no visible dust is migrating from the work area.
- If, after implementation of dust suppression techniques, downwind PM-10 particulate levels are greater than $150 \text{ mcg}/\text{m}^3$ above the upwind level, work will be stopped and a re-evaluation of activities initiated. Work will resume provided that dust suppression measures and other controls are successful in reducing the downwind PM-10 particulate concentration to within $150 \text{ mcg}/\text{m}^3$ of the upwind level and in preventing visible dust migration.

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

5.6 AGENCY APPROVALS

All permits or government approvals required for remedial construction have been or will be obtained prior to the start of remedial construction. Approval of this RAWP by OER does not constitute satisfaction of these requirements and will not be a substitute for any required permit.

5.7 SITE PREPARATION

Pre-Construction Meeting

OER will be invited to attend the pre-construction meeting at the Site with all parties involved in the remedial process prior to the start of remedial construction activities.

Mobilization

Mobilization will be conducted as necessary for each phase of work at the Site. Mobilization includes field personnel orientation, equipment mobilization (including securing all sampling equipment needed for the field investigation), marking/staking sampling locations and utility mark-outs. Each field team member will attend an orientation meeting to become familiar with the general operation of the Site, health and safety requirements, and field procedures.

Utility Marker Layouts, Easement Layouts

The presence of utilities and easements on the Site will be fully investigated prior to the performance of invasive work such as excavation or drilling under this plan by using, at a minimum, the One-Call System (811). Underground utilities may pose an electrocution, explosion, or other hazard during excavation or drilling activities. All invasive activities will be performed in compliance with applicable laws and regulations to assure safety. Utility companies and other responsible authorities will be contacted to locate and mark the locations, and a copy of the Markout Ticket will be retained by the contractor prior to the start of drilling, excavation or other invasive subsurface operations. Overhead utilities may also be present within the anticipated work zones. Electrical hazards associated with drilling in the vicinity of overhead utilities will be prevented by maintaining a safe distance between overhead power lines and drill rig masts.

Proper safety and protective measures pertaining to utilities and easements, and compliance with all laws and regulations will be employed during invasive and other work contemplated under this RAWP. The integrity and safety of on-Site and off-Site structures will be maintained during all invasive, excavation or other remedial activity performed under the RAWP.

Equipment and Material Staging

Equipment and materials will be stored and staged in a manner that complies with applicable laws and regulations.

Stabilized Construction Entrance

Steps will be taken to ensure that trucks departing the site will not track soil, fill or debris off-Site. Such actions may include use of cleaned asphalt or concrete roads or use of stone or

other aggregate-based egress paths between the truck inspection station and the property exit. Measures will be taken to ensure that adjacent roadways will be kept clean of project related soils, fill and debris.

Truck Inspection Station

An outbound-truck inspection station will be set up close to the Site exit. Before exiting the NYC VCP Site, trucks will be required to stop at the truck inspection station and will be examined for evidence of contaminated soil on the undercarriage, body, and wheels. Soil and debris will be removed. Brooms, shovels and potable water will be utilized for the removal of soil from vehicles and equipment, as necessary.

5.8 TRAFFIC CONTROL

Drivers of trucks leaving the NYC VCP Site with soil/fill will be instructed to proceed without stopping in the vicinity of the site to prevent neighborhood impacts. The planned route on local roads for trucks leaving the site will be planned by the construction manager for the Site and reported to OER.

5.9 DEMOBILIZATION

Demobilization will include:

- As necessary, restoration of temporary access areas and areas that may have been disturbed to accommodate support areas (e.g., staging areas, decontamination areas, storage areas, temporary water management areas, and access area);
- Removal of sediment from erosion control measures and truck wash and disposal of materials in accordance with applicable laws and regulations;
- Equipment decontamination, and;
- General refuse disposal.

Equipment will be decontaminated and demobilized at the completion of all field activities. Investigation equipment and large equipment (e.g., soil excavators) will be washed at the truck inspection station as necessary. In addition, all investigation and remediation derived waste will be appropriately disposed.

5.10 REPORTING AND RECORD KEEPING

Daily Reports

Daily reports providing a general summary of activities for each day of *active remedial work* will be emailed to the OER Project Manager by the end of the following day. Those reports will include:

- Project number and statement of the activities and an update of progress made and locations of work performed;
- Quantities of material imported and exported from the Site;
- Status of on-Site soil/fill stockpiles;
- A summary of all citizen complaints, with relevant details (basis of complaint; actions taken; etc.);
- A summary of CAMP excursions, if any;
- Photograph of notable Site conditions and activities.

The frequency of the reporting period may be revised in consultation with OER project manager based on planned project tasks. Daily email reports are not intended to be the primary mode of communication for notification to OER of emergencies (accidents, spills), requests for changes to the RAWP or other sensitive or time critical information. However, such information will be included in the daily reports. Emergency conditions and changes to the RAWP will be communicated directly to the OER project manager by personal communication. Daily reports will be included as an Appendix in the Remedial Action Report.

Record Keeping and Photo-Documentation

Job-site record keeping for all remedial work will be performed. These records will be maintained on-Site during the project and will be available for inspection by OER staff. Representative photographs will be taken of the Site prior to any remedial activities and during major remedial activities to illustrate remedial program elements and contaminant source areas.

Photographs will be submitted at the completion of the project in the RAR in digital format (i.e. jpeg files).

5.11 COMPLAINT MANAGEMENT

All complaints from citizens will be promptly reported to OER. Complaints will be addressed and outcomes will also be reported to OER in daily reports. Notices to OER will include the nature of the complaint, the party providing the complaint, and the actions taken to resolve any problems.

5.12 DEVIATIONS FROM THE REMEDIAL ACTION WORK PLAN

All changes to the RAWP will be reported to the OER Project Manager and will be documented in daily reports and reported in the Remedial Action Report. The process to be followed if there are any deviations from the RAWP will include a request for approval for the change from OER noting the following:

- Reasons for deviating from the approved RAWP;
- Effect of the deviations on overall remedy; and
- Determination that the remedial action with the deviation(s) is protective of public health and the environment.

5.13 DATA USABILITY SUMMARY REPORT

The primary objective of a Data Usability Summary Report (DUSR) is to determine whether or not data meets the site specific criteria for data quality and data use. The DUSR provides an evaluation of analytical data without third party data validation. The DUSR for post-remedial samples collected during implementation of this RAWP will be included in the Remedial Action Report (RAR).

6.0 REMEDIAL ACTION REPORT

A Remedial Action Report (RAR) will be submitted to OER following implementation of the remedial action defined in this RAWP. The RAR will document that the remedial work required under this RAWP has been completed and has been performed in compliance with this plan. The RAR will include:

- Information required by this RAWP;
- As-built drawings for all constructed remedial elements, required certifications, manifests and other written and photographic documentation of remedial work performed under this remedy;
- Site Management Plan;
- Description of any changes in the remedial action from the elements provided in this RAWP and associated design documents;
- Tabular summary of all end point sampling results and all material characterization results, QA/QC results for end-point sampling, and other sampling and chemical analysis performed as part of the remedial action and DUSR;
- Test results or other evidence demonstrating that remedial systems are functioning properly;
- Account of the source area locations and characteristics of all contaminated material removed from the Site including a map showing source areas;
- Account of the disposal destination of all contaminated material removed from the Site. Documentation associated with disposal of all material will include transportation and disposal records, and letters approving receipt of the material.
- Account of the origin and required chemical quality testing for material imported onto the Site.
- Recorded Declaration of Covenants and Restrictions.
- Reports and supporting material will be submitted in digital form.

Remedial Action Report Certification

The following certification will appear in front of the Executive Summary of the Remedial Action Report. The certification will include the following statements:

I, J.R. Holzmacher, am currently a professional engineer licensed by the State of New York. I had primary direct responsibility for implementation of the remedial program for the 24 Merrick Blvd Site.

I, James DeMartinis, am a qualified Environmental Professional. I had primary direct responsibility for implementation remedial program for the 224 Merrick Blvd.

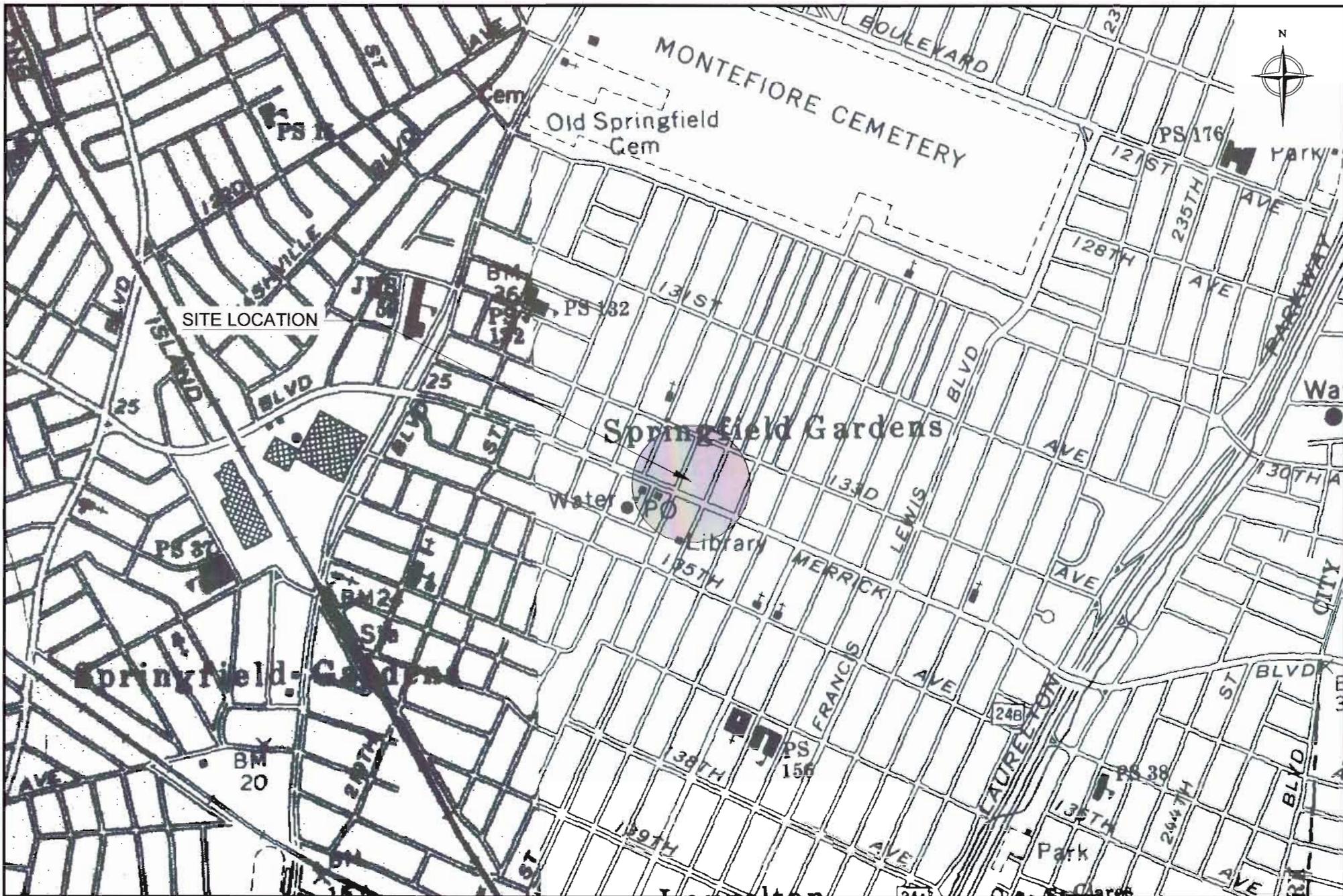
I certify that the OER-approved Remedial Action Work Plan dated month day year and Stipulations in a letter dated month day, year; if any were implemented and that all requirements in those documents have been substantively complied with. I certify that contaminated soil, fill, liquids or other material from the property were taken to facilities licensed to accept this material in full compliance with applicable laws and regulations.

7.0 SCHEDULE

The table below presents a schedule for the proposed remedial action and reporting. If the schedule for remediation and development activities changes, it will be updated and submitted to OER. Currently, a one month remediation period is anticipated.

| Schedule Milestone | Weeks from Remedial Action Start | Duration (weeks) |
|--|---|-------------------------|
| OER Approval of RAWP | 0 | - |
| Fact Sheet 2 announcing start of remedy | 0 | - |
| Mobilization | 1 | |
| Remedial Excavation | 1 | 2 |
| Demobilization | 3 | |
| Record Declaration of Covenants and Restrictions | N/A | |
| Submit Remedial Action Report | 6 | |

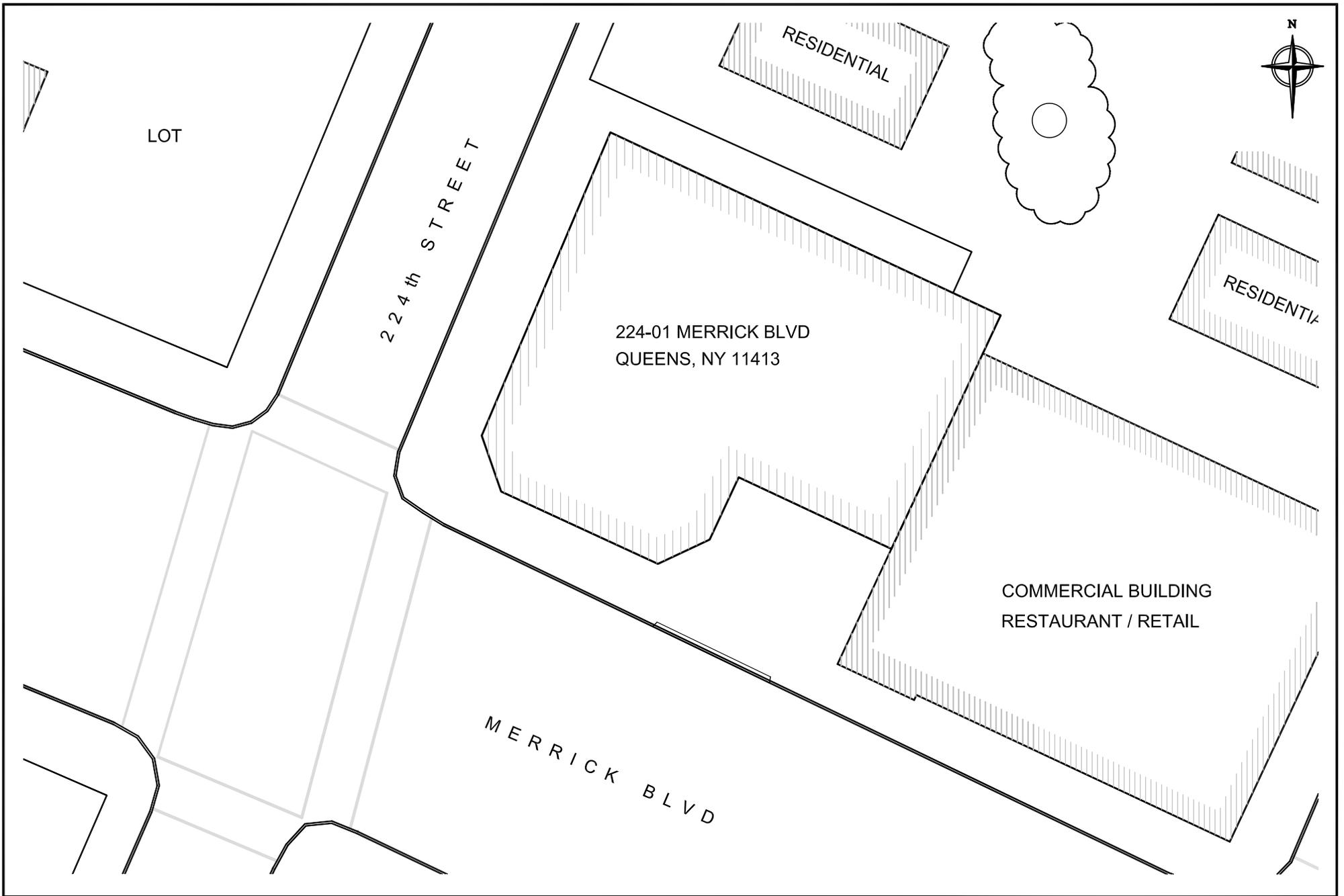
FIGURES



PREPARED BY:
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 HAUPPAUGE, NEW YORK 11788 E-MAIL: info@holzmacher.com

TITLE:
LOCATION MAP
 224-01 MERRICK BLVD
 QUEENS, NEW YORK 11413

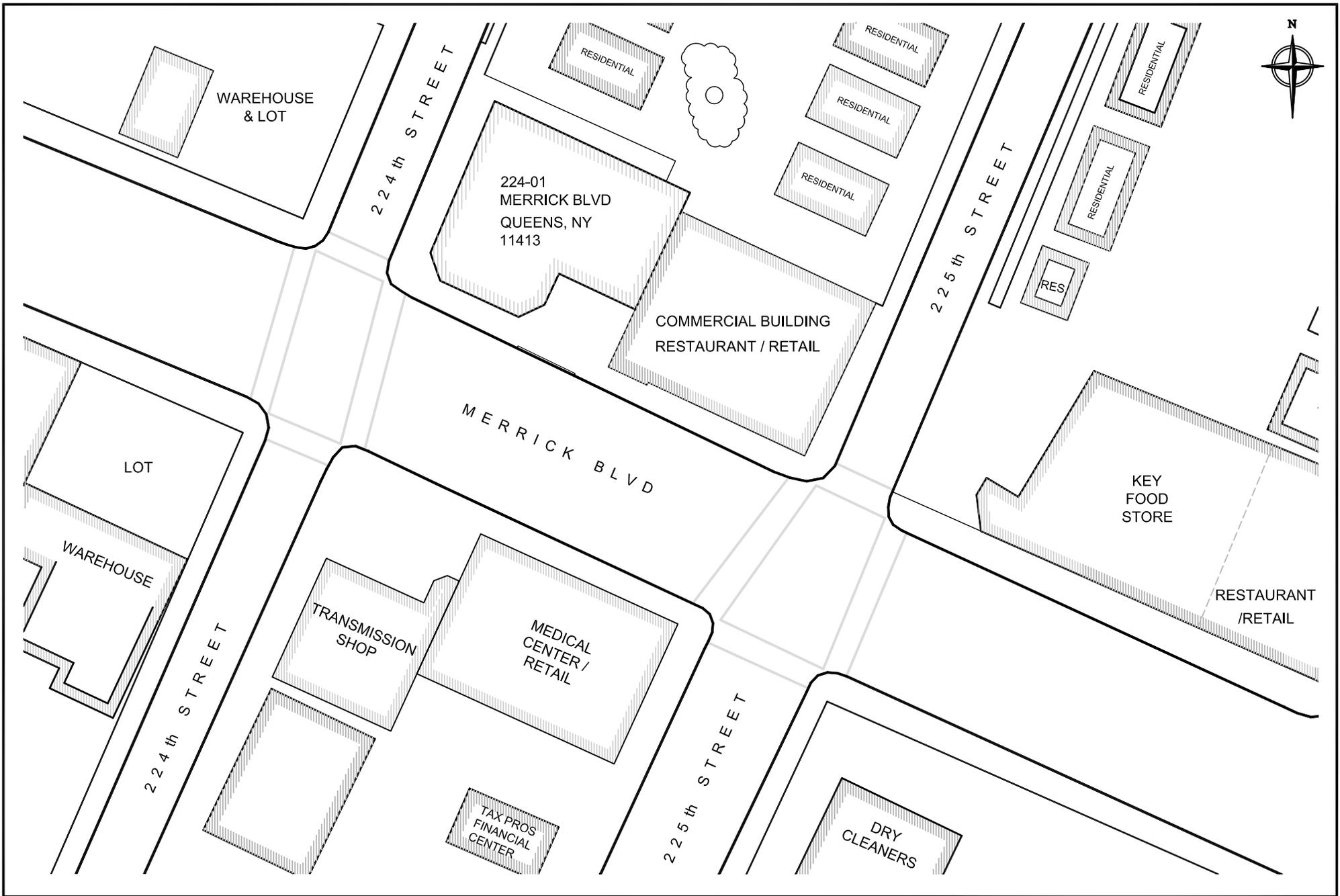
| | | | |
|--------------|----------------------|--------------------|-----------------------------|
| DWN: BJH | SCALE: 1" = 1000' | DATE: 5/30/2012 | PROJECT NO.: KoptD 12-02 |
| CHKD: JMD | APPD: JMD | REV.: - | NOTES: - |
| FIGURE NO.: | | | 1 |



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TITLE:
SITE PLAN
 224-01 MERRICK BLVD
 QUEENS, NEW YORK 11413

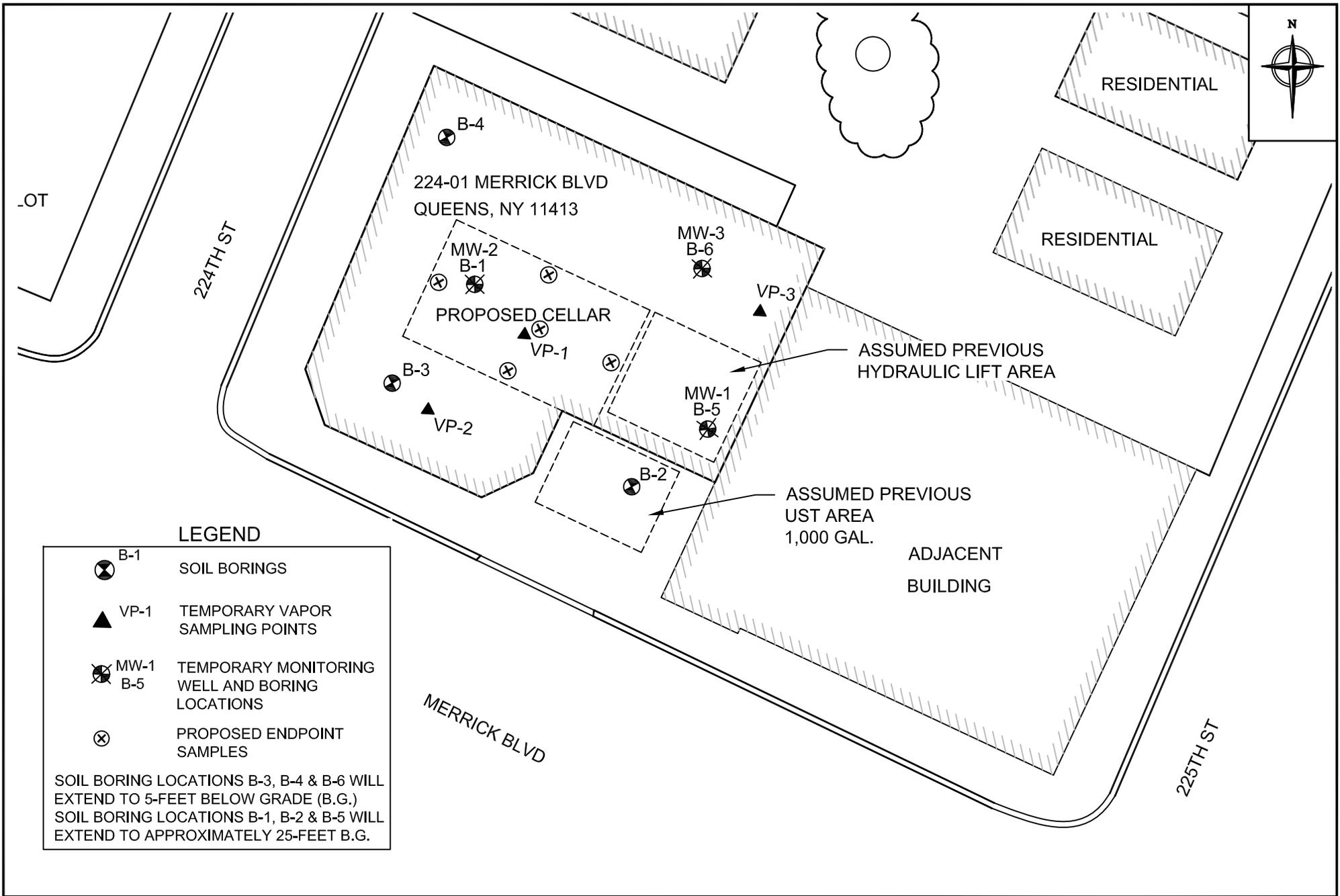
| | | | |
|--------------|--------------------|--------------------|-----------------------------|
| DWN: BJH | SCALE: 1" = 30' | DATE: 5/31/2012 | PROJECT NO.: KoptD 12-02 |
| CHKD: JMD | APPD: JMD | REV.: - | NOTES: - |
| FIGURE NO.: | | 2 | |



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 E-MAIL: info@holzmacher.com

TITLE:
SURROUNDING PROPERTY USE
 224-01 MERRICK BLVD
 QUEENS, NEW YORK 11413

| | | | |
|--------------|--------------------|--------------------|-----------------------------|
| DWN: BJH | SCALE: 1" = 60' | DATE: 5/31/2012 | PROJECT NO.: KoptD 12-02 |
| CHKD: JMD | APPD: JMD | REV.: - | NOTES: - |
| FIGURE NO.: | | | 4 |



LEGEND

| | |
|--|---|
| | B-1 SOIL BORINGS |
| | VP-1 TEMPORARY VAPOR SAMPLING POINTS |
| | MW-1 B-5 TEMPORARY MONITORING WELL AND BORING LOCATIONS |
| | PROPOSED ENDPOINT SAMPLES |

SOIL BORING LOCATIONS B-3, B-4 & B-6 WILL EXTEND TO 5-FEET BELOW GRADE (B.G.)
 SOIL BORING LOCATIONS B-1, B-2 & B-5 WILL EXTEND TO APPROXIMATELY 25-FEET B.G.

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TITLE: **LOCATION OF AOCs, SOIL BORINGS, WELLS, SOIL VAPOR SAMPLES AND PROPOSED ENDPOINT SAMPLES**
 224-01 MERRICK BLVD
 QUEENS, NEW YORK 11413

| | | | |
|--------------|----------------|--------------------|-----------------------------|
| DWN: BJH | SCALE: 1:30 | DATE: 4/10/2012 | PROJECT NO.: KoptD 12-02 |
| CHKD: JMD | APPD: JMD | REV.: - | NOTES: - |
| FIGURE NO.: | | | 5 |

TABLES

224-01 Merrick Blvd
 Queens NY
 OER# 12EH-N378Q

Volatile Organic Chemicals For Soils
 EPA Method 8260
 Table 1

| Client SampleID: | | SCOs | B-2 | B-2 | B-5 | B-5 | B-3 | B-1 | B-1 | B-4 | B-6 |
|---------------------------------------|--------------|--------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Depth of Sample | | Restricted | 0-2' | 15-17' | 0-2' | 15-17' | 0-2' | 0-2' | 15-17' | 0-2' | 0-2' |
| Sampling Date: | | Residential | 5/2/2012 |
| Analyte | Units | Track 2 | | | | | | | | | |
| 1,1,1,2-Tetrachloroethane | PPB | NA | ND |
| 1,1,1-Trichloroethane | PPB | 100000 | ND |
| 1,1,2,2-Tetrachloroethane | PPB | NA | ND |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | PPB | NA | ND |
| 1,1,2-Trichloroethane | PPB | NA | ND |
| 1,1-Dichloroethane | PPB | 19000 | ND |
| 1,1-Dichloroethene | PPB | 100000 | ND |
| 1,1-Dichloropropene | PPB | NA | ND |
| 1,2,3-Trichlorobenzene | PPB | NA | ND |
| 1,2,3-Trichloropropane | PPB | NA | ND |
| 1,2,4,5-Tetramethylbenzene | PPB | NA | ND |
| 1,2,4-Trichlorobenzene | PPB | NA | ND |
| 1,2,4-Trimethylbenzene | PPB | 47000 | ND |
| 1,2-Dibromo-3-chloropropane | PPB | NA | ND |
| 1,2-Dibromoethane | PPB | NA | ND |
| 1,2-Dichlorobenzene | PPB | 100000 | ND |
| 1,2-Dichloroethane | PPB | 2300 | ND |
| 1,2-Dichloropropane | PPB | NA | ND |
| 1,3,5-Trimethylbenzene | PPB | 47000 | ND |
| 1,3-Dichlorobenzene | PPB | 17000 | ND |
| 1,3-dichloropropane | PPB | NA | ND |
| 1,4-Dichlorobenzene | PPB | 9800 | ND |
| 1,4-Dioxane | PPB | 9800 | ND |
| 2,2-Dichloropropane | PPB | NA | ND |
| 2-Butanone | PPB | NA | ND |
| 2-Chloroethyl vinyl ether | PPB | NA | ND |
| 2-Chlorotoluene | PPB | NA | ND |
| 2-Hexanone | PPB | NA | ND |
| 2-Propanol | PPB | NA | ND |
| 4-Chlorotoluene | PPB | NA | ND |
| 4-Isopropyltoluene | PPB | NA | ND |

224-01 Merrick Blvd
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Volatile Organic Chemicals For Soils
 EPA Method 8260
 Table 1

| Client SampleID: | | SCOs | B-2 | B-2 | B-5 | B-5 | B-3 | B-1 | B-1 | B-4 | B-6 |
|-------------------------|--------------|--------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Depth of Sample | | Restricted | 0-2' | 15-17' | 0-2' | 15-17' | 0-2' | 0-2' | 15-17' | 0-2' | 0-2' |
| Sampling Date: | | Residential | 5/2/2012 |
| Analyte | Units | Track 2 | | | | | | | | | |
| 4-Methyl-2-pentanone | PPB | NA | ND |
| Acetone | PPB | 100000 | ND |
| Acrolein | PPB | NA | ND |
| Acrylonitrile | PPB | NA | ND |
| Benzene | PPB | 2900 | ND |
| Bromobenzene | PPB | NA | ND |
| Bromochloromethane | PPB | NA | ND |
| Bromodichloromethane | PPB | NA | ND |
| Bromoform | PPB | NA | ND |
| Bromomethane | PPB | NA | ND |
| Carbon disulfide | PPB | NA | ND |
| Carbon tetrachloride | PPB | 1400 | ND |
| Chlorobenzene | PPB | 100000 | ND |
| Chlorodifluoromethane | PPB | NA | ND |
| Chloroethane | PPB | NA | ND |
| Chloroform | PPB | 10000 | ND |
| Chloromethane | PPB | NA | ND |
| cis-1,2-Dichloroethene | PPB | 59000 | ND |
| cis-1,3-Dichloropropene | PPB | NA | ND |
| Dibromochloromethane | PPB | NA | ND |
| Dibromomethane | PPB | NA | ND |
| Dichlorodifluoromethane | PPB | NA | ND |
| Diisopropyl ether | PPB | NA | ND |
| Ethanol | PPB | NA | ND |
| Ethyl acetate | PPB | NA | ND |
| Ethylbenzene | PPB | 30000 | ND |
| Freon-114 | PPB | NA | ND |
| Hexachlorobutadiene | PPB | NA | ND |
| Isopropyl acetate | PPB | NA | ND |
| Isopropylbenzene | PPB | NA | ND |

224-01 Merrick Blvd
 Queens NY
 OER# 12EH-N378Q

Volatile Organic Chemicals For Soils
 EPA Method 8260
 Table 1

| Client SampleID: | | SCOs | B-2 | B-2 | B-5 | B-5 | B-3 | B-1 | B-1 | B-4 | B-6 |
|---------------------------|-------|-------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Depth of Sample | | Restricted | 0-2' | 15-17' | 0-2' | 15-17' | 0-2' | 0-2' | 15-17' | 0-2' | 0-2' |
| Sampling Date: | | Residential | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 |
| Analyte | Units | Track 2 | | | | | | | | | |
| m,p-Xylene | PPB | NA | ND |
| Methyl Acetate | PPB | NA | ND |
| Methyl tert-butyl ether | PPB | 62000 | ND |
| Methylene chloride | PPB | 51000 | 12B | 13B | 11B | 13B | 9.4B | 9.2B | 11B | 10B | 8B |
| n-Amyl acetate | PPB | NA | ND |
| Naphthalene | PPB | 100000 | ND |
| n-Butyl acetate | PPB | NA | ND |
| n-Butylbenzene | PPB | 100000 | ND |
| n-Propyl acetate | PPB | NA | ND |
| n-Propylbenzene | PPB | 100000 | ND |
| o-Xylene | PPB | 100000 | ND |
| p-Diethylbenzene | PPB | NA | ND |
| p-Ethyltoluene | PPB | NA | ND |
| sec-Butylbenzene | PPB | 100000 | ND |
| Styrene | PPB | NA | ND |
| t-Butyl alcohol | PPB | NA | ND |
| tert-Butylbenzene | PPB | 100000 | ND |
| Tetrachloroethene | PPB | 5500 | ND | ND | ND | 17 | ND | ND | ND | ND | ND |
| Toluene | PPB | 100000 | ND |
| trans-1,2-Dichloroethene | PPB | 100000 | ND |
| trans-1,3-Dichloropropene | PPB | NA | ND |
| Trichloroethene | PPB | 10000 | ND |
| Trichlorofluoromethane | PPB | NA | ND |
| Vinyl acetate | PPB | NA | ND |
| Vinyl chloride | PPB | 210 | ND |

Notes:

ND - Not detected

Objectives as per NYSDEC Part 375-6.8(b)

J- Laboratory Estimated Concentration

B- Detected in Blank

NA- Not Available

224-01 Merrick Blvd
 Queens NY
 OER# 12EH-N378Q

Semi Volatile Organic Chemicals (SVOCs) for Soils
 EPA Method 8270 STARS
 Table 2

| Client SampleID: | | SCOs | B-2 | B-2 | B-5 | B-5 | B-3 | B-1 | B-1 | B-4 | B-6 |
|-----------------------------|-------|-------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Depth of Sample | | Restricted | 0-2' | 15-17' | 0-2' | 15-17' | 0-2' | 0-2' | 15-17' | 0-2' | 0-2' |
| Sampling Date: | | Residential | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 |
| Analyte | Units | Track 2 | | | | | | | | | |
| 1,2,4-Trichlorobenzene | PPB | NA | ND |
| 1,2-Dichlorobenzene | PPB | 100000 | ND |
| 1,3-Dichlorobenzene | PPB | 17000 | ND |
| 1,4-Dichlorobenzene | PPB | 9800 | ND |
| 2,4,5-Trichlorophenol | PPB | NA | ND |
| 2,4,6-Trichlorophenol | PPB | NA | ND |
| 2,4-Dichlorophenol | PPB | NA | ND |
| 2,4-Dimethylphenol | PPB | NA | ND |
| 2,4-Dinitrophenol | PPB | NA | ND |
| 2,4-Dinitrotoluene | PPB | NA | ND |
| 2,6-Dinitrotoluene | PPB | NA | ND |
| 2-Chloronaphthalene | PPB | NA | ND |
| 2-Chlorophenol | PPB | NA | ND |
| 2-Methylnaphthalene | PPB | NA | ND |
| 2-Methylphenol | PPB | 100000 | ND |
| 2-Nitroaniline | PPB | NA | ND |
| 2-Nitrophenol | PPB | NA | ND |
| 3,3'-Dichlorobenzidine | PPB | NA | ND |
| 3+4-Methylphenol | PPB | 100000 | ND |
| 3-Nitroaniline | PPB | NA | ND |
| 4,6-Dinitro-2-methylphenol | PPB | NA | ND |
| 4-Bromophenyl phenyl ether | PPB | NA | ND |
| 4-Chloro-3-methylphenol | PPB | NA | ND |
| 4-Chloroaniline | PPB | NA | ND |
| 4-Chlorophenyl phenyl ether | PPB | NA | ND |
| 4-Nitroaniline | PPB | NA | ND |
| 4-Nitrophenol | PPB | NA | ND |
| Acenaphthene | PPB | 100000 | ND |
| Acenaphthylene | PPB | 100000 | ND |
| Acetophenone | PPB | NA | ND |
| Aniline | PPB | NA | ND |
| Anthracene | PPB | 100000 | ND |

224-01 Merrick Blvd
 Queens NY
 OER# 12EH-N378Q

Semi Volatile Organic Chemicals (SVOCs) for Soils
 EPA Method 8270 STARS
 Table 2

| Client SampleID: | | SCOs | B-2 | B-2 | B-5 | B-5 | B-3 | B-1 | B-1 | B-4 | B-6 |
|-----------------------------|-------|-------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Depth of Sample | | Restricted | 0-2' | 15-17' | 0-2' | 15-17' | 0-2' | 0-2' | 15-17' | 0-2' | 0-2' |
| Sampling Date: | | Residential | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 |
| Analyte | Units | Track 2 | | | | | | | | | |
| Atrazine | PPB | NA | ND |
| Azobenzene | PPB | NA | ND |
| Benzaldehyde | PPB | NA | ND |
| Benzidine | PPB | NA | ND |
| Benzo(a)anthracene | PPB | 1000 | ND |
| Benzo(a)pyrene | PPB | 1000 | ND | ND | 28J | ND | ND | ND | ND | ND | ND |
| Benzo(b)fluoranthene | PPB | 1000 | ND |
| Benzo(g,h,i)perylene | PPB | 100000 | ND | ND | 71J | ND | ND | ND | ND | ND | ND |
| Benzo(k)fluoranthene | PPB | 1000 | ND |
| Benzoic acid | PPB | NA | ND |
| Benzyl alcohol | PPB | NA | ND |
| Biphenyl | PPB | NA | ND |
| Bis(2-chloroethoxy)methane | PPB | NA | ND |
| Bis(2-chloroethyl)ether | PPB | NA | ND |
| Bis(2-chloroisopropyl)ether | PPB | NA | ND |
| Bis(2-ethylhexyl)phthalate | PPB | NA | ND | ND | 890 | ND | ND | ND | ND | ND | ND |
| Butyl benzyl phthalate | PPB | NA | ND |
| Caprolactam | PPB | NA | ND |
| Carbazole | PPB | NA | ND |
| Chrysene | PPB | 1000 | ND |
| Dibenzo(a,h)anthracene | PPB | 330 | ND |
| Dibenzofuran | PPB | 14000 | ND |
| Diethyl phthalate | PPB | NA | ND |
| Dimethyl phthalate | PPB | NA | ND |
| Di-n-butyl phthalate | PPB | NA | ND |
| Di-n-octyl phthalate | PPB | NA | ND |
| Fluoranthene | PPB | 100000 | ND | 28J |
| Fluorene | PPB | 100000 | ND |
| Hexachlorobenzene | PPB | NA | ND |
| Hexachlorobutadiene | PPB | NA | ND |
| Hexachlorocyclopentadiene | PPB | NA | ND |
| Hexachloroethane | PPB | NA | ND |
| Indeno(1,2,3-c,d)pyrene | PPB | 500 | ND | ND | 37J | ND | ND | ND | ND | ND | ND |

224-01 Merrick Blvd
 Queens NY
 OER# 12EH-N378Q

Semi Volatile Organic Chemicals (SVOCs) for Soils
 EPA Method 8270 STARS
 Table 2

| Client SampleID: | | SCOs | B-2 | B-2 | B-5 | B-5 | B-3 | B-1 | B-1 | B-4 | B-6 |
|---------------------------|-------|-------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Depth of Sample | | Restricted | 0-2' | 15-17' | 0-2' | 15-17' | 0-2' | 0-2' | 15-17' | 0-2' | 0-2' |
| Sampling Date: | | Residential | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 |
| Analyte | Units | Track 2 | | | | | | | | | |
| Isophorone | PPB | NA | ND |
| Naphthalene | PPB | 100000 | ND |
| Nitrobenzene | PPB | NA | ND |
| N-Nitrosodimethylamine | PPB | NA | ND |
| N-Nitrosodi-n-propylamine | PPB | NA | ND |
| N-Nitrosodiphenylamine | PPB | NA | ND |
| Parathion | PPB | NA | ND |
| Pentachlorophenol | PPB | 2400 | ND |
| Phenanthrene | PPB | 100000 | ND | ND | 33J | ND | ND | ND | ND | ND | ND |
| Phenol | PPB | 100000 | ND |
| Pyrene | PPB | 100000 | ND | ND | 57 | ND | ND | ND | ND | ND | ND |
| Pyridine | PPB | NA | ND |

Notes:

ND - Not detected

Objectives as per NYSDEC Part 375-6.8(b)

J- Laboratory Estimated Concentration

B- Detected in Blank

NA- Not Available

224-01 Merrick Blvd
 Queens NY
 OER# 12EH-N378Q

Pesticides Method 8081
 Table 3

| Client SampleID: | | SCOs | B-2 | B-2 | B-5 | B-5 | B-3 | B-1 | B-1 | B-4 | B-6 |
|---------------------------|--------------|--------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Depth of Sample | | Restricted | 0-2' | 15-17' | 0-2' | 15-17' | 0-2' | 0-2' | 15-17' | 0-2' | 0-2' |
| Sampling Date: | | Residential | 5/2/2012 |
| Analyte | Units | Track 2 | | | | | | | | | |
| 4,4'-DDD | PPB | 2600 | ND |
| 4,4'-DDE | PPB | 1800 | ND |
| 4,4'-DDT | PPB | 1700 | ND |
| Aldrin | PPB | 19 | ND |
| alpha-BHC | PPB | 97 | ND |
| beta-BHC | PPB | 72 | ND |
| Chlordane | PPB | 910 | ND |
| Chlorobenzilate | PPB | NA | ND |
| DBCP | PPB | NA | ND |
| delta-BHC | PPB | 100000 | ND |
| Dieldrin | PPB | 39 | ND |
| Endosulfan I | PPB | 4800 | ND |
| Endosulfan II | PPB | 4800 | ND |
| Endosulfan sulfate | PPB | 4800 | ND |
| Endrin | PPB | 2200 | ND |
| Endrin aldehyde | PPB | NA | ND |
| Endrin ketone | PPB | NA | ND |
| gamma-BHC | PPB | 280 | ND |
| Heptachlor | PPB | 420 | ND |
| Heptachlor epoxide | PPB | NA | ND |
| Hexachlorobenzene | PPB | NA | ND |
| Hexachlorocyclopentadiene | PPB | NA | ND |
| Methoxychlor | PPB | NA | ND |
| Toxaphene | PPB | NA | ND |

Notes:

ND - Not detected

Objectives as per NYSDEC Part 375-6.8(b)

NA- Not Available

224-01 Merrick Blvd
 Queens NY
 OER# 12EH-N378Q
 PCBs Method 8082
 Table 4

| Client SampleID: | | SCOs | B-2 | B-2 | B-5 | B-5 | B-3 | B-1 | B-1 | B-4 | B-6 |
|-------------------------|--------------|--------------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|-----------------|
| Depth of Sample | | Restricted | 0-2' | 15-17' | 0-2' | 15-17' | 0-2' | 0-2' | 15-17' | 0-2' | 0-2' |
| Sampling Date: | | Residential | 5/2/2012 |
| Analyte | Units | Track 2 | | | | | | | | | |
| Aroclor 1016 | PPB | 1000 | ND |
| Aroclor 1221 | PPB | 1000 | ND |
| Aroclor 1232 | PPB | 1000 | ND |
| Aroclor 1242 | PPB | 1000 | ND |
| Aroclor 1248 | PPB | 1000 | ND |
| Aroclor 1254 | PPB | 1000 | ND |
| Aroclor 1260 | PPB | 1000 | ND |
| Aroclor 1262 | PPB | 1000 | ND |
| Aroclor 1268 | PPB | 1000 | ND |

Notes:

*All results in ppb
 ND - Not detected*

224-01 Merrick Blvd
 Queens NY
 OER# 12EH-N378Q

TAL Metals Analysis
 Table 5

| Client SampleID: | | SCOs | B-2 | B-2 | B-5 | B-5 | B-3 | B-1 | B-1 | B-4 | B-6 |
|------------------|-------|-------------|----------|----------|----------|----------|----------|----------|----------|----------|----------|
| Depth of Sample | | Restricted | 0-2' | 15-17' | 0-2' | 15-17' | 0-2' | 0-2' | 15-17' | 0-2' | 0-2' |
| Sampling Date: | | Residential | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 | 5/2/2012 |
| Analyte | Units | Track 2 | | | | | | | | | |
| Aluminum | PPM | NA | 1480 | 1520 | 1770 | 1640 | 1840 | 1610 | 1670 | 2190 | 2460 |
| Antimony | PPM | NA | ND |
| Arsenic | PPM | 16 | 0.682 | 0.507 | 1.45 | 1.14 | 0.735 | 0.452J | 0.614 | 0.982 | 0.969 |
| Barium | PPM | 350 | 6.08 | 11.2 | 13.7 | 8.39 | 7.56 | 6.77 | 7.78 | 9.21 | 15 |
| Beryllium | PPM | 14 | ND |
| Cadmium | PPM | 2.5 | ND | ND | 0.108J | ND | ND | ND | ND | ND | ND |
| Calcium | PPM | NA | 222 | 281 | 2100 | 157 | 244 | 110 | 350 | 144 | 182 |
| Chromium | PPM | 36 | 4.52 | 8.08 | 7.24 | 9.22 | 5.18 | 3.98 | 4.16 | 8.1 | 6.16 |
| Cobalt | PPM | NA | ND |
| Copper | PPM | 270 | 3.7 | 4.36 | 7.67 | 5.06 | 3.71 | 2.5 | 3.59 | 2.97 | 3.47 |
| Iron | PPM | NA | 3450 | 3240 | 11600 | 3830 | 3320 | 2630 | 2970 | 3390 | 3530 |
| Lead | PPM | 400 | 1.7 | 1.43 | 11.2 | 2 | 2.09 | 1.33 | 1.58 | 1.94 | 3.74 |
| Magnesium | PPM | NA | 582 | 597 | 650 | 445 | 761 | 590 | 690 | 861 | 613 |
| Manganese | PPM | NA | 74.8 | 104 | 105 | 41.1 | 107 | 92.1 | 82.9 | 134 | 106 |
| Mercury | PPM | 0.81 | ND | ND | 0.0103 | ND | ND | ND | 0.00533J | ND | 0.00941 |
| Nickel | PPM | 140 | 7.2 | 7.39 | 5.57 | 6.04 | 9.23 | 6.85 | 6.79 | 7.89 | 8.02 |
| Potassium | PPM | NA | 249 | 434 | 344 | 355 | 285 | 218 | 315 | 420 | 221 |
| Selenium | PPM | 36 | ND |
| Silver | PPM | 36 | ND |
| Sodium | PPM | NA | 22.6 | 28.6 | 164 | 42.6 | 28 | 13 | 20.1 | 22.4 | 31 |
| Thallium | PPM | NA | ND | 0.371J | ND |
| Vanadium | PPM | NA | 5.45 | 4.87 | 7.7 | 9.12 | 5.77 | 3.77 | 4.31 | 6.7 | 6.44 |
| Zinc | PPM | 2200 | 6.32 | 6.7 | 24.8 | 11 | 8.06 | 5.79 | 7.76 | 8.62 | 9.78 |

Notes:

All results in ppm

ND - Not detected

NA- Not Available

224-01 Merrick Blvd
 Queens NY
 OER# 12EH-N378Q

Volatile Organic Chemicals for Groundwater
 EPA Method 8260
 Table 6

| Client SampleID: | | NYS Groundwater Standards | MW-1 | MW-2 | MW-3 | Trip Blank |
|---------------------------------------|-------|---------------------------|-----------|-----------|-----------|------------|
| Sampling Date: | | | 5/17/2012 | 5/17/2012 | 5/17/2012 | 5/17/2012 |
| Analyte | Units | Limits | | | | |
| 1,1,1,2-Tetrachloroethane | PPB | 5 | ND | ND | ND | ND |
| 1,1,1-Trichloroethane | PPB | 5 | ND | ND | ND | ND |
| 1,1,2,2-Tetrachloroethane | PPB | 0.2 | ND | ND | ND | ND |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | PPB | 1 | ND | ND | ND | ND |
| 1,1,2-Trichloroethane | PPB | 5 | ND | ND | ND | ND |
| 1,1-Dichloroethane | PPB | 5 | ND | ND | ND | ND |
| 1,1-Dichloroethene | PPB | 5 | ND | ND | ND | ND |
| 1,1-Dichloropropene | PPB | 5 | ND | ND | ND | ND |
| 1,2,3-Trichlorobenzene | PPB | 5 | ND | ND | ND | ND |
| 1,2,3-Trichloropropane | PPB | 0.04 | ND | ND | ND | ND |
| 1,2,4,5-Tetramethylbenzene | PPB | 5 | ND | ND | ND | ND |
| 1,2,4-Trichlorobenzene | PPB | 5 | ND | ND | ND | ND |
| 1,2,4-Trimethylbenzene | PPB | 5 | ND | ND | ND | ND |
| 1,2-Dibromo-3-chloropropane | PPB | 0.04 | ND | ND | ND | ND |
| 1,2-Dibromoethane | PPB | 5 | ND | ND | ND | ND |
| 1,2-Dichlorobenzene | PPB | 3 | ND | ND | ND | ND |
| 1,2-Dichloroethane | PPB | 0.6 | ND | ND | ND | ND |
| 1,2-Dichloropropane | PPB | 5 | ND | ND | ND | ND |
| 1,3,5-Trimethylbenzene | PPB | 5 | ND | ND | ND | ND |
| 1,3-Dichlorobenzene | PPB | 3 | ND | ND | ND | ND |
| 1,3-dichloropropane | PPB | 0.4 | ND | ND | ND | ND |
| 1,4-Dichlorobenzene | PPB | NR | ND | ND | ND | ND |
| 1,4-Dioxane | PPB | 3 | ND | ND | ND | ND |
| 2,2-Dichloropropane | PPB | 1 | ND | ND | ND | ND |
| 2-Butanone | PPB | 50* | ND | ND | ND | ND |
| 2-Chloroethyl vinyl ether | PPB | 50* | ND | ND | ND | ND |
| 2-Chlorotoluene | PPB | 5 | ND | ND | ND | ND |
| 2-Hexanone | PPB | 50* | ND | ND | ND | ND |
| 2-Propanol | PPB | 7 | ND | ND | ND | ND |
| 4-Chlorotoluene | PPB | 5 | ND | ND | ND | ND |
| 4-Isopropyltoluene | PPB | 5 | ND | ND | ND | ND |
| 4-Methyl-2-pentanone | PPB | 50* | ND | ND | ND | ND |
| Acetone | PPB | 50* | ND | ND | ND | ND |
| Acrolein | PPB | 20 | ND | ND | ND | ND |
| Acrylonitrile | PPB | 5 | ND | ND | ND | ND |
| Benzene | PPB | 1 | ND | ND | ND | ND |
| Bromobenzene | PPB | 5 | ND | ND | ND | ND |
| Bromochloromethane | PPB | 5 | ND | ND | ND | ND |
| Bromodichloromethane | PPB | 50* | ND | ND | ND | ND |
| Bromoform | PPB | 50* | ND | ND | ND | ND |
| Bromomethane | PPB | 5 | ND | ND | ND | ND |

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 Queens NY
 OER# 12EH-N378Q

Volatile Organic Chemicals for Groundwater
 EPA Method 8260
 Table 6

| Client SampleID: | | NYS Groundwater Standards | MW-1 | MW-2 | MW-3 | Trip Blank |
|---------------------------|--------------|---------------------------|-----------|-----------|-----------|------------|
| | | | | | | |
| Sampling Date: | | | 5/17/2012 | 5/17/2012 | 5/17/2012 | 5/17/2012 |
| Analyte | Units | Limits | | | | |
| Carbon disulfide | PPB | 50* | ND | ND | ND | ND |
| Carbon tetrachloride | PPB | 5 | ND | ND | ND | ND |
| Chlorobenzene | PPB | 5 | ND | ND | ND | ND |
| Chlorodifluoromethane | PPB | 50* | ND | ND | ND | ND |
| Chloroethane | PPB | 5 | ND | ND | ND | ND |
| Chloroform | PPB | 7 | ND | ND | ND | ND |
| Chloromethane | PPB | 5 | ND | ND | ND | ND |
| cis-1,2-Dichloroethene | PPB | 5 | ND | ND | ND | ND |
| cis-1,3-Dichloropropene | PPB | 0.4 | ND | ND | ND | ND |
| Dibromochloromethane | PPB | 5 | ND | ND | ND | ND |
| Dibromomethane | PPB | 5 | ND | ND | ND | ND |
| Dichlorodifluoromethane | PPB | 5 | ND | ND | ND | ND |
| Diisopropyl ether | PPB | 50* | ND | ND | ND | ND |
| Ethanol | PPB | 50* | ND | ND | ND | ND |
| Ethyl acetate | PPB | 50* | ND | ND | ND | ND |
| Ethylbenzene | PPB | 5 | ND | ND | ND | ND |
| Freon-114 | PPB | 50* | ND | ND | ND | ND |
| Hexachlorobutadiene | PPB | 0.5 | ND | ND | ND | ND |
| Isopropyl acetate | PPB | 50* | ND | ND | ND | ND |
| Isopropylbenzene | PPB | 5 | ND | ND | ND | ND |
| m,p-Xylene | PPB | 5 | ND | ND | ND | ND |
| Methyl Acetate | PPB | 50* | ND | ND | ND | ND |
| Methyl tert-butyl ether | PPB | 10 | ND | ND | ND | ND |
| Methylene chloride | PPB | 5 | 3B | 2.7B | 2.7B | 3.5B |
| n-Amyl acetate | PPB | 50* | ND | ND | ND | ND |
| Naphthalene | PPB | 10 | ND | ND | ND | ND |
| n-Butyl acetate | PPB | 50* | ND | ND | ND | ND |
| n-Butylbenzene | PPB | 5 | ND | ND | ND | ND |
| n-Propyl acetate | PPB | 50* | ND | ND | ND | ND |
| n-Propylbenzene | PPB | 5 | ND | ND | ND | ND |
| o-Xylene | PPB | 5 | ND | ND | ND | ND |
| p-Diethylbenzene | PPB | 50* | ND | ND | ND | ND |
| p-Ethyltoluene | PPB | 50* | ND | ND | ND | ND |
| sec-Butylbenzene | PPB | 5 | ND | ND | ND | ND |
| Styrene | PPB | 5 | ND | ND | ND | ND |
| t-Butyl alcohol | PPB | 50* | ND | ND | ND | ND |
| tert-Butylbenzene | PPB | 5 | ND | ND | ND | ND |
| Tetrachloroethene | PPB | 5 | ND | ND | ND | ND |
| Toluene | PPB | 5 | ND | ND | ND | ND |
| trans-1,2-Dichloroethene | PPB | 5 | ND | ND | ND | ND |
| trans-1,3-Dichloropropene | PPB | 0.4 | ND | ND | ND | ND |

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 Queens NY
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Volatile Organic Chemicals for Groundwater
 EPA Method 8260
 Table 6

| Client SampleID: | | NYS Groundwater Standards | MW-1 | MW-2 | MW-3 | Trip Blank |
|-------------------------|--------------|----------------------------------|------------------|------------------|------------------|-------------------|
| | | | | | | |
| Sampling Date: | | | 5/17/2012 | 5/17/2012 | 5/17/2012 | 5/17/2012 |
| Analyte | Units | Limits | | | | |
| Trichloroethene | PPB | 5 | ND | ND | ND | ND |
| Trichlorofluoromethane | PPB | 5 | ND | ND | ND | ND |
| Vinyl acetate | PPB | 50* | ND | ND | ND | ND |
| Vinyl chloride | PPB | 2 | ND | ND | ND | ND |

Notes:

ND - Not detected

**- Guidance Value*

B- Detected in Blank

224-01 Merrick Blvd
 Queens NY
 OER# 12EH-N378Q

Semi Volatile Organic Chemicals (SVOCs) for Groundwater
 EPA Method 8270
 Table 7

| Client SampleID: | | NYS Groundwater Standards | MW-1 | MW-2 | MW-3 |
|-----------------------------|--------------|---------------------------|-----------|-----------|-----------|
| | | | | | |
| Sampling Date: | | | 5/17/2012 | 5/17/2012 | 5/17/2012 |
| Analyte | Units | Limits | | | |
| 1,2,4-Trichlorobenzene | PPB | 5 | ND | ND | ND |
| 1,2-Dichlorobenzene | PPB | 3 | ND | ND | ND |
| 1,3-Dichlorobenzene | PPB | 3 | ND | ND | ND |
| 1,4-Dichlorobenzene | PPB | 3 | ND | ND | ND |
| 2,4,5-Trichlorophenol | PPB | NA | ND | ND | ND |
| 2,4,6-Trichlorophenol | PPB | NA | ND | ND | ND |
| 2,4-Dichlorophenol | PPB | 5 | ND | ND | ND |
| 2,4-Dimethylphenol | PPB | 50 | ND | ND | ND |
| 2,4-Dinitrophenol | PPB | 10 | ND | ND | ND |
| 2,4-Dinitrotoluene | PPB | 5 | ND | ND | ND |
| 2,6-Dinitrotoluene | PPB | 5 | ND | ND | ND |
| 2-Chloronaphthalene | PPB | 10 | ND | ND | ND |
| 2-Chlorophenol | PPB | NA | ND | ND | ND |
| 2-Methylnaphthalene | PPB | NA | ND | ND | ND |
| 2-Methylphenol | PPB | NA | ND | ND | ND |
| 2-Nitroaniline | PPB | 5 | ND | ND | ND |
| 2-Nitrophenol | PPB | NA | ND | ND | ND |
| 3,3'-Dichlorobenzidine | PPB | 5 | ND | ND | ND |
| 3+4-Methylphenol | PPB | 1 | ND | ND | ND |
| 3-Nitroaniline | PPB | 5 | ND | ND | ND |
| 4,6-Dinitro-2-methylphenol | PPB | NA | ND | ND | ND |
| 4-Bromophenyl phenyl ether | PPB | NA | ND | ND | ND |
| 4-Chloro-3-methylphenol | PPB | NA | ND | ND | ND |
| 4-Chloroaniline | PPB | NA | ND | ND | ND |
| 4-Chlorophenyl phenyl ether | PPB | NA | ND | ND | ND |
| 4-Nitroaniline | PPB | 5 | ND | ND | ND |
| 4-Nitrophenol | PPB | NA | ND | ND | ND |
| Acenaphthene | PPB | 20 | ND | ND | ND |
| Acenaphthylene | PPB | NA | ND | ND | ND |
| Acetophenone | PPB | NA | ND | ND | ND |
| Aniline | PPB | NA | ND | ND | ND |
| Anthracene | PPB | 50 | ND | ND | ND |
| Atrazine | PPB | NA | ND | ND | ND |
| Azobenzene | PPB | NA | ND | ND | ND |
| Benzaldehyde | PPB | NA | ND | ND | ND |
| Benzidine | PPB | NA | ND | ND | ND |
| Benzo(a)anthracene | PPB | 0.002 | ND | ND | ND |
| Benzo(a)pyrene | PPB | NA | ND | ND | ND |
| Benzo(b)fluoranthene | PPB | 0.002 | ND | ND | ND |
| Benzo(g,h,i)perylene | PPB | NA | ND | ND | ND |
| Benzo(k)fluoranthene | PPB | 0.002 | ND | ND | ND |
| Benzoic acid | PPB | NA | ND | ND | ND |

224-01 Merrick Blvd
 Queens NY
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Semi Volatile Organic Chemicals (SVOCs) for Groundwater
 EPA Method 8270
 Table 7

| Client SampleID: | | NYS Groundwater Standards | MW-1 | MW-2 | MW-3 |
|-----------------------------|--------------|---------------------------|-----------|-----------|-----------|
| | | | | | |
| Sampling Date: | | | 5/17/2012 | 5/17/2012 | 5/17/2012 |
| Analyte | Units | Limits | | | |
| Benzyl alcohol | PPB | NA | ND | ND | ND |
| Biphenyl | PPB | NA | ND | ND | ND |
| Bis(2-chloroethoxy)methane | PPB | NA | ND | ND | ND |
| Bis(2-chloroethyl)ether | PPB | NA | ND | ND | ND |
| Bis(2-chloroisopropyl)ether | PPB | NA | ND | ND | ND |
| Bis(2-ethylhexyl)phthalate | PPB | 5 | ND | ND | ND |
| Butyl benzyl phthalate | PPB | NA | ND | ND | ND |
| Caprolactam | PPB | NA | ND | ND | ND |
| Carbazole | PPB | NA | ND | ND | ND |
| Chrysene | PPB | 0.002 | ND | ND | ND |
| Dibenzo(a,h)anthracene | PPB | NA | ND | ND | ND |
| Dibenzofuran | PPB | NA | ND | ND | ND |
| Diethyl phthalate | PPB | NA | ND | ND | ND |
| Dimethyl phthalate | PPB | NA | ND | ND | ND |
| Di-n-butyl phthalate | PPB | 50 | ND | ND | ND |
| Di-n-octyl phthalate | PPB | 50 | ND | ND | ND |
| Fluoranthene | PPB | 50 | ND | ND | ND |
| Fluorene | PPB | 50 | ND | ND | ND |
| Hexachlorobenzene | PPB | 0.04 | ND | ND | ND |
| Hexachlorobutadiene | PPB | 0.5 | ND | ND | ND |
| Hexachlorocyclopentadiene | PPB | 5 | ND | ND | ND |
| Hexachloroethane | PPB | 5 | ND | ND | ND |
| Indeno(1,2,3-c,d)pyrene | PPB | 0.002 | ND | ND | ND |
| Isophorone | PPB | 50 | ND | ND | ND |
| Naphthalene | PPB | 10 | ND | ND | ND |
| Nitrobenzene | PPB | 0.4 | ND | ND | ND |
| N-Nitrosodimethylamine | PPB | NA | ND | ND | ND |
| N-Nitrosodi-n-propylamine | PPB | NA | ND | ND | ND |
| N-Nitrosodiphenylamine | PPB | 50 | ND | ND | ND |
| Parathion | PPB | NA | ND | ND | ND |
| Pentachlorophenol | PPB | NA | ND | ND | ND |
| Phenanthrene | PPB | 50 | ND | ND | ND |
| Phenol | PPB | NA | ND | ND | ND |
| Pyrene | PPB | 50 | ND | ND | ND |
| Pyridine | PPB | 50 | ND | ND | ND |

Notes:

ND - Not detected

*- Guidance Value

224-01 Merrick Blvd
 Queens NY
 OER# 12EH-N378Q
 Pesticides (Method 8021)
 Table 8

| Client SampleID: | | NYS Groundwater Standards | MW-1 | MW-2 | MW-3 |
|---------------------------|--------------|---------------------------------|------------------|------------------|------------------|
| | | | | | |
| Sampling Date: | | | 5/17/2012 | 5/17/2012 | 5/17/2012 |
| Analyte | Units | Limits | | | |
| 4,4'-DDD | PPB | 0.3 | ND | ND | ND |
| 4,4'-DDE | PPB | 0.2 | ND | ND | ND |
| 4,4'-DDT | PPB | 0.2 | ND | ND | ND |
| Aldrin | PPB | 0.001 | ND | ND | 0.11J |
| alpha-BHC | PPB | 0.01 | ND | ND | ND |
| beta-BHC | PPB | 0.04 | ND | ND | ND |
| Chlordane | PPB | 0.05 | ND | ND | ND |
| Chlorobenzilate | PPB | NA | ND | ND | ND |
| DBCP | PPB | NA | ND | ND | ND |
| delta-BHC | PPB | 0.04 | ND | ND | ND |
| Dieldrin | PPB | 0.004 | ND | ND | ND |
| Endosulfan I | PPB | 0.009 | 0.029J | ND | 0.12J |
| Endosulfan II | PPB | 0.009 | ND | ND | ND |
| Endosulfan sulfate | PPB | 0.009 | ND | ND | ND |
| Endrin | PPB | ND | ND | ND | ND |
| Endrin aldehyde | PPB | 5 | ND | ND | ND |
| Endrin ketone | PPB | 5 | ND | ND | 0.051J |
| gamma-BHC | PPB | 0.05 | ND | ND | ND |
| Heptachlor | PPB | 0.04 | ND | ND | ND |
| Heptachlor epoxide | PPB | 0.03 | 0.043J | ND | ND |
| Hexachlorobenzene | PPB | 0.04 | ND | ND | ND |
| Hexachlorocyclopentadiene | PPB | 5 | ND | ND | ND |
| Methoxychlor | PPB | 35 | ND | ND | ND |
| Toxaphene | PPB | 0.06 | ND | ND | ND |

Notes:

ND - Not detected

J- Laboratory Estimated Concentration

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PCBs as AROCLORS- METHOD 8082
Table 9

| Client SampleID: | | NYS Groundwater Standards | MW-1 | MW-2 | MW-3 |
|-------------------------|--------------|--|------------------|------------------|------------------|
| Sampling Date: | | | 5/17/2012 | 5/17/2012 | 5/17/2012 |
| Analyte | Units | Limits | | | |
| Aroclor 1016 | PPB | 0.09 | ND | ND | ND |
| Aroclor 1221 | PPB | 0.09 | ND | ND | ND |
| Aroclor 1232 | PPB | 0.09 | ND | ND | ND |
| Aroclor 1242 | PPB | 0.09 | ND | ND | ND |
| Aroclor 1248 | PPB | 0.09 | ND | ND | ND |
| Aroclor 1254 | PPB | 0.09 | ND | ND | ND |
| Aroclor 1260 | PPB | 0.09 | ND | ND | ND |
| Aroclor 1262 | PPB | 0.09 | ND | ND | ND |
| Aroclor 1268 | PPB | 0.09 | ND | ND | ND |

Notes:
ND - Not detected

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TAL Metals Analysis- Groundwater
 Table 10

| Client SampleID: | | NYS Groundwater Standards | MW-1 | MW-1 | MW-2 | MW-2 | MW-3 | MW-3 |
|------------------|-------|---------------------------------|----------------|--------------|----------------|-------------|----------------|----------------|
| | | | Total | Dissolved | Total | Dissolved | Total | Dissolved |
| Sampling Date: | | | 5/17/2012 | 5/17/2012 | 5/17/2012 | 5/17/2012 | 5/17/2012 | 5/17/2012 |
| Analyte | Units | Limits | | | | | | |
| Aluminum | PPM | NA | 4 | 0.0382 | 0.658 | 0.0228 | 2.21 | 0.0278 |
| Antimony | PPM | 0.003 | 0.0133J | ND | 0.0109J | ND | ND | ND |
| Arsenic | PPM | 0.025 | ND | ND | ND | ND | ND | ND |
| Barium | PPM | 1 | 0.0797 | 0.0456 | 0.143 | 0.147 | 0.0412 | 0.0261 |
| Beryllium | PPM | 0.003 | ND | ND | ND | ND | ND | ND |
| Cadmium | PPM | 0.005 | ND | ND | ND | ND | ND | ND |
| Calcium | PPM | NA | 16.5 | 16.7 | 35.5 | 38.6 | 15.2 | 15.7 |
| Chromium | PPM | 0.05 | 0.0316 | ND | 0.00853J | ND | 0.0194J | ND |
| Cobalt | PPM | NA | ND | ND | ND | ND | ND | ND |
| Copper | PPM | 0.2 | 0.0245 | ND | ND | ND | 0.0101J | ND |
| Iron | PPM | 0.3 | 20.7 | 1.97 | 8.17 | 6.55 | 8.08 | 1.34 |
| Lead | PPM | 0.025 | 0.00819J | ND | ND | ND | ND | ND |
| Magnesium | PPM | 35 | 3.67 | 3.08 | 5.11 | 5.45 | 2.47 | 2.05 |
| Manganese | PPM | 0.3 | 0.417 | 0.347 | 1.92 | 2.04 | 1.27 | 1.22 |
| Mercury | PPM | 0.0007 | ND | 0.00025 | ND | 0.00027 | 0.00155 | 0.00108 |
| Nickel | PPM | 0.1 | 0.0262 | 0.00691J | 0.0192J | 0.0164J | 0.0187J | 0.00895J |
| Potassium | PPM | NA | 3.39 | 2.98 | 7.04 | 6.95 | 2.7 | 1.99 |
| Selenium | PPM | 0.01 | ND | ND | ND | ND | ND | ND |
| Silver | PPM | 0.05 | ND | ND | ND | ND | ND | ND |
| Sodium | PPM | 20 | 4.5 | 4.8 | 36.3 | 35.4 | 5.78 | 6.2 |
| Thallium | PPM | 0.0005 | ND | ND | ND | ND | ND | ND |
| Vanadium | PPM | NA | 0.0124J | ND | ND | ND | 0.0054J | ND |
| Zinc | PPM | 2 | 0.0787 | 0.0207 | 0.0388 | 0.035 | 0.0533 | 0.0446 |

Notes:

All results in ppm

ND - Not detected

N/A- Not Applicable

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Vapor Sampling
 Table 11

| Sample ID | VP-1 | VP-1DL | VP-2 | VP-2DL | VP-3 | VP-3DL |
|--------------------------------|----------|------------|----------|------------|----------|------------|
| Lab Sample Number | D2545-01 | D2545-01DL | D2545-02 | D2545-02DL | D2545-03 | D2545-03DL |
| Sampling Date | 5/3/2012 | 5/3/2012 | 5/3/2012 | 5/3/2012 | 5/3/2012 | 5/3/2012 |
| Matrix | AIR | AIR | AIR | AIR | AIR | AIR |
| Dilution Factor | 1 | 10 | 1 | 10 | 1 | 10 |
| Units | Ug/M3 | Ug/M3 | Ug/M3 | Ug/M3 | Ug/M3 | Ug/M3 |
| COMPOUND | | | | | | |
| 1,1,1-Trichloroethane | 0.22J | 1.64U | 0.16U | 1.64U | 0.22J | 1.64U |
| 1,1,2,2-Tetrachloroethane | ND | 17.2U | 1.72U | 17.2U | 1.72U | 17.2U |
| 1,1,2-Trichloroethane | ND | 13.6U | 1.36U | 13.6U | 1.36U | 13.6U |
| 1,1,2-Trichlorotrifluoroethane | ND | 19.2U | 1.92U | 19.2U | 1.92U | 19.2U |
| 1,1-Dichloroethane | ND | 10.1U | 1.01U | 10.1U | 1.01U | 10.1U |
| 1,1-Dichloroethene | ND | 9.91U | 0.99U | 9.91U | 0.99U | 9.91U |
| 1,2,4-Trichlorobenzene | ND | 18.6U | 1.86U | 18.6U | 1.86U | 18.6U |
| 1,2,4-Trimethylbenzene | 10.3 | 7.37JD | 12.3 | 8.85JD | 9.83 | 7.87JD |
| 1,2-Dibromoethane | ND | 19.2U | 1.92U | 19.2U | 1.92U | 19.2U |
| 1,2-Dichlorobenzene | ND | 15U | 1.5U | 15U | 1.5U | 15U |
| 1,2-Dichloroethane | ND | 10.1U | 1.01U | 10.1U | 1.01U | 10.1U |
| 1,2-Dichloropropane | ND | 11.6U | 1.16U | 11.6U | 1.16U | 11.6U |
| 1,3,5-Trimethylbenzene | 3.24 | 12.3U | 3.54 | 12.3U | 3.05 | 12.3U |
| 1,3-Butadiene | ND | 5.53U | 0.55U | 5.53U | 0.55U | 5.53U |
| 1,3-Dichlorobenzene | ND | 15U | 1.5U | 15U | 1.5U | 15U |
| 1,4-Dichlorobenzene | ND | 15U | 1.5U | 15U | 1.5U | 15U |
| 1,4-Dioxane | ND | 9.01U | 0.9U | 9.01U | 0.9U | 9.01U |
| 2,2,4-Trimethylpentane | 6.07 | 11.7U | 4.3 | 11.7U | 5.6 | 11.7U |
| 2-Butanone | 11.8 | 7.67JD | 6.19 | 4.72JD | 6.78 | 5.31JD |
| 2-Chlorotoluene | ND | 12.9U | 1.29U | 12.9U | 1.29U | 12.9U |
| 4-Ethyltoluene | 6.39 | 12.3U | 6.39 | 4.92JD | 5.41 | 12.3U |
| 4-Methyl-2-Pentanone | 2.25 | 10.2U | 1.52J | 10.2U | 2.09 | 10.2U |
| Acetone | 116E | 156D | 73.6E | 87.9D | 97.4E | 133D |
| Allyl Chloride | ND | 7.83U | 0.78U | 7.83U | 0.78U | 7.83U |
| Benzene | 2.81 | 7.99U | 2.52 | 7.99U | 2.94 | 7.99U |
| Bromodichloromethane | ND | 16.8U | 1.67U | 16.8U | 1.67U | 16.8U |
| Bromoethene | ND | 10.9U | 1.09U | 10.9U | 1.09U | 10.9U |
| Bromoform | ND | 25.8U | 2.58U | 25.8U | 2.58U | 25.8U |
| Bromomethane | ND | 9.71U | 0.97U | 9.71U | 0.97U | 9.71U |
| Carbon Disulfide | 0.69J | 7.79U | 1.71 | 7.79U | 0.72J | 7.79U |
| Carbon Tetrachloride | 0.31J | 1.89U | 0.19J | 1.89U | 0.25J | 1.89U |
| Chlorobenzene | ND | 11.5U | 1.15U | 11.5U | 1.15U | 11.5U |
| Chloroethane | ND | 6.6U | 0.66U | 6.6U | 0.66U | 6.6U |
| Chloroform | 1.17J | 12.2U | 4.35 | 12.2U | 10.3 | 10.3JD |
| Chloromethane | 0.39J | 5.16U | 0.21J | 5.16U | 0.52U | 5.16U |
| cis-1,2-Dichloroethene | ND | 9.91U | 0.99U | 9.91U | 0.99U | 9.91U |
| cis-1,3-Dichloropropene | ND | 11.4U | 1.13U | 11.4U | 1.13U | 11.4U |
| Cyclohexane | 0.96J | 8.61U | 1.14J | 8.61U | 1.38J | 8.61U |
| Dibromochloromethane | ND | 21.3U | 2.13U | 21.3U | 2.13U | 21.3U |
| Dichlorodifluoromethane | 1.53J | 12.4U | 1.73J | 12.4U | 2.03J | 12.4U |
| Dichlorotetrafluoroethane | ND | 17.5U | 1.75U | 17.5U | 1.75U | 17.5U |
| Ethyl Benzene | 10.4 | 6.95JD | 9.99 | 6.95JD | 9.99 | 6.95JD |
| Heptane | 9.02 | 4.92JD | 6.56 | 10.2U | 7.38 | 4.1JD |
| Hexachloro-1,3-Butadiene | ND | 26.7U | 2.67U | 26.7U | 2.67U | 26.7U |

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Vapor Sampling
 Table 11

| Sample ID | VP-1 | VP-1DL | VP-2 | VP-2DL | VP-3 | VP-3DL |
|--------------------------|----------|------------|----------|------------|----------|------------|
| Lab Sample Number | D2545-01 | D2545-01DL | D2545-02 | D2545-02DL | D2545-03 | D2545-03DL |
| Sampling Date | 5/3/2012 | 5/3/2012 | 5/3/2012 | 5/3/2012 | 5/3/2012 | 5/3/2012 |
| Matrix | AIR | AIR | AIR | AIR | AIR | AIR |
| Dilution Factor | 1 | 10 | 1 | 10 | 1 | 10 |
| Units | Ug/M3 | Ug/M3 | Ug/M3 | Ug/M3 | Ug/M3 | Ug/M3 |
| COMPOUND | | | | | | |
| Hexane | ND | 8.81U | 0.88U | 8.81U | 0.88U | 8.81U |
| m/p-Xylene | 34.3 | 23JD | 33.4 | 23.5JD | 32.1 | 23.5JD |
| Methyl Methacrylate | ND | 10.2U | 1.02U | 10.2U | 1.02U | 10.2U |
| Methyl tert-Butyl Ether | ND | 9.01U | 0.9U | 9.01U | 0.9U | 9.01U |
| Methylene Chloride | 6.95 | 11.1JD | 5.21 | 9.38JD | 5.21 | 10.1JD |
| o-Xylene | 10.9 | 8.25JD | 10.9 | 8.25JD | 9.99 | 8.25JD |
| Styrene | ND | 10.6U | 1.06U | 10.6U | 1.06U | 10.6U |
| t-1,3-Dichloropropene | ND | 11.4U | 1.13U | 11.4U | 1.13U | 11.4U |
| tert-Butyl alcohol | 19.4 | 19.1D | 12.4 | 11.8JD | 17 | 17.3D |
| Tetrachloroethene | 406E | 250D | 230E | 176D | 305E | 257D |
| Tetrahydrofuran | 2.06 | 7.37U | 1.33J | 7.37U | 1.47J | 7.37U |
| Toluene | 45.2 | 26.8D | 33.2 | 21.9D | 35.4 | 24.9D |
| trans-1,2-Dichloroethene | ND | 9.91U | 0.99U | 9.91U | 0.99U | 9.91U |
| Trichloroethene | 0.48 | 1.61U | 0.32J | 1.61U | 0.97 | 1.61U |
| Trichlorofluoromethane | 1.07J | 14U | 1.18J | 14U | 1.35J | 14U |
| Vinyl Chloride | ND | 6.39U | 0.64U | 6.39U | 0.64U | 6.39U |

Total Concentration. 709.91 521.16 464.18 364.17 573.86 508.58

Qualifiers

- ND - The compound was not detected at the indicated concentration.
- N - Presumptive Evidence of a Compound
- J - Data indicates the presence of a compound that meets the identification criteria. The result is less than the quantitation limit but greater than MDL. The concentration given is an approximate value.
- B - The analyte was found in the laboratory blank as well as the sample. This indicates possible laboratory contamination of the environmental sample.
- P - For dual column analysis, the percent difference between the quantitated concentrations on the two columns is greater than 40%.
- * - For dual column analysis, the lowest quantitated concentration is being reported due to coeluting interference.
- E (Organics) - Indicates the analyte 's concentration exceeds the calibrated range of the instrument for that specific analysis.
- E (Inorganics) - The reported value is estimated because of the presence of interference.
- D - The reported value is from a secondary analysis with a dilution factor. The original analysis exceeded the calibration range.
- * - For dual column analysis, the lowest quantitated concentration is being reported due to coeluting interference.
- NR - Not analyzed

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PCBs as AROCLORS- METHOD 8082
Soil Clean Objectives (SCOs)
Table 12

| Client Sample ID: | | SCOs | SCOs |
|--------------------------|---------------|---------------------|-------------------|
| Depth of Sample | | Unrestricted | Commercial |
| Sampling Date: | | Track 1 | Track 4 |
| Analyte: | Units: | | |
| Aroclor 1016 | PPB | 100 | 1000 |
| Aroclor 1221 | PPB | 100 | 1000 |
| Aroclor 1232 | PPB | 100 | 1000 |
| Aroclor 1242 | PPB | 100 | 1000 |
| Aroclor 1248 | PPB | 100 | 1000 |
| Aroclor 1254 | PPB | 100 | 1000 |
| Aroclor 1260 | PPB | 100 | 1000 |
| Aroclor 1262 | PPB | 100 | 1000 |
| Aroclor 1268 | PPB | 100 | 1000 |

Notes:

NA- Not Available

Objectives as per NYSDEC Part 375-6.8(b)

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Pesticides (Method 8021)
 Soil Clean Objectives (SCOs)
 Table 12

| Client Sample ID: | | SCOs | SCOs |
|---------------------------|---------------|---------------------|-------------------|
| Depth of Sample | | Unrestricted | Commercial |
| Sampling Date: | | Track 1 | Track 4 |
| Analyte: | Units: | | |
| 4,4'-DDD | PPB | 3.3 | 92000 |
| 4,4'-DDE | PPB | 3.3 | 62000 |
| 4,4'-DDT | PPB | 3.3 | 47000 |
| Aldrin | PPB | 5 | 680 |
| alpha-BHC | PPB | 20 | 3400 |
| beta-BHC | PPB | 36 | 3000 |
| Chlordane | PPB | 94 | 24000 |
| Chlorobenzilate | PPB | NA | NA |
| DBCP | PPB | NA | NA |
| delta-BHC | PPB | 40 | 500000 |
| Dieldrin | PPB | 5 | 1400 |
| Endosulfan I | PPB | 2400 | 200000 |
| Endosulfan II | PPB | 2400 | 200000 |
| Endosulfan sulfate | PPB | 2400 | 200000 |
| Endrin | PPB | 14 | 89000 |
| Endrin aldehyde | PPB | NA | NA |
| Endrin ketone | PPB | NA | NA |
| gamma-BHC | PPB | 100 | 9200 |
| Heptachlor | PPB | 42 | 15000 |
| Heptachlor epoxide | PPB | NA | NA |
| Hexachlorobenzene | PPB | 330 | 6000 |
| Hexachlorocyclopentadiene | PPB | NA | NA |
| Methoxychlor | PPB | NA | NA |
| Toxaphene | PPB | NA | NA |

Notes:

NA- Not Available

Objectives as per NYSDEC Part 375-6.8(b)

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TAL Metals
 EPA Method 6010C
 Soil Clean Objectives (SCOs)
 Table 12

| Client Sample ID: | | SCOs | SCOs |
|--------------------------|---------------|---------------------|-------------------|
| Depth of Sample | | Unrestricted | Commercial |
| Sampling Date: | | Track 1 | Track 4 |
| Analyte: | Units: | | |
| Aluminum | PPM | NA | NA |
| Antimony | PPM | NA | NA |
| Arsenic | PPM | 13 | 16 |
| Barium | PPM | 350 | 400 |
| Beryllium | PPM | 7.2 | 590 |
| Cadmium | PPM | 2.5 | 9.3 |
| Calcium | PPM | NA | NA |
| Chromium | PPM | 30 | 1500 |
| Cobalt | PPM | NA | NA |
| Copper | PPM | 50 | 270 |
| Iron | PPM | NA | NA |
| Lead | PPM | 63 | 1000 |
| Magnesium | PPM | NA | NA |
| Manganese | PPM | 1600 | NA |
| Mercury | PPM | 0.18 | NA |
| Nickel | PPM | 30 | 310 |
| Potassium | PPM | NA | NA |
| Selenium | PPM | 3.9 | 1500 |
| Silver | PPM | 2 | 1500 |
| Sodium | PPM | NA | NA |
| Thallium | PPM | NA | NA |
| Vanadium | PPM | NA | NA |
| Zinc | PPM | 109 | 10000 |

Notes:

NA- Not Available

Objectives as per NYSDEC Part 375-6.8(b)

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Semi Volatile Organic Chemicals (SVOCs) for Soils
 EPA Method 8270
 Soil Clean Objectives (SCOs)
 Table 12

| Client Sample ID: | | SCOs | SCOs |
|-----------------------------|---------------|---------------------|-------------------|
| Depth of Sample | | Unrestricted | Commercial |
| Sampling Date: | | Track 1 | Track 4 |
| Analyte: | Units: | | |
| 1,2,4-Trichlorobenzene | PPB | NA | NA |
| 1,2-Dichlorobenzene | PPB | 1100 | 500000 |
| 1,3-Dichlorobenzene | PPB | 2400 | 280000 |
| 1,4-Dichlorobenzene | PPB | 1800 | 130000 |
| 2,4,5-Trichlorophenol | PPB | NA | NA |
| 2,4,6-Trichlorophenol | PPB | NA | NA |
| 2,4-Dichlorophenol | PPB | NA | NA |
| 2,4-Dimethylphenol | PPB | NA | NA |
| 2,4-Dinitrophenol | PPB | NA | NA |
| 2,4-Dinitrotoluene | PPB | NA | NA |
| 2,6-Dinitrotoluene | PPB | NA | NA |
| 2-Chloronaphthalene | PPB | NA | NA |
| 2-Chlorophenol | PPB | NA | NA |
| 2-Methylnaphthalene | PPB | NA | NA |
| 2-Methylphenol | PPB | 330 | 500000 |
| 2-Nitroaniline | PPB | NA | NA |
| 2-Nitrophenol | PPB | NA | NA |
| 3,3'-Dichlorobenzidine | PPB | NA | NA |
| 3+4-Methylphenol | PPB | 330 | 500000 |
| 3-Nitroaniline | PPB | NA | NA |
| 4,6-Dinitro-2-methylphenol | PPB | NA | NA |
| 4-Bromophenyl phenyl ether | PPB | NA | NA |
| 4-Chloro-3-methylphenol | PPB | NA | NA |
| 4-Chloroaniline | PPB | NA | NA |
| 4-Chlorophenyl phenyl ether | PPB | NA | NA |
| 4-Nitroaniline | PPB | NA | NA |
| 4-Nitrophenol | PPB | NA | NA |
| Acenaphthene | PPB | 20000 | 500000 |
| Acenaphthylene | PPB | 100000 | 500000 |
| Acetophenone | PPB | NA | NA |
| Aniline | PPB | NA | NA |
| Anthracene | PPB | 100000 | 500000 |
| Atrazine | PPB | NA | NA |
| Azobenzene | PPB | NA | NA |
| Benzaldehyde | PPB | NA | NA |
| Benzidine | PPB | NA | NA |
| Benzo(a)anthracene | PPB | 1000 | 5600 |
| Benzo(a)pyrene | PPB | 1000 | 1000 |
| Benzo(b)fluoranthene | PPB | 1000 | 5600 |
| Benzo(g,h,i)perylene | PPB | 100000 | 500000 |

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Semi Volatile Organic Chemicals (SVOCs) for Soils
 EPA Method 8270
 Soil Clean Objectives (SCOs)
 Table 12

| Client Sample ID: | | SCOs | SCOs |
|-----------------------------|---------------|---------------------|-------------------|
| Depth of Sample | | Unrestricted | Commercial |
| Sampling Date: | | Track 1 | Track 4 |
| Analyte: | Units: | | |
| Benzo(k)fluoranthene | PPB | 800 | 56000 |
| Benzoic acid | PPB | NA | NA |
| Benzyl alcohol | PPB | NA | NA |
| Biphenyl | PPB | NA | NA |
| Bis(2-chloroethoxy)methane | PPB | NA | NA |
| Bis(2-chloroethyl)ether | PPB | NA | NA |
| Bis(2-chloroisopropyl)ether | PPB | NA | NA |
| Bis(2-ethylhexyl)phthalate | PPB | NA | NA |
| Butyl benzyl phthalate | PPB | NA | NA |
| Caprolactam | PPB | NA | NA |
| Carbazole | PPB | NA | NA |
| Chrysene | PPB | 1000 | 56000 |
| Dibenzo(a,h)anthracene | PPB | 330 | 560 |
| Dibenzofuran | PPB | 7000 | 350000 |
| Diethyl phthalate | PPB | NA | NA |
| Dimethyl phthalate | PPB | NA | NA |
| Di-n-butyl phthalate | PPB | NA | NA |
| Di-n-octyl phthalate | PPB | NA | NA |
| Fluoranthene | PPB | 100000 | 500000 |
| Fluorene | PPB | 30000 | 500000 |
| Hexachlorobenzene | PPB | 330 | 6000 |
| Hexachlorobutadiene | PPB | NA | NA |
| Hexachlorocyclopentadiene | PPB | NA | NA |
| Hexachloroethane | PPB | NA | NA |
| Indeno(1,2,3-c,d)pyrene | PPB | 500 | 5600 |
| Isophorone | PPB | NA | NA |
| Naphthalene | PPB | 12000 | 500000 |
| Nitrobenzene | PPB | NA | NA |
| N-Nitrosodimethylamine | PPB | NA | NA |
| N-Nitrosodi-n-propylamine | PPB | NA | NA |
| N-Nitrosodiphenylamine | PPB | NA | NA |
| Parathion | PPB | NA | NA |
| Pentachlorophenol | PPB | 800 | 6700 |
| Phenanthrene | PPB | 100000 | 500000 |
| Phenol | PPB | 330 | 500000 |
| Pyrene | PPB | 100000 | 500000 |
| Pyridine | PPB | NA | NA |

Notes:

NA- Not Available

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Semi Volatile Organic Chemicals (SVOCs) for Soils
EPA Method 8270
Soil Clean Objectives (SCOs)
Table 12

| | | | |
|--------------------------|---------------|---------------------|-------------------|
| Client Sample ID: | | SCOs | SCOs |
| Depth of Sample | | Unrestricted | Commercial |
| Sampling Date: | | Track 1 | Track 4 |
| Analyte: | Units: | | |

Objectives as per NYSDEC Part 375-6.8(b)

Volatile Organic Chemicals for Soils
 EPA Method 8260
 Soil Clean Objectives (SCOs)
 Table 12

| Client Sample ID: | Depth of Sample | Sampling Date: | SCOs | |
|---------------------------------------|-----------------|----------------|--------------|------------|
| | | | Unrestricted | Commercial |
| Analyte: | Units: | Track 1 | Track 4 | |
| 1,1,1,2-Tetrachloroethane | PPB | NA | NA | |
| 1,1,1-Trichloroethane | PPB | 680 | 500000 | |
| 1,1,2,2-Tetrachloroethane | PPB | NA | NA | |
| 1,1,2-Trichloro-1,2,2-trifluoroethane | PPB | NA | NA | |
| 1,1,2-Trichloroethane | PPB | NA | NA | |
| 1,1-Dichloroethane | PPB | 270 | 240000 | |
| 1,1-Dichloroethene | PPB | 330 | 500000 | |
| 1,1-Dichloropropene | PPB | NA | NA | |
| 1,2,3-Trichlorobenzene | PPB | NA | NA | |
| 1,2,3-Trichloropropane | PPB | NA | NA | |
| 1,2,4,5-Tetramethylbenzene | PPB | NA | NA | |
| 1,2,4-Trichlorobenzene | PPB | NA | NA | |
| 1,2,4-Trimethylbenzene | PPB | 3600 | 190000 | |
| 1,2-Dibromo-3-chloropropane | PPB | NA | NA | |
| 1,2-Dibromoethane | PPB | NA | NA | |
| 1,2-Dichlorobenzene | PPB | 1100 | 500000 | |
| 1,2-Dichloroethane | PPB | 20 | 30000 | |
| 1,2-Dichloropropane | PPB | NA | NA | |
| 1,3,5-Trimethylbenzene | PPB | 8400 | 190000 | |
| 1,3-Dichlorobenzene | PPB | 2400 | 280000 | |
| 1,3-dichloropropane | PPB | NA | NA | |
| 1,4-Dichlorobenzene | PPB | 1800 | 130000 | |
| 1,4-Dioxane | PPB | 100 | 130000 | |
| 2,2-Dichloropropane | PPB | NA | NA | |
| 2-Butanone | PPB | 120 | 500000 | |
| 2-Chloroethyl vinyl ether | PPB | NA | NA | |
| 2-Chlorotoluene | PPB | NA | NA | |
| 2-Hexanone | PPB | NA | NA | |
| 2-Propanol | PPB | NA | NA | |
| 4-Chlorotoluene | PPB | NA | NA | |
| 4-Isopropyltoluene | PPB | NA | NA | |
| 4-Methyl-2-pentanone | PPB | NA | NA | |
| Acetone | PPB | 50 | 500000 | |
| Acrolein | PPB | NA | NA | |
| Acrylonitrile | PPB | NA | NA | |
| Benzene | PPB | 60 | 44000 | |
| Bromobenzene | PPB | NA | NA | |
| Bromochloromethane | PPB | NA | NA | |
| Bromodichloromethane | PPB | NA | NA | |
| Bromoform | PPB | NA | NA | |
| Bromomethane | PPB | NA | NA | |
| Carbon disulfide | PPB | NA | NA | |
| Carbon tetrachloride | PPB | 760 | 22000 | |
| Chlorobenzene | PPB | 1100 | 500000 | |
| Chlorodifluoromethane | PPB | NA | NA | |
| Chloroethane | PPB | NA | NA | |
| Chloroform | PPB | 370 | 350000 | |
| Chloromethane | PPB | NA | NA | |
| cis-1,2-Dichloroethene | PPB | 250 | 500000 | |
| cis-1,3-Dichloropropene | PPB | NA | NA | |
| Dibromochloromethane | PPB | NA | NA | |

224-01 Merrick Blvd
 Queens NY
 OER# 12EH-N378Q

Volatile Organic Chemicals for Soils
 EPA Method 8260
 Soil Clean Objectives (SCOs)
 Table 12

| Client Sample ID: | Depth of Sample | SCOs | |
|---------------------------|-----------------|--------------|------------|
| | | Unrestricted | Commercial |
| Sampling Date: | | Track 1 | Track 4 |
| Analyte: | Units: | | |
| Dibromomethane | PPB | NA | NA |
| Dichlorodifluoromethane | PPB | NA | NA |
| Diisopropyl ether | PPB | NA | NA |
| Ethanol | PPB | NA | NA |
| Ethyl acetate | PPB | NA | NA |
| Ethylbenzene | PPB | 1000 | 390000 |
| Freon-114 | PPB | NA | NA |
| Hexachlorobutadiene | PPB | NA | NA |
| Isopropyl acetate | PPB | NA | NA |
| Isopropylbenzene | PPB | NA | NA |
| m,p-Xylene | PPB | 260 | 500000 |
| Methyl Acetate | PPB | NA | NA |
| Methyl tert-butyl ether | PPB | 930 | 500000 |
| Methylene chloride | PPB | 50 | 500000 |
| n-Amyl acetate | PPB | NA | NA |
| Naphthalene | PPB | 12000 | 500000 |
| n-Butyl acetate | PPB | NA | NA |
| n-Butylbenzene | PPB | 12000 | 500000 |
| n-Propyl acetate | PPB | NA | NA |
| n-Propylbenzene | PPB | 3900 | 500000 |
| o-Xylene | PPB | 260 | 500000 |
| p-Diethylbenzene | PPB | NA | NA |
| p-Ethyltoluene | PPB | NA | NA |
| sec-Butylbenzene | PPB | 11000 | 500000 |
| Styrene | PPB | NA | NA |
| t-Butyl alcohol | PPB | NA | NA |
| tert-Butylbenzene | PPB | 5900 | 500000 |
| Tetrachloroethene | PPB | 1300 | 150000 |
| Toluene | PPB | 700 | 500000 |
| trans-1,2-Dichloroethene | PPB | 190 | 500000 |
| trans-1,3-Dichloropropene | PPB | NA | NA |
| Trichloroethene | PPB | 470 | 200000 |
| Trichlorofluoromethane | PPB | NA | NA |
| Vinyl acetate | PPB | NA | NA |
| Vinyl chloride | PPB | 20 | 13000 |

Notes:

NA- Not Available

Objectives as per NYSDEC Part 375-6.8(b)

APPENDIX 1

CITIZEN PARTICIPATION PLAN

The NYC Office of Environmental Remediation and 224-01 LLC have established this Citizen Participation Plan because the opportunity for citizen participation is an important component of the NYC Voluntary Cleanup Program. This Citizen Participation Plan describes how information about the project will be disseminated to the Community during the remedial process. As part of its obligations under the NYC VCP, 224-01 LLC will maintain a repository for project documents and provide public notice at specified times throughout the remedial program. This Plan also takes into account potential environmental justice concerns in the community that surrounds the project Site. Under this Citizen Participation Plan, project documents and work plans are made available to the public in a timely manner. Public comment on work plans is strongly encouraged during public comment periods. Work plans are not approved by the NYC Office of Environmental Remediation (OER) until public comment periods have expired and all comments are formally reviewed. An explanation of cleanup plans in the form of a public meeting or informational session is available upon request to OER's project manager assigned to this Site, Zach Schreiber, who can be contacted about these issues or any others questions, comments or concerns that arise during the remedial process at (212) 788-8841.

Project Contact List. OER has established a Site Contact List for this project to provide public notices in the form of fact sheets to interested members of the Community. Communications will include updates on important information relating to the progress of the cleanup program at the Site as well as to request public comments on the cleanup plan. The Project Contact List includes owners and occupants of adjacent buildings and homes, principal administrators of nearby schools, hospitals and day care centers, the public water supplier that serves the area, established document repositories, the representative Community Board, City Council members, other elected representatives and any local Brownfield Opportunity Area (BOA) grantee organizations. Any member of the public or organization will be added to the Site Contact List on request. A copy of the Site Contact List is maintained by OER's project manager. If you would like to be added to the Project Contact List, contact NYC OER at (212) 788-8841 or by email at brownfields@cityhall.nyc.gov.

Repositories. A document repository is maintained in the nearest public library that maintains evening and weekend hours. This document repository is intended to house, for community review, all principal documents generated during the cleanup program including Remedial Investigation plans and reports, Remedial Action work plans and reports, and all public notices and fact sheets produced during the lifetime of the remedial project. 224-01 LLC will inspect the repositories to ensure that they are fully populated with project information. The repository for this project is:

Queens Borough Public Library: Laurelton

13426 225th Street

Jamaica, NY 11413

(718) 528-2822

Mon 1:00 PM - 8:00 PM

Tue 1:00 PM - 6:00 PM

Wed 10:00 AM - 6:00 PM

Thu 1:00 PM - 8:00 PM

Fri 10:00 AM - 6:00 PM

Sat Closed

Sun Closed

Digital Documentation. NYC OER strongly encourages the use of digital documents in repositories as a means of minimizing paper use while also increasing convenience in access and ease of use.

Identify Issues of Public Concern. 224-01 LLC is required to identify whether there are specific issues of concern to stakeholders proximate to the project site. Such issues include but are not limited to interests of Environmental Justice communities. 224-01 LLC should list any site-specific issues of public concern and the method that they will be used resolved them. If needed, contact OER for additional guidance on how to identify issues of public concern.

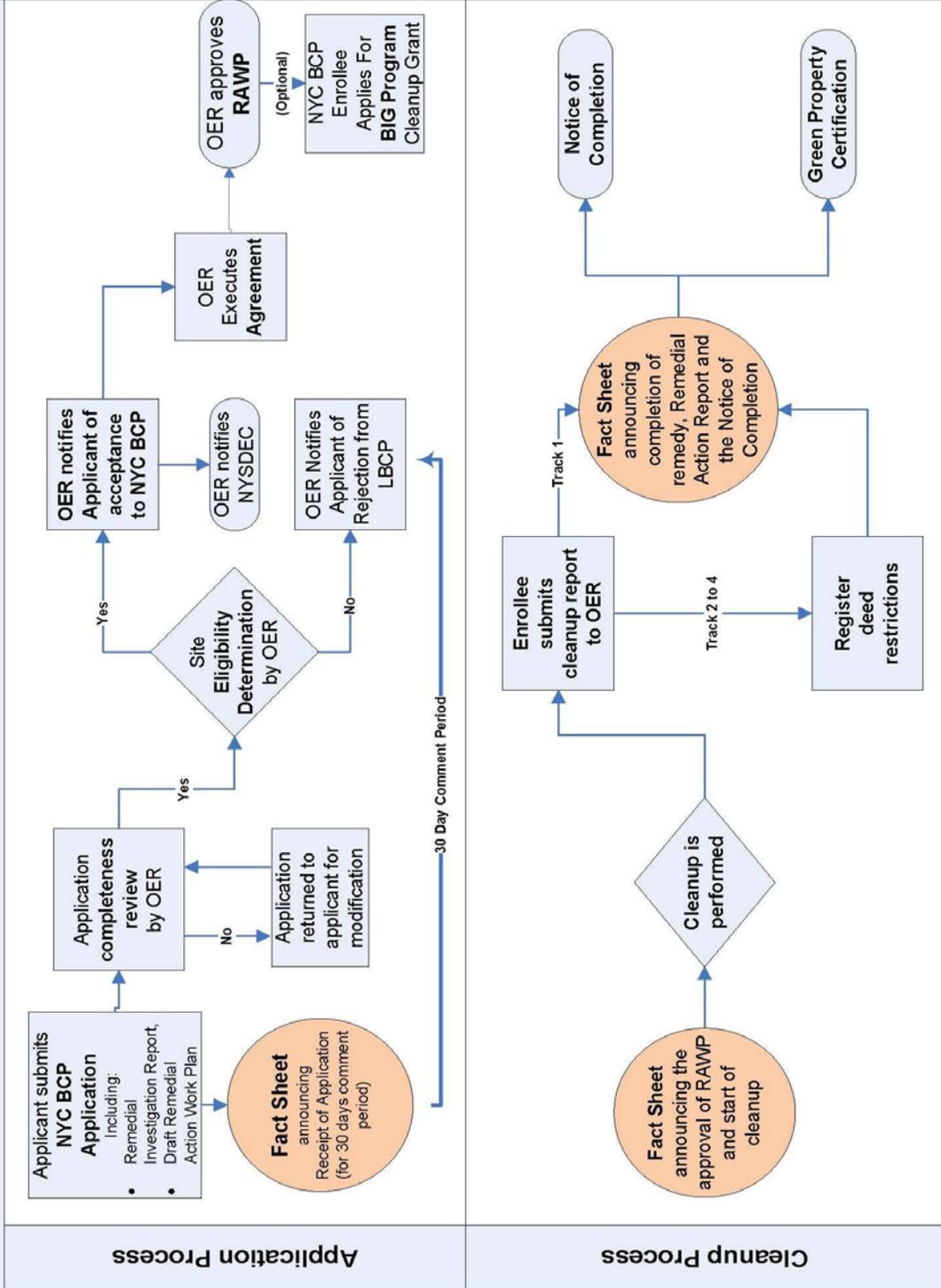
Public Notice and Public Comment. Public notice to all members of the Project Contact List is required at three major steps during the performance of the cleanup program (listed below) and at other points that may be required by OER. Notices will include Fact Sheets with

descriptive project summaries, updates on recent and upcoming project activities, repository information, and important phone and email contact information. All notices will be prepared by 224-01 LLC, reviewed and approved by OER prior to distribution and mailed by 224-01 LLC. Public comment is solicited in public notices for all work plans developed under the NYC Voluntary Cleanup Program. Final review of all work plans by OER will consider all public comments. Approval will not be granted until the public comment period has been completed.

Citizen Participation Milestones. Public notice and public comment activities occur at several steps during a typical NYC VCP project. See flow chart on the following page, which identifies when during the NYC VCP public notices are issued: These steps include:

- **Public Notice of the availability of the Remedial Investigation Report and Remedial Action Work Plan and a 30-day public comment period on the Remedial Action Work Plan.**
- Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the availability of the Remedial Investigation Report and Remedial Action Work Plan and the initiation of a 30-day public comment period on the Remedial Action Work Plan. The Fact Sheet summarizes the findings of the RIR and provides details of the RAWP. The public comment period will be extended an additional 15 days upon public request. A public meeting or informational session will be conducted by OER upon request.
- **Public Notice announcing the approval of the RAWP and the start of remediation**
- Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the approval of the RAWP and the start of remediation.
- **Public Notice announcing the completion of remediation, designation of Institutional and Engineering Controls and issuance of the Notice of Completion**
- Public notice in the form of a Fact Sheet is sent to all parties listed on the Site Contact List announcing the completion of remediation, providing a list of all Institutional and Engineering Controls implemented for to the Site and announcing the issuance of the Notice of Completion.

Flow Chart For NYC Brownfield Cleanup Program (NYC BCP)



APPENDIX 2

SUSTAINABILITY STATEMENT

This Sustainability Statement documents sustainable activities and green remediation efforts planned under this remedial action.

Reuse of Clean, Recyclable Materials. Reuse of clean, locally-derived recyclable materials reduces consumption of non-renewable virgin resources and can provide energy savings and greenhouse gas reduction.

An estimate of the quantity (in tons) of clean, non-virgin materials (reported by type of material) reused under this plan will be quantified and reported in the RAR.

Reduce Consumption of Virgin and Non-Renewable Resources. Reduced consumption of virgin and non-renewable resources lowers the overall environmental impact of the project on the region by conserving these resources.

An estimate of the quantity (in tons) of virgin and non-renewable resources, the use of which will be avoided under this plan, will be quantified and reported in the RAR.

Reduced Energy Consumption and Promotion of Greater Energy Efficiency. Reduced energy consumption lowers greenhouse gas emissions, improves local air quality, lessens in-city power generation requirements, can lower traffic congestion, and provides substantial cost savings.

Best efforts will be made to quantify energy efficiencies achieved during the remediation and will be reported in the Remedial Action Report (RAR). Where energy savings cannot be easily quantified, a gross indicator of the amount of energy saved or the means by which energy savings was achieved will be reported.

Conversion to Clean Fuels. Use of clean fuel improves NYC's air quality by reducing harmful emissions.

An estimate of the volume of clean fuels used during remedial activities will be quantified and reported in the RAR.

Recontamination Control. Recontamination after cleanup and redevelopment is completed undermines the value of work performed, may result in a property that is less protective of public health or the environment, and may necessitate additional cleanup work later or impede future redevelopment. Recontamination can arise from future releases that occur within the property or by influx of contamination from off-Site.

Under future conditions, building recontamination from potential off-site sources will be prevented through the use of a vapor barrier below the buildings slabs and the construction of sub-grade depressurization systems. Current regulations will be met for storage and handling of any materials onsite that may present a potential recontamination threat. If a Track 1 remedy cannot be achieved, long term site management will include periodic site inspection that will identify and correct any new issues of environmental concern.

An estimate of the area of the Site that utilizes recontamination controls under this plan will be reported in the RAR in square feet.

Storm-water Retention. Storm-water retention improves water quality by lowering the rate of combined storm-water and sewer discharges to NYC's sewage treatment plants during periods of precipitation, and reduces the volume of untreated influent to local surface waters.

An estimate of the enhanced storm-water retention capability of the redevelopment project will be included in the RAR.

Linkage with Green Building. Green buildings provide a multitude of benefits to the city across a broad range of areas, such as reduction of energy consumption, conservation of resources, and reduction in toxic materials use.

The number of Green Buildings that are associated with this brownfield redevelopment property will be reported in the RAR. The total square footage of green building space created as a function of this brownfield redevelopment will be quantified for residential, commercial and industrial/manufacturing uses.

Paperless Voluntary Cleanup Program. 224-01 LLC is participating in OER's Paperless Voluntary Cleanup Program. Under this program, submission of electronic documents will

replace submission of hard copies for the review of project documents, communications and milestone reports.

Low-Energy Project Management Program. 224-01 LLC is participating in OER's low-energy project management program. Under this program, whenever possible, meetings are held using remote communication technologies, such as videoconferencing and teleconferencing to reduce energy consumption and traffic congestion associated with personal transportation.

Trees and Plantings. Trees and other plantings provide habitat and add to NYC's environmental quality in a wide variety of ways. Native plant species and native habitat provide optimal support to local fauna, promote local biodiversity, and require less maintenance.

An estimate of trees planted or preserved, will be reported in square feet in the RAR.

APPENDIX 3

SOIL/MATERIALS MANAGEMENT PLAN

1.1 Soil Screening Methods

Visual, olfactory and PID soil screening and assessment will be performed under the supervision of a Qualified Environmental Professional and will be reported in the RAR. Soil screening will be performed during invasive work performed during the remedy and development phases prior to issuance of the Notice of Completion.

1.2 Stockpile Methods

Excavated soil from suspected areas of contamination (e.g., hot spots, USTs, drains, etc.) will be stockpiled separately and will be segregated from clean soil and construction materials. Stockpiles will be used only when necessary and will be removed as soon as practicable. While stockpiles are in place, they will be inspected daily, and before and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by OER. Excavated soils will be stockpiled on, at minimum, double layers of 8-mil minimum sheeting, will be kept covered at all times with appropriately anchored plastic tarps, and will be routinely inspected. Broken or ripped tarps will be promptly replaced.

All stockpile activities will be compliant with applicable laws and regulations. Soil stockpile areas will be appropriately graded to control run-off in accordance with applicable laws and regulations. Stockpiles of excavated soils and other materials shall be located at least of 50 feet from the property boundaries, where possible. Hay bales or equivalent will surround soil stockpiles except for areas where access by equipment is required. Silt fencing and hay bales will be used as needed near catch basins, surface waters and other discharge points.

1.3 Characterization of Excavated Materials

Soil/fill or other excavated media that is transported off-Site for disposal will be sampled in a manner required by the receiving facility, and in compliance with applicable laws and regulations. Soils proposed for reuse on-Site will be managed as defined in this plan.

1.4 Materials Excavation, Load-Out and Departure

The PE/QEP overseeing the remedial action will:

- oversee remedial work and the excavation and load-out of excavated material;
- ensure that there is a party responsible for the safe execution of invasive and other work performed under this work plan;
- ensure that Site development activities and development-related grading cuts will not interfere with, or otherwise impair or compromise the remedial activities proposed in this RAWP;
- ensure that the presence of utilities and easements on the Site has been investigated and that any identified risks from work proposed under this plan are properly addressed by appropriate parties;
- ensure that all loaded outbound trucks are inspected and cleaned if necessary before leaving the Site;
- ensure that all egress points for truck and equipment transport from the Site will be kept clean of Site-derived materials during Site remediation.

Locations where vehicles exit the Site shall be inspected daily for evidence of soil tracking off premises. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site-derived materials.

Open and uncontrolled mechanical processing of historical fill and contaminated soil on-Site will not be performed without prior OER approval.

1.5 Off-Site Materials Transport

Loaded vehicles leaving the Site will comply with all applicable materials transportation requirements (including appropriate covering, manifests, and placards) in accordance with applicable laws and regulations, including use of licensed haulers in accordance with 6 NYCRR Part 364. If loads contain wet material capable of causing leakage from trucks, truck liners will be used. Queuing of trucks will be performed on-Site, when possible in order to minimize off Site disturbance. Off-Site queuing will be minimized.

Outbound truck transport routes are will take into account the following factors: (a) limiting transport through residential areas and past sensitive sites; (b) use of mapped truck routes; (c) minimizing off-Site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport. To the extent possible, all trucks loaded with Site materials will travel from the Site using these truck routes. Trucks will not stop or idle in the neighborhood after leaving the project Site.

1.6 Materials Disposal Off-Site

The following documentation will be established and reported by the PE/QEP for each disposal destination used in this project to document that the disposal of regulated material exported from the Site conforms with applicable laws and regulations: (1) a letter from the PE/QEP or Enrollee to each disposal facility describing the material to be disposed and requesting written acceptance of the material. This letter will state that material to be disposed is regulated material generated at an environmental remediation Site in Queens, New York under a governmental remediation program. The letter will provide the project identity and the name and phone number of the PE/QEP or Enrollee. The letter will include as an attachment a summary of all chemical data for the material being transported; and (2) a letter from each disposal facility stating it is in receipt of the correspondence (1, above) and is approved to accept the material. These documents will be included in the RAR.

The Remedial Action Report will include an itemized account of the destination of all material removed from the Site during this remedial action. Documentation associated with disposal of all material will include records and approvals for receipt of the material. This information will be presented in the RAR.

All impacted soil/fill or other waste excavated and removed from the Site will be managed as regulated material and will be disposed in accordance with applicable laws and regulations. Historic fill and contaminated soils taken off-Site will be handled as solid waste and will not be disposed at a Part 360-16 Registration Facility (also known as a Soil Recycling Facility).

Waste characterization will be performed for off-Site disposal in a manner required by the receiving facility and in conformance with its applicable permits. Waste characterization sampling and analytical methods, sampling frequency, analytical results and QA/QC will be

reported in the RAR. A manifest system for off-Site transportation of exported materials will be employed. Manifest information will be reported in the RAR. Hazardous wastes derived from on-Site will be stored, transported, and disposed of in compliance with applicable laws and regulations.

If disposal of soil/fill from this Site is proposed for unregulated disposal (i.e., clean soil removed for development purposes), including transport to a Part 360-16 Registration Facility, a formal request will be made for approval by OER with an associated plan compliant with 6NYCRR Part 360-16. This request and plan will include the location, volume and a description of the material to be recycled, including verification that the material is not impacted by site uses and that the material complies with receipt requirements for recycling under 6NYCRR Part 360. This material will be appropriately handled on-Site to prevent mixing with impacted material.

1.7 Materials Reuse On-Site

Soil and fill that is derived from the property that meets the soil cleanup objectives established in this plan may be reused on-Site. The soil cleanup objectives for on-Site reuse are listed in Table 12. 'Reuse on-Site' means material that is excavated during the remedy or development, does not leave the property, and is relocated within the same property and on comparable soil/fill material, and addressed pursuant to the NYC VCP agreement subject to Engineering and Institutional Controls. The PE/QEP will ensure that reused materials are segregated from other materials to be exported from the Site and that procedures defined for material reuse in this RAWP are followed.

Organic matter (wood, roots, stumps, etc.) or other waste derived from clearing and grubbing of the Site will not be buried on-Site. Soil or fill excavated from the site for grading or other purposes will not be reused within a cover soil layer or within landscaping berms.

1.8 Demarcation

After completion of hotspot removal and any other invasive remedial activities, and prior to backfilling, the top of the residual soil/fill will be defined by one of three methods: (1) placement of a demarcation layer. The demarcation layer will consist of geosynthetic fencing or equivalent material to be placed on the surface of residual soil/fill to provide an observable reference layer. A description or map of the approximate depth of the demarcation layer will be provided in the

SMP; or (2) a land survey of the top elevation of residual soil/fill before the placement of cover soils, pavement and associated sub-soils, or other materials or structures or, (3) all materials beneath the approved cover will be considered impacted and subject to site management after the remedy is complete. Demarcation may be established by one or any combination of these three methods. As appropriate, a map showing the method of demarcation for the Site and all associated documentation will be presented in the RAR.

This demarcation will constitute the top of the site management horizon. Materials within this horizon require adherence to special conditions during future invasive activities as defined in the Site Management Plan.

1.9 Import of Backfill Soil from Off-Site Sources

This Section presents the requirements for imported fill materials to be used below the cover layer and within the clean soil cover layer. All imported soils will meet OER-approved backfill and cover soil quality objectives for this Site. The backfill and cover soil quality objectives are listed in Table 12.

A process will be established to evaluate sources of backfill and cover soil to be imported to the Site, and will include an examination of source location, current and historical use(s), and any applicable documentation. Material from industrial sites, spill sites, environmental remediation sites or other potentially contaminated sites will not be imported to the Site.

The following potential sources may be used pending attainment of backfill and cover soil quality objectives:

- Clean soil from construction projects at non-industrial sites in compliance with applicable laws and regulations;
- Clean soil from roadway or other transportation-related projects in compliance with applicable laws and regulations;
- Clean recycled concrete aggregate (RCA) from facilities permitted or registered by the regulations of NYS DEC.

All materials received for import to the Site will be approved by a PE/QEP and will be in compliance with provisions in this RAWP. The RAR will report the source of the fill, evidence that an inspection was performed on the source, chemical sampling results, frequency of testing, and a Site map indicating the locations where backfill or soil cover was placed.

Source Screening and Testing

Inspection of imported fill material will include visual, olfactory and PID screening for evidence of contamination. Materials imported to the Site will be subject to inspection, as follows:

- Trucks with imported fill material will be in compliance with applicable laws and regulations and will enter the Site at designated locations;
- The PE/QEP is responsible to ensure that every truck load of imported material is inspected for evidence of contamination; and
- Fill material will be free of solid waste including pavement materials, debris, stumps, roots, and other organic matter, as well as ashes, oil, perishables or foreign matter.

Composite samples of imported material will be taken at a minimum frequency of one sample for every 500 cubic yards of material. Once it is determined that the fill material meets imported backfill or cover soil chemical requirements and is non-hazardous, and lacks petroleum contamination, the material will be loaded onto trucks for delivery to the Site.

Recycled concrete aggregate (RCA) will be imported from facilities permitted or registered by NYSDEC. Facilities will be identified in the RAR. A PE/QEP is responsible to ensure that the facility is compliant with 6NYCRR Part 360 registration and permitting requirements for the period of acquisition of RCA. RCA imported from compliant facilities will not require additional testing, unless required by NYSDEC under its terms for operation of the facility. RCA imported to the Site must be derived from recognizable and uncontaminated concrete. RCA material is not acceptable for, and will not be used as cover material.

1.10 Fluids Management

All liquids to be removed from the Site, including dewatering fluids, will be handled, transported and disposed in accordance with applicable laws and regulations. Liquids discharged into the New York City sewer system will receive prior approval by New York City Department of Environmental Protection (NYC DEP). The NYC DEP regulates discharges to the New York City sewers under Title 15, Rules of the City of New York Chapter 19. Discharge to the New York City sewer system will require an authorization and sampling data demonstrating that the groundwater meets the City's discharge criteria. The dewatering fluid will be pretreated as necessary to meet the NYC DEP discharge criteria. If discharge to the City sewer system is not appropriate, the dewatering fluids will be managed by transportation and disposal at an off-Site treatment facility.

Discharge of water generated during remedial construction to surface waters (i.e. a stream or river) is prohibited without a SPDES permit issued by New York State Department of Environmental Conservation.

1.11 Storm-water Pollution Prevention

Applicable laws and regulations pertaining to storm-water pollution prevention will be addressed during the remedial program. Erosion and sediment control measures identified in this RAWP (silt fences and barriers, and hay bale checks) will be installed around the entire perimeter of the remedial construction area and inspected once a week and after every storm event to ensure that they are operating appropriately. Discharge locations will be inspected to determine whether erosion control measures are effective in preventing significant impacts to receptors. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by OER. All necessary repairs shall be made immediately. Accumulated sediments will be removed as required to keep the barrier and hay bale check functional. Undercutting or erosion of the silt fence toe anchor will be repaired immediately with appropriate backfill materials. Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.

1.12 Contingency Plan

This contingency plan is developed for the remedial construction to address the discovery of unknown structures or contaminated media during excavation. Identification of unknown contamination source areas during invasive Site work will be promptly communicated to OER's Project Manager. Petroleum spills will be reported to the NYS DEC Spill Hotline. These findings will be included in the daily report. If previously unidentified contaminant sources are found during on-Site remedial excavation or development-related excavation, sampling will be performed on contaminated source material and surrounding soils and reported to OER. Chemical analytical testing will be performed for TAL metals, TCL volatiles and semi-volatiles, TCL pesticides and PCBs, as appropriate.

1.13 Odor, Dust and Nuisance Control

Odor Control

All necessary means will be employed to prevent on- and off-Site odor nuisances. At a minimum, procedures will include: (a) limiting the area of open excavations; (b) shrouding open excavations with tarps and other covers; and (c) use of foams to cover exposed odorous soils. If odors develop and cannot otherwise be controlled, additional means to eliminate odor nuisances will include: (d) direct load-out of soils to trucks for off-Site disposal; and (e) use of chemical odorants in spray or misting systems.

This odor control plan is capable of controlling emissions of nuisance odors. If nuisance odors are identified, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. OER will be notified of all odor complaint events. Implementation of all odor controls, including halt of work, will be the responsibility of the PE/QEP's certifying the Remedial Action Report.

Dust Control

Dust management during invasive on-Site work will include, at a minimum:

- Use of a dedicated water spray methodology for roads, excavation areas and stockpiles.
- Use of properly anchored tarps to cover stockpiles.

- Exercise extra care during dry and high-wind periods.
- Use of gravel or recycled concrete aggregate on egress and other roadways to provide a clean and dust-free road surface.

This dust control plan is capable of controlling emissions of dust. If nuisance dust emissions are identified, work will be halted and the source of dusts will be identified and corrected. Work will not resume until all nuisance dust emissions have been abated. OER will be notified of all dust complaint events. Implementation of all dust controls, including halt of work, will be the responsibility of the PE/QEP's responsible for certifying the Remedial Action Report.

Other Nuisances

Noise control will be exercised during the remedial program. All remedial work will conform, at a minimum, to NYC noise control standards.

Rodent control will be provided, during Site clearing and grubbing, and during the remedial program, as necessary, to prevent nuisances.

APPENDIX 4

HEALTH AND SAFETY PLAN

**Health and Safety Plan
For
Property Located at
224-01 Merrick Boulevard
Queens, New York**

**OER # 12EH-N378Q
March 2012**

**Prepared by
J.R. Holzmacher P.E., LLC
Consulting Engineers
300 Wheeler Road, Suite 402, Hauppauge, NY 11788**

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1.0 INTRODUCTION

This section of the Health and Safety Plan (HASP) document defines general applicability and general responsibilities with respect to compliance with Health and Safety programs. This plan has been prepared for excavation/remediation activities to be conducted to determine if subsurface contamination is present. Soil sampling activities are estimated to occur during the excavation period for the proposed new building and sub-grade parking structures at the site.

1.1 Scope and Applicability of the Site Health and Safety Plan

The purpose of this HASP is to define the requirements and designate protocols to be followed during the excavation/remediation activities at the site. Applicability extends to all government employees, contractors, subcontractors, and visitors.

All personnel on site, contractors and subcontractors included, shall be informed of the site emergency response procedures and any potential fire, explosion, health, or safety hazards of the operation. This HASP summarizes those hazards in Table 3.1 and defines protective measures planned for the site.

This plan must be reviewed and an agreement to comply with the requirements must be signed by all personnel prior to entering the exclusion zone or contamination reduction zone.

During development of this plan, consideration was given to current safety standards as defined by the Environmental Protection Agency (EPA)/Occupational Health and Safety Administration (OSHA)/National Institute of Occupational Safety and Health (NIOSH), health effects and standards for known contaminants, and procedures designed to account for the potential for exposure to unknown substances. Specifically, the following reference sources have been consulted:

- OSHA 29 CFR 1910.120 and EPA 40 CFR 311
- USEPA, Office of Emergency and Remedial Response, Emergency Response Team, Standard Operating Safety Guides
- NIOSH/OSHA/USCG/EPA Occupational Health and Safety Guidelines
- American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values

1.2 Visitors

There will be no outside visitors allowed on the site during excavation/remediation activities. Outside visitors are defined as those not directly involved with construction and sampling activities.

2.0 KEY PERSONNEL/IDENTIFICATION OF HEALTH AND SAFETY

2.1 Key Personnel

The following personnel and organizations are critical to the excavation/remediation efforts at the site estimated to occur during the excavation activities identified in Figure 1.1 – Construction Activities Schedule. The organizational structure will be reviewed and updated periodically by the site supervisor.

Excavation/Construction Team Representatives:

1. J.R. Holzmacher P.E., LLC
2. Zebra Environmental

TO BE DETERMINED

2.2 Site Specific Health and Safety Personnel

The Site Health and Safety Officer (SHSO) has responsibility for ensuring that the provisions of this HASP are adequate and implemented in the field. Changing field conditions may require decisions to be made concerning adequate protection programs. The SHSO is also responsible for conducting site inspections on a regular basis in order to ensure the effectiveness of this plan.

The SHSO at the site with respect to Phase II investigation activities is:

J.R. Holzmacher P.E., LLC
Heather V. Sonnenberg
Project Engineer

Designated alternates include:

James DeMartinis
Senior Hydrogeologist

TO BE DETERMINED

2.3 Organizational Responsibility

1. The SHSO of the site will conduct site inspections throughout the project making sure the Health and Safety Plan is followed. His main concern is the personal protection of the workers.

3.0 TASK SAFETY AND HEALTH RISK ANALYSIS

3.1 Historical Overview of Site

The subject property, 224-01 Merrick Boulevard, is a 10,000 square foot parcel located on the northeast corner of the intersection of Merrick Boulevard and 224th Street in Springfield Gardens, New York. A one story building with no basement, built in 1945 (now vacant), occupies 7,100 of the property. This property has been designated with a Hazardous Materials “E” (E-219) as part of the Laurelton Rezoning Action (CEQR # 08DCP073Q).

Based on available Sanborn Maps from 1929 to 1949, the property was designated as an auto sales and service facility later auto parts sales and service. It was most recently occupied by R & L Strauss. There was an underground 1,000 gallon waste oil tank that was removed without incident in 2003.

3.2 Task-by-Task Risk Analysis

The evaluation of hazards is based upon the knowledge of the site background presented in Section 3.1 above, and anticipated risks posed by the specific tasks to be performed.

The following subsections describe each task/operation in terms of the specific hazards associated with it. In addition, the protective measures to be implemented during completion of those tasks are also identified.

Table 3.1 provides a summary of task analysis and chemical hazards potentially encountered at the Site.

| TABLE 3.1 TASK ANALYSIS POTENTIAL CHEMICAL HAZARDS OF CONCERN | | | |
|---|-------------------------|---------|--------------|
| Contaminant | PEL/TLV | LEL (%) | IDLH |
| VOCs | | | |
| Benzene | 1/0.5ppm | 1.2 | 500 ppm |
| Toluene | 200/50 ppm | 1.1 | 500 ppm |
| Xylenes | 100/100 ppm | ~1 | 900 ppm |
| Ethyl benzene | 100/100ppm | 0.8 | 800 ppm |
| MTBE | NE/50ppm | NE | NE |
| Diesel Fuel | NE/100mg/m ³ | | Ca (exhaust) |
| Gasoline | NE/300 | 1.4 | Ca |

| | | | |
|------------|--------------------------------|----|------------------------|
| Lead | 0.05/0.05 mg/m ³ | NA | 100 mg/m ³ |
| PCBs | 0.5-1 mg/m ³ | NA | 5 mg/m ³ |
| PAHs | 0.2 mg/m ³ | NA | 1750 mg/m ³ |
| Pesticides | Variable | NA | NA |
| Arsenic | 0.01 mg/m ³ | NA | 5 mg/m ³ |
| Mercury | 0.025 mg/m ³ | NA | 10 mg/m ³ |

NE – not established

Ca - Cancer

Notes:

1. TLV = Threshold Limit Value
2. IDLH = Immediately Dangerous to Life and Health

3.3 Physical Hazards -Soil Sampling and Excavation

3.3.1 Hazard Identification and Prevention

- Safety related work practices would be used to prevent electric shock or other injuries resulting from either direct or indirect electrical contacts. Overhead power lines, buried cables and electrical equipment used on site all pose a danger of shock or electrocution if workers contact or sever them during field operations.
- New York State law requires that a utility mark out to be performed at a site at least 72 hours prior to starting any subsurface work. The tank removal contractor will contact New York City One Call (1-800-272-4480) to request a mark out of underground utilities in the proposed excavation and drilling areas. Work will not begin until the required utility clearances have been completed.
- Public utilities typically do not mark-out utility lines that are located on private property. Therefore, JRH will exercise due diligence and try to identify the location of any private utilities at the site. A private utility contractor will clear on-site subsurface disturbance locations for utilities prior to the commencement of any such work. JRH will also use as-built drawings for the area being investigated, perform a line locating survey, and identify a no-dig/drill zone and hand dig if there is insufficient data to determine the location of utility lines.
- Care must be taken to ensure loose clothing does not get tangled in any moving equipment while borings are being drilled.
- There may be slip or trip hazards associated with rough, slippery or elevated work surfaces at the site. The sampling sites could contain a number of slip, trip and fall

hazards for site workers, such as: holes, pits, or ditches; excavation faces and slippery surfaces (steep grades, uneven grades, snow and ice and sharp objects).

- Drilling or excavating is dangerous during electrical storms. All field activity must terminate when thunderstorms are evident. Extreme heat and cold, ice and heavy rain can produce unsafe conditions for drilling work. Such conditions, when present, will be evaluated on a case-by-case basis to determine if work shall terminate.
- The use of an excavator and other equipment that are gasoline or fuel powered presents the possibility of encountering fire and explosion hazards.
- Plants and animals that are known to be hazardous to humans may affect work that takes place. Spiders, bees, wasps, hornets, ticks, poison oak and poison ivy are only some of the hazards that may be encountered. Individuals who may potentially be exposed to these hazards should be made aware of their existence and instructed in their identification. Emergencies resulting from contact with a natural hazard should be handled through the normal medical emergency channels. Individuals who are sensitive to these types of "natural" hazards should indicate their susceptibility to the SHSO.
- Work on-site will involve the use of heavy construction equipment such as an excavator. The unprotected exposure of site workers to this noise during field activities can result in noise induced hearing loss. The SHSO will monitor the noise exposure for the initial trip and determine whether noise protection is warranted for each of the team members. The SHSO will ensure that either ear muffs or disposable foam earplugs are made available to all personnel and are used by the personnel in the immediate vicinity of the field operation as required.

3.4 Chemical Hazards

3.4.1 General Description

There is potential low-level VOC and SVOC contamination because the site was formerly occupied by an auto repair shop. The current building was constructed in 1945 and has been used for auto parts sales and service. The building is being renovated and a small cellar will be added during the renovation.

Potential chemical hazards below the building slab are evaluated below. It is anticipated that petroleum compounds and dust could be of concern. The potential for exposure to vapors, contaminated dusts, and contaminated soil/groundwater is of utmost concern.

3.4.2 Potential Chemical Health Hazards

Benzene

Exposure to benzene above the Permissible Exposure Limit (PEL) may produce skin irritation with potential for redness, blistering and burning. Overexposure may also result in irritation of the mucous membranes for the upper respiratory tract, nose and mouth causing difficulty breathing and possible pulmonary edema. Symptoms of exposure include headache, confusion, dizziness and tightening of the leg muscles. The OSHA PEL for benzene is 1 ppm. The American Conference of Governmental Industrial Hygienists recommends a Threshold Limit Value (TLV) of 0.5 ppm for benzene based on classification as a confirmed human carcinogen.

Toluene

Exposure to the vapors of toluene above the Permissible Exposure Limit (PEL) may produce irritation of the mucous membranes of the upper respiratory tract, nose and mouth. Overexposure may also result in depression of the central nervous system. Symptoms of such exposure include drowsiness, headache, fatigue and intoxicated behavior. The PEL for toluene is 200 ppm. The American Conference of Governmental Industrial Hygienists (ACGIH) recommends a Threshold Limit Value (TLV) of 50 ppm for toluene due to effects on the central nervous system.

Xylene

Xylene is a flammable, colorless liquid with an OSHA PEL of 100 ppm. Inhalation of xylene vapors above the PEL may result in motor activity changes, headaches, dizziness, drowsiness and intoxicated behavior. Inhalation can also cause nose, throat and respiratory tract irritation, causing difficulty in breathing and possible pulmonary edema on high exposure. Xylene vapors are also irritating to the eye and potential redness, blistering and serious burning of the skin. Xylene can pass through intact skin to cause systemic effects, including narcosis. The ACGIH recommends a TLV of 100 ppm for xylene due to irritant effects.

Methyl Tertiary-Butyl Ether (MTBE)

Methyl tertiary-butyl ether is a chemical compound that is manufactured by the chemical reaction of methanol and isobutylene. MTBE is almost exclusively used as a fuel additive in motor gasoline. It is one of a group of chemicals commonly known as "oxygenates" because they raise the oxygen content of gasoline. At room temperature, MTBE is a volatile, flammable and colorless liquid that dissolves rather easily in water.

The majority of the human health-related research conducted to date on MTBE has focused on effects associated with the inhalation of the chemical. When research animals inhaled high concentrations of MTBE, some developed cancers or experienced other non-cancerous health effects. OSHA has not established a PEL or MTBE. The ACGIH has established a TLV of 50 ppm based on its effects on the kidney and reproductive system and gives it an A3 carcinogenicity rating. This means that it is a known animal carcinogen with unknown significance to humans.

Lead

The effects of lead exposure are long-term in nature. Early signs of lead poisoning include fatigue, headache, uneasy stomach, metallic taste and irritability. Later signs include memory loss, nausea, muscle/joint pains, stomachaches, weight loss and kidney problems.

Lead dust can be inhaled. Particles of lead can be swallowed if lead gets on clothing, hands or beard or into food or drinks. There will be no eating, drinking or smoking in the work area (the tunnels and access rooms). It will also be important to wash your hands and face before eating, drinking, or smoking outside of the work area.

PCBs

Polychlorinated biphenyls are mixtures of up to 209 individual chlorinated compounds (known as congeners). There are no known natural sources of PCBs. PCBs are either oily liquids or solids that are colorless to light yellow. Some PCBs can exist as a vapor in air. PCBs have no known smell or taste. Many commercial PCB mixtures are known in the U.S. by the trade name Aroclor. Exposure to PCBs causes eye irritation, chloracne and liver toxicity. Arochlor 1254 is a known animal carcinogen that may or may not cause cancer in humans. PCBs are readily absorbed through the skin. The OSHA PEL ranges from 0.5-1 mg/m³. The ACGIH has also set TLVs between 0.5-1 mg/m³ based on its irritant effects and its ability to cause chloracne and liver damage.

Polycyclic Aromatic Hydrocarbons (PAHS or SVOCs)-

PAHs are a group of over 100 different chemicals that are formed during the incomplete burning of coal, oil and gas, garbage, or other organic substances such as tobacco or charbroiled meat. PAHs are regulated based on effects of respiratory tract and skin irritation as well as eye irritation and nervous system disturbances. Acute exposures cause difficulty in breathing, skin/eye irritation and burns.

The Occupational Safety and Health Administration (OSHA) have set a limit of 0.2 milligrams of PAHs per cubic meter of air (0.2 mg/m³). The OSHA

Permissible Exposure Limit (PEL) for mineral oil mist that contains PAHs is 5 mg/m³ averaged over an 8-hour exposure period.

The National Institute for Occupational Safety and Health (NIOSH) recommends that the average workplace air levels for coal tar products not exceed 0.1 mg/m³ for a 10-hour workday, within a 40-hour workweek. There are other limits for workplace exposure for things that contain PAHs, such as coal, coal tar, and mineral oil.

Pesticides

A pesticide is a substance or mixture of substances intended to prevent, destroy, repel or mitigate any pest. The health effects of pesticides depend on the type of pesticide. Some such as organophosphates and carbamates, affect the nervous system. Others may irritate the skin or eyes. Other may affect the hormone or endocrine system in the body. EPA human health risk assessments for many pesticides are available at <http://cfpub.epa.gov/oppref/rereg/status.cfm>.

Arsenic

Arsenic is a naturally occurring element combined with oxygen, chlorine and sulfur to form inorganic arsenic compounds. Overexposure to arsenic may cause vomiting, ulceration of the nasal septum, hoarse voice, sore throat, numbness in extremities, respiratory irritation, and skin/eye irritation. The EPA has set limits on the amount of arsenic that industrial sources can release to the environment and has restricted or cancelled many of the uses of arsenic in pesticides. EPA has set a limit of 0.01 parts per million (ppm) for arsenic in drinking water.

The Occupational Safety and Health Administration (OSHA) have set a permissible exposure limit (PEL) of 10 micrograms of arsenic per cubic meter of workplace air (10 µg/m³) for 8 hour shifts and 40 hour work weeks.

Mercury

Mercury occurs naturally in the environment and exists in several forms. Overexposure may cause headache, drowsiness or insomnia, weakness, and pink skin on hands and feet. OSHA regulates levels of mercury in the workplace. It has set limits of 0.1 milligrams of mercury per cubic meter of air (mg/m³) for organic mercury and 0.05 mg/m³ for metallic mercury vapor in workplace air to protect workers during an 8-hour shift and a 40-hour workweek. NIOSH recommends that the amount of metallic mercury vapor in workplace air be limited to an average level of 0.05 mg/m³ during a 10-hour work shift.

3.4.3 First Aid

If soil comes in contact with the eyes immediately wash the eyes with large amounts of water, occasionally lifting the lower and upper lids. Contact lenses

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Queens, NY 11413
OER # 12EH-N378Q

should not be worn but can be protected by safety glasses/goggles. If lead contaminated soil comes in contact with the skin, wash the skin with soap and water prior to leaving the site. If a person breathes in large amounts of dust, move the exposed person to fresh air at once. If contaminated soil has been swallowed, get medical attention immediately (NIOSH, 1987).

4.0 PERSONNEL TRAINING REQUIREMENTS

Consistent with OSHA 29 CFR 1910.120 regulation covering Hazardous Waste Operations and Emergency Response, all site personnel are required to be trained in accordance with the standard. At a minimum, all personnel are required to be trained to recognize the hazards on-site, the provisions of this HASP, and the responsible personnel. The SHSO at the site pre-entry briefing(s) or periodic site briefings will discuss this plan.

5.0 PERSONNEL PROTECTIVE EQUIPMENT TO BE USED

This section describes the general requirements of the EPA designated Levels of Protection (A through D), and the specific levels of protection required for each task at the Site.

5.1 Levels of Protection

Personnel will wear the appropriate protective equipment when response activities involve known or suspected atmospheric contamination, vapors, gases, or particulates may be generated by site activities, or when direct contact with skin-affecting substances may occur. Full facepiece respirators protect lungs, gastrointestinal tract, and eyes against airborne toxicants. Chemical-resistant clothing protects the skin from contact with skin-destructive and absorbable chemicals.

The specific levels of protection and necessary components for each have been divided into four categories according to the degrees of protection afforded:

- Level A: Should be worn when the highest level of respiratory, skin, and eye protection is needed.
- Level B: Should be worn when the highest level of respiratory protection is needed, but a lesser level of skin protection. Level B is the primary level of choice when encountering unknown environments.
- Level C: Should be worn when the criteria for using air-purifying respirators are met, and a lesser level of skin protection is needed.
- Level D: Should be worn only as a work uniform and not in any area with respiratory or skin hazards. It provides minimal protection against chemical hazards.

Modifications of these levels are permitted, and routinely employed during site work activities to maximize efficiency. For example, Level C respiratory protection and Level D skin protection may be required for a given task. Likewise the type of chemical protective ensemble (i.e., material, format) will depend upon contaminants and degrees of contact.

The Level of Protection selected is based upon the following:

- Type and measured concentration of the chemical substance in the ambient atmosphere and its toxicity.
- Potential for exposure to substances in air, liquids, or other direct contact with material due to work being done.
- Knowledge of chemicals on-site along with properties such as toxicity, route of exposure, and contaminant matrix.

In situations where the type of chemical, concentration, and possibilities of contact are not known, the appropriate Level of Protection must be selected based on professional experience and judgment until the hazards can be better identified.

5.2 Level D Personnel Protective Equipment:

- Disposable Tyvek^R coveralls (as needed)
- Disposable Nitrile Exam gloves (as needed)
- Disposable Tyvek^R booties (as needed)
- Steel-tipped work boots
- Safety glasses
- Hard hat
- 3M N95 Dust Masks with Exhalation Valves (if needed)

5.3 Reassessment of Protection Program

The Level of Protection provided by PPE selection shall be upgraded or downgraded based upon changes in site conditions or investigation findings. When a significant change occurs, the hazards should be reassessed. Some indicators of the need for reassessment are:

- Commencement of a new work phase.
- Change in job tasks during a work phase.
- Change of season/weather
- When temperature extremes or individual medical considerations limit the effectiveness of PPE.
- Change in work scope, which affects the degree of contact with contaminants.

5.4 Work Mission Duration

Before the workers actually begin work in their PPE ensembles, the anticipated duration of the work mission will be established. Several factors limit mission length, including:

- Air supply consumption (SCBA use)-**Not Applicable.**
- Suit/Ensemble permeation and penetration rates for chemicals-**Not Applicable.**
- Ambient temperature and weather conditions (heat stress/cold stress).
- Capacity of personnel to work in PPE.

5.5 Personal Protective Equipment Recommended for Site

The following specific clothing materials are recommended for the site:

A. Soil Sampling – Level D

Site activities will require PPE as follows: hardhat, disposable Tyvek^R coveralls (if needed), disposable Tyvek^R booties (if needed), safety glasses and chemical resistant gloves. Particulate respirator-3M N95 Dust Masks with exhalation valves will be available.

5.6 SOP for Personal Protective Equipment

Proper inspection of PPE features several sequences of inspection depending upon specific articles of PPE and it's frequency of use. The different levels of inspection are as follows:

- Inspection and operation testing of equipment received from the factory or distributor.
- Inspection of equipment as it is issued to workers.
- Inspection after use or training and prior to maintenance.
- Periodic inspection of stored equipment.
- Periodic inspection when a question arises concerning the appropriateness of the selected equipment, or when problems with similar equipment arise.
- The primary inspection of the PPE in use for activities at the Site will occur prior to immediate use and will be conducted by the user. This ensures that the specific device or article has been checked-out by the user and that the user is familiar with its use.

TABLE 5.1
SAMPLE PPE INSPECTION CHECKLIST

CLOTHING

Before use:

- Determine that the clothing material is correct for the specified task at hand.
- Visually inspect for:
 - Imperfect seams
 - Non-uniform coatings
 - Tears
 - Malfunctioning closures
- Hold up to light and check for pinholes.
- Flex product:
 - Observe for cracks
 - Observe for other signs of shelf deterioration
- If the product has been used previously, inspect inside and out for signs of chemical attack:
 - Discoloration
 - Swelling
 - Stiffness

During the work task:

- Evidence of chemical attack such as discoloration, swelling, stiffening, and softening. Keep in mind, however, that chemical permeation can occur without any visible effects.
- Closure failure.
- Tears.
- Punctures.
- Seam Discontinuities.

GLOVES

Before use:

- Visually inspect for:
 - Imperfect seams
 - Tears
 - Non-uniform coating
 - Pressurize glove with air; listen for pinhole leaks.

5.7 Specific Levels of Protection Planned for the Site

The following levels of protection will be utilized during activities at the Site:

- Level D

6.0 FREQUENCY AND TYPES OF AIR MONITORING/SAMPLING

This section explains the general concepts of an air-monitoring program and specifies the surveillance activities that will take place during project completion at the Site.

The purpose of air monitoring is to identify and quantify airborne contaminants in order to verify and determine the level of worker protection needed. Initial screening for identification is often qualitative, i.e., the contaminant, or the class to which it belongs, is demonstrated to be present, but the determination of its concentration (quantification) must await subsequent testing. Two principal approaches are available for identifying and/or quantifying airborne contaminants:

- The on-site use of direct-reading instruments.
- Laboratory analysis of air samples obtained by a gas-sampling bag, collection media (i.e., filter, sorbent) and/or wet-contaminant collection methods.

6.1 Direct-Reading Monitoring Instruments

Unlike air sampling devices, which are used to collect samples for subsequent analysis in a laboratory, direct-reading instruments provide information at the time of sampling, enabling rapid decision-making. Data obtained from the real-time monitors are used to assure proper selection of personnel protection equipment, engineering controls, and work practices. Overall, the instruments provide the user the capability to determine if site personnel are being exposed to concentrations that exceed exposure limits or action levels for specific hazardous materials.

Of significant importance, especially during initial entries, is the potential for IDLH conditions or oxygen deficient atmospheres. Real-time monitors can be useful in identifying any IDLH conditions, toxic levels of airborne contaminants, flammable atmospheres, or radioactive hazards. Periodic monitoring of conditions is critical, especially, as exposures may have increased since initial monitoring or if new site activities have commenced.

6.2 Site Air Monitoring and Sampling Program

A. Air Monitoring Instruments

• Organic Vapor Monitoring

Instrument :Photoionization Detector (PID) with for use during all intrusive activities (10.6 Ev lamp).

Instrument: Detector Tubes – for measuring benzene and vinyl chloride concentrations.

Monitoring for organic vapors will be conducted in the breathing zone of employees using a PID during intrusive activities. Refer to Table 6.1 for total volatile organic vapor and benzene action levels.

• **Combustible Gas Monitoring**

Instrument: Combustible Gas Indicator (CGI)/ Oxygen Meter

Continuous air monitoring with a CGI/Oxygen meter will be conducted in areas where flammable vapors or gases are suspected. All work activities must stop where the monitor indicates the concentration of flammable vapors exceeds ten percent of the lower flammable limit (LEL) at a location with a potential ignition source. The area must be ventilated to reduce the concentration to below ten percent of the LEL.

• **Dust Monitoring**

Instrument: TSI DustTrak Model 8520 (or equivalent)

Continuous dust monitoring during all site activities will be conducted. Dust mitigation must be employed should readings exceed 10 mg/m³.

• **Calibration and Record keeping**

Equipment used will be calibrated in accordance with the manufacturers' specifications. The PID and CGI will be calibration checked before and after use under approximately the same conditions at which the instrument will be used. Calibration information will be kept in the field notebook or instrument log. The date, time, location, instrument serial number, calibration gas and concentration, will be noted.

B. Action Levels

| TABLE 6.1 | | |
|--|---|---|
| SITE AIR MONITORING AND SAMPLING PROGRAM SUMMARY | | |
| Instrument | Action Level | Action |
| PID (10.6 ev) | <u>Continuous</u> readings to 9ppm | Remain in level D PPE. |
| PID | <u>Continuous</u> reading of 10 to 100 ppm above background | Level D PPE but screen with Drager detection tube for benzene. If benzene detected >1 ppm upgrade to Level C and wear an organic vapor (OV) cartridge/air-purifying respirator (APR). Investigate source. |
| PID | <u>Continuous</u> reading over 100 ppm background | <u>Stop Work.</u> Reevaluate work conditions and procedures, Contact SHSO prior to continuing for authorization. |
| Drager Tubes: | 1- 10 ppm | Upgrade PPE to level C with OV/APR. |

| | | |
|------------------------------|--|---|
| Benzene | | |
| Drager Tubes: Benzene | >10 ppm | <u>Stop Work</u> . Reevaluate work conditions and procedures. Contact SHSO prior to continuing for authorization. |
| Combustible Gas Indicator | <u>Continuous reading</u> of 0% to 1% lower explosive level (LEL). | Remain in level D PPE. If no benzene present, assume source is methane. Continuously monitoring LEL. |
| Combustible Gas Indicator | <u>Continuous</u> reading of 1% to 10% LEL | Level D unless benzene is present. Investigate source and ventilate, if possible. SHSO may require upgrade to Level C PPE. |
| Combustible Gas Indicator | <u>Continuous</u> reading > 10% LEL | <u>Stop Work</u> . Evacuate work area and ventilate source of combustible gas, if possible, Contact SHSO prior to continuing for authorization. |
| Dust Monitor | <u>Continuous</u> reading >10.0 mg/m ³ | Suppress by spraying the dusty area with water. |

Notes: PEL = Occupational Safety and Health Administration (OSHA) Permissible Exposure Limit
 REL = National Institute of Occupational Safety and Health (NIOSH) Recommended Exposure Limit
 TLV = American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Value

C. Reporting Format

- Air Monitoring Log

6.3 Site Ambient Air Sampling

A. Sampling Criteria

A site ambient air sampling program will be considered if the following criteria are met:

1. Meteorological conditions
2. Health and safety observations
3. Particulate levels are two to three times above background.
4. Site specific activities
5. Site activity increases airborne contaminant(s) exposure potential.

7.0 SITE CONTROL MEASURES

The following section defines measures and procedures for maintaining site control. Site control is an essential component in the implementation of the site health and safety program.

7.1 Buddy System

During all Level B, C or D activities or when some conditions present a risk to personnel, the implementation of a buddy system is recommended if not mandatory. A buddy system requires at least two (2) people to work as a team, each looking out for each other. Table 8.1 lists those tasks, which require a buddy system and any additional site control requirements.

| TABLE 7.1 | |
|------------------------|-----------------------------|
| PERSONNEL REQUIREMENTS | |
| Task | Control Measures |
| Soil Sampling | Line of sight, buddy system |
| | |

7.2 Site Communications Plan

Successful communications between field teams and personnel in the support zone is essential. The following communications systems will be available during activities at the Site.

- Hand Signals
- Direct Vocal Communication
- For hand signal communications, the following definitions will apply during activities at the Site:

| TABLE 7.2 | |
|-------------------------|--------------------------------|
| HAND SIGNAL DEFINITIONS | |
| Signal | Definition |
| Hands clutching throat | Out of air/cannot breath |
| Hands on top of head | Need assistance |
| Thumbs up | OK/I am all right/I understand |
| Thumbs down | No/Negative |
| Arms waving upright | Send backup support |
| Grip partners wrist | Exit area immediately |

7.3 Work Zone Definition

The three general work zones established at the Site are the Exclusion Zone, Contamination Reduction Zone, and Support Zone. One of the basic elements of effective site soil remediation activities is the delineation of work zones. The purpose of establishing work zones is to:

- Reduce the accidental spread of hazardous substances by workers or equipment from the contaminated areas to the clean areas;
- Confine work activities to the appropriate areas, thereby minimizing the likelihood of accidental exposures;
- Facilitate the location and evacuation of personnel in case of an emergency; and
- Prevent unauthorized personnel from entering controlled areas.

Although a site may be divided into as many zones as necessary to ensure minimal employee exposure to hazardous substances, this plan uses the three most frequently identified zones in similar projects. These zones are the Exclusion Zone, the Decontamination Zone, and the Support Zone (sometimes referred to by others as the “clean zone”). Movement of personnel and equipment between these zones should be minimized and restricted to specific access control points to minimize the spreading of contamination, if encountered.

7.3.1 Exclusion Zone

The Exclusion Zone is the area where contamination is either known or expected to occur and where the greatest potential for exposure exists. No contamination is actually known to exist on this site. Therefore, the following protective measures will be taken in the Exclusion Zone.

Unprotected onlookers will be restricted from suspicious pre-screened soils requiring sampling such that they are 25 feet upwind or 50 feet downwind of excavation or drilling activities.

Those conducting activities and sampling in the Exclusion Zone will wear the applicable Personal Protective Equipment (PPE). The actions to be taken and PPE to be worn in the Exclusion Zone if VOCs are determined with the PID to be above background are described in Section 6 and Table 6.1.

7.3.2 Decontamination Zone

A Decontamination Zone will be established between the Exclusion Zone and the Support Zone, and will include the personnel, equipment and supplies that are needed to decontaminate equipment and personnel. The size will be selected by the SHSO to be sufficient to conduct the necessary decontamination activities. Personnel and equipment in the Exclusion Zone must pass through this zone before leaving or entering the Support Zone. This zone should always be established and maintained upwind of the Exclusion Zone.

7.3.3 Support Zone

The Support Zone will surround the Decontamination Zone and the Exclusion Zone. Break areas, operational direction and support facilities will be located in this area. Eating, smoking and drinking will be allowed only in this area.

7.4 Nearest Medical Assistance

Figure 7.1 shows a map of the route to the Flushing Hospital Medical Center (718-670-5000), which is the nearest hospital that can provide emergency care for individuals who may experience an injury or exposure on site. The route to the hospital will be verified by the SHSO, and will be familiar to all site personnel.

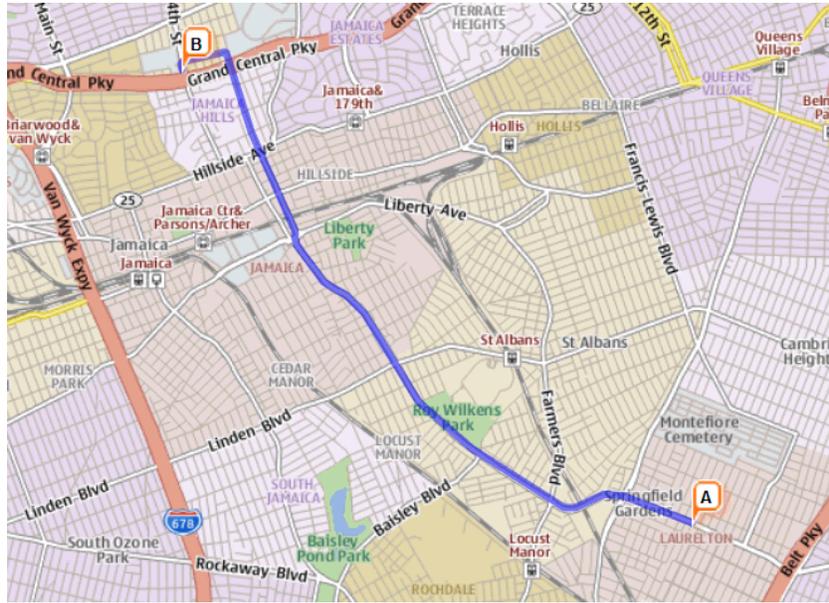


FIGURE 7.1

Directions

Distance

224-01 Merrick Blvd, Queens, NY 11413

1. Head toward 224th St on Merrick Blvd. Go for 3.1 mi/5.0 km.
2. Bear **L** onto 168th St. Go for 1.2 mi/1.9 km.
3. Turn **L** onto 82nd Rd. Go for 0.3 mi/442 m.
4. Turn **L** onto 164th St. Go for 216 ft/66 m.
5. Your destination on 164th St is on the right. The trip takes 4.6 mi/7.5 km and 18 mins.

82-68 164th St, Jamaica, NY 11432

Total Est. Time: 18 mins, Distance: 4.3 miles

Start:

Start at 224-01 MERRICK BLVD, QUEENS New York

End:

**QUEENS HOSPITAL CENTER
(718) 883-3000
82-68 164th Street, NY 11432**

7.5 Safe Work Practices

Table 7.3 provides a list of standing orders for the Exclusion Zone.

Table 7.4 provides a list of standing orders for the Decontamination Zone.

7.6 Emergency Alarm Procedures

The warning signals described in Section 9.4 “Evacuation Routes and Procedures,” will be deployed in the event of an emergency. Communication signals will also be used according to Section 7.2.

**TABLE 7.3
STANDING ORDERS FOR EXCLUSION ZONE**

- No smoking, eating, or drinking in this zone.
- No horseplay.
- No matches or lighters in this zone.
- Check-in on entrance to this zone.
- Check-out on exit from this zone.
- Implement the communications system.
- Line of sight must be in position.
- Wear the appropriate level of protection as defined in the HASP.

**TABLE 7.4
STANDING ORDERS FOR CONTAMINATION REDUCTION ZONE**

- No smoking, eating, or drinking in this zone.
- No horseplay.
- No matches or lighters in this zone.
- Wear the appropriate level of protection.

8.0 DECONTAMINATION PLAN

Consistent with the levels of protection required, the decontamination table(s) provides a step-by-step representation of the personnel decontamination process. These procedures should be modified to suit site conditions and protective ensembles in use.

8.1 Standard Operating Procedures

Decontamination involves the orderly controlled removal of contaminants. Standard decontamination sequences are presented in Table 8.1. All site personnel should minimize contact with contaminants in order to minimize the need for extensive decontamination. Personnel shall clean on-site as much gross contamination from clothing and equipment, as possible.

8.2 Levels of Decontamination Protection Required for Personnel

The levels of protection required for personnel assisting with decontamination will be Level D. The SHSO is responsible for monitoring decontamination procedures and determining their effectiveness.

8.3 Equipment Decontamination

Sampling equipment will be dedicated to each sample as practicable. Appendix A is the decontamination protocol for equipment. After on-site decontamination, non-disposable materials, such as gloves and booties, will be placed in plastic bags and for proper disposal off site.

8.4 Disposition of Decontamination Wastes

Contaminated disposable materials will be left in a secured condition on-site.

| TABLE 8.1 | |
|-------------------------------|---|
| LEVEL D DECONTAMINATION STEPS | |
| Step 1 | Remove outer garments (i.e., coveralls) and boots |
| Step 2 | Remove gloves |
| Step 3 | Wash hands and face |

9.0 EMERGENCY RESPONSE/CONTINGENCY PLAN

This section describes contingencies and emergency planning procedures to be implemented at the Site. This plan is compatible with local, state and federal disaster and emergency management plans, as appropriate.

9.1 Pre-Emergency Planning

During the site briefing held periodically/daily, all employees will be trained in and reminded of provisions of the emergency response plan, communication systems, and evacuation routes. Table 9.1 identifies potential hazards associated with site activities, along with the available emergency prevention/control equipment and its location. The plan will be reviewed and revised, if necessary, on a regular basis by the SHSO. This will ensure that the plan is adequate and consistent with prevailing site conditions.

| TABLE 9.1 | | |
|--|--------------------|---|
| EMERGENCY RECOGNITION/CONTROL MEASURES | | |
| HAZARD | PREVENTION/CONTROL | LOCATION |
| Fire/Explosion | Fire Extinguisher | Site Trailer and Heavy Equipmt. mounted |
| Spill | Sorbent Materials | Not Applicable |
| Air Release | Evacuation Routes | Not Applicable |

9.2 Personnel Roles and Lines of Authority

The Site Supervisor has primary responsibility for responding to and correcting emergency situations. This includes taking appropriate measures to ensure the safety of site personnel and the public. Possible actions may involve evacuation of personnel from the site area, and evacuation of adjacent residents. He/she is additionally responsible for ensuring that corrective measures have been implemented, appropriate authorities notified and follow-up reports completed. The SHSO may be called upon to act on the behalf of the site supervisor, and will direct responses to any medical emergency. The individual contractor organizations are responsible for assisting the project manager in his/her mission within the parameters of their scope of work.

The Site Supervisor is: Heather Sonnenberg of JRH.

9.3 Emergency Recognition/Prevention

Table 3.1 provides a listing of chemical and physical hazards on-site. Additional potential hazards associated with site activities are listed in Table 9.1, along with the available emergency prevention/control equipment and its location. Personnel will be familiar with techniques of hazard recognition from preassignment training and site-

specific briefings. The SHSO is responsible for ensuring that prevention devices and equipment are available to personnel.

9.4 Evacuation Routes/Procedures

In the event of an emergency which necessitates an evacuation of the site, the following alarm procedures will be implemented:

- Insure that a predetermined location is identified off-site in case of an emergency, so that all personnel can be accounted for.
- Personnel will be expected to proceed to the closest site exit with their buddy, and mobilize to the safe distance area associated with the evacuation route. Personnel will remain at that area until the re-entry alarm is sounded or an authorized individual provides further instructions.

9.5 Emergency Contact/Notification System

The following list provides names and telephone numbers for emergency contact personnel. In the event of a medical emergency, personnel will take direction from the SHSO and notify the appropriate emergency organization(s). In the event of a fire or spill, the site supervisor will notify the appropriate local, state and federal agencies.

| TABLE 9.2 | | |
|-----------------------------|--------------------------------|--------------|
| List of Emergency Contacts | | |
| Organization | Contact | Telephone |
| Police | NYCPD | 911 |
| Fire | NYCFD | 911 |
| Hospital | Flushing Hospital Medical Ctr. | 718-670-5000 |
| EPA Emergency Response Team | | 800-424-8802 |
| NYSDEC | Spill Hotline | 800-457-7362 |
| National Response Center | | 800-424-8802 |
| Center for Disease Control | | 404-488-4100 |
| Chemtrec | | 800-424-9555 |

9.6 Emergency Medical Treatment Procedures

Any person who becomes ill or injured in the Exclusion Zone must be decontaminated to the maximum extent possible. If the injury or illness is minor, full decontamination should be completed and first aid administered prior to transport. If the patient's condition is serious, at least partial decontamination should be completed (i.e., complete disrobing of the victim and redressing in clean coveralls or wrapping in a blanket.) First aid should be administered while awaiting an ambulance or paramedics. All injuries and illnesses must immediately be reported to the Site Supervisor.

Any person being transported to a clinic or hospital for treatment should take with them information on the chemical(s) they have been exposed to at the site. This information is included in Table 3.1.

Any vehicle used to transport contaminated personnel will be treated and cleaned as necessary.

9.7 Fires or Explosion

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

If it is safe to do so, site personnel may:

- Use fire fighting equipment available on site to control or extinguish the fire; and,
- Remove or isolate flammable or other hazardous materials, which may contribute to the fire.

9.8 Spill or Leaks

In the event of a spill or a leak from excavation or drilling equipment, including containers, site personnel will:

- Inform their supervisor immediately;
- Locate the source of the spillage and stop the flow if it can be done safely; and,
- Begin containment and recovery of the spilled materials.

9.9 Emergency Equipment/Facilities

The following emergency equipment/facilities will be utilized on-site.

| List of Emergency Equipment/Facilities | Storage Location |
|---|-------------------------|
| First Aid Kit | Support Zone |
| Fire Extinguisher | Support Zone |
| Spill Kits | Support Zone |
| Berm Materials | Support Zone |
| Eye Wash | Support Zone |
| Real Time Air Equipment | Exclusion Zone |

10.0 REFERENCES

1. *Aldrich Chemical Book*, RTECS
2. *American Conference of Governmental Industrial Hygienists (ACGIH) Threshold Limit Values*
3. *Chemical Protective Clothing Performance Index Book*, Forsburg
4. *Dangerous Properties of Industrial Materials*, SAX and Lewis
5. *Emergency Response Guide Book*, DOT P 5800.5, 1990
6. *EPA 40 CFR 311 Health and Safety Regulations*
7. *EPA/Office of Emergency and Remedial Response/Environmental Response Team Standard Operating Safety Guide*
8. *Extremely Hazardous Substances*, EPA, Noyes
9. *Guide to Occupational Exposure Values – 1992*
10. *Guidelines for the Selection of Chemical Protective Clothing*, Little
11. *Handbook of Toxic and Hazardous Chemicals and Carcinogens*, Sittig, np (Noyes)
12. *Hazardous Chemicals Data Book*, G. Weiss, ndc (Noyes)
13. *Hazardous Chemicals Desk Reference*
14. *NIOSH/OSHA/USCG/EPA Occupational Health and Safety Guidelines*
15. *OHMTADS Database*
16. *OSHA 29 CFR 1910.120 Health and Safety Regulations*
17. *The Merck Index, an Encyclopedia of Chemicals, Drugs, and Biologicals*, Merck & Co., Inc.
18. *Threshold Limit Values and Biological Exposure Indices*, ACGIH, 1991-1992
19. *V.S.L.G. Chris Man*

*224-01 Merrick Blvd.
Queens, NY 11413
OER # 12EH-N378Q*

APPENDIX A

**EQUIPMENT CLEANING AND
DECONTAMINATION PROCEDURES**

APPENDIX A

STANDARD OPERATING PROCEDURES

EQUIPMENT CLEANING AND DECONTAMINATION PROCEDURES

Summary

Equipment, tools, materials, etc. used in the excavation/remediation and collection of samples at the site must be properly prepared and cleaned/decontaminated during and after each sampling event. The degree of cleaning/decontamination will be dependent upon site conditions and the nature and type of contamination, if present, the intent and goal(s) of the remediation, and data quality objectives, as well as other site-specific requirements. The importance of this action must be impressed upon the sampling team and those assisting the team, such as a backhoe or drill rig operator.

Procedure

1. Heavy Equipment Decontamination

All equipment, tools and materials associated with sampling events must be cleaned or decontaminated prior to usage. Items such as drill rigs, auger flights, trackhoes, and backhoes all present potential sources of contamination to environmental samples. Therefore, all heavy equipment utilized at a site must undergo the following decontamination procedures:

- the equipment will first be high pressure, hot washed or steam-cleaned with potable water; and,
- the equipment will be rinsed thoroughly with potable water.

Contain, collect and dispose of all decontamination fluids in accordance with site/project-specific requirements. The bucket of trackhoes and backhoes may be cleaned over the excavation allowing high pressure decontamination washwater to return to the excavation.

2. Cleaning of Field Sampling Equipment

All equipment and tools used to collect samples for chemical analyses, including spatulas, spoons, scoops, trowels, split-spoons, augers, etc. will be decontaminated using the following procedures:

- non-phosphate detergent wash;
- potable water or distilled/deionized water rinse; and
- air or oven-dry.

If the equipment, listed above, is to be stored for future use, allow to dry and then wrap in aluminum foil (shiny-side out) or seal in plastic bags. Collect or dispose of all decontamination fluids in accordance with site/project-specific requirements.

3. Personal Clothing Decontamination

All footwear worn in and around a contamination area will be washed down using soap and water to remove any soil or oily residue remnants. If disposable gloves, booties or suits (such as Tyvek® suits) are worn, these suits or booties are to be removed and disposed of in a designated 55-gallon drum on site for future disposal. Any other clothing that comes in contact with contaminated soil should not be worn more than 24-hours and should be washed prior to wearing again.

APPENDIX B

MSDSs



MATERIAL SAFETY DATA SHEET

Prepared to U.S. OSHA, CMA, ANSI and Canadian WHMIS Standards

PART I *What is the material and what do I need to know in an emergency?*

1. PRODUCT IDENTIFICATION

| | |
|--------------------------------------|---|
| <u>TRADE NAME (AS LABELED):</u> | MERCURY |
| <u>CHEMICAL NAME/CLASS:</u> | Mercury; Element |
| <u>SYNONYMS:</u> | Colloidal Mercury, Quick Silver; Liquid Silver; NCI-C60399; Hydrargyrum |
| <u>PRODUCT USE:</u> | Variety of industrial, analytical, and research applications. |
| <u>SUPPLIER/MANUFACTURER'S NAME:</u> | BETHLEHEM APPARATUS COMPANY |
| <u>ADDRESS:</u> | 890 Front Street Hellertown, PA 18055 |
| <u>EMERGENCY PHONE:</u> | 610-838-7034 |
| <u>BUSINESS PHONE:</u> | 610-838-7034 |
| <u>DATE OF PREPARATION:</u> | May 20, 1997 |
| <u>DATE OF REVISION:</u> | May 2, 2000 |

2. COMPOSITION and INFORMATION ON INGREDIENTS

| CHEMICAL NAME | CAS # | %w/w | EXPOSURE LIMITS IN AIR | | | | | |
|---|-----------|------|--|---------------------------|--|--|---------------------------|---|
| | | | ACGIH-TLV | | OSHA-PEL | | IDLH mg/m ³ | OTHER mg/m ³ |
| | | | TWA mg/m ³ | STEL mg/m ³ | TWA mg/m ³ | STEL mg/m ³ | | |
| Mercury Exposure limits are for Mercury, Inorganic Compounds | 7439-97-6 | 100 | 0.025, (skin) A4 (Not Classifiable as a Human Carcinogen) | NE | Mercury Vapor: 0.5, Skin; (Vacated 1989 PEL) | 0.1 (ceiling) Non-alkyl Mercury Compounds: 0.1 Ceiling, skin (Vacated 1989 PEL) | 10 | NIOSH REL: STEL = 0.1 (ceiling, skin) DFG MAKs: TWA = 0.1 PEAK = 10•MAK 30 min., momentary value Carcinogen: EPA-D; IARC-3, TLV-A4 |

NE = Not Established.

See Section 16 for Definitions of Terms Used.

NOTE: ALL WHMIS required information is included in appropriate sections based on the ANSI Z400.1-1998 format. 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.

3. HAZARD IDENTIFICATION

EMERGENCY OVERVIEW: Mercury is a silver-white, odorless, heavy liquid. Mercury is highly toxic, irritating, and causes sensitization and neurological symptoms. The primary health hazard associated with overexposure to this product is the potential for irritation of skin, eyes, or other contaminated tissues. Mercury causes severe, adverse health effects after chronic exposure to low vapor levels; emergency response efforts must be directed to removal of all traces of this product. Mercury is not flammable, and is relatively stable (though it can react with many metals to form amalgams). Emergency responders must wear the personal protective equipment suitable for the situation to which they are responding.

SYMPTOMS OF OVER-EXPOSURE BY ROUTE OF EXPOSURE: The most significant routes of occupational over-exposure are inhalation and contact with skin and eyes. The symptoms of over-exposure to Mercury, via route of exposure, are as follows:

INHALATION: Long-term exposures to Mercury vapors present a severe health hazard. When inhaled, Mercury will be rapidly distributed throughout the body. During this time, Mercury will cross the blood-brain barrier, and become oxidized to the Hg(II) oxidation state. The oxidized species of Mercury cannot cross the blood-brain barrier and thus accumulates in the brain. Mercury in other organs is removed slowly from the body via the kidneys. The average half-time for clearance of Mercury for different parts of the human body is as follows: lung: 1.7 days; head: 21 days; kidney region: 64 days; chest: 43 days; whole body: 58 days.

Long-term inhalation over-exposures can lead to the development of a wide variety of symptoms, including the following: excessive salivation, gingivitis, anorexia, chills, fever, cardiac abnormalities, anemia, digestive problems, abdominal pains, frequent urination, an inability to urinate, diarrhea, peripheral neuropathy (numbness, weakness, or burning sensations in the hands or feet), tremors (especially in the hands, fingers, eyelids, lips, cheeks, tongue, or legs), alteration of tendon reflexes, slurred speech, visual disturbances, and deafness. Allergic reactions (i.e. breathing difficulty) may also occur in sensitive individuals.

The principal target organ associated with chronic Mercury exposures via inhalation is the central nervous system. Such exposures lead to the development of "Erethism". This syndrome consists of subtle or dramatic changes in behavior and personality: depression, fearfulness, restlessness, irritability, timidity, and indecision. These psychic and behavioral characteristics are often accompanied by insomnia, drowsiness, headache, and fatigue. In advanced cases, memory loss, hallucinations, and mental deterioration may occur.

Another, less common, syndrome associated with Mercury over-exposure is "Acrodynia". Symptoms of this syndrome include a pink color to the extremities, apathy, fever, kidney problems, sensitivity to light, generalized edema, and a painful scaling of the skin of the hands and feet. Other symptoms of chronic over-exposure to Mercury can include loosening of the teeth, inflammation of the mucous membranes, a dark blue line appearing along gingival margins, abnormal blushing, excessive sweating, and rashes. Reproductive effects, sexual disorders, and impotence may also develop in the event of Mercury over-exposure.

Short-term over-exposures to high concentrations of mercury vapors can lead to breathing difficulty, coughing, acute, chemical pneumonia, and pulmonary edema (a potentially fatal accumulation of fluid in the lungs). Depending on the concentration of over-exposure, cardiac abnormalities, damage to the kidney, liver or nerves and effects on the brain may occur.

If this product is heated, and exposure to Mercury fumes occurs, "Metal Fume Fever" may develop. This syndrome is a flu-like illness which occurs when metal oxides below 1.5 microns in size are inhaled. Symptoms of this syndrome may develop 4-12 hours after exposure and begin with the onset of thirst, metallic taste in the mouth, and symptoms of Mercury poisoning as described above. All symptoms generally subside within 24-36 hours after the over-exposure ends.

CONTACT WITH SKIN or EYES: Mercury can be irritating to contaminated skin and eyes. Symptoms of skin exposure can include redness, dry skin, and pain. Prolonged contact may lead to ulceration of the skin. Allergic reactions (i.e. rashes, welts) may occur in sensitive individuals. Dermatitis (redness and inflammation of the skin) may occur after repeated skin exposures. Symptoms of eye exposure can include redness, pain, and watery eyes. A symptom of Mercury exposure is discoloration of the lens of the eyes.

HAZARDOUS MATERIAL IDENTIFICATION SYSTEM

| | | |
|---------------|--------|---|
| HEALTH | (BLUE) | 3 |
|---------------|--------|---|

| | | |
|---------------------|-------|---|
| FLAMMABILITY | (RED) | 0 |
|---------------------|-------|---|

| | | |
|-------------------|----------|---|
| REACTIVITY | (YELLOW) | 0 |
|-------------------|----------|---|

PROTECTIVE EQUIPMENT | X

| EYES | RESPIRATORY | HANDS | BODY |
|--|---------------|--|---------------|
|  | See Section 8 |  | See Section 8 |

For a variety of applications involving elemental Mercury.

See Section 16 for Definition of Ratings

3. HAZARD IDENTIFICATION (continued)

SKIN ABSORPTION: Skin absorption is a significant route of potential over-exposure to Mercury. Currently, no quantitative estimates of the rate of penetration are available. Symptoms of such over-exposure would include redness and irritation of the contaminated area, as well as the development of symptoms described for "Inhalation".

INGESTION: Ingestion is not anticipated to be a significant route of occupational over-exposure. If Mercury is swallowed, symptoms of such over-exposure can include metallic taste in mouth, nausea, vomiting, central nervous system effects, and damage to the kidneys. Metallic mercury is not usually absorbed sufficiently from the gastrointestinal tract to induce an acute, toxic response. Damage to the tissues of the mouth, throat, esophagus, and other tissues of the digestive system may occur. Ingestion may be fatal, due to effects on gastrointestinal system and kidneys.

INJECTION: Injection is not anticipated to be a significant route of over-exposure for this product. If Mercury is injected (i.e. through abrasions and lacerations of the skin), local redness and pain will occur. Other symptoms of such exposure can include the development of embolisms (Mercury blocking a vein or artery), malaise, chest pain, and difficulty in breathing.

HEALTH EFFECTS OR RISKS FROM EXPOSURE: An Explanation in **Lay Terms**. The most severe health effects associated with Mercury exposure are related to long-term exposures to vapors. In the event of over-exposure, the following symptoms may be observed:

ACUTE: Mercury can be irritating to contaminated skin and eyes. Short-term over-exposures to high concentrations of mercury vapors can lead to breathing difficulty, coughing, acute, and potentially fatal lung disorders. Depending on the concentration of inhalation over-exposure, heart problems, damage to the kidney, liver or nerves and effects on the brain may occur.

CHRONIC: Long-term over-exposure can lead to a wide range of adverse health effects. Anyone using Mercury must pay attention to personality changes, weight loss, skin or gum discolorations, stomach pains, and other signs of Mercury over-exposure. Gradually developing syndromes ("Erethism" and "Acrodynia") are indicative of potentially severe health problems. Mercury can cause the development of allergic reactions (i.e. dermatitis, rashes, breathing difficulty) upon prolonged or repeated exposures. Refer to Section 11 (Toxicology Information) for additional data.

TARGET ORGANS: ACUTE: Skin, eyes, respiratory system, central nervous system, brain. CHRONIC: Skin, respiratory system, central nervous system, brain, blood system, kidneys, and reproductive system.

PART II *What should I do if a hazardous situation occurs?*

4. FIRST-AID MEASURES

Contaminated individuals must be taken for medical attention. Rescuers should be taken for medical attention, if necessary. Take a copy of label and MSDS to health professional with victim.

SKIN EXPOSURE: If Mercury contaminates the skin, immediately begin decontamination with running water. Minimum flushing is for 15 minutes. Remove exposed or contaminated clothing, taking care not to contaminate eyes. The contaminated individual must seek immediate medical attention.

EYE EXPOSURE: If Mercury contaminates the eyes, open the victim's eyes while under gently running water. Use sufficient force to open eyelids. Have the contaminated individual "roll" eyes. Minimum flushing is for 15 minutes. The contaminated individual must seek immediate medical attention.

INHALATION: If Mercury vapors are inhaled, remove victim to fresh air. If necessary, use artificial respiration to support vital functions. Remove or cover gross contamination to avoid exposure to rescuers. The contaminated individual must seek immediate medical attention.

INGESTION: If Mercury is swallowed, CALL PHYSICIAN OR POISON CONTROL CENTER FOR MOST CURRENT INFORMATION. If professional advice is not available, induce vomiting. Have victim rinse mouth with water, or drink several cupfuls of water, if conscious. Never induce vomiting or give diluents (milk or water) to someone who is unconscious, having convulsions, or unable to swallow.

MEDICAL CONDITIONS AGGRAVATED BY EXPOSURE: Preexisting respiratory problems, dermatitis, central nervous system disorders, kidney problems, and liver dysfunctions can be aggravated by exposure to this product.

RECOMMENDATIONS TO PHYSICIANS: Treatment for Mercury over-exposure must be given. The following treatment protocol for ingestion of Mercury is from Clinical Toxicology of Commercial Products (5th Edition, 1984).

1. As soon as possible, have patient drink milk or slurry of activated charcoal to help precipitate mercury in the stomach.
2. Gastric lavage with tap water, milk, or 2-5% solution of sodium bicarbonate, unless spontaneous vomiting is intense and productive,
3. Administer through the lavage tube 0.5-1.0 oz. of sodium or magnesium sulfate in 6-8 oz. of water (unless spontaneous purging has already begun) and a slurry of activated charcoal.
4. Administer BAL (Dimercaprol; 3 mg/kg or 0.3 mL/10 kg) intramuscularly as a 10% solution in oil. If given within three hours after ingestion, severe renal damage may be prevented. Collect urine before and after BAL therapy for mercury analysis.
5. Demulcents (i.e. milk of magnesia, starch, bismuth subcarbonate) and analgesic drugs may be useful and necessary.

4. FIRST AID MEASURES (continued)

RECOMMENDATIONS TO PHYSICIANS (continued):

6. Because the BAL-Mercury Complex excreted in bile may be partly resorbed in the bowel, it is probably useful to administer activated charcoal every few hours, starting as soon as vomiting subsides.
7. Treat shock by correcting dehydration and electrolyte imbalances. If renal insufficiency develops, treat for acute renal failure.
8. The maintenance of an adequate nutritional status may be troublesome if gastrointestinal disorders becomes severe or persistent.
9. If toxic signs or symptoms recur after an apparent recovery, another course of chelation therapy is warranted. BAL is still appropriate, but a trial with D-Penicillamine or N-acetyl-D,L-penicillamine may be preferable. Either penicillamine compound is given by mouth, usually on an empty stomach, in a dose of 250 mg (4 times daily for adults; 3 times daily in children; 5-10 days). Penicillamine should be withheld until mercury is cleared out of the bowels. A chelating agent should be used until the urine-mercury level falls below 50µg/24 hours.

Laboratory Analysis: Determination of β2-Microglobulins has been recommended as a useful test for renal function. Electroencephalographic changes may be correlated closely with the clinical state. Analysis of the blood, hair, urine, or feces can be done to determine the level of Mercury exposure. Mercury deposits in the body can be observed in X-Rays.

5. FIRE-FIGHTING MEASURES

FLASH POINT: Not flammable.

AUTOIGNITION TEMPERATURE: Not applicable.

FLAMMABLE LIMITS (in air by volume, %): Lower (LEL): Not applicable.
Upper (UEL): Not applicable.

FIRE EXTINGUISHING MATERIALS:

Water Spray: YES

Carbon Dioxide: YES

Foam: YES

Dry Chemical: YES

Halon: YES

Other: Any "ABC" Class.

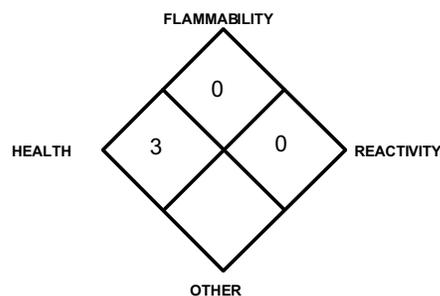
UNUSUAL FIRE AND EXPLOSION HAZARDS: Mercury vapors and mercury oxides generated during fires involving this product are toxic; additionally, this element can be irritating to contaminated tissue. Therefore, this product presents a severe health hazard to firefighters. Mercury is not flammable, and is relatively stable (though it can react with many metals to form amalgams).

Explosion Sensitivity to Mechanical Impact: Not sensitive.

Explosion Sensitivity to Static Discharge: Not sensitive.

SPECIAL FIRE-FIGHTING PROCEDURES: Incipient fire responders should wear eye protection. Structural firefighters must wear Self-Contained Breathing Apparatus and full protective equipment. Move fire-exposed containers if it can be done without risk to firefighters. Apply cooling water to sides of containers that are exposed to flame until well after fire is out. Decontaminate all equipment thoroughly after the conclusion of fire-fighting activities. If possible, prevent run-off water from entering storm drains, bodies of water, or other environmentally sensitive areas.

NFPA RATING



**See Section 16 for
Definition of Ratings**

6. ACCIDENTAL RELEASE MEASURES

SPILL AND LEAK RESPONSE: Uncontrolled releases should be responded to by trained personnel using pre-planned procedures. Proper protective equipment should be used. In case of a Mercury release, clear the affected area, protect people, and respond with trained personnel. In the event of a release under 1 pound of Mercury, the minimum Personal Protective Equipment should be **Level C: triple-gloves (rubber gloves and nitrile gloves over latex gloves), chemical resistant suit and boots, hard-hat, and Air-Purifying Respirator with cartridge appropriate for Mercury. Level B, which includes Self-Contained Breathing Apparatus, must be worn if the amount of Mercury released is over 1 pound or when the concentration of oxygen in atmospheres is less than 19.5% or unknown.** If necessary, dike area of release with suitable absorbent materials. There are a variety of methods which can be used to clean-up Mercury spills. Use a commercially-available Mercury Spill Kit for small spills. A suction pump with aspirator can also be used during clean-up operations. For larger releases, a Mercury vacuum can be used. Calcium polysulfide or excess sulfur can also be used for clean-up. Mercury can migrate into cracks and other difficult-to-clean areas; calcium polysulfide and sulfur can be sprinkled effectively into these areas. Decontaminate the area thoroughly. The area should be inspected visually and with colorimetric tubes for Mercury to ensure all traces of Mercury have been removed prior to re-occupation by non-emergency personnel. Decontaminate all equipment used in response thoroughly. If such equipment cannot be adequately decontaminated, it must be discarded with other spill residue. Place all spill residue in an appropriate container, seal immediately, and label appropriately. Dispose of in accordance with U.S. Federal, State, and local hazardous waste disposal regulations and regulations of Canada and its Provinces. (see Section 13, Disposal Considerations).

PART III *How can I prevent hazardous situations from occurring?*

7. HANDLING and STORAGE

WORK PRACTICES AND HYGIENE PRACTICES: As with all chemicals, avoid getting Mercury ON YOU or IN YOU. Wash thoroughly after handling this product. Avoid breathing vapors or spays of this product. Do not eat or drink while handling this product. Remove contaminated clothing immediately. Report all Mercury releases promptly. Clean-up all releases of this product immediately. Supervisors and other responsible personnel must be aware of personality changes, weight loss, or other signs of Mercury over-exposure in employees using this product; these symptoms can develop gradually and are indicative of potentially severe health effects related to Mercury contamination.

STORAGE AND HANDLING PRACTICES: All employees who handle this material should be trained to handle it safely. Use in a well-ventilated location. Open containers slowly on a stable surface. Drums, flask, and bottles of this product must be properly labeled. Empty containers may contain residual amounts of Mercury; therefore, empty containers should be handled with care. Store drums, flasks, and bottles in a cool, dry location, away from direct sunlight, sources of intense heat, or where freezing is possible. Store away from incompatible materials (see Section 10, Stability and Reactivity). Material should be stored in secondary containers or in a diked area, as appropriate. Keep drums, flasks, and bottles tightly closed when not in use. Storage areas should be made of fire-resistant materials. If appropriate, post warning signs in storage and use areas. Inspect all incoming containers before storage to ensure containers are properly labeled and not damaged.

PROTECTIVE PRACTICES DURING MAINTENANCE OF CONTAMINATED EQUIPMENT: Follow practices indicated in Section 6 (Accidental Release Measures). Make certain that application equipment is locked and tagged-out safely. Always use this product in areas where adequate ventilation is provided. Decontaminate equipment thoroughly before maintenance begins.

8. EXPOSURE CONTROLS - PERSONAL PROTECTION

VENTILATION AND ENGINEERING CONTROLS: Use with adequate ventilation to ensure exposure levels are maintained below the limits provided in Section 2 (Composition and Information on Ingredients), if applicable. Ensure eyewash/safety shower stations are available near areas where this product is used.

RESPIRATORY PROTECTION: Maintain airborne contaminant concentrations below exposure limits listed in Section 2 (Composition and Information on Ingredients), if applicable. If necessary, use only respiratory protection authorized in the U.S. Federal OSHA Respiratory Protection Standard (29 CFR 1910.134) or equivalent U.S. State standards, and Canadian CSA Standard Z94.4-93. Oxygen levels below 19.5% are considered IDLH by OSHA. In such atmospheres, use of a full-facepiece pressure/demand SCBA or a full facepiece, supplied air respirator with auxiliary self-contained air supply is required under OSHA's Respiratory Protection Standard (1910.134-1998). The following respirator selection guidelines from NIOSH are provided for additional information:

RECOMMENDATIONS FOR MERCURY COMPOUNDS [except (organo) alkyls] (as Hg) CONCENTRATIONS IN AIR:

- Up to 0.5 mg/m³: Chemical cartridge respirator with cartridge(s) to protect against mercury compounds (an End-of-Service Life Indicator is required); or Supplied-Air Respirator (SAR).
- Up to 1.25 mg/m³: SAR operated in a continuous-flow mode; or powered air-purifying respirator with cartridge(s) to protect against mercury compounds (canister) (an End-of-Service Life Indicator is required.)
- Up to 2.5 mg/m³: Full-facepiece chemical cartridge respirator with cartridge(s) to protect against mercury compounds; or gas mask with canister to protect against mercury compounds; or SAR with a tight-fitting facepiece operated in a continuous-flow mode; or powered air-purifying respirator with a tight-fitting facepiece and cartridge(s) to protect against mercury compounds (canister) (an End-of-Service Life Indicator is required); or full-facepiece Self-Contained Breathing Apparatus (SCBA); or full-facepiece SAR.
- Up to 10 mg/m³: Positive pressure SAR.
- Emergency or Planned Entry into Unknown Concentrations or IDLH Conditions: Positive pressure, full-facepiece SCBA; or positive pressure, full-facepiece SAR with an auxiliary positive pressure SCBA.
- Escape: Gas mask with canister to protect against mercury compounds; or escape-type SCBA.

EYE PROTECTION: Splash goggles or safety glasses. For operations involving the use of more than 1 pound of Mercury, or if the operation may generate a spray of Mercury, the use of a faceshield is recommended.

HAND PROTECTION: Wear neoprene gloves for routine industrial use. Use triple gloves for spill response, as stated in Section 6 (Accidental Release Measures) of this MSDS.

BODY PROTECTION: Use body protection appropriate for task (i.e. lab coat, coveralls, Tyvek suit).

9. PHYSICAL and CHEMICAL PROPERTIES

RELATIVE VAPOR DENSITY (air = 1): 6.9
determined.

EVAPORATION RATE (n-BuAc = 1): Not

SPECIFIC GRAVITY (water = 1): 13.5939

MELTING/FREEZING POINT: -38.87°C (-37.97°F)

SOLUBILITY IN WATER: Insoluble.

BOILING POINT: 356.72°C (674.1°F)

VAPOR PRESSURE, mm Hg @ 25°C: 0.002

pH: Not applicable.

ODOR THRESHOLD: Not applicable.

COEFFICIENT OF OIL/WATER DISTRIBUTION (PARTITION COEFFICIENT): Not available.

APPEARANCE, ODOR AND COLOR: Mercury is a silver-white, heavy liquid which is odorless.

HOW TO DETECT THIS SUBSTANCE (warning properties): The appearance of this product is a distinguishing characteristic.

10. STABILITY and REACTIVITY

STABILITY: Stable

DECOMPOSITION PRODUCTS: If this product is exposed to extremely high temperatures in the presence of oxygen or air, toxic vapors of mercury and mercury oxides will be generated.

MATERIALS WITH WHICH SUBSTANCE IS INCOMPATIBLE: Mercury is incompatible with acetylene and acetylene derivatives, amines, ammonia, 3-bromopropyne, boron diiodophosphide, methyl azide, sodium carbide, heated sulfuric acid, methylsilane/oxygen mixtures; nitric acid/alcohol mixtures, tetracarbonylnickel/oxygen mixtures, alkyne/silver perchlorate mixtures, halogens (i.e. chlorine, bromine) and strong oxidizers (i.e. chlorine dioxide, perchlorates). Mercury can attack copper and copper alloys. Additionally, mercury can react with many metals (i.e. calcium, lithium, potassium, sodium, rubidium, aluminum) to form amalgams.

HAZARDOUS POLYMERIZATION: Will not occur.

CONDITIONS TO AVOID: Avoid exposure or contact to extreme temperatures, incompatible chemicals

PART IV *Is there any other useful information about this material?*

11. TOXICOLOGICAL INFORMATION

TOXICITY DATA: The specific toxicology data available for Mercury are as follows.

TDLo (Subcutaneous-Man) 254 mg/kg: Skin and Appendages: dermatitis, other (after systemic exposure)

TDLo (Oral-Man) 43 mg/kg: Behavioral: tremor; Liver: jaundice, other or unclassified, other changes

TDLo (Skin-Man) 129 mg/kg/5 hours-continuous: Sense Organs and Special Senses (Ear): tinnitus; Behavioral: headache; Skin and Appendages: dermatitis, allergic (after systemic exposure)

TDLo (Intravenous-Man) 571 µL/kg: Peripheral Nerve and Sensation: paresthesia; Lungs, Thorax, or Respiration: dyspnea; Skin and Appendages: sweating

TDLo (Intraperitoneal-Rat) 400 mg/kg/14 days-intermittent: Tumorigenic: equivocal tumorigenic agent by RTECS criteria, tumors at site of application

TCLo (Inhalation-Woman) 150 µg/m³/46 days: Behavioral: wakefulness, anorexia (human); Gastrointestinal: hypermotility, diarrhea

TCLo (Inhalation-Man) 44300 µg/m³/8 hours: Behavioral: muscle weakness; Liver: other changes; Nutritional and Gross Metabolic: body temperature increase

TCLo (Inhalation-Rat) 4 mg/m³/2 hours/11 days-intermittent: Brain and Coverings: other degenerative changes; Kidney, Ureter, Bladder: other changes; Biochemical: Enzyme inhibition, induction, or change in blood or tissue levels: other Enzymes

TCLo (Inhalation-Rat) 1 mg/m³/24 hours/5 weeks-continuous: Kidney, Ureter, Bladder: proteinuria

TCLo (Inhalation-Rat) 8 µg/m³/6.5 hours/41 weeks-intermittent: Behavioral: alteration of classical conditioning

TCLo (Inhalation-Rat) 17 mg/m³/2 hours/30 days-continuous: Brain and Coverings: other degenerative changes; Behavioral: alteration of classical conditioning, alteration of operant conditioning

TCLo (Inhalation-Rat) 890 ng/m³/24 hours: male 16 week(s) pre-mating: Reproductive: Paternal Effects: spermatogenesis (incl. genetic material, sperm morphology, motility, and count)

TCLo (Inhalation-Rat) 7440 ng/m³/24 hours: male 16 week(s) pre-mating: Reproductive: Fertility: post-implantation mortality (e.g. dead and/or resorbed implants per total number of implants)

TCLo (Inhalation-Rat) 1 mg/m³/24 hours: female 1-20 day(s) after conception: Reproductive: Effects on Embryo or Fetus: fetotoxicity (except death, e.g., stunted fetus)

TCLo (Inhalation-Rat) 300 µg/m³/4 hours: female 7-21 day(s) after conception: Reproductive: Specific Developmental Abnormalities: Central Nervous System

LCLo (Inhalation-Rabbit) 29 mg/m³/30 hours Cytogenetic Analysis (Unreported-Man) 150 µg/m³

SUSPECTED CANCER AGENT: Mercury is listed as follows by agencies tracking carcinogenic potential:

ACGIH TLV-A4 (Not Classifiable as a Human Carcinogen: Agents which cause concern that they could be carcinogenic for humans, but which cannot be assessed conclusively because of a lack of data); EPA- D (Not Classifiable as to Human Carcinogenicity-Inadequate human and animal evidence of carcinogenicity or no data are available); IARC-3 (Possibly Carcinogenic to Humans)

Mercury is not found on the following lists: FEDERAL OSHA Z LIST, NTP, or CAL/OSHA and therefore is not considered to be, nor suspected to be, a cancer-causing agent by these agencies.

11. TOXICOLOGICAL INFORMATION (CONTINUED)

IRRITANCY OF PRODUCT: Mercury can be irritating to skin, eyes, or other contaminated tissue.

SENSITIZATION TO THE PRODUCT: Mercury is a sensitizer capable of causing allergic reactions (i.e. breathing difficulty, dermatitis, rashes) after prolonged or repeated over-exposures.

REPRODUCTIVE TOXICITY INFORMATION: Listed below is information concerning the effects of Mercury on the human reproductive system.

Mutagenicity: Human mutation data are available for Mercury; these data were obtained during clinical studies on specific human tissues exposed to high doses of this element.

Embryotoxicity: This product may cause embryotoxic effects in humans. Refer to the paragraph on "Teratogenicity" for additional information.

Teratogenicity: This product may cause teratogenic effects in humans. Intrauterine exposure may result in tremors and involuntary movements in the fetus. Mercury has also been reported to produce teratogenic effects in test animals.

Reproductive Toxicity: This product is reported to cause reproductive effects in humans. Impotence has been reported in over-exposed males. Women occupationally exposed have reported menstrual disturbances, reduced ovulation, and spontaneous abortions. Mercury is excreted in breast milk. Mercury has also been reported to produce adverse reproductive effects in test animals.

*A **mutagen** is a chemical which causes permanent changes to genetic material (DNA) such that the changes will propagate through generational lines. An **embryotoxin** is a chemical which causes damage to a developing embryo (i.e. within the first eight weeks of pregnancy in humans), but the damage does not propagate across generational lines. A **teratogen** is a chemical which causes damage to a developing fetus, but the damage does not propagate across generational lines. A **reproductive toxin** is any substance which interferes in any way with the reproductive process.*

BIOLOGICAL EXPOSURE INDICES: The following Biological Exposure Indices (BEIs) have been determined for Mercury.

| CHEMICAL DETERMINANT | SAMPLING TIME | BEI |
|---|---|-----------------------------------|
| MERCURY • Total inorganic mercury in urine • Total inorganic mercury in blood | • Preshift • End of shift at end of workweek | • 35 µg/g creatinine • 15 µg/L |

Note: Women of child-bearing potential, whose blood Pb exceeds 10 µg/dl, are at risk of delivering a child with a blood Pb over the current Center for Disease Control Guideline of 10 µg/dl. If the blood Pb of such children remains elevated, they may be at increased risk of cognitive deficits. The blood Pb of these children should be closely monitored and appropriate steps should be taken to minimize the child's exposure to environmental lead.

12. ECOLOGICAL INFORMATION

ALL WORK PRACTICES MUST BE AIMED AT ELIMINATING ENVIRONMENTAL CONTAMINATION.

ENVIRONMENTAL STABILITY: Mercury is stable, and persists for long periods in ambient environmental conditions. The following environmental data are available for this element:

The biological half-life of mercury in fish is approximately 2 to 3 years. Mercury bioaccumulates and concentrates in the food chain. Concentration may be as much as 10,000 times that of water. Mercury is concentrated by animals, plants and fishes. Chinook salmon fed contaminated fingerlings concentrated Mercury in the liver and kidneys. Methyl mercury is formed naturally in aquatic and terrestrial environments from elemental mercury. Methylation is likely to occur in upper sedimentary layers of sea or lake bottoms.

EFFECT OF MATERIAL ON PLANTS or ANIMALS: Mercury can be harmful or fatal to contaminated plant or animal life.

EFFECT OF CHEMICAL ON AQUATIC LIFE: Mercury can be harmful or fatal to contaminated aquatic plant or animal life in contaminated bodies of water. The following aquatic toxicity data are available for Mercury:

MERCURY:

LC₅₀ (Catfish) = 0.35 mg/L / 96 hours (conditions of bioassay not specified)

LC₅₀ (*Modiolus carvalhoi*) (mollusk) = 0.5 ppm / 48 hours; 0.19 ppm - 96 hours (conditions of bioassay not specified)

LC₅₀ (*Rana hexadactyla*) (tadpoles) = 0.051 ppm / 96 hours (conditions of bioassay not specified)

13. DISPOSAL CONSIDERATIONS

PREPARING WASTES FOR DISPOSAL: Waste disposal must be in accordance with appropriate Federal, State, and local regulations. This product, if unaltered by use, should be recycled. If altered by use, recycling may be possible. Consult Bethlehem Apparatus Company for information. If Mercury must be disposed of as hazardous waste, it must be handled at a permitted facility or as advised by your local hazardous waste regulatory authority.

EPA WASTE NUMBER: Depending on the nature of the waste, one of the following RCRA codes will be applicable: U151 (Toxic Commercial Chemical Products/Mercury); D009 (Characteristic; Toxicity Characteristic Leaching Procedure; Regulated Level: 0.2 mg/L).

14. TRANSPORTATION INFORMATION

THIS MATERIAL IS HAZARDOUS AS DEFINED BY 49 CFR 172.101 BY THE U.S. DEPARTMENT OF TRANSPORTATION.

PROPER SHIPPING NAME: Mercury
HAZARD CLASS NUMBER and DESCRIPTION: 8 (Corrosive Material)
UN IDENTIFICATION NUMBER: UN 2809
PACKING GROUP: PG III
DOT LABEL(S) REQUIRED: Corrosive

NOTE: For transport by aircraft, Mercury must be packaged in packagings which meet the requirements of Packing Group I Performance Level. For transportation by other modes, Mercury must be packaged in packagings which meet the requirements of Packing Group III Performance Level or in non-specification reusable metal packagings. Refer to 49 CFR 173.164 for specific packaging requirements.

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MARINE POLLUTANT: Mercury is not listed as a Marine Pollutant, per Appendix B to 49 CFR 172.101.

TRANSPORT CANADA, TRANSPORTATION OF DANGEROUS GOODS REGULATIONS: This material is considered as dangerous goods, per regulations of Transport Canada. Use the above U.S. DOT information for the preparation of Canadian Shipments.

15. REGULATORY INFORMATION

ADDITIONAL U.S. REGULATIONS:

U.S. SARA REPORTING REQUIREMENTS: Mercury is subject to the reporting requirements of Sections 302, 304, and 313 of Title III of the Superfund Amendments and Reauthorization Act, as follows:

| CHEMICAL NAME | SARA 302 (40 CFR 355, Appendix A) | SARA 304 (40 CFR Table 302.4) | SARA 313 (40 CFR 372.65) |
|---------------|--------------------------------------|----------------------------------|-----------------------------|
| Mercury | No | YES | YES |

U.S. SARA THRESHOLD PLANNING QUANTITY: There are no specific Threshold Planning Quantities for Mercury. The default Federal MSDS submission and inventory requirement filing threshold of 10,000 lbs. (4,540 kg) therefore applies, per 40 CFR 370.20.

U.S. TSCA INVENTORY STATUS: Mercury is listed on the TSCA Inventory.

U.S. CERCLA REPORTABLE QUANTITY (RQ): Mercury = 1 lb (0.454 kg)

OTHER U.S. FEDERAL REGULATIONS: Mercury is regulated as follows (other regulations may be applicable):

EPA: Mercury is listed as a Hazardous Air Pollutant (HAP) generally known or suspected to cause serious health problems. The Clean Air Act, as amended in 1990, directs EPA to set standards requiring major sources to sharply reduce routine emissions of toxic pollutants. EPA is required to establish and phase in specific performance based standards for all air emission sources that emit one or more of the listed pollutants. Mercury is included on this list.

FDA: The action level of 1.0 ppm total mercury in fish has been revised on September 12, 1984 by FDA to apply only to methyl mercury.

FIFRA: All uses of mercury are cancelled except the following: 1) as a fungicide in the treatment of textiles and fabrics intended for continuous outdoor use; 2) as a fungicide to control brown mold on freshly sawn lumber; 3) as a fungicide treatment to control Dutch elm disease; 4) as an in-can preservative in water based paints and coatings; 5) as a fungicide in water-based paints and coatings used for exterior application; 6) as a fungicide to control "winter turf diseases" such as Sclerotinia boreales, and gray and pink snow mold subject to the following: a. the use of these products shall be prohibited within 25 feet of any water body where fish are taken for human consumption. b. these products can be applied only by or under the direct supervision of golf course superintendents. These types of Mercury-containing products will be classified as restricted use pesticides when they are reregistered and classified in accordance with Section 4(C) of FEPCA.

U.S. STATE REGULATORY INFORMATION: Mercury is covered under specific State regulations, as denoted below:

Alaska - Designated Toxic and Hazardous Substances: Mercury.
California - Permissible Exposure Limits for Chemical Contaminants: Mercury.
Florida - Substance List: Mercury.
Illinois - Toxic Substance List: Mercury.
Kansas - Section 302/313 List: Mercury.
Massachusetts - Substance List: Mercury.
Michigan - Critical Materials Register: Mercury.

Minnesota - List of Hazardous Substances: Mercury.
Missouri - Employer Information/Toxic Substance List: Mercury.
New Jersey - Right to Know Hazardous Substance List: Mercury.
North Dakota - List of Hazardous Chemicals, Reportable Quantities: Mercury.

Pennsylvania - Hazardous Substance List: Mercury.
Rhode Island - Hazardous Substance List: Mercury.
Texas - Hazardous Substance List: Mercury.
West Virginia - Hazardous Substance List: Mercury.
Wisconsin - Toxic and Hazardous Substances: Mercury.

15. REGULATORY INFORMATION (continued)

ADDITIONAL U.S. REGULATIONS (continued):

CALIFORNIA PROPOSITION 65: Mercury is on the California Proposition 65 lists. **WARNING**: Contains a chemical known to the State of California to cause birth defects or other reproductive harm.

LABELING (Precautionary Statements) ANSI LABELING (Z129.1): **DANGER!** HIGHLY TOXIC AFTER LONG-TERM EXPOSURE. DANGER OF CUMULATIVE EFFECTS. MAY CAUSE DAMAGE TO THE NERVOUS SYSTEM, BLOOD SYSTEM, KIDNEYS, LIVER. REPRODUCTIVE HAZARD. HARMFUL OR FATAL IF INHALED OR SWALLOWED. MAY CAUSE ALLERGIC SKIN AND RESPIRATORY REACTION. CAUSES SKIN AND EYE IRRITATION. Do not get on skin, in eyes, or on clothing. Avoid prolonged contact with the skin. Avoid breathing vapors and fumes. Do not take internally. Keep container closed. Use only with adequate ventilation. Wash thoroughly after handling. Wear gloves, goggles, face-shield, body protection, and NIOSH-approved respiratory protection, as appropriate. **FIRST-AID**: In case of contact, immediately flush skin or eyes with plenty of water for at least 15 minutes while removing contaminated clothing and shoes. If inhaled, remove to fresh air. If ingested, induce vomiting. Get medical attention immediately. **IN CASE OF FIRE**: Use water fog, dry chemical, CO₂, or "alcohol" foam. **IN CASE OF SPILL**: Vacuum released material, or use a Mercury Spill Kit. Containerize residue immediately, and label appropriately. Consult Material Safety Data Sheet for additional information.

ADDITIONAL CANADIAN REGULATIONS:

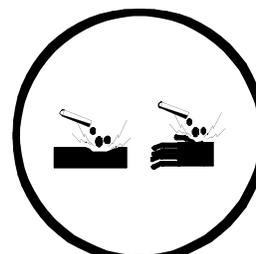
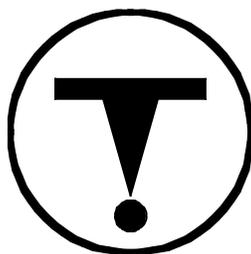
CANADIAN DSL/NDL INVENTORY STATUS: Mercury is listed on the DSL Inventory.

OTHER CANADIAN REGULATIONS: Not applicable.

CANADIAN ENVIRONMENTAL PROTECTION ACT (CEPA) PRIORITIES SUBSTANCES LISTS: Mercury is not on the CEPA Priorities Substances Lists.

CANADIAN WHMIS SYMBOLS:

| | |
|------|--|
| D1B: | Materials Causing Immediate and Serious Toxic Effects/Toxic Material |
| D2A: | Materials Causing Other Toxic Effects/Very Toxic Material |
| D2B: | Materials Causing Other Toxic Effects/Toxic Material |
| E: | Corrosive Material |



16. OTHER INFORMATION

PREPARED BY:

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DATE OF PRINTING:

May 1, 2000

The information contained herein is based on data considered accurate. However, no warranty is expressed or implied regarding the accuracy of these data or the results to be obtained from the use thereof. Bethlehem Apparatus Company responsibility for injury to the vendee or third persons proximately caused by the material if reasonable safety procedures are not adhered to as stipulated in the data sheet. Additionally, Bethlehem Apparatus Company for injury to vendee or third persons proximately caused by abnormal use of the material even if reasonable safety procedures are followed. Furthermore, vendee assumes the risk in his use of the material.

DEFINITIONS OF TERMS

A large number of abbreviations and acronyms appear on a MSDS. Some of these which are commonly used include the following:

CAS #: This is the Chemical Abstract Service Number which uniquely identifies each constituent.

EXPOSURE LIMITS IN AIR:

ACGIH - American Conference of Governmental Industrial Hygienists, a professional association which establishes exposure limits. **TLV** - Threshold Limit Value - an airborne concentration of a substance which represents conditions under which it is generally believed that nearly all workers may be repeatedly exposed without adverse effect. The duration must be considered, including the 8-hour Time Weighted Average (**TWA**), the 15-minute Short Term Exposure Limit, and the instantaneous Ceiling Level (**C**). Skin absorption effects must also be considered.

OSHA - U.S. Occupational Safety and Health Administration.

PEL - Permissible Exposure Limit - This exposure value means exactly the same as a TLV, except that it is enforceable by OSHA. The OSHA Permissible Exposure Limits are based in the 1989 PELs and the June, 1993 Air Contaminants Rule (Federal Register: 58: 35338-35351 and 58: 40191). Both the current PELs and the vacated PELs are indicated. The phrase, "Vacated 1989 PEL," is placed next to the PEL which was vacated by Court Order. **IDLH** - Immediately Dangerous to Life and Health - This level represents a concentration from which one can escape within 30-minutes without suffering escape-preventing or permanent injury. **The DFG - MAK** is the Republic of Germany's Maximum Exposure Level, similar to the U.S. PEL. **NIOSH** is the National Institute of Occupational Safety and Health, which is the research arm of the U.S. Occupational Safety and Health Administration (**OSHA**). NIOSH issues exposure guidelines called Recommended Exposure Levels (**RELs**). When no exposure guidelines are established, an entry of **NE** is made for reference.

HAZARD RATINGS:

HAZARDOUS MATERIALS IDENTIFICATION SYSTEM: Health Hazard: **0** (minimal acute or chronic exposure hazard); **1** (slight acute or chronic exposure hazard); **2** (moderate acute or significant chronic exposure hazard); **3** (severe acute exposure hazard; onetime overexposure can result in permanent injury and may be fatal); **4** (extreme acute exposure hazard; onetime overexposure can be fatal). Flammability Hazard: **0** (minimal hazard); **1** (materials that require substantial pre-heating before burning); **2** (combustible liquid or solids; liquids with a flash point of 38-93°C [100-200°F]); **3** (Class IB and IC flammable liquids with flash points below 38°C [100°F]); **4** (Class IA flammable liquids with flash points below 23°C [73°F] and boiling points below 38°C [100°F]). Reactivity Hazard: **0** (normally stable); **1** (material that can become unstable at elevated temperatures or which can react slightly with water); **2** (materials that are unstable but do not detonate or which can react violently with water); **3** (materials that can detonate when initiated or which can react explosively with water); **4** (materials that can detonate at normal temperatures or pressures).

NATIONAL FIRE PROTECTION ASSOCIATION: Health Hazard: **0** (material that on exposure under fire conditions would offer no hazard beyond that of ordinary combustible materials); **1** (materials that on exposure under fire conditions could cause irritation or minor residual injury); **2** (materials that on intense or continued exposure under fire conditions could cause temporary incapacitation or possible residual injury); **3** (materials that can on short exposure could cause serious temporary or residual injury); **4** (materials that under very short exposure causes death or major residual injury). Flammability Hazard and Reactivity Hazard: Refer to definitions for "Hazardous Materials Identification System".

FLAMMABILITY LIMITS IN AIR:

Much of the information related to fire and explosion is derived from the National Fire Protection Association (**NFPA**). Flash Point - Minimum temperature at which a liquid gives off sufficient vapors to form an ignitable mixture with air. Autoignition Temperature: The minimum temperature required to initiate combustion in air with no other source of ignition. LEL - the lowest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source. UEL - the highest percent of vapor in air, by volume, that will explode or ignite in the presence of an ignition source.

TOXICOLOGICAL INFORMATION:

Human and Animal Toxicology: Possible health hazards as derived from human data, animal studies, or from the results of studies with similar compounds are presented. Definitions of some terms used in this section are: **LD₅₀** - Lethal Dose (solids & liquids) which kills 50% of the exposed animals; **LC₅₀** - Lethal Concentration (gases) which kills 50% of the exposed animals; **ppm** concentration expressed in parts of material per million parts of air or water; **mg/m³** concentration expressed in weight of substance per volume of air; **mg/kg** quantity of material, by weight, administered to a test subject, based on their body weight in kg. Other measures of toxicity include **TDLo**, the lowest dose to cause a symptom and **TCLo** the lowest concentration to cause a symptom; **TDo**, **LDLo**, and **LDo**, or **TC**, **TCo**, **LCLo**, and **LCo**, the lowest dose (or concentration) to cause lethal or toxic effects. **Cancer Information:** The sources are: **IARC** - the International Agency for Research on Cancer; **NTP** - the National Toxicology Program, **RTECS** - the Registry of Toxic Effects of Chemical Substances, **OSHA** and **CAL/OSHA**. IARC and NTP rate chemicals on a scale of decreasing potential to cause human cancer with rankings from 1 to 4. Subrankings (2A, 2B, etc.) are also used. **Other Information:** **BEI** - ACGIH Biological Exposure Indices, represent the levels of determinants which are most likely to be observed in specimens collected from a healthy worker who has been exposed to chemicals to the same extent as a worker with inhalation exposure to the TLV. **Ecological Information:** **EC** is the effect concentration in water. **BCF** = Bioconcentration Factor, which is used to determine if a substance will concentrate in lifeforms which consume contaminated plant or animal matter. Coefficient of Oil/Water Distribution is represented by **log K_{ow}** or **log K_{oc}** and is used to assess a substance's behavior in the environment.

REGULATORY INFORMATION:

This section explains the impact of various laws and regulations on the material. **U.S.:** **EPA** is the U.S. Environmental Protection Agency. **DOT** is the U.S. Department of Transportation. **SARA** is the Superfund Amendments and Reauthorization Act. **TSCA** is the U.S. Toxic Substance Control Act. **CERCLA (or Superfund)** refers to the Comprehensive Environmental Response, Compensation, and Liability Act. Labeling is per the American National Standards Institute (**ANSI Z129.1**). **CANADA:** **CEPA** is the Canadian Environmental Protection Act. **WHMIS** is the Canadian Workplace Hazardous Materials Information System. **TC** is Transport Canada. **DSL/NDSL** are the Canadian Domestic/Non-Domestic Substances Lists. **The CPR is the Canadian Product Regulations.** This section also includes information on the precautionary warnings which appear on the materials package label.



Material Safety Data Sheet

1. Product and Company Identification

Product name : **Benzene**

Chemical formula : C₆H₆

Synonyms : Benzol, Cyclohexatriene, Benzole, Phene, Pyrobenzol, Pyrobenzole, Carbon Oil, Coal Tar Naphtha, Phenyl Hydride, Benzolene, Bicarburet of Hydrogen, Coal Naphtha, Motor Benzol, Annulene, (6) Annulene, UN 1114

Company : Specialty Gases of America, Inc
6055 Brent Dr.
Toledo, OH 43611

Telephone : 419-729-7732

Emergency : 800-424-9300

2. Composition/Information on Ingredients

| Components | CAS Number | % Volume |
|------------|------------|----------|
| Benzene | 71-43-2 | 99+% |
| Thiophene | 110-02-1 | 0.00010 |

3. Hazards Identification

Emergency Overview

Flammable liquid and vapor. Vapor may cause flash fire.
May cause respiratory tract irritation, skin irritation, eye irritation, central nervous system depression, cancer hazard (in humans).

Potential Health Effects

Inhalation : Irritation, ringing in the ears, nausea, vomiting, chest pain, difficulty breathing, irregular heartbeat, headache, drowsiness, symptoms of drunkenness, disorientation, blurred vision, lung congestion, blood disorders, paralysis, convulsion, coma. May cause hearing loss, visual disturbances, reproductive effects, brain damage, cancer in long term exposure.

Eye contact : Irritation.

Skin contact : Irritation, blisters. May cause tingling sensation in long term exposure.

Ingestion : Nausea, vomiting, chest pain, headache, drowsiness, symptoms of drunkenness, disorientation, visual disturbances, lung congestion, paralysis, convulsion, coma. May cause impotence, cancer in long term exposure.

Chronic Health Hazard : Not applicable.

4. First Aid Measures

General advice : None.

Eye contact : Flush eyes with plenty of water for at least 15 minutes. Then get immediate medical attention.

- Skin contact : Wash skin with soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical attention, if needed. Thoroughly clean and dry contaminated clothing and shoes before reuse.
- 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.
- Inhalation : If adverse effects occur, remove to contaminated area. Give artificial respiration if not breathing. If breathing is difficult, oxygen should be administered by qualified personnel. Get immediate medical attention.

5. Fire-Fighting Measures

- Suitable extinguishing media : Regular dry chemical carbon dioxide water regular foam.
Large fires: Use regular foam or flood with fine water spray.
- Specific hazards : Severe fire hazard. Moderate explosion hazard. Vapor/air mixtures are explosive. The vapor is heavier than air. Vapors or gases may ignite at distant ignition sources and flash back. Electrostatic discharges may be generated by flow or agitation resulting in ignition or explosion.
- Fire fighting : Move container from fire area if it can be done without risk. Cool containers with water spray until well after the fire is out. Stay away from the ends of tanks. For fires in cargo or storage area: Cool containers with water from unmanned hose holder or monitor nozzles well after fire is out. If this is impossible, take the following precautions: Keep unnecessary people away, isolate hazard area and deny entry. Let the fire burn. Withdraw immediately in case of rising sound from venting safety device or any discoloration of tanks due to fire. For tank, rail car or tank truck: Evacuation radius: 800 meters (1/2 mile). Water may be ineffective.

6. Accidental Release Measures

- Air release : Reduce vapors with water spray. Stay upwind and keep out of low areas.
- Soil release : Dig holding area such as lagoon, pond or pit for containment. Dike for later disposal. Absorb with sand or other non-combustible material.
- Water release : Subject to California Safe Drinking Water and Toxic Enforcement Act of 1986 (Proposition 65). Keep out of water supplies and sewers. Cover with absorbent sheets, spill-control pads or pillows. Apply detergents, soaps, alcohols or another surface active agent. Collect with absorbent into suitable container. Absorb with activated carbon. Remove trapped material with suction hoses. Collect spilled material using mechanical equipment.
- Occupational release : Avoid heat, flames, sparks and other sources of ignition. Stop leak if possible without personal risk. Reduce vapors with water spray. Small spills: Absorb with sand or non-combustible material. Collect spilled material in appropriate container for disposal. Large spills: Dike for later disposal. Remove sources of ignition. Keep unnecessary people away, isolate hazard area and deny entry. Notify Local Emergency Planning Committee and State Emergency Response Committee for release greater than or equal to RQ (U.S. SARA Section 304). If release occurs in the U.S. and is reportable under CERCLA Section 103, notify the National Response Center at (800) 424-8802 (USA) or (202) 426-2675 (USA).

7. Handling and Storage

Handling

Secure cylinder when using to protect from falling. Use suitable hand truck to move cylinders.

Storage

Store in accordance with all current regulations and standards. Subject to storage regulation: U.S. OSHA 29 CFR 1910.106. Grounding and bonding required. Protect from physical damage. Store outside or in a detached building. Store with flammable liquids. Keep separated from incompatible substances.

8. Exposure Controls / Personal Protection

Exposure limits

| | | |
|----------------|---|--|
| ACGIH | : | 0.5 ppm TWA 2.5 ppm STEL Skin – potential significant contribution to overall exposure by the cutaneous route |
| OSHA (final) | : | 5 ppm STEL (see 29 CFR 1910.1028) 10 ppm TWA applies to industry segments except from the benzene standard at 29 CFR 1910.1028; 1 ppm TWA 25 ppm Ceiling |
| OSHA (vacated) | : | 50 ppm STEL unless specified in 1910.1028 10 minute 10 ppm TWA unless specified in 1910.1028 25 ppm Ceiling unless specified in 1910.1028 |
| NIOSH | : | 1 ppm STEL 0.1 ppm TWA |

Ventilation

Provide local exhaust or process enclosure ventilation system. Ventilation equipment should be explosion-resistant if explosive concentrations of material are present. Ensure compliance with applicable exposure limits.

Personal protective equipment

| | | |
|--------------------------|---|---|
| Respiratory protection | : | The following respirators and maximum use concentrations are drawn from NIOSH and/or OSHA. OSHA Standard: Respirator selection should comply with 29 CFR 1910.134, 29 CFR 1910.1028 and the final rule published in the Federal Register on August 24, 2006. NIOSH Recommendations: At any detectable concentration – Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode. Any supplied-air respirator with full facepiece and operated in pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained breathing apparatus operated in positive-demand or other positive-pressure mode. Escape – Any air-purifying respirator (gas mask) with a chin-style, front-mounted or back-mounted organic vapor canister. Any escape-type, self-contained breathing apparatus. |
| Hand protection | : | Wear appropriate chemical resistant gloves. OSHA REGULATED SUBSTANCES: U.S. OSHA 29 CFR 1910.1028. |
| Eye protection | : | Wear splash resistant safety goggles. Provide an emergency eye wash fountain and quick drench shower in the immediate work area. |
| Skin and body protection | : | Wear appropriate chemical resistant clothing. |

9. Physical and Chemical Properties

| | | |
|-------|---|----------------------|
| Form | : | Liquid. |
| Color | : | Colorless to yellow. |

| | |
|--------------------|--|
| Odor | : Distinct odor. |
| Molecular weight | : 78.11 |
| Vapor pressure | : 75 mmHg @ 20°C |
| Vapor density | : 2.8 (air = 1) |
| Specific gravity | : 0.8765 @ 20°C (water = 1) |
| Boiling point | : 176°F (80°C) |
| Melting point | : 43°F (6°C) |
| Water solubility | : 0.18% @ 25°C |
| Solvent solubility | : Soluble: acetone, alcohol, carbon disulfide, acetic acid, carbon tetrachloride, chloroform, ether, oils. |
| Evaporation rate | : 5.1 (butyl acetate = 1) |

10. Stability and Reactivity

| | |
|----------------------------------|--|
| Stability | : Stable under normal conditions. |
| Conditions to avoid | : Avoid heat, flames, sparks and other sources of ignition. Containers may rupture or explode if exposed to heat. Keep out of water supplies and sewers. |
| Materials to avoid | : Acids, bases, halogens, oxidizing materials, metal salts. |
| Hazardous decomposition products | : Thermal decomposition products: oxides of carbon. |

11. Toxicological Information

The components of this material have been reviewed in various sources and the following selected endpoints are published:

| | |
|----------------------|--|
| BENZENE (71-43-2) | : Inhalation LC50 Rat: 13050-14380 ppm/4H; Oral LD50 Rat: 1800 mg/kg |
| THIOPHENE (110-02-1) | : Oral LD50 Rat: 1400 mg/kg |

Acute Toxicity Level

| | |
|----------------------|---|
| BENZENE (71-43-2) | : Highly toxic: dermal absorption. Moderately toxic: ingestion. Slightly toxic: inhalation. |
| THIOPHENE (110-02-1) | : Toxic: inhalation. Moderately toxic: ingestion. |

Component Carcinogenicity

| | |
|-------------------|--|
| BENZENE (71-43-2) | : ACGIH: A1 – Confirmed Human Carcinogen IARC: Supplement 7 [1987]; Monograph 29 [1982] (Group 1 (carcinogenic to humans)) DFG: Category 1 (causes cancer in man) Present Known Human Carcinogen |
|-------------------|--|

Local Effects

| | |
|-------------------|------------------------------------|
| BENZENE (71-43-2) | : Irritant: inhalation, skin, eye. |
|-------------------|------------------------------------|

Target Organs

| | |
|----------------------|--|
| BENZENE (71-43-2) | : Immune system (blood), central nervous system. |
| THIOPHENE (110-02-1) | : Central nervous system. |

Medical Conditions Aggravated by Exposure

Blood system disorders, immune system disorders or allergies.

Additional Data

May cross the placenta. Alcohol may enhance the toxic effects. Interactions with drugs may occur.

12. Ecological Information

Ecotoxicity Data

BENZENE (71-43-2) : Fish:
96 Hr LC50 Pimephales promelas: 10.7 – 14.7 mg/L [flow-through]; 96 Hr LC50 Oncorhynchus mykiss: 5.3 mg/L [flow-through]; 96 Hr LC50 Lepomis macrochirus: 22.49 mg/L [static]; 96 Hr LC50 Poecilia reticulata: 28.6 mg/L [static]; 96 Hr LC50 Pimephales promelas: 22330 – 41160 µg/L [static]; 96 Hr LC50 Lepomis macrochirus: 70000 – 142000 µg/L [static]

Algae:
72 Hr EC50 Pseudokirchneriella subcapitata: 29 mg/L

Invertebrate:
48 Hr EC50 Daphnia magna: 8.76 – 15.6 mg/L [static]; 48 Hr EC50 Daphnia magna: 10 mg/L

13. Disposal Considerations

Waste from residues / unused products : Subject to disposal regulations: U.S. EPA 40 CFR 262. Hazardous Waste Number(s): U019. Hazardous Waste Number(s): D018. Dispose of in accordance with U.S. EPA 40 CFR 262 for concentrations at or above the Regulatory level. Regulatory level – 0.5 mg/L. Dispose in accordance with all applicable regulations.

Contaminated packaging : Return cylinder to supplier.

Component Waste Numbers

BENZENE (71-43-2) : RCRA: waste_number U019 (Ignitable waste; Toxic waste)
0.5 mg/L regulatory level

14. Transport Information

DOT (US only)

Proper shipping name : Benzene
Class : 3, Packing Group II
UN/ID No. : UN1114
Labeling : Flammable Liquid

Further information

Cylinders should be transported in a secure upright position in a well ventilated truck.

15. Regulatory Information

U.S. Federal Regulations

This material contains one or more of the following chemicals required to be identified under SARA Section 302/304 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65), CERCLA (40 CFR 302.4), TSCA 12(b), and/or require an OSHA process safety plan.

BENZENE (71-43-2) – 10 lb final RQ (received an adjusted RQ of 10 lbs based on potential carcinogenicity in an August 14, 1989 final rule); 4.54 kg final RQ (received an adjusted RQ of 10 lbs based on potential carcinogenicity in an August 1989 final rule)

BENZENE (71-43-2) – SARA 313: 0.1% de minimis concentration
CERCLA: 10 lb final RQ (received an adjusted RQ of 10 lbs based on potential carcinogenicity in an August 14, 1989 final rule); 4.54 kg final RQ (received an adjusted RQ of 10 lbs based on potential carcinogenicity in an August 1989 final rule)

SARA 311/312

Acute: Yes
Chronic: Yes
Fire: Yes
Reactive: No
Pressure: No

U.S. State Regulations

The following components appear on one or more of the following state hazardous substances lists:

| Component | CAS | CA | MA | MN | NJ | PA | RI |
|-----------|----------|-----|-----|-----|-----|-----|-----|
| BENZENE | 71-43-2 | Yes | Yes | Yes | Yes | Yes | Yes |
| THIOPHENE | 110-02-1 | No | Yes | No | Yes | Yes | No |

The following statement(s) are provided under the California Safe Drinking Water and Toxic Enhancement Act of 1986 (Proposition 65):

WARNING! This product contains a chemical known to the state of California to cause cancer.

16. Other Information

Prepared by : Specialty Gases of America, Inc.

For additional information, please visit our website at www.americangasgroup.com.

Material Safety Data Sheet

Toluene

MSDS Number: M1003
Effective Date: 9/07/2004

Section 1 - Chemical Product and Company Identification

MSDS Name: Toluene

Synonyms: Methacide; Methylbenzene; Methylbenzol; Phenylmethane; Toluol

Company Identification:

VEE GEE Scientific, Inc.
13600 NE 126th PI Ste A
Kirkland, WA 98034

For information in North America, call: 425-823-4518

Section 2 - Composition, Information on Ingredients

| CAS# | Chemical Name | Percent | EINECS/ELINCS |
|----------|---------------|---------|---------------|
| 108-88-3 | Toluene | >99 | 203-625-9 |

Hazard Symbols: XN F

Risk Phrases: 11 20

Section 3 - Hazards Identification

Emergency Overview

Appearance: Colorless. Flash Point: 40°F. **Warning!** Flammable liquid and vapor. May cause central nervous system depression. May cause liver and kidney damage. This substance has caused adverse reproductive and fetal effects in animals. Causes digestive and respiratory tract irritation. May cause skin irritation. Aspiration hazard if swallowed. Can enter lungs and cause damage. **Danger!** Harmful or fatal if swallowed. Causes eye irritation and possible transient injury. **Poison!** May be absorbed through intact skin. Vapor harmful. Call physician immediately.

Target Organs: Kidneys, central nervous system, liver.

Potential Health Effects

Eye Contact: Causes eye irritation. May result in corneal injury. Vapors may cause eye irritation.

Skin Contact: Causes moderate skin irritation. May cause cyanosis of the extremities.

Ingestion: Aspiration hazard. May cause irritation of the digestive tract. May cause effects similar to those for inhalation exposure. 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. Inhalation of vapor may cause respiratory tract irritation. May cause liver and kidney damage. Vapors may cause dizziness or suffocation. Overexposure may cause dizziness, tremors, restlessness, rapid heart beat, increased blood pressure, hallucinations, acidosis, kidney failure.

Chronic Exposure: Prolonged or repeated skin contact may cause dermatitis. May cause cardiac sensitization and severe heart abnormalities. May cause liver and kidney damage.

Section 4 - First Aid Measures

Eye Contact: Flush eyes with plenty of water for at least 15 minutes, occasionally lifting the upper and lower eyelids. Get medical aid immediately.

Skin Contact: Flush skin with plenty of soap and water for at least 15 minutes while removing contaminated clothing and shoes. Get medical aid if irritation develops or persists.

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. Possible aspiration hazard. Get medical aid immediately.

Inhalation: Get medical aid immediately. Remove from exposure to fresh air immediately. If not breathing, give artificial respiration. If breathing is difficult, give oxygen.

Notes to Physician: Causes cardiac sensitization to endogenous catecholamines which may lead to cardiac arrhythmias. Do NOT use adrenergic agents such as epinephrine or pseudoepinephrine.

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. Water runoff can cause environmental damage. Dike and collect water used to fight fire. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. Flammable Liquid. Can release vapors that form explosive mixtures at temperatures above the flashpoint. Use water spray to keep fire-exposed containers cool. Water may be ineffective. Material is lighter than water and a fire may be spread by the use of water. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. Containers may explode when heated.

Fire Extinguishing Media: Use water spray to cool fire-exposed containers. Water may be ineffective. Do NOT use straight streams of water. For small fires, use dry chemical, carbon dioxide, water spray or regular foam. Cool containers with flooding quantities of water until well after fire is out. For large fires, use water spray, fog or regular foam.

Section 5 -

Fire Fighting Measures

Autoignition Temperature: 422°C (792°F)

Flash Point: 7°C (45°F)

Explosion Limits, lower: 1.2 vol%.

Explosion Limits, upper: 7.1 vol%

NFPA Rating: (estimated) Health: 2; Flammability: 3; Instability: 0

Section 6 -

Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.

Spills/Leaks: Avoid runoff into storm sewers and ditches which lead to waterways. Remove all sources of ignition. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. Do not use combustible materials such as saw dust. 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. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 -

Exposure Controls, Personal Protection

| Chemical Name | ACGIH | NIOSH | OSHA - Final PELs | OSHA - Vacated Pels |
|---------------|------------|--|--------------------------|--|
| Toluene | 50 ppm TWA | 100 ppm TWA 375 mg/m ³ TWA 500 ppm IDLH | 200 ppm TWA C 300 ppm | 100 ppm TWA 375 mg/m ³ TWA 150 ppm STEL 560 mg/m ³ STEL |

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.

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: Clear liquid

Appearance: Colorless

Odor: Sweet, pleasant

pH: Not available

Vapor Pressure: 36.7 mm Hg @ 30° C

Vapor Density: 3.1

Evaporation Rate: 2.4

Viscosity: 0.59 cP @ 20° C

Boiling Point: 232° F

Freezing/Melting Point: -139° F

Decomposition Temperature: Not available

Solubility: Insoluble

Specific Gravity/Density: 0.9

Molecular Formula: C₆H₅CH₃

Molecular Weight: 92.056

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: Nitrogen tetroxide, nitric acid plus sulfuric acid, silver perchlorate, strong oxidizers, sodium difluoride.

Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.

Hazardous Polymerization: Has not been reported.

Section 11 -

Toxicological Information

Carcinogenicity:

CAS# 108-88-3:

ACGIH: A4 - Not Classifiable as a Human Carcinogen

IARC: Group 3 carcinogen

Section 11 -**Toxicological Information (continued)**

Epidemiology: No information available.

Teratogenicity: Specific developmental abnormalities included craniofacial effects involving the nose and tongue, musculoskeletal effects, urogenital and metabolic effects in studies on mice and rats by the inhalation and oral routes of exposure. Some evidence of fetotoxicity with reduced fetal weight and retarded skeletal development has been reported in mice and rats.

Reproductive Effects: Effects on fertility such as abortion were reported in rabbits by inhalation. Paternal effects were noted in rats by inhalation. These effects involved the testes, sperm duct and epididymis.

Neurotoxicity: No information available.

Mutagenicity: No information available.

Section 12 -**Ecological Information**

Ecotoxicity: No data available. Bluegill LC50=17 mg/L/24H Shrimp LC50=4.3 ppm/96H Fathead minnow LC50=36.2 mg/L/96H Sunfish (fresh water) TLm=1180 mg/L/96H

Environmental: From soil, substance evaporates and is microbially biodegraded. In water, substance volatilizes and biodegrades.

Physical: Photochemically produced hydroxyl radicals degrade substance.

Other: None.

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# 108-88-3: waste number U220.

Section 14 -**Transport Information**

| Shipping Name | US DOT | Canada TDG |
|----------------------|---------|------------|
| | Toluene | Toluene |
| Hazard Class | 3 | 3 (9.2) |
| UN Number | UN1294 | UN1294 |
| Packing Group | II | II |
| Other | | FP 4C |

Section 15 -**Regulatory Information****US Federal**

TSCA: CAS# 108-88-3 is listed on the TSCA inventory.

Health & Safety Reporting List: None of the chemicals are on the Health & Safety Reporting List.

CAS# 108-88-3: Effective Date: October 4, 1982; Sunset Date: October 4, 1992

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# 108-88-3: final RQ = 1000 pounds (454 kg)

Section 302 (TPQ): None of the chemicals in this product have a TPQ.

SARA Codes: CAS # 108-88-3: acute, flammable.

Section 313: This material contains Toluene (CAS# 108-88-3, 99%), which is subject to the reporting requirements of Section 313 of SARA Title III and 40 CFR Part 373.

Clean Air Act: CAS# 108-88-3 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# 108-88-3 is listed as a Hazardous Substance under the CWA. CAS# 108-88-3 is listed as a Priority Pollutant under the Clean Water Act. CAS# 108-88-3 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: CAS# 108-88-3 can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.

WARNING: This product contains Toluene, a chemical known to the state of California to cause birth defects or other reproductive harm. California No Significant Risk Level: CAS# 108-88-3: NOEL = 7000 ug/day

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

Section 15 -

Regulatory Information (continued)

Safety Phrases:

- S 16 Keep away from sources of ignition - No smoking.
- S 25 Avoid contact with eyes.
- S 29 Do not empty into drains.
- S 33 Take precautionary measures against static discharges.

WGK (Water Danger/Protection): CAS# 108-88-3: 2

Canada - DSL/NDSL: CAS# 108-88-3 is listed on Canada's DSL List.

Canada - WHMIS: This product has a WHMIS classification of B2, D2B.

Canadian Ingredient Disclosure List: CAS# 108-88-3 is listed on Canada's Ingredient Disclosure List.

Exposure Limits: CAS# 108-88-3: OEL-AUSTRALIA:TWA 100 ppm (375 mg/m³);STEL 150 ppm (560 mg/m³) OEL-BELGIUM:TWA 100 ppm (377 g/m³);STEL 150 ppm (565 mg/m³) OEL-CZECHOSLOVAKIA:TWA 200 mg/m³;STEL 1000 mg/m³ OEL-DENMARK:TWA 50 ppm (190 mg/m³);Skin OEL-FINLAND:TWA 100 ppm (375 mg/m³);STEL 150 ppm;Skin OEL-FRANCE:TWA 100 ppm (375 mg/m³);STEL 150 ppm (560 mg/m³) OEL-GERMANY:TWA 100 ppm (380 mg/m³) OEL-HUNGARY:TWA 100 mg/m³;STEL 300 mg/m³;Skin OEL-JAPAN:TWA 100 ppm (380 mg/m³) OEL-THE NETHERLANDS:TWA 100 ppm (375 mg/m³);Skin OEL-THE PHILIPPINES:TWA 100 ppm (375 mg/m³) OEL-POLAND:TWA 100 mg/m³ OEL-USSIA:TWA 100 ppm;STEL 50 mg/m³ OEL-SWEDEN:TWA 50 ppm (200 mg/m³);STEL 100 ppm (400 mg/m³);Skin OEL-SWITZERLAND:TWA 100 ppm (380 mg/m³);STEL 500 ppm OEL-THAILAND:TWA 200 ppm;STEL 300 ppm OEL-TURKEY:TWA 200 ppm (750 mg/m³) OEL-UNITED KINGDOM :TWA 100 ppm (375 mg/m³);STEL 150 ppm;Skin 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: 09/07/2004

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 VEE GEE Scientific 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 VEE GEE Scientific has been advised of the possibility of such damages.

MATERIAL SAFETY DATA SHEET

Xylenes (Xylol)

SECTION 1 . Product and Company Identification

Product Name and Synonym: Xylenes (Xylol)
Product Code: 280-20
Material Uses:
Manufacturer: OFI Testing Equipment Inc.
1006 W. 34th Street
Houston, TX 77018
(877) 880-9885
Entry Date : 5/12/2010
Print Date: 9/13/2010
24 Hour Emergency Assistance : Chemtrec 800-424-9300
Canutec 613-996-6666

| | | | | |
|---------------------|--------|----------------------|------|---------|
| Health: | 2 | | | |
| Flammability: | 3 | | | |
| Reactivity: | 0 | | | |
| Hazard Rating: | | | | |
| Least | Slight | Moderate | High | Extreme |
| 0 | 1 | 2 | 3 | 4 |
| NA = Not Applicable | | NE = Not Established | | |

SECTION 2 HAZARD IDENTIFICATION

Keep away from heat and ignition sources. May be harmful if swallowed. Avoid breathing vapor or dust. Use with adequate ventilation. Avoid contact with eyes, skin, and clothes. Wash thoroughly after handling. Keep container closed.

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.

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 Salvation. Minute Amounts Aspirated into the Lungs can Produce a Severe Hemorrhagic Pneumonitis with Severe Pulmonary Injury or Death.

Skin: Skin Contact Results in Loss of Natural Oils and Often Results in 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 Liver and Kidneys.

Aggravated by Exposure: Persons with Pre-Existing Skin Disorders or Eye Problems or Impaired Respiratory Function, or Impaired Liver or Kidney Function may be more Susceptible to the Effects of the Substance.

SECTION 3 MIXTURE COMPONENTS

Xylenes (Xylol)

| SARA 313 | Component | CAS Number | Percent Comp. | Dimension | Exposure Limits |
|-------------------------------------|-----------------|----------------|---------------|-----------|---|
| <input checked="" type="checkbox"/> | Xylenes (Xylol) | CAS# 1330-20-7 | 100 | V/V | OSHA TWA 100 ppm (435 mg/m ³) |

SECTION 4 FIRST AID MEASURES

Keep away from heat and ignition sources. May be harmful if swallowed. Avoid breathing vapor or dust. Use with adequate ventilation. Avoid contact with eyes, skin, and clothes. Wash thoroughly after handling. Keep container closed.

FIRST AID: SKIN: Remove contaminated clothing. Wash exposed area with soap and water. If symptoms persist, seek medical attention

EYES: Wash eyes with plenty of water for at least 15 minutes, lifting lids occasionally. Seek Medical Aid. INHALATION: Remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen

INGESTION: Give several glasses of milk or water. Vomiting may occur spontaneously, but DO NOT INDUCE! Never give anything by mouth to an unconscious person.

SECTION 5 FIRE FIGHTING MEASURES

Fire Extinguisher Type: Water spray, dry chemical, carbon dioxide, alcohol foam

Fire / Explosion Hazards: Vapor may travel considerable distance to source of ignition and flash back.

Fire Fighting Procedure: Wear self-contained breathing apparatus and protective clothing to prevent contact with skin and clothing.

SECTION 6 ACCIDENTAL RELEASE MEASURES

Remove all sources of ignition. Ventilate area of leak or spill. Wear protective equipment. Clean up in a manner that doesn't disperse dust.

Ventilate area or 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! US Regulations (CERCLA) Require Reporting Spills and Releases to Soil, Water and Air in Excess of Reportable Quantities.

SECTION 7 HANDLING AND STORAGE

Keep away from heat and flame. Do not get in eyes, on skin, on clothing. Use with adequate ventilation.

SECTION 8 EXPOSURE CONTROLS/PERSONAL PROTECTION

Respiratory Protection: NIOSH/MSHA-approved respirator

Ventilation: Local Exhaust

Xylenes (Xylol)

Mechanical

Protective Gloves: Gloves to prevent skin exposure as rubber or vinyl

Eye Protection: Goggles and Face Shield

Other Protective Equipment: Wear appropriate clothing to prevent skin exposure

SECTION 9 PHYSICAL AND CHEMICAL PROPERTIES

| | | | |
|----------------------|--------------------------|-----------------------------|---------------------------|
| Melting Point: | 12.2° C | Percent Volatile by Volume: | > 99% |
| Boiling Point: | 138° C | Evaporation Rate | Information not available |
| Vapor Pressure: | 6.72 | Evaporation Standard | |
| Vapor Density: | 3.66 | Auto Ignition Temp | Information not available |
| Solubility in Water: | Negligible | Lower Flamm. Limit in Air | 1.0 |
| Appearance /Odors: | Red liquid, solvent odor | Upper Flamm. Limit in Air | 6.0 |
| Flash Point: | 17.0° C | | |
| Specific Gravity: | 0.864 | | |

SECTION 10 STABILITY AND REACTIVITY INFORMATION

Stability: Stable

Conditions to Avoid: Avoid contact with heat, sparks, flames, or other sources of ignition.

Materials to Avoid: Oxidizing materials

Hazardous Decomposition Products: Oxides of carbon, acrid fumes

Hazardous polymerization: Will Not Occur

Conditions to Avoid: None known

SECTION 11 Toxicological Information

Carcinogenic References: NTP Carcinogen - Known: No, IARC Category- 3

SECTION 12 Ecological Information

Environmental Toxicity: When Released to the Soil and Water, this Material may Evaporate to Moderate Extent.

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.

SECTION 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.

SECTION 14 Transport Information

Xylenes (Xylol)

DOT Classification: Xylenes, 3, UN1307, PG III

DOT Regulations may change from time to time. Please consult the most recent D.O.T. regulations.

SECTION 15 Regulatory Information

Chemical Inventory Status –

Part 1:Ingredient

p-Xylene (106-42-3)

TSCA Yes

EC Yes

Japan YES

Australia Yes

Chemical Inventory Status –

Part 2:Ingredient

p-Xylene (106-42-3)

Korea Yes

DSL Yes

NDSL No

Phil. Yes

Federal, State & International Regulations –

Part 1: Ingredient.

p-Xylene (106-42-3)

RQ No

TPQ No

List YES

Chemical Catg No

Federal, State &
International Regulations –

Part 2:Ingredient

p-Xylene (106-42-3)

CERCLA 100

261.33 No

8(d) YES

Chemical Weapons Convention: No

TSCA 12 (b):YES

CDTA:NO PURE/LIQUID

SARA 311/312: Acute:YES

Chronic: YES

Fire: YES

Pressure: No

Reactivity: No

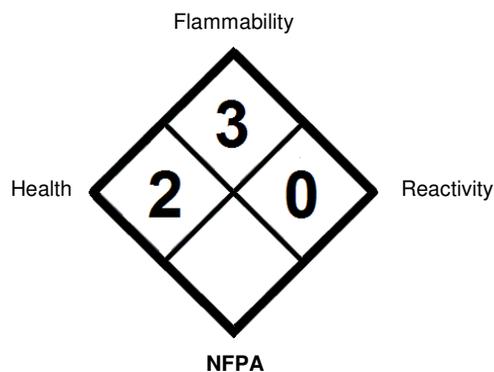
Australian Hazchem Code: 3Y

Poison Schedule:S6

SECTION 16 Additional Information

Effects of overexposure, Acute and Chronic: Irritation of eyes, nose and throat. Reversible eye damage, dermatitis, chemical pneumonia, central nervous system depression. Conditions aggravated: Persons with pre-existing eye, skin or respiratory conditions may be more susceptible. Target organs: Liver and kidneys.

Xylenes (Xylol)



Revisions

| | | |
|-----------|-----|--|
| 6/22/2010 | 0.1 | updated msds to 16 section from 10 section msds. STN |
|-----------|-----|--|

The information herein is believed to be accurate and is offered in good faith for the user's consideration and investigation. No warranty either expressed or implied is made for the completeness or accuracy of the information whether originating from the above mentioned company or not. Users of this material should satisfy themselves by independent investigation of current scientific and medical knowledge that the material can be used safely.

MATERIAL SAFETY DATA SHEET

SECTION 1 ♦ PRODUCT AND COMPANY IDENTIFICATION

Explorer Pipeline Company
6846 South Canton
P.O. Box 2650
Tulsa, Oklahoma 74101

FOR EMERGENCY SOURCE INFORMATION CONTACT:

- (918) 493 - 5100
- CHEMTREC: (800) 424-9300 (24 hour contact)
- CANUTEC: (613) 996-6666
- SETIQ: 91-800-00214

TRADE NAMES/SYNONYMS:

Methyl Tertiary Butyl Ether, Methyl Ether, Butyl Ether, or MTBE

CHEMICAL FAMILY: Alkyl Ethyl

EPL Code: 17

This material safety data sheet represents the composite characteristics and properties of fungible petroleum hydrocarbons and other related substances transported by explorer pipeline company. The information presented was compiled from one or more product shipper sources and is intended to provide health and safety guidance for these fungible products. Individual shipper and manufacturer MSDSs are available at Explorer Pipeline Company's, Tulsa, Oklahoma, offices.

SECTION 2 * HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

DANGER! EXTREMELY FLAMMABLE LIQUID

- Clear, colorless liquid with ether-like odor;
- Eye and mucous membrane irritant - effects central Nervous system - harmful or fatal if swallowed - aspiration hazard;
- High fire hazard. Keep away from heat, spark, open flame, and other ignition sources;
- Contact may cause eye, skin and mucous membrane irritation. Avoid prolonged breathing of vapors or mists;
- Inhalation may cause irritation, anesthetic effects (dizziness, nausea, headache, intoxication), and respiratory system effects;
- If ingested, do NOT induce vomiting, as this may cause chemical pneumonia (fluid in the lungs); and
- Obtain prompt medical attention. Keep Out of Reach of Children!

SECTION 3 ▼ COMPOSITION/INFORMATION OF INGREDIENTS

| INGREDIENT | CAS NUMBER | PERCENTAGE (%) |
|-----------------------------|------------|----------------|
| Methyl Tertiary Butyl Ether | 1634-04-4 | 97+% |

ACUTE

GETTING IT IN YOUR EYE...

- May cause minor eye irritation.

GETTING IT ON YOUR SKIN...

- No significant signs or symptoms indicative of any health hazard are expected to occur as a result of skin absorption exposure.
- May produce skin irritation.

SWALLOWING IT...

- The major health threat of ingestion occurs from the danger of aspiration (breathing) of liquid drops into the lungs, particularly from vomiting. Aspiration may result in chemical pneumonia (fluid in the lungs), severe lung damage, respiratory failure and even death.

BREATHING IT...

- Excessive exposure may cause irritation to the nose, throat, lungs and respiratory tract. Central nervous system (brain) effects may include headache, dizziness, loss of balance and coordination, unconsciousness, coma, respiratory failure, and death.

CHRONIC

➤ Medical information regarding special health effects is not conclusive.

CANCER, REPRODUCTIVE AND GENETIC EFFECTS

➤ This product has produced cancer, developmental and systemic toxicity in laboratory animals following repeated exposure. The significance of these results to human exposures has not been determined.

See Toxicological Information (Section 11) For More Information

SECTION 4 ☩ FIRST AID MEASURES

EYES: In case of eye contact, immediately rinse with clean water for 20-30 minutes. Retract eyelids often. Obtain emergency medical attention if pain, blinking, tears or redness persist.

SKIN: Immediately remove contaminated clothing. Wash skin thoroughly with mild soap/water. Flush with lukewarm water for 15 minutes. If sticky, use waterless cleaner first.

INGESTION: If large quantity swallowed, give lukewarm water (pint) if victim completely conscious/alert. Do not induce vomiting/risk of damage to lungs exceeds poisoning risk. Obtain emergency medical attention.

INHALATION: If overcome by exposure, remove victim to fresh air immediately. Give oxygen or artificial respiration as needed. Obtain emergency medical attention. Prompt action is essential.

NOTE TO PHYSICIAN: TREAT SYMPTOMATICALLY AND SUPPORTIVELY

SECTION 5 ⚠ FIRE FIGHTING MEASURES

Releases flammable vapors below normal ambient temperatures. When mixed with air and exposed to ignition source, vapors can burn in open or explode if confined. Flammable vapors may be heavier than air. May travel long distances along ground before igniting/flashing back to vapor source.

FLASH POINT:(Method Used) -30°F

FLAMMABLE LIMITS:

LEL: 1.0%

UEL: 8.0%

AUTOIGNITION TEMPERATURE: 797°F

EXTINGUISHING MEDIA: Dry Chemical, CO₂, Foam for Alcohols, Water spray, and fog to cool exposures

HAZARDOUS REACTIONS/DECOMPOSITION: Combustion may produce carbon monoxide, carbon dioxide, and acrid fumes. Incomplete combustion generates highly poisonous carbon monoxide and perhaps other toxic gases.

SPECIAL INSTRUCTIONS: Do not enter fire area without proper protection. Decomposition products possible. Fight fires from safe distance/protected location. Heat may build pressure/rupture closed containers, spreading fire, increasing risk of burns/injuries. Water may be ineffective due to low flash point. Even if material is water soluble, may not be practicable to extinguish fire by water dilution. Apply water spray/fog for cooling. Notify authorities if liquid enters sewer/public waters.

SECTION 6 ❖ ACCIDENTAL RELEASE MEASURES

➤ Flammable liquid. Release can cause fire/explosion. Liquids/vapors may ignite. Evacuate/limit access. Equip responders with proper protection. Kill all ignition sources. Stop release. Prevent flow to sewers/public waters. Notify fire/environmental authorities. Blanket with firefighting foam. Restrict water use for cleanup. Impound/recover large land spill. Soak up small spill with inert solids. Use suitable disposal containers. On water material partially soluble/may float or sink. Contain/minimize dispersion/collect. Disperse residue to reduce aquatic harm.

SECTION 7 ⚡ HANDLING AND STORAGE

Prior to working with this product workers should be trained on its proper handling and storage

➤ Store in tightly closed/properly vented containers away from heat/sparks/open flame/strong oxidizers. Use only non-sparking tools. Store drums with bung in up position. Carefully vent internal pressure before removing closure. Containers must be grounded before transfer. Electrical equipment should conform to National Electric Code. Handle used containers with care; residue may be flammable/explosive, unless blanketed with inert gas.

➤ Isolate, vent, drain, wash, and purge equipment before maintenance. Remove all ignition sources, check atmosphere for explosiveness and oxygen deficiencies. Use adequate personal protective equipment. Observe precautions pertaining to confined space entry.

SECTION 8 ⚠ EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS: No special ventilation is usually required beyond that needed for normal comfort control.

OTHER HYGIENIC AND WORK PRACTICES: Emergency eye wash fountains and safety showers should be available in the immediate vicinity of any potential exposure. Use good personal hygiene practices. Wash hands before eating, drinking, smoking, or using toilet facilities. Promptly remove soiled clothing/wash thoroughly before reuse. Shower after work using plenty of soap and water.

EXPOSURE LIMITS

OSHA PEL

ACGIH TLV (2005)

METHYL TERT BUTYL ETHER

| TWA | STEL | TWA | STEL |
|-----------------------|------|--------|------|
| Not Applicable (N.A.) | N.A. | 50 ppm | N.A. |

PERSONAL PROTECTIVE EQUIPMENT

- **EYES:** Eye protection such as chemical splash goggles and/or face shield must be worn when possibility exists for eye contact due to splashing or spraying liquid, airborne particles, or vapor. Contact lenses should not be worn.
- **SKIN:** Depending on the conditions of use, protective gloves, apron, boots, head and face protection should be worn. This equipment should be cleaned thoroughly after each use.
- **RESPIRATORY PROTECTION:** No occupational exposure standards have been developed for this material. Where exposure through inhalation may occur from use, NIOSH/MSHA approved respiratory protection is recommended.

SECTION 9 ⚡ PHYSICAL AND CHEMICAL PROPERTIES

| | |
|---|--|
| BOILING POINT (760 MM HG): 131°F | PERCENT VOLATILE BY VOLUME: 100% |
| SPECIFIC GRAVITY (H₂O = 1): 0.74 @ 68°F | VISCOSITY UNITS, TEMP: No Data |
| FREEZING POINT: -164°F | VAPOR DENSITY (AIR = 1): 3.1 |
| VAPOR PRESSURE AT 68°F: 75 mm Hg | SOLUBILITY IN WATER: Approximately 4% to 5% |
| APPEARANCE AND ODOR: Clear, colorless liquid with ether-like odor. | |

SECTION 10 ☞ STABILITY AND REACTIVITY

CHEMICAL STABILITY: Stable

CONDITIONS TO AVOID: High temperature, open flame or spark.

OTHER PHYSICAL AND CHEMICAL PROPERTIES: No Data

MATERIALS TO AVOID: Strong oxidizing agents, ungrounded electrical equipment, open flames and spark.

HAZARDOUS POLYMERIZATION: Not Expected to Occur

SECTION 11 ☠ TOXICOLOGICAL INFORMATION

METHYL TERT BUTYL ETHER (MTBE)

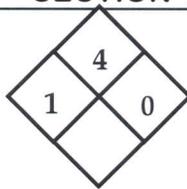
Acute symptoms associated with human exposure to MTBE appear to be mild and transient. Breathing small amounts of MTBE for short periods may cause nose and throat irritation. In laboratory studies, rodents exposed to high doses of MTBE exhibited blood chemistry changes and liver and kidney abnormalities.

TOXICITY

| Type Of Dose | Specie | Result | Type Of Dose | Specie | Result | Type Of Dose | Specie | Result |
|-------------------------|--------|-------------|------------------------|--------|------------|-------------------------|--------|-------------------|
| LD ₅₀ (oral) | Mouse | 3,500 mg/kg | LC ₅₀ (inh) | Mouse | 35,000 ppm | LD _{LO} (oral) | Human | No Data Available |

CARCINOGENICITY

| | | | |
|-------------|---|-------------------------------|------------------------------------|
| IARC | Sufficient evidence in animals | Inadequate evidence in humans | Group 3: Possible human carcinogen |
| NTP | Not identified as a Know Carcinogen or Anticipated Human Carcinogen | | |

| | | | | | |
|---|-------------------------|---|--|--|--|
| MATERIAL NAME: MTBE | |  | | MSDS # EPL-9 | |
| California (Prop 65): Listed as carcinogen | | NIOSH: Not Listed | | ACGIH: A3 – Confirmed Animal | |
| OSHA: not classifiable as a human carcinogen | | | | | |
| MUTAGENICITY, TERATOGENICITY AND REPRODUCTIVE EFFECTS | | | | | |
| 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. There is no evidence that MTBE causes cancer in humans. | | | | | |
| SECTION 12 ✨ ECOLOGICAL INFORMATION | | | | | |
| ACUTE EFFECTS: MTBE is considered moderately toxicity to aquatic life. Insufficient data are available to evaluate or predict the short-term effects to birds or land animals. | | | | | |
| CHRONIC EFFECTS: MTBE is considered moderately toxicity to aquatic life. Insufficient data are available to evaluate or predict the long-term effects to birds or land animals. | | | | | |
| DISTRIBUTION AND PERSISTENCE IN THE ENVIRONMENT: MTBE evaporates when exposed to air. It dissolves when mixed with water. Most direct releases of MTBE to the environment are to air. MTBE also evaporates from water and soil exposed to air. Once in air, it is expected to break down to other chemicals. Because it is a liquid that does not bind well to soil, MTBE that makes its way into the ground can move through the ground and enter groundwater. Plants and animals are not likely to store methyl tertiary-butyl ether.. | | | | | |
| SECTION 13 ✨ DISPOSAL CONSIDERATIONS | | | | | |
| Contaminated product/soil/water may be RCRA/OSHA hazardous waste due to low flash point. Use registered transporters. Dilute aqueous waste may biodegrade. | | | | | |
| SECTION 14 ★ TRANSPORTATION INFORMATION | | | | | |
| Not Meant To Be All Inclusive - Check Local, State, And Federal Laws And Regulations | | | | | |
| Agency | Shipping Name | Packing Group | Hazard Class | UN/NA # | |
| U.S. DOT | Methyl tert-butyl ether | II | Flammable Liquid | UN 2398 | |
| SECTION 15 ☽ REGULATORY INFORMATION | | | | | |
| CERCLA RQ's (40 CFR Part 302) | | | MTBE - 1,000 pounds | | |
| RCRA | | | Not Listed | | |
| SARA (40 CFR Part 355) TPQ's | | | None of the ingredients are listed | | |
| SARA Title III Section 313 | | | All ingredients listed | | |
| California's Prop 65 | | | All ingredients listed | | |
| OSHA | | | All ingredients are listed as hazardous under 29 CFR 1910.1200 | | |
| SECTION 16 ☼ OTHER INFORMATION | | | | | |
| NFPA 704 LABEL: | | | HMIS LABEL | | |
|  | | | 1-4-0 | | |
| MSDS REVISIONS: Change in Format and update of Information | | | | | |
| MSDS CREATION DATE: July 1997 | | | REVISION #1: 01/03/06 | | |

DISCLAIMER

The information in this MSDS was obtained from sources which we believe are reliable. **HOWEVER, THE INFORMATION IS PROVIDED WITHOUT ANY WARRANTY, EXPRESS OR IMPLIED, REGARDING ITS ACCURACY.** Some 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 OR IN ANY WAY CONNECTED WITH THE HANDLING, STORAGE, USE OR DISPOSAL OF THE PRODUCT.** All product measurements such as flash point, *etc.* are considered approximate values. All data provided by Explorer Pipeline Company.

This MSDS was prepared and is to be used only for this product. If the product is used as a component in another product, such as refined petroleum hydrocarbon mixtures, this MSDS information may not be applicable.

MSDS DEVELOPER: _____

A handwritten signature in black ink that reads "Cass Willard".

Cass Willard, CIH

DATE: 01/03/06

MATERIAL SAFETY DATA SHEET FOR LEAD

SECTION 1 – MATERIAL IDENTIFICATION

Material Name: **Lead**

Description: Bluish-Grey metal, apparently odorless

Other Designations: Soft lead, Hard Lead, Calcium lead.

Manufacturer: Mars Metal Company,
4130 Morris Drive,
Burlington, Ontario
L7L 5L6

Emergency Phone Number: (905) 637-3862

SECTION II – HAZARDOUS INGREDIENTS EXPOSURE GUIDELINES

Base Metal: Lead – C.A.S. #7439-9201/Exposure Limits: 1.05 Mg/M3 ACGIH TWA
Alloys: Sb, Sn, As, Cu, Ca – Antimony C.A.S. #7440-36-0/
Exposure Limits: 0.50 Mg/M3 ALGIH TWA

SECTION III – PHYSICAL DATA:

Boiling Point: 3164 degrees Fahrenheit
Melting Point: 622 degrees Fahrenheit
Specific Gravity: (H_o = 1) Approximately 10.3
Vapour Pressure: (MM HG) N.A.
Solubility in Water: Negligible

SECTION IV – FIRE AND EXPLOSION DATA

Hazards: Toxic fumes and vapours are produced by molten lead.
Dust explosion potential exists

Extinguishing Media: Dry chemical or carbon dioxide should be used on surrounding Area.

Firefighting Procedures: Full body protective clothing should be worn and positive pressure breathing apparatus used.

Flammability: Metal is not flammable, powders or dust may be flammable.

SECTION V – REACTIVITY DATA

Chemical Stability: Metal is stable.

Incompatibility: Strong oxidizers, Hydrogen Peroxide, Active metals.

Hazardous Decomposition Products: High temperature may produce hazardous fumes.

SECTION VI – HEALTH HAZARD DATA AND FIRST AID

Threshold Limit Value: Time weighed average exposure 0.15 MG/M3. Short term Exposure 0.30 MG/M3.

Routes of Exposure: Ingestion, Inhalation, and Eyes.

EFFECTS OF EXPOSURE:

Acute Overexposure: May cause weakness, vomiting, loss of appetite and Constipation.

Chronic Exposure: May cause weakness, Insomnia, Hypertension, Anemia, Neuromuscular dysfunction's and joint paint.

EMERGENCY AND FIRST AID PROCEDURES:

Ingestion: Rinse mouth, give plenty of water, get medical attention.

Inhalation: Remove from exposure to fresh air, get medical attention.

Eyes: Rinse thoroughly with water, get medical attention.

Skin: Remove contaminated clothing and wash effected area with water and soap.

SECTION VII – SPILL AND LEAK PROCEDURES:

Released or Spilled: Sweep up carefully using water (or other suitable wetting agent) to prevent emissions, place waste in sealable containers which are to be disposed of in accordance with local legislation.

Waste Disposal Method: Contact local authorities for instructions on proper disposal procedures in your area.

SECTION VIII – SPECIAL PROTECTION INFORMATION:

Respiratory: Use respirators as per the regulations respecting Lead.

Eye Protection: Face shield/approved safety glasses.

Hands: Protective gloves should be worn when handling Lead.

Other Protective Equipment: Clean overalls, safety boots, and helmets.

Local Exhaust: Adequate local and general ventilation must be provided.

SECTION IX – SPECIAL PRECAUTIONS:

Handling and Storage: Lead dust should be handled in sealed containers. Every effort should be made to prevent dusts from becoming airborne.

Other Precautions: Use wet methods for dust control whenever possible. Ensure that there is sufficient ventilation in areas of lead use.

January 2008



MATERIAL SAFETY DATA SHEET

(POLYCHLORINATED BIPHENYLS)

COMPOSITION/INFORMATION ON INGREDIENTS

Ingredients Name: polychlorinated biphenyls (PCBs)

HAZARD IDENTIFICATION

Reports of Carcinogenicity: YES

HEALTH HAZARDS ACUTE AND CHRONIC

- **Eyes**: Moderately irritating to eye tissues.
- **Skin**: Can be absorbed through intact skin, may cause de-fatting, potential for chloracne.
- **Inhalation**: Possible liver injury.
- **Ingestion**: Slightly toxic; reasonably anticipated to be carcinogenic.

EFFECTS OF OVER-EXPOSURE

Can cause dermatological symptoms; however, these are reversible upon removal of exposure source.

FIRST AID MEASURES

- **Eyes**: Irrigate immediately with copious quantities of running water for at least 15 minutes if liquid or solid PCBs get into them.
- **Skin**: Contaminated clothing should be removed and the skin washed thoroughly with soap and water. Hot PCBs may cause thermal burns.
- **Inhalation**: Remove to fresh air; if skin rash or respiratory irritation persists, consult a physician (if electrical equipment arcs over, PCBs may decompose to produce hydrochloric acid).
- **Ingestion**: Consult a physician. Do not induce vomiting or give any oily laxatives. (If large amounts are ingested, gastric lavage is suggested).

FIRE FIGHTING MEASURES: Flash Point: >141 °C (285.8 °F)

EXTINGUISHING MEDIA: PCBs are fire-resistant compounds.

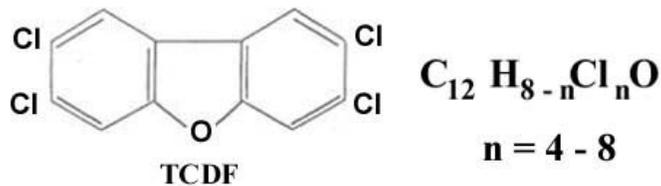
FIRE-FIGHTING PROCEDURES

Standard fire-fighting wearing apparel and self-contained breathing apparatus should be worn when fighting fires that involve possible exposure to chemical combustion products. Fire fighting equipment should be thoroughly cleaned and decontaminated after use.

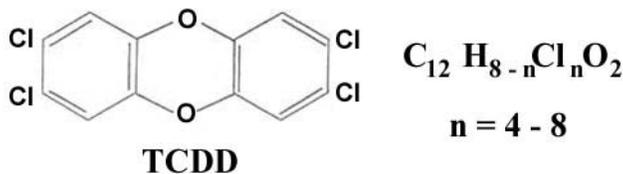
UNUSUAL FIRE/EXPLOSION HAZARD

If a PCB transformer is involved in a fire-related incident, the owner of the transformer is required to report the incident. Consult and follow appropriate federal, provincial and local regulations.

Note: When askarel liquid becomes involved in a fire, toxic by-products of combustion are typically produced including polychlorinated dibenzofurans and polychlorinated dibenzodioxins, both known carcinogens. The structures of these chemical species are as follows:



2,3,7,8-tetrachlorodibenzofuran



2,3,7,8-tetrachloro-dibenzo-p-dioxin

Note: 2,3,7,8-tetrachloro-dibenzo-p-dioxin is one of the most potent teratogenic, mutagenic and carcinogenic agents known to man.

SPILL RELEASE PROCEDURES

Cleanup & disposal of liquid PCBs are strictly regulated by the federal government. Ventilate area. Contain spill/leak. Remove spill by means of absorptive material. Spill clean-up personnel should use proper protective clothing. All wastes and residues containing PCBs should be collected, containerized, marked and disposed of in the manner prescribed by applicable federal, provincial and local laws.

HANDLING AND STORAGE PRECAUTIONS

Care should be taken to prevent entry into the environment through spills, leakage, use, vaporization, or disposal of liquid. Avoid prolonged breathing of vapours or mists. Avoid contact with eyes or prolonged contact with skin. Comply with all federal, provincial and local regulations.

OTHER PRECAUTIONS

Federal regulations require PCBs, PCB items, storage areas, transformer vaults, and transport vehicles to be appropriately labelled.

RESPIRATORY PROTECTION

Use OSHA approved equipment when airborne exposure limits are exceeded. Full facepiece equipment is recommended and, if used, replaces need for face shield and/or chemical splash goggles. The respirator use limitations specified by the manufacturer must be observed.

VENTILATION

Provide natural or mechanical ventilation to control exposure levels below airborne exposure levels.

PROTECTIVE GLOVES: Wear appropriate chemical resistant gloves to prevent skin contact.

EYE PROTECTION: Wear chemical splash goggles and have eye baths available.

OTHER PROTECTIVE EQUIPMENT

Wear appropriate protective clothing. Provide a safety shower at any location where skin contact can occur.

WORK HYGIENIC PRACTICES

Wash thoroughly after handling. Supplemental safety and health : none

PHYSICAL/CHEMICAL PROPERTIES

- **Vapour pressure:** (mm Hg @100 °F) 0.005 - 0.00006
- **Viscosity:** (CENTISTOKES) 3.6 - 540
- **Stability indicator/materials to avoid:** Yes
- **Stability Condition to Avoid:** PCBs are very stable, fire-resistant compounds.

HAZARDOUS DECOMPOSITION PRODUCTS

Carbon monoxide, carbon dioxide, hydrogen chloride, phenolics, aldehydes, furans, dioxins

WASTE DISPOSAL METHODS

Consult the applicable PCB regulations prior to any disposal of PCBs or PCB-contaminated items.



Material Safety Data Sheet

MSDS ID NO.: 0255MAR019
Revision date: 09/12/2005

1. CHEMICAL PRODUCT AND COMPANY INFORMATION

Product name: Marathon 325 Extract
Synonyms: SB-AE Binder; 325 Aromatic Extract; Heavy Paraffinic Solvent Extract
Chemical Family: Aromatic Extract
Formula: Mixture

Manufacturer:
Marathon Petroleum Company LLC
539 South Main Street
Findlay OH 45840

Other information: 419-421-3070
Emergency telephone number: 877-627-5463

2. COMPOSITION/INFORMATION ON INGREDIENTS

325 Extract is a complex mixture of hydrocarbons obtained as the extract from a solvent extraction process. It consists predominantly of aromatic hydrocarbons having carbon numbers predominantly in the range of C20-C50. The CAS description of this stream states that it is likely to contain >5% 4 to 6-membered condensed ring polycyclic aromatic hydrocarbons.

This product was analyzed by MAP and found to contain <0.05% of the 22 3-7 ring polycyclic aromatic compounds identified as Persistent Bioaccumulative Toxic (PBT) Chemicals subject to reporting under EPA EPCRA Section 313 regulations.

Product information

| Name | CAS Number | Weight % | ACGIH Exposure Limits: | OSHA - Vacated PELs - Time Weighted Ave | Other: |
|----------------------|------------|----------|------------------------|---|--------|
| Marathon 325 Extract | 64742-04-7 | 100 | | | |

Component Information

| Name | CAS Number | Weight % | ACGIH Exposure Limits: | OSHA - Vacated PELs - Time Weighted Ave | Other: |
|---|------------|----------|------------------------|---|--------|
| Extracts, Petroleum Heavy Paraffinic Distillate Solvent | 64742-04-7 | 100.0000 | | | |
| Sulfur Compounds | Mixture | 0.5-4 | | | |

Notes: The manufacturer has voluntarily elected to reflect exposure limits contained in OSHA's 1989 air contaminants standard in its MSDS's, even though certain of those exposure limits were vacated in 1992.

3. HAZARDS IDENTIFICATION

EMERGENCY OVERVIEW

THIS PRODUCT IS A BROWN TO BLACK VISCOUS COLORED LIQUID. CONTAINS POLYNUCLEAR AROMATIC HYDROCARBONS SOME OF WHICH HAVE PRODUCED CANCER IN LABORATORY ANIMALS AND HUMANS. REPEATED SKIN CONTACT TO SOME COMPONENTS OF THIS PRODUCT HAVE PRODUCED SYSTEMIC TOXICITY (INCLUDING LIVER DAMAGE) IN LABORATORY ANIMALS. VAPORS CAN PRODUCE EYE, SKIN, AND RESPIRATORY TRACT IRRITATION. THIS PRODUCT IS NOT A COMBUSTIBLE LIQUID PER THE OSHA HAZARD COMMUNICATION STANDARD, BUT WILL IGNITE AND BURN AT TEMPERATURES EXCEEDING THE FLASH POINT.

OSHA WARNING LABEL:

DANGER!

**CONTAINS POLYNUCLEAR AROMATIC HYDROCARBONS SOME OF WHICH HAVE PRODUCED CANCER IN LABORATORY ANIMALS AND HUMANS.
REPEATED SKIN CONTACT TO SOME COMPONENTS IN THIS PRODUCT HAS PRODUCED SYSTEMIC TOXICITY (INCLUDING LIVER DAMAGE) IN LABORATORY ANIMALS.**

CONSUMER WARNING LABEL:

A CONSUMER WARNING LABEL IS NOT APPLICABLE FOR THIS PRODUCT.

Inhalation: Exposure to vapor or mist may cause pulmonary irritation, dizziness, nausea and loss of consciousness.

Ingestion: Product is presumed to be slightly toxic (single dose). Significant ingestion could result in liver damage.

Skin contact: Prolonged and repeated liquid contact can cause dermatitis, folliculitis or oil acne. Components of this product may cause skin sensitization. Components of this product can cause liver damage if absorbed through the skin.

Eye contact: Liquid or vapor contact may result in slight eye irritation.

Carcinogenic Evaluation:

Product information

| Name | IARC Carcinogens: | NTP Carcinogens: | ACGIH - Carcinogens: | OSHA - Select Carcinogens: |
|------------------------------------|-------------------|------------------|----------------------|----------------------------|
| Marathon 325 Extract 64742-04-7 | NE | | | |

Notes: The International Agency for Research on Cancer (IARC) has determined that there is sufficient evidence for the carcinogenicity of untreated vacuum distillates, acid-treated oils, and aromatic oils, including extracts from solvent treatment of distillates and the high boiling fraction of catalytically cracked oils in animals.

Component Information

Notes: The International Agency for Research on Cancer (IARC) and the National Toxicology Program (NTP) have concluded that certain polycyclic aromatic hydrocarbons, i.e. (benzo(a)pyrene, benz(a)anthracene, benzo(a)phenanthrene, indeno(1,2,3-cd)pyrene, benzo(j)fluoranthene, benzo(j,k,fluorine, benzo(g,h,i)perylene, and 5-methylchrysene are probably carcinogenic to humans (Group 2A and B).

4. FIRST AID MEASURES

Inhalation: If affected, move person to fresh air. If breathing is difficult, administer oxygen. If not breathing or if no heartbeat, give artificial respiration or cardiopulmonary resuscitation (CPR). Immediately call a physician. If symptoms or irritation occur with any exposure, call a physician.

| | |
|---|--|
| Skin contact: | Wash with soap and large amounts of water. Remove contaminated clothing. If symptoms or irritation occur, call a physician. |
| Ingestion: | Ingestion not likely. If swallowed, do not induce vomiting and do not give liquids. Immediately call a physician. |
| Eye contact: | Flush eyes with large amounts of tepid water for at least 15 minutes. If symptoms or irritation occur, call a physician. |
| Medical conditions aggravated by exposure: | Preexisting skin conditions, respiratory disorders, and impaired liver function may be aggravated by exposure to components of this product. |

5. FIRE FIGHTING MEASURES

| | |
|---|---|
| Suitable extinguishing media: | For small fires, Class B fire extinguishing media such as CO2, dry chemical, foam (AFFF/ATC) or water spray can be used. For large fires, water spray, fog or foam (AFFT/ATC) can be used. Fire fighting should be attempted only by those who are adequately trained and equipped with proper protective equipment. |
| Specific hazards: | This product is not a combustible liquid per the OSHA Hazard Communication Standard, but will ignite and burn at temperatures exceeding the flash point. |
| Special protective equipment for firefighters: | Avoid using straight water streams. Water spray and foam (AFFF/ATC) must be applied carefully to avoid frothing and from as far a distance as possible. Avoid excessive water spray application. Use water spray to cool exposed surfaces from as far a distance as possible. Keep run-off water out of sewers and water sources. |
| Flash point: | 435 F; 224 C (Min) |
| Autoignition temperature: | No data available. |
| Flammable limits in air - lower (%): | No data available. |
| Flammable limits in air - upper (%): | No data available. |
| <u>NFPA rating:</u> | <u>HMIS classification:</u> |
| Health: 2 | Health: 2 |
| Flammability: 1 | Flammability: 1 |
| Reactivity: 1 | Reactivity: 1 |
| Other: - | Special: *See Section 8 for guidance in selection of personal protective equipment. |

6. ACCIDENTAL RELEASE MEASURES

| | |
|------------------------------|--|
| Personal precautions: | Keep public away. Isolate and evacuate area. Shut off source if safe to do so. Advise authorities and National Response Center (800-424-8802) if substance has entered a watercourse or sewer. Notify local health and pollution control agencies, if appropriate. Contain liquid with sand or soil. Recover and return product to source. |
|------------------------------|--|

7. HANDLING AND STORAGE

Handling:

Comply with all applicable EPA, OSHA, NFPA and consistent state and local requirements. Use appropriate grounding and bonding practices. Store in properly closed containers that are appropriately labeled and in a cool well-ventilated area. Do not expose to heat, open flames, strong oxidizers or other sources of ignition. Do not cut, drill, grind or weld on empty containers since they may contain explosive residues.

Avoid skin contact. Stay upwind and vent open hatches before unloading. Exercise good personal hygiene including removal of soiled clothing and prompt washing with soap and water.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

PERSONAL PROTECTIVE EQUIPMENT

| | |
|----------------------------------|---|
| Engineering measures: | Local or general exhaust required in an enclosed area or when there is inadequate ventilation. |
| Respiratory protection: | Not required under normal conditions and adequate ventilation. Use atmosphere supplying respirators in confined spaces or when vapors exceed permissible limits; otherwise, an organic vapor respirator with pre-filter for fumes can be used. Self-contained breathing apparatus should be used for fire fighting. |
| Skin and body protection: | Impermeable gloves (e.g., nitrile, viton, tyvek/saranex 23) to prevent skin contact. Chemical resistant apron or other protective clothing to avoid skin contact. |
| Eye protection: | Goggles and faceshield when handling hot material. |
| Hygiene measures: | Use mechanical ventilation equipment that is explosion-proof. |

9. PHYSICAL AND CHEMICAL PROPERTIES:

| | |
|---|--------------------------------------|
| Appearance: | Brown To Black Viscous Liquid |
| Physical state (Solid/Liquid/Gas): | Liquid |
| Substance type (Pure/Mixture): | Mixture |
| Color: | Brown to Black |
| Odor: | Aromatic Sweet |
| Molecular weight: | Not determined. |
| pH: | Neutral |
| Boiling point/range (5-95%): | 642-1017 F |
| Melting point/range: | Not determined. |
| Decomposition temperature: | Not applicable. |
| Specific gravity: | 1.0 |
| Density: | 8.3 lbs/gal |
| Bulk density: | No data available. |
| Vapor density: | No data available. |
| Vapor pressure: | Negligible |
| Evaporation rate: | No data available. |
| Solubility: | Not determined |
| Solubility in other solvents: | No data available. |
| Partition coefficient (n-octanol/water): | No data available. |
| VOC content(%): | No data available. |
| Viscosity: | 453.4 cSt @ 40 C 16.4 cSt @ 100 C |
| Pour Point: | 70 F |

10. STABILITY AND REACTIVITY

| | |
|------------------------|--|
| Stability: | The material is stable at 70 F, 760 mm pressure. |
| Polymerization: | Will not occur. |

Hazardous decomposition products:

Combustion produces carbon monoxide, aldehydes, aromatic and other hydrocarbons.

Materials to avoid:

Strong oxidizers such as nitrates, chlorates, peroxides.

Conditions to avoid:

Sources of heat or ignition.

11. TOXICOLOGICAL INFORMATION

Acute toxicity:**Product information**

| Name | CAS Number | Inhalation: | Dermal: | Oral: |
|----------------------|------------|-------------------|-------------------|----------------|
| Marathon 325 Extract | 64742-04-7 | No data available | >2 mg/kg [Rabbit] | >5 gm/kg [Rat] |

Lifetime skin painting studies with heavy distillate aromatic extracts (HDAE) have produced tumors following prolonged and repeated skin contact. HDAE was found to be positive in an Ames mutagenicity test. Repeated dermal application of HDAE (30 mg/kg/day for 13 weeks) resulted in anemia, liver degeneration and injury to bone marrow and lymphoid tissues. Treatment related mortality and body weight reduction was observed at 500 mg/kg. Repeated dermal application (125 mg/kg/day) of HDAE to pregnant rats during gestation produced maternal and fetal toxicity. Increased resorptions were observed at doses of 30 mg/kg/day and above.

Summary of health effect data on aromatic extracts:

This product contains >0.1% 3-7 ring polynuclear aromatic hydrocarbons (PAC's). Some 3-7 ring PACs have been shown to be carcinogenic in experiment animals. An increased risk of cancer has been observed in workers employed in the aluminum production, coal gasification, coal-tar pitch, coke production and iron and steel industries that had been occupationally exposed to polynuclear aromatic hydrocarbons (PAC). Since these kinds of PACs have been measured at high levels in air samples taken in these industries, IARC has concluded that these PACs are probably carcinogenic to humans.

12. ECOLOGICAL INFORMATION

Ecotoxicity effects:

If spilled, hot product and/or the coating action of the oil components could harm plant life.

The 96 hour TLM for WAF (water accommodated fraction) of an aromatic extract is >1000 mg/l in fish or algae. 21 day exposures of 1000 mg/l WAF of an aromatic extract to Daphnia did not affect survival nor reproduction.

13. DISPOSAL CONSIDERATIONS

Cleanup Considerations:

This material as supplied and by itself, when discarded or disposed of, is not an EPA RCRA hazardous waste according to federal regulations. This material could become a hazardous waste if mixed or contaminated with a hazardous waste or other substance(s). It is the responsibility of the user to determine if disposal material is hazardous according to federal, state and local regulations.

14. TRANSPORT INFORMATION

49 CFR 172.101:**DOT:****Transport Information:**

This material when transported via US commerce is NOT REGULATED by DOT regulations.

DOT reportable quantity (lbs):

Not applicable.

TDG (Canada):

Regulated substances:

Not applicable.

15. REGULATORY INFORMATION

Federal Regulatory Information:

US TSCA Chemical Inventory Section 8(b):

This product and/or its components are listed on the TSCA Chemical Inventory.

OSHA Hazard Communication Standard:

This product has been evaluated and determined to be hazardous as defined in OSHA's Hazard Communication Standard.

EPA Superfund Amendment & Reauthorization Act (SARA):

SARA Section 302:

This product contains the following component(s) that have been listed on EPA's Extremely Hazardous Substance (EHS) List:

| Name | CERCLA/SARA - Section 302 Extremely Hazardous Substances and TPQs |
|---|---|
| Extracts, Petroleum Heavy Paraffinic Distillate Solvent | NA |
| Sulfur Compounds | NA |

SARA Section 304:

This product contains the following component(s) identified either as an EHS or a CERCLA Hazardous substance which in case of a spill or release may be subject to SARA reporting requirements:

| Name | CERCLA/SARA - Hazardous Substances and their Reportable Quantities |
|---|--|
| Extracts, Petroleum Heavy Paraffinic Distillate Solvent | NA |
| Sulfur Compounds | NA |

SARA Section 311/312:

The following EPA hazard categories apply to this product:

Acute Health Hazard
Chronic Health Hazard

SARA Section 313:

This product contains the following component(s) that may be subject to reporting on the Toxic Release Inventory (TRI) From R:

| Name | CERCLA/SARA 313 Emission reporting: |
|---|-------------------------------------|
| Extracts, Petroleum Heavy Paraffinic Distillate Solvent | None |
| Sulfur Compounds | None |

State and Community Right-To-Know Regulations:

The following component(s) of this material are identified on the regulatory lists below:

Extracts, Petroleum Heavy Paraffinic Distillate Solvent

| | |
|------------------------------|---------------------------------------|
| Louisiana Right-To-Know: | Not Listed |
| California Proposition 65: | Not Listed |
| New Jersey Right-To-Know: | Not Listed. |
| Pennsylvania Right-To-Know: | Not Listed. |
| Massachusetts Right-To Know: | Carcinogen; Extraordinarily hazardous |
| Florida substance List: | Not Listed. |
| Rhode Island Right-To-Know: | Not Listed |

| | |
|---|---------------------------------------|
| Michigan critical materials register list: | Not Listed. |
| Massachusetts Extraordinarily Hazardous Substances: | carcinogen; extraordinarily hazardous |
| California - Regulated Carcinogens: | Not Listed |
| Pennsylvania RTK - Special Hazardous Substances: | Not Listed |
| New Jersey - Special Hazardous Substances: | Not Listed |
| New Jersey - Environmental Hazardous Substances List: | Not Listed |
| Illinois - Toxic Air Contaminants | Not Listed |
| New York - Reporting of Releases Part 597 - List of Hazardous Substances: | Not Listed |
| Sulfur Compounds | |
| Louisiana Right-To-Know: | Not Listed |
| California Proposition 65: | Not Listed |
| New Jersey Right-To-Know: | Not Listed. |
| Pennsylvania Right-To-Know: | Not Listed. |
| Massachusetts Right-To Know: | Not Listed. |
| Florida substance List: | Not Listed. |
| Rhode Island Right-To-Know: | Not Listed |
| Michigan critical materials register list: | Not Listed. |
| Massachusetts Extraordinarily Hazardous Substances: | Not Listed |
| California - Regulated Carcinogens: | Not Listed |
| Pennsylvania RTK - Special Hazardous Substances: | Not Listed |
| New Jersey - Special Hazardous Substances: | Not Listed |
| New Jersey - Environmental Hazardous Substances List: | Not Listed |
| Illinois - Toxic Air Contaminants | Not Listed |
| New York - Reporting of Releases Part 597 - List of Hazardous Substances: | Not Listed |

Canadian Regulatory Information:

Canada DSL/NDSL Inventory: This product and/or its components are listed either on the Domestic Substances List (DSL) or the Non Domestic Substance List (NDSL).

16. OTHER INFORMATION

Additional Information: No data available.

Prepared by: Craig M. Parker Manager, Toxicology And Product Safety

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End of Safety Data Sheet

MATERIAL SAFETY DATA SHEET

MALATHION ULV® CONCENTRATE INSECTICIDE

FOR CHEMICAL EMERGENCY, SPILL, LEAK, FIRE, EXPOSURE OR ACCIDENT, CALL CHEMTREC - DAY OR NIGHT 1-800-424-9300

1. CHEMICAL PRODUCT AND COMPANY IDENTIFICATION

FORMULATED FOR:

Loveland Products, Inc.
P.O. Box 1286 • Greeley, CO 80632-1286

24-Hour Emergency Phone: 1-800-424-9300
Medical Emergencies: 1-800-301-7976
U.S. Coast Guard National Response Center: 1-800-424-8802

PRODUCT NAME: MALATHION ULV® CONCENTRATE INSECTICIDE
CHEMICAL NAME: Malathion; (0-0-Dimethyl phosphorodithioate of diethyl mercaptosuccinate)
CHEMICAL FAMILY: Organophosphate Insecticide
EPA REG. NO.: 34704-565
MSDS Number: 000565-04b-LPI

MSDS Revisions: See section 16

Date of Issue: 07/08/04

Supersedes: 01/08/04

2. HAZARDS IDENTIFICATION SUMMARY

KEEP OUT OF REACH OF CHILDREN – CAUTION – Harmful if swallowed, inhaled or absorbed through skin. Avoid breathing vapors or spray mist. Avoid contact with skin, eyes, or clothing. Do not contaminate feed or foodstuffs.

This product is clear yellow-amber colored liquid with a mild petroleum odor.

Warning Statements:

NOTE TO PHYSICIAN: This product is a cholinesterase inhibitor. Treat symptomatically. Atropine is an antidote. Symptoms of cholinesterase inhibition include salivation, gastrointestinal hypermotility, abdominal cramping, nausea, diarrhea, sweating, miosis, tearing, blurred vision, headache, dizziness, ataxia, bradycardia, dyspnea, cyanosis, and muscle twitching or tremors. In extreme cases, tetany, mental confusion, incontinence, weakness, collapse, paralysis, convulsive seizures, and even death, can occur.

3. COMPOSITION, INFORMATION ON INGREDIENTS

| <u>Chemical Ingredients:</u> | <u>Percentage by Weight:</u> | <u>CAS No.</u> | <u>TLV (Units)</u> |
|------------------------------|------------------------------|----------------|-----------------------------|
| Malathion | 96.50 | 121-75-5 | 15 mg/m ³ (skin) |
| Inert Ingredients | 3.50 | | |

This product is hazardous according to the OSHA Hazard Communication Standard (29 CFR 1910.1200)

4. FIRST AID MEASURES

If swallowed: Call a poison control center or doctor immediately for treatment advice. Have a person sip a glass of water if able to swallow. Do not induce vomiting unless told to do so by a poison control center or doctor. Do not give anything by mouth to an unconscious person.

If inhaled: Move person to fresh air. If person is not breathing, call 911 or an ambulance, then give artificial respiration, preferably mouth-to-mouth, if possible. Call a poison control center or doctor for further treatment advice.

If in eyes: Hold eye open and rinse slowly and gently with water 15-20 minutes. Remove contact lenses, if present, after the first 5 minutes, then continue rinsing eye. Call a poison control center or doctor for treatment advice.

If on skin or clothing: Take off contaminated clothing. Rinse skin immediately with plenty of water for 15-20 minutes. Call a poison control center or doctor for further treatment advice.

FOR A MEDICAL EMERGENCY INVOLVING THIS PRODUCT CALL: **1-800-301-7976**. Have the product label or container with you when calling a poison control center or doctor, or going for treatment.

5. FIRE FIGHTING MEASURES

FLASH POINT (°F/Test Method): 325.4°F/163°C (PMCC)

FLAMMABLE LIMITS (LFL & UFL): None established

EXTINGUISHING MEDIA: Dry chemical, carbon dioxide, foam, water spray or fog.

HAZARDOUS COMBUSTION PRODUCTS: Thermal decomposition products include dimethyl sulfide, sulfur dioxide, carbon monoxide, carbon dioxide, and phosphorus pentoxide.

SPECIAL FIRE FIGHTING PROCEDURES: Wear self-contained breathing apparatus with full protective clothing. Fight fire from upwind and keep all non-essential personnel out of area. Avoid heavy hose streams.

UNUSUAL FIRE AND EXPLOSION HAZARDS: If water is used to fight fire or cool containers, contain runoff by diking to prevent contamination of water supplies. Containers in fire may burst or explode from excessive heat. Stay well back from fire area.

6. ACCIDENTAL RELEASE MEASURES

STEPS TO BE TAKEN IF MATERIAL IS RELEASED OR SPILLED:

For small spills, absorb with an absorbent material such as pet litter. Sweep up and transfer to containers for possible land application according to label use or for proper disposal. Check local, state and federal regulations for proper disposal. Flush the area with water to remove any residue.

CAUTION: Keep spills and cleaning runoff out of municipal sewers and open bodies of water.

7. HANDLING AND STORAGE

HANDLING: Wash hands before eating, drinking, chewing gum, using tobacco or using the toilet. Remove clothing immediately if pesticide gets inside. Then wash thoroughly and put on clean clothing. Remove PPE after handling this product. Wash the outside of gloves before removing. As soon as possible, wash thoroughly and change into clean clothing.

MATERIAL SAFETY DATA SHEET

MALATHION ULV® CONCENTRATE INSECTICIDE

STORAGE: Store in a safe manner. Store in original container only. Keep container tightly closed when not in use. Store at temperatures not exceeding 77°F/25°C. Do not use or store near heat or open flame. Do not contaminate water, food or feed by storage or disposal.

Personal Protective Equipment: Applicators and other handlers must wear: long sleeved shirt and long pants, chemical-resistant gloves, such as barrier laminate, butyl rubber, nitrile rubber or Viton® and shoes plus socks. Follow manufacturer's instructions for cleaning and maintaining PPE. If no instructions for washables, use detergent and hot water. Keep and wash PPE separately from other laundry.

8. EXPOSURE CONTROLS / PERSONAL PROTECTION

ENGINEERING CONTROLS: When handlers use closed systems, enclosed cabs, or aircraft in a manner that meets with requirements listed in the Worker Protection Standard (WPS) for agricultural pesticides [40 CFR 170.240(d)(4-6)], the handler PPE requirements may be reduced or modified as specified in the WPS.

RESPIRATORY PROTECTION: Not normally required, if vapors or mists exceed acceptable levels, wear a NIOSH approved pesticide respirator.

EYE PROTECTION: Chemical goggles or shielded safety glasses.

SKIN PROTECTION: Wear protective clothing: long-sleeved shirts and pants, shoes with socks. Wear chemical-resistant gloves.

| | OSHA PEL 8 hr TWA | ACGIH TLV-TWA |
|-----------|-----------------------------|---|
| Malathion | 15 mg/m ³ (Skin) | 1 mg/m ³ (Inhalable fraction of aerosol); BEI* |

9. PHYSICAL AND CHEMICAL PROPERTIES

APPEARANCE AND ODOR: Clear yellow-amber colored liquid with a mild petroleum odor.

SOLUBILITY: Emulsifies
pH: 3.7-3.8 (50% solution)

SPECIFIC GRAVITY (Water = 1): 1.231 g/ml

BULK DENSITY: 10.27 lbs/gal.

VAPOR PRESSURE: 3.4×10^{-6} mm/Hg @ 25°C

BOILING POINT: >300°F/>148.9°C

PERCENT VOLATILE (by volume): Not established

EVAPORATION RATE: Not established

Note: These physical data are typical values based on material tested but may vary from sample to sample.

Typical values should not be construed as a guaranteed analysis of any specific lot or as specification items.

10. STABILITY AND REACTIVITY

STABILITY: Stable

CONDITIONS TO AVOID: Excessive heat.

INCOMPATIBILITY: Strong alkalis, amines, and strong oxidizing compounds. Can corrode iron, steel, tin plate, lead and copper. Rapidly hydrolyzed at pH >7.0 or <5.0.

HAZARDOUS DECOMPOSITION PRODUCTS: Dimethyl sulfide, sulfur dioxide, carbon monoxide, carbon dioxide, and phosphorus pentoxide.

HAZARDOUS POLYMERIZATION: Will not occur.

11. TOXICOLOGICAL INFORMATION

Acute Oral LD₅₀ (rat): 5500 mg/kg

Acute Dermal LD₅₀ (rabbit): > 2000 mg/kg

Eye Irritation (rabbit): Slight irritation

Skin Irritation (rabbit): Slight irritation

Inhalation LC₅₀ (rat): >5.2 mg/L (4 hr)

Skin Sensitization (Guinea Pig): Not a sensitizer

Carcinogenic Potential: Not listed by NTP, ACGIH, OSHA, or NIOSH as a carcinogen.

12. ECOLOGICAL INFORMATION

Malathion is toxic to fish, aquatic invertebrates, and aquatic life stages of amphibians. For terrestrial uses, do not apply directly to water, or to areas where surface water is present or to intertidal areas below the mean high water mark. Drift and runoff may be hazardous to aquatic organisms in areas near the application site. Do not contaminate water by cleaning equipment or disposal of wash waters. Highly toxic to bees exposed to direct treatment on blooming crops or weeds. Do not apply this product or allow it to drift to blooming crops or weeds if bees are visiting the treatment area.

13. DISPOSAL CONSIDERATIONS

Do not reuse empty container. **Metal:** Triple rinse (or equivalent), then offer for recycling or reconditioning, or puncture and dispose of in a sanitary landfill, or by other procedures approved by local, state and federal regulations. **Plastic:** Triple rinse (or equivalent), then offer for recycling at an ACRC site (go to <http://www.acrecycle.org/> for locations) or by reconditioning, or puncture and dispose of in a sanitary landfill, or, incineration, or, if allowed by state and local authorities, by burning. If burned, stay out of smoke. Wastes resulting from the use of this product may be disposed of on site or at an approved waste disposal facility. Do not contaminate water, food or feed by storage or disposal.

14. TRANSPORT INFORMATION

DOT Shipping Description: LESS THAN 10.2 GALLONS NOT REGULATED BY USDOT.

DOT Shipping Description: RQ ENVIRONMENTALLY HAZARDOUS SUBSTANCE, LIQUID, N.O.S., 9, UN3082, III (MALATHION) MARINE POLLUTANT ERG GUIDE 171

U.S. Surface Freight Classification: INSECTICIDES, INSECT REPELLENTS, NOI, OTHER THAN POISON (NMFC 102120, CLASS: 60)

Consult appropriate ICAO/IATA and IMDG regulations for shipment requirements in the Air and Maritime shipping modes.

15. REGULATORY INFORMATION

| | | | |
|-----------------------------|----------------|------------|----------------|
| NFPA & HMIS Hazard Ratings: | NFPA | | HMIS |
| | 2 Health | 0 Least | 2 Health |
| | 1 Flammability | 1 Slight | 1 Flammability |
| | 0 Instability | 2 Moderate | 0 Reactivity |
| | | 3 High | H PPE |
| | 4 Severe | | |

SARA Hazard Notification/Reporting
 SARA Title III Hazard Category: Immediate Y Fire N Sudden Release of Pressure N
 Delayed Y Reactive N

Reportable Quantity (RQ) under U.S. CERCLA: Malathion (CAS: 121-75-5): 100 pounds
 SARA, Title III, Section 313: Malathion (CAS: 121-75-5) 96.5%
 RCRA Waste Code: Not listed
 CA Proposition 65: Not listed

16. OTHER INFORMATION

MSDS STATUS: Format modified to address changes in ANSI Standard Z400.1-2004
 PREPARED BY: Registrations and Regulatory Affairs REVIEWED BY: Environmental/ Regulatory Services

©Viton is a registered trademark of DUPONT DOW ELASTOMERS L.L.C.
 *ACGIH® has recommended a Biological Exposure Index for this substance: Acetylcholinesterase Inhibiting Pesticides
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MATERIAL SAFETY DATA SHEET

UNITED MINERAL & CHEMICAL CORPORATION
 1100 VALLEY BROOK AVENUE
 LYNDHURST, NJ 07071
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FOR EMERGENCY CALL:
C H E M T R E C
 1-800-424-9300

SECTION A - PRODUCT INFORMATION

| | | |
|--------------------------|--|--|
| TRADE NAME : | ARSENIC METAL: MBE CHARGES, ARSENIC CHUNK & GRANULE | REVISION DATE : NOVEMBER 16, 2007 |
| CAS NUMBER : | 7440-38-2 | |
| SYNONYMS : | METALLIC ARSENIC; GREY ARSENIC; ARSENIA | |
| CHEMICAL FAMILY : | METALS - GROUP 5a | |
| FORMULA : | As | |

SECTION B - HAZARDOUS COMPONENTS

| COMPONENT | CAS NO. | % | PEL/TLV |
|--------------------|-----------|-----|---|
| ARSENIC METAL (As) | 7440-38-2 | 100 | 0.01mg/m ³ ACGIH TWA AS As 0.01mg/m ³ OSHA TWA, INORGANIC COMPOUNDS AS AS (SEE 29 CFR 1910.1018) 0.5 mg/m ³ OSHA TWA, ORGANIC COMPOUNDS AS AS 0.002 mg/m ³ /15 min. CEILING-NIOSH, INORGANIC CMPD. 5 mg As/m ³ IDLH-CARCINOGEN, INORGANIC COMPOUNDS |

TWA – Time Weighted Average over 8 hours
 IDLH - Immediately dangerous to life & health

See the OSHA Inorganic Arsenic Standard at 29 CFR 1910.1018 before processing.

SECTION C - PHYSICAL PROPERTIES

| | |
|--|--|
| BOILING POINT (°C) : SUBLIMES @ 615 | SPECIFIC GRAVITY : 5.72 |
| MELTING POINT (°C) : 817 @ 3.6477 Mpa | FREEZING POINT (°) : N/A |
| VAPOR PRESSURE (mm Hg) : 1mm @ 372°C | PERCENT VOLATILE (BY WT.) : N/A |
| VAPOR DENSITY (AIR=1) : N/A | EVAPORATION RATE : N/A |
| SOLUBILITY IN WATER : INSOLUBLE | pH (0 % IN WATER) : NONE |
| ODOR THRESHOLD : N/A | |
| APPEARANCE & ODOR : SILVER GRAY CRYSTALLINE CHUNKS, RODS, OR GRANULES; NO ODOR AS METAL AS COMPOUND, AsH ₃ HAS GARLIC ODOR | |

SECTION D - FIRE & EXPLOSION DATA

| | | |
|------------------------------|-------------------------------|--|
| FLAMMABLE LIMITS : | FLASH POINT (°) : NONE | AUTO IGNITION TEMP (° F): (UNKNOWN) |
| EXTINGUISHING MEDIA : | LEL : (N/A) | CO₂ : (X) |
| | WATER : () | DRY CHEMICAL : (X) |
| | UEL : (N/A) | |
| | FOAM : (X) | |

SPECIAL FIRE FIGHTING PROCEDURES : ARSENIC IN MASS FORM IS NON-FLAMMABLE. IN THE EVENT OF A FIRE, RESTRICT PERSONS NOT WEARING PROTECTIVE EQUIPMENT FROM AREA. TRY TO SNUFF FIRE WITH SAND, DRY MEDIA, FOAM OR CO₂. IF NO OTHER OPTIONS AVAILABLE, USE WATER & ALWAYS WEAR SELF CONTAINED BREATHING APPARATUS OR NIOSH TOXIC VAPOR RESPIRATOR. POISONOUS GASES ARE PRODUCED IN FIRE, INCLUDING ARSENIC OXIDES.

UNUSUAL FIRE & EXPLOSION HAZARDS : ARSENIC, WHEN HEATED OR IN CONTACT WITH ACID OR ACID FUMES, CAN PRODUCE HIGHLY TOXIC FUMES (SUCH AS ARSINE). ARSENIC REACTS VIGOROUSLY WITH OXIDIZING MATERIALS. ARSENIC IS FLAMMABLE IN THE FORM OF DUST WHEN EXPOSED TO HEAT OR FLAME OR BY CHEMICAL REACTION WITH POWERFUL OXIDIZERS (SEE SECTION E). SLIGHT EXPLOSION HAZARD EXISTS IN THE FORM OF DUST WHEN EXPOSED TO FLAME. IN THE EVENT OF A FIRE OR SPILL, CONTACT THE STATE DEPT. OF THE ENVIRONMENT & YOUR REGIONAL OFFICE OF THE FEDERAL ENVIRONMENTAL PROTECTION AGENCY.

SECTION E - REACTIVITY DATA

STABILITY : STABLE

INCOMPATIBILITY : HYDROGEN GAS CAN REACT WITH INORGANIC ARSENIC TO FORM THE HIGHLY TOXIC GAS ARSINE. INCOMPATIBLE WITH BROMINE AZIDE, DIRUBIDIUM ACETYLIDE, HALOGENS, PALLADIUM ZINC, PLATINUM, NCl₃, AgNO₃, CrO₃, Na₂O₂, HEXAFLUOROISOPROPYLIDENEAMINO LITHIUM. CAN REACT WITH ACIDS OR ACID FUMES AND POWERFUL OXIDIZERS SUCH AS BROMATES, CHLORATES, IODATES, PEROXIDES, LITHIUM, NaCl₃, KNO₃, KMnO₃, Rb₂C₂, AgNO₄, NOCl, IF₅, CrO₃, ClF₃, ClO, BrF₃, BrF₅, BrN₃, RbC₃BCH, CsC₃BCH.

HAZARDOUS DECOMPOSITION PRODUCTS : ARSENIC FUMES, ARSINE, OTHER ARSENIC COMPOUNDS

HAZARDOUS POLYMERIZATION : WILL NOT OCCUR

CONDITIONS TO AVOID : AVOID OPEN CONTAINERS AND CONTACT WITH INCOMPATIBLE MATERIALS

SECTION F - PERSONAL PROTECTIVE EQUIPMENT INFO

RESPIRATORY EQUIPMENT : FOR HANDLING ELEMENTAL ARSENIC IN CHUNK, ROD, OR GRANULES USE NIOSH APPROVED, AIR PURIFYING, TOXIC VAPOR RESPIRATOR FOR PARTICULATE & FUME/ AIR LEVEL. IF PROCESSING MATERIAL INTO INORGANIC ARSENIC COMPOUNDS, CHOOSE PROPER RESPIRATORY PROTECTION IN ACCORDANCE WITH THE OSHA INORGANIC ARSENIC STANDARD AT 29 CFR 1910.1018 (h). FOR UNKNOWN CONCENTRATIONS OF INORGANIC ARSENIC OR UNDER FIRE-FIGHTING CONDITIONS USE FULL FACEPIECE SELF-CONTAINED BREATHING APPARATUS OPERATED IN POSITIVE PRESSURE MODE.

PROTECTIVE GLOVES : NEOPRENE OR PLASTIC

EYE PROTECTION : FACE SHIELD OR VENTED GOGGLES FOR WHEN DUST/ FUME OR INORGANIC COMPOUNDS ARE GENERATED.

VENTILATION : LOCAL EXHAUST/MECHANICAL(GENERAL) SCRUBBER OR TRAP IF POSSIBLE TO MAINTAIN EXPOSURE TO LESS THAN PERMISSIBLE LIMITS FOR ELEMENTAL ARSENIC AND ANY COMPOUNDS BEING GENERATED (SEE SECTION B)

OTHER PROTECTIVE EQUIPMENT : LAB COAT, COVERALLS, COVERLETS FOR SHOES, AND ACCESS TO EYEWASH FOUNTAIN FOR DUST OR INORGANIC COMPOUND GENERATION

SECTION G - HEALTH HAZARD DATA

THRESHOLD LIMIT VALUE : 0.01mg/m³ TWA ARSENIC, ELEMENTAL & INORGANIC COMPOUNDS(EXCEPT ARSINE), AS As

PRIMARY ROUTES OF EXPOSURE : INHALATION OF FUMES, DUST, REACTION GASES; INGESTION; SKIN CONTACT

ORAL LD₅₀ : 763 mg/m³ RAT; ORAL RAT TDLo 605 micrograms/kg – REPRODUCTIVE EFFECTS; ORAL-MAN TDLo 7857 mg/kg/55 year old – SKIN & GASTROINTESTINAL EFFECTS

DERMAL IRRITATION-RABBIT : UNKNOWN; SUBCUTANEOUS RABBIT LDLo: 300 mg/kg

EYE IRRITATION-RABBIT : UNKNOWN

OSHA PEL : 0.01mg/m³ TWA INORGANIC COMPOUNDS AS As; 0.5 mg/m³ TWA ORGANIC COMPOUNDS AS As.

ACGIH TLV : 0.01mg/m³ TWA ELEMENTAL ARSENIC & INORGANIC COMPOUNDS (EXCEPT ARSINE), AS As

EFFECTS OF OVEREXPOSURE : ARSENIC METAL IS NOT AS READILY AVAILABLE IN THE BODY AS ARSENIC IN THE FORM OF DUST OR VAPOR OR WHEN PROCESSED INTO ARSENIC COMPOUNDS (ARSENICALS). INORGANIC ARSENICALS ARE MORE TOXIC THAN ORGANIC ARSENICALS.

ACUTE EFFECTS: ARSENIC IS A POISON BY SUBCUTANEOUS, INTRAMUSCULAR, AND INTRAPERITONEAL ROUTES. ACUTE ARSENIC POISONING FROM INGESTION RESULTS IN BURNING LIPS, THROAT CONSTRICTION, ABDOMINAL PAIN, MARKED IRRITATION OF THE STOMACH AND INTESTINES WITH NAUSEA, VOMITING, AND DIARRHEA. IN SEVERE CASES THE STOOLS AND VOMIT ARE BLOODY AND THE PATIENT MAY GO INTO COLLAPSE AND SHOCK WITH WEAK, RAPID PULSE, COLD SWEATS, COMA, AND DEATH. INHALATION MAY CAUSE ULCERATION OF NASAL SEPTUM, RESPIRATORY IRRITATION (COUGH, SORE THROAT), SHORTNESS OF BREATH AND WEAKNESS. SKIN OR EYE CONTACT MAY CAUSE DERMATITIS, SKIN AND EYE IRRITATION. AFTER ABSORPTION, ARSENIC MAY CAUSE MULTI-ORGAN FAILURE AS DELAYED EFFECTS. ARSENIC IS AN EXPERIMENTAL TERATOGEN (MAY CAUSE DAMAGE TO THE DEVELOPING FETUS) AND MAY CAUSE SPONTANEOUS ABORTION OR STILLBIRTH WITH EITHER ACUTE OR CHRONIC POISONING.

CHRONIC EFFECTS: ARSENIC IS A CONFIRMED HUMAN CARCINOGEN AND HAS BEEN ASSOCIATED WITH LUNG, BLADDER, SKIN, AND OTHER CANCERS IN HUMANS. CHRONIC ARSENIC POISONING MAY INCLUDE ANY OR ALL OF THE FOLLOWING: DIGESTIVE SYSTEM DISTURBANCES, LOSS OF APPETITE, CRAMPS, NAUSEA, CONSTIPATION, DIARRHEA; LIVER DAMAGE WHICH MAY RESULT IN JAUNDICE; DISTURBANCES OF THE BLOOD, KIDNEYS AND NERVOUS SYSTEM; SKIN ABNORMALITIES INCLUDING ITCHING, PIGMENTATION, AND POSSIBLE CANCEROUS CHANGES. ARSENIC HAS INDUCED DNA DAMAGE IN HUMAN CELLS.

TARGET ORGANS (NIOSH) : (FOR INORGANIC COMPOUNDS AS As): LIVER, KIDNEYS, SKIN, LUNGS, LYMPHATIC SYSTEM

KNOWN EFFECTS ON OTHER ILLNESSES : EXPECTED TO AGGRAVATE PRE-EXISTING GASTROINTESTINAL, NERVOUS SYSTEM, SKIN, LIVER & KIDNEY PROBLEMS.

| | | | | | |
|----------------------------|----------|------------|-----------|------------|-------------|
| LISTED CARCINOGEN : | NONE () | OSHA (YES) | NTP (YES) | IARC (YES) | OTHER (YES) |
|----------------------------|----------|------------|-----------|------------|-------------|

SECTION H – EMERGENCY & FIRST AID DATA

SKIN : FLUSH WITH SOAP & WATER. AVOID RUBBING INTO THE SKIN. CONTACT PHYSICIAN IMMEDIATELY.

EYES : FLUSH WITH WATER FOR AT LEAST 15 MINUTES, LIFTING UPPER AND LOWER EYELIDS. CONTACT PHYSICIAN IMMEDIATELY.

INHALATION : REMOVE TO FRESH AIR. PROVIDE OXYGEN IF NECESSARY. CONTACT PHYSICIAN IMMEDIATELY.

INGESTION : IMMEDIATELY CALL POISON CONTROL OR A PHYSICIAN. DO NOT INDUCE VOMITING UNLESS DIRECTED TO DO SO BY POISON CONTROL OR EMERGENCY MEDICAL PERSONNEL. TAKE TO HOSPITAL IMMEDIATELY.

MEDICAL NOTE: AGGRESSIVE DECONTAMINATION WITH GASTRIC LAVAGE IS RECOMMENDED. IF AN X-RAY INDICATES THE PRESENCE OF ARSENIC IN THE LOWER GI TRACT, WHOLE BOWEL IRRIGATION SHOULD BE CONSIDERED. ACTIVATED CHARCOAL MAY NOT BIND SIGNIFICANT AMOUNTS BUT IS RECOMMENDED UNTIL DEFINITIVE QUANTITATIVE DATA IS AVAILABLE. FLUID REPLETION SHOULD BEGIN AS SOON AS POSSIBLE.

SECTION I - SPILL & DISPOSAL INFORMATION

STEPS TO BE TAKEN IN CASE OF SPILL OR LEAK:

EVACUATE THE DANGER AREA. WEARING FULL PROTECTIVE EQUIPMENT (RESPIRATOR, GLOVES, GOGGLES, LAB COAT), GATHER UP CHUNKS, RODS, OR GRANULES WITH VACUUM OR UTENSILS RESERVED FOR POISONOUS SOLIDS AND PLACE IN SUITABLE CONTAINER AND SEAL. DO NOT RELEASE TO THE ENVIRONMENT. AVOID GENERATING DUST. VENTILATE THE AREA AFTER CLEANUP OF MATERIAL AND RESIDUE IS COMPLETE.

WASTE DISPOSAL INFORMATION:

SOLID WASTES SHOULD BE VITRIFIED, PLACED IN LABELED CONTAINER & BURIED IN AN EPA SUPERVISED FACILITY. ETCHING SOLUTIONS & CUTTING WASTES SHOULD BE PRECIPITATED, CEMENTED/VITRIFIED & PLACED IN METAL/PLASTIC LABELED CONTAINERS & BURIED IN EPA SUPERVISED FACILITY. PASS GAS THROUGH POTASSIUM PERMANGANATE, PRECIPITATE & TREAT AS ABOVE. WASTE MAY BE CONSIDERED HAZARDOUS DEPENDING ON LEVEL OF TOXICITY CHARACTERISTIC OF ARSENIC. SEE 40 CFR 261.24 FOR DETERMINATION.

RCRA HAZARDOUS WASTE : NO () YES (**X) **RCRA # :** (**D004)

** - IF TESTED POSITIVE AS CHARACTERISTIC OF TOXICITY FOR ARSENIC

CERCLA : NO () YES (X)

RQ (1 LB. RQ IS APPLICABLE ONLY IF THE DIAMETER OF THE PIECES OF THE SOLID METAL RELEASED IS LESS THAN 100 MICROMETERS OR 0.004 INCH. THIS PRODUCT FORM IS LARGER THAN 100 MICROMETERS AND HAS NO RQ IN ITS CURRENT FORM. IF AS HAZARDOUS WASTE CHARACTERISTIC OF ARSENIC, THEN RQ=1 LB.)

FOLLOW ALL LOCAL, STATE AND FEDERAL INFORMATION AND REGULATIONS

SECTION J - OTHER REGULATORY INFORMATION

TSCA: WE CERTIFY THAT ALL COMPONENTS OF THIS PRODUCT ARE REGISTERED UNDER THE REGULATIONS OF THE TOXIC SUBSTANCES CONTROL ACT.

SARA TITLE III, SECT. 313: LISTED (X) UNLISTED ()

DOT REGULATED: YES: (X) NO: () **RQ:** (N/A - PIECES ARE LARGER THAN 100 MICROMETERS IN DIAMETER)

IF REGULATED, PROPER SHIPPING NAME: ARSENIC

HAZARD CLASS: (6.1)

IDENTIFICATION NO.: (UN1558)

PACKING GROUP: (II)

LABEL REQUIRED: (POISON)

INLAND B/L: UN1558, ARSENIC, 6.1, PACKING GROUP II, POISON

EMERGENCY RESPONSE GUIDE NO.: (152)

SECTION K - SPECIAL PRECAUTIONS

FOR INDUSTRIAL USE ONLY

HANDLING & STORAGE INFORMATION:

PRIOR TO WORKING WITH ARSENIC, PERSONNEL SHOULD BE TRAINED IN PROPER HANDLING & STORAGE. STORE IN ORIGINAL PACKAGING IN COOL DRY AREA. WHEN HANDLING, WEAR FULL PROTECTIVE EQUIPMENT (SEE SECTION F). PLACE INTO INERT ATMOSPHERE IMMEDIATELY. IF PROCESSING INTO INORGANIC ARSENIC COMPOUNDS, FOLLOW THE OSHA STANDARD AT 29 CFR 1910.1018. DO NOT INGEST. DO NOT INHALE DUST OR ANY PROCESSING FUMES. AVOID SKIN AND EYE CONTACT.

NOTE: MAINTENANCE PERSONNEL OF PROCESSING AND EXTRACT EQUIPMENT MUST ALSO WEAR FULL PROTECTIVE EQUIPMENT (SEE SECTION F) AND OBSERVE THE REQUIREMENTS OF THE OSHA INORGANIC ARSENIC STANDARD (29 CFR 1910.1018) AS RESIDUES MAY CONTAIN ARSENIC PARTICLES AND VARYING COMPOUNDS OF ARSENIC.

OTHER PRECAUTIONS :

MINIMUM - HAVE QUARTERLY MEDICAL CHECKS INCLUDING URINE TESTS OF PERSONNEL WORKING WITH ARSENIC OR ARSENIC COMPOUNDS. DO NOT EAT, DRINK OR SMOKE IN THE WORK AREA.

IN ACCORDANCE WITH GOOD PRACTICES OF PERSONAL HYGIENE, HANDLE WITH DUE CARE AND AVOID ANY UNNECESSARY CONTACT WITH THIS PRODUCT. THIS INFORMATION IS BEING SUPPLIED TO YOU UNDER OSHA "RIGHT TO KNOW" REGULATION 29 CFR 1910.1200 AND IS OFFERED IN GOOD FAITH AS TYPICAL VALUES AND NOT AS PRODUCT SPECIFICATION. THE INFORMATION IS BELIEVED TO BE TRUE AND ACCURATE. NO WARRANTY, EXPRESSED OR IMPLIED, REGARDING THE ACCURACY OF THIS DATA, THE HAZARD CONNECTED WITH USE OF THE MATERIAL, OR THE RESULTS TO BE OBTAINED FROM THE USE THEREOF, IS MADE. UNITED MINERAL AND CHEMICAL CORPORATION AND ITS SUPPLIERS ASSUME NO RESPONSIBILITY FOR DAMAGE OR INJURY FROM THE USE OF THE PRODUCT DESCRIBED HEREIN.
UNITED MINERAL & CHEMICAL CORPORATION

APPENDIX 5

PROPOSED DEVELOPMENT PLANS

ZONING INFORMATION
 BOROUGH QUEENS
 ADDRESS: 224-01 MERRICK BLVD QUEENS NY 11413
 BLOCK: 12963
 LOT: 308
 MAP 19A
 ZONE R50, C2-3
 COMMUNITY BOARD: 413
 EXISTING OCCUPANCY CLASS D-2
 EXISTING ONE STORY EXIST USE AUTO REPAIR SHOP, USE GROUP 18
 PROPOSED USE: GENERAL RETAIL AND SERVICE
 PROPOSED ZONE USE GROUP: EC
 PROPOSED OCCUPANCY CLASS: M
 CONSTRUCTION CLASS: 1-C
 PROPOSED CONVERT TO RETAIL STORES USE GROUP 6C FROM AUTO REPAIRSHOP USE GROUP 18 ON THE FIRST FLOOR
 LOT LAND AREA = 10,012 SF SHOW TAX LOT AREA AND SHOW SURVEY 9,998 SF AND
 EXIST FIRST FLOOR AREA = 7,573 SF
 PROPOSED FIRST FLOOR AREA = 7,573 SF
 MAXIMUM ALLOWABLE FLOOR AREA RATIO --- AS PER ZR 33-121 = 2.0
 MAXIMUM ALLOWABLE FLOOR AREA = 9,998 S.F. X 2.0 = 19,996 S.F. > 7,573 SF = EXIST FIRST FLOOR AREA
 EXIST F.A.R. = 7,573 SF / 9,998 S.F. = 0.76 --- NO CHANGE
 ALLOWABLE BOTH COMMERCIAL AND COMMUNITY FACILITY F.A.R. AS PER ZR 33-121 = MAX 2.0 > 0.76 EXIST
 --- O.K.
 PROPOSED COMMERCIAL FIRST FLOOR AREA = 7,573 SF
 COMMERCIAL F.A.R. = 7,573 SF / 9,998 S.F. = 0.76 < MAX 2.0 --- O.K.
 EXIST LOT COVERAGE AREA: 7,573 SF
 EXIST LOT COVERAGE IN PERCENT: 100 (EXIST LOT COVERAGE AREA / LOT AREA) = 100 (7,573 / 9,998)
 = 100 X 0.76 = 76 --- NO CHANGE
 REQUIRED PARKING NUMBER OF CAR CALCULATION AS PER ZR. 36-21 --- GENERAL RETAIL OR SERVICE USES --- ONE CAR PER 400 SQ. FT. OF FLOOR AREA: 7,573 SQ. FT. / 400 = 18.9 CARS
 NUMBER OF REQUIREMENTS FOR SPACES AS PER ZR 36-231 --- 25 CARS > 18.9 CARS --- WAIVER
 PARKING SPACES --- O.K.
 REAR YARD: NONE REQUIRED AS PER ZR 33-301 WITHIN 100 FT OF CORNERS --- PROPERTY IS WITHIN 100.0' OF THE CORNER --- O.K.
 REAR YARD: NONE REQUIRED AS 23.0' ABOVE THE CURB LEVEL --- AS PER ZR 33-292 YARDS ALONG DISTRICT BOUNDARIES COINCIDENT WITH REAR LOT LINES OF TWO ADJOINING ZONING LOTS --- EXIST BUILDING HT 15'-0" < MAX 23.0' --- NONE REQUIRED --- O.K.
 FRONT YARD: NONE REQUIRED
 SIDE YARD: NONE REQUIRED AS PER ZR 33-25 --- NOT REQUIRED --- O.K.
 EXIST NB HEIGHT: 15'-0" ONE STORY < MAXIMUM 30'-0" TWO STORY --- O.K.

- MECHANICAL VENTILATION NOTES**
- UPON COMPLETION OF THE VENTILATION SYSTEM, A TEST WILL BE MADE IN THE PRESENCE AND UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, QUALIFIED TO CONDUCT SUCH TESTS, OR OTHER PERSON HAVING NOT LESS THAN 5 YEARS EXPERIENCE, AND QUALIFIED TO CONDUCT SUCH TESTS. THE TEST SHALL SHOW COMPLIANCE WITH THE CODE REQUIREMENTS FOR VENTILATING AND THE PROPER FUNCTIONING OF ALL OPERATING DEVICES BEFORE SYSTEM IS APPROVED. KITCHENETTES TO HAVE AROH, 12" DROP FROM CEILING.
 - THE LICENSED PROFESSIONAL ENGINEER OR OTHER QUALIFIED PERSON WHO CONDUCTS SUCH TEST SHALL FILE A CERTIFICATE AS TO WHETHER TEST SHOWS THAT THE RATE OF AIR SUPPLY AND EXHAUST COMPLES WITH THE REQUIREMENTS OF THE CODE PERTAINING TO VENTILATION. IT SHALL BE THE RESPONSIBILITY OF THE GENERAL CONTRACTOR TO HAVE A TEST MADE BY A COMPETENT PARTY AND TO PROVIDE A CERTIFICATE OF FITNESS.
 - A STATEMENT SHALL BE FILED BY THE OWNER, THAT THE SYSTEM OF VENTILATION WILL BE KEPT IN CONTINUOUS OPERATION AT ALL TIMES DURING THE NORMAL OCCUPANCY OF THE STRUCTURE AS PROVIDED IN THE APPLICABLE LAWS AS FILED BY THE LICENSED PROFESSIONAL ENGINEER OR OTHER QUALIFIED PERSON WHO CONDUCTED THE TEST OF THE SYSTEM AND NOT UNTIL THE STATEMENT OF THE OWNER IS FILED.
 - KITCHENETTES TO HAVE #18 GAUGE GALVANIZED METAL VENT DUCTS WITH ANGLE IRON SUPPORTS AND WITH ADJACENT REGISTER AND FUSE LINK DAMPERS AT EACH KITCHENETTE. ELECTRICAL EXHAUST FAN 1/20 H.P. CAPABLE OF EXHAUSTING 50 (5) CHANGES AIR PER HOUR IN METAL FAN HOUSING AT ROOF DUCTS TO BE 144 SQ. INCH MINIMUM. FAN TO RUN CONTINUOUSLY.
 - ALL INTERIOR BATHROOMS TO HAVE A MINIMUM OF 144 SQ. INCH DUCT 24 GAUGE WITH ANGLE IRON SUPPORTS (ALL METAL) OF MINIMUM WIDTH. FIREPROOF WITH 2 LAYERS OF 1/2" PLASTERBOARD TAPPED JOINTS ADJACENT REGISTER DAMPERS (APPROVED TYPE) AT EACH BATHROOM. ELECTRICAL EXHAUSTING FAN IN METAL HOUSING AT ROOF CAPABLE OF EXHAUSTING FOUR (4) AIR CHANGES PER HOUR. FAN TO RUN CONTINUOUSLY FROM 6:00 A.M. TO 12 MIDDNIGHT.
 - NO RESONANCE OF NOISE OR VIBRATION WILL BE CREATED BY VENTILATING MOTORS.

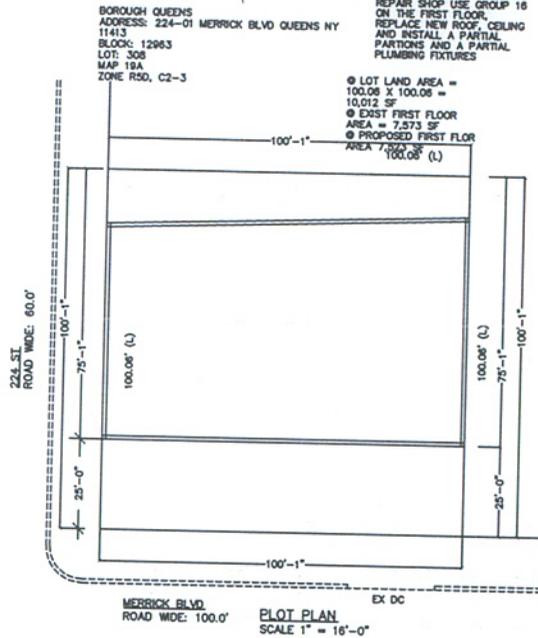


TABLE 1004.3 MAX FL AREA ALLOWANCES PER OCCUPANT

| USE OF SPACE | FL AREA (SF) |
|--|--------------|
| UNREARABLE AREA OVER FLOOR | 80 |
| BARRIAGE AND GRADE FLOOR STORAGE, STOCK, SHIPPING AREA | 300 |
| BUSINESS | 100 |

TABLE 1004.5 BUILDINGS WITH ONE EXIT

| OCCUPANCY | MAX HEIGHT ABOVE GRADE PLANE | MAX OCCUPANTS OR GROUNDING (NET) PER FLOOR AND TRAVEL DISTANCE |
|------------------|------------------------------|--|
| A, B, E, F, H, U | 1 STORY | 50 OCCUPANTS AND 75 FT TRAVEL DISTANCE |
| B, F, H, S | 2 STORY | 30 OCCUPANTS AND 75 FT TRAVEL DISTANCE |

TABLE 1004.1 SPACES WITH ONE MEANS EGRESS

| OCCUPANTS | MAX OCCUPANTS LOAD |
|---------------|--------------------|
| A, B, E, H, U | 74 |
| F | 90 |

BC 1014.2.1 TWO EXITS OR EXIT ACCESS DOORWAYS
 EXIT ACCESS DOORWAYS MUST BE 1/2 OF THE LENGTH OF MAX DIAGONAL DIMENSION OF THE BUILDING OR AREA TO BE SERVED MEASURED IN A STRAIGHT LINE BETWEEN EXIT DOORS OR EXIT ACCESS DOORWAYS

TABLE 1000.1 EXITS WITH PER OCCUPANTS SERVED

| OCCUPANTS | STAIRWAYS (DOORS PER OCCUPANTS) | OTHER COMPONENTS (DOORS PER OCCUPANTS) |
|------------------------------|---------------------------------|--|
| OTHER THAN LIST SINGLE EXITS | 0.3 | 0.2 |
| HAZARDOUS H-1, H-2, H-3, H-4 | 0.4 | 0.2 |

TABLE 1001.1 EXIT ACCESS TRAVEL DISTANCE

| OCCUPANTS | STRAIGHT SPRINKLER SYSTEM (FEET) | WITH SPRINKLER SYSTEM (FEET) |
|------------------------|----------------------------------|------------------------------|
| E, F-1, I-1, M, R, S-1 | 180 | 300 |
| B | 300 | 300 |

- GENERAL NOTES**
- CONTRACTOR TO CHECK AND VERIFY ALL MEASUREMENTS AND DIMENSIONS AND ACTUAL CONDITIONS AT SITE AND BE RESPONSIBLE FOR SAME. CONTRACTOR TO OBTAIN ALL PERMITS AND FEES TO START AND COMPLETE ALL WORK UPON COMPLETION OF JOB CONTRACTOR IS TO SUPPLY OWNER WITH A CERTIFICATE OF OCCUPANCY.
 - A STATEMENT SHALL BE FILED BY THE OWNER, THAT THE SYSTEM OF VENTILATION WILL BE KEPT IN CONTINUOUS OPERATION AT ALL TIMES DURING THE NORMAL OCCUPANCY OF THE STRUCTURE AS PROVIDED IN THE APPLICATION LAWS AS FILED BY THE LICENSED PROFESSIONAL ENGINEER OR OTHER QUALIFIED PERSON WHO CONDUCTED THE TEST OF THE SYSTEM AND NOT UNTIL THE STATEMENT OF THE OWNER IS FILED.
 - ALL PLUMBING WORK SHALL BE IN ACCORDANCE WITH REQUIREMENTS OF TITLE 27 (CHAPTER 28) ARTICLE 18 AND REFERENCE STANDARDS IS-14 OF THE NYC BUILDING CODE.
 - ALL WATER SUPPLIES SHALL BE OVER THE FAN OR SHALL BE PROVIDED WITH APPROVED VACUUM BREAKER FOR WATER CLOSET FLUSH VALVES, HOSE BIBBS, ETC.
 - ALL NOTES, DIMENSIONS, DETAILS AND JOB CONDITIONS ARE TO BE CHECKED AND VERIFIED. ANY DISCREPANCY SHALL BE BROUGHT TO THE ATTENTION OF THE ARCHITECT/ENGINEER PRIOR TO COMMENCEMENT OF WORK.
 - ALL REQUIRED AND NECESSARY PERMITS SHALL BE SECURED FROM ALL MUNICIPAL AGENCIES HAVING JURISDICTION AT THE COST AND EXPENSE OF THE CONTRACTOR AND PRIOR TO START OF WORK AND HE SHALL OBTAIN APPROVAL OF ALL COMPLETED WORK AS REQUIRED BY NEW YORK CITY ADMINISTRATIVE CODE AND ALL REQUIRED AGENCIES.
 - EACH CONTRACTOR WILL BE HELD RESPONSIBLE FOR HIS WORK. ALL GENERAL CONTRACTOR SHALL BE HELD RESPONSIBLE FOR THE CONDITIONS AT THE BUILDINGS AND WILL BE RESPONSIBLE FOR THE JOINING OF WORK OF ALL TRADES.
 - ALL MATERIALS, ASSEMBLIES AND METHODS OF CONSTRUCTION NOT LISTED AS CONTROLLED INSPECTIONS SHALL BE SUBJECT TO SEMI-DAILY INSPECTION BY THE PERSON SUPERINTENDING THE CONSTRUCTION. SIGNED COPIES OF ALL TEST AND INSPECTION REPORTS SHALL BE FILED THROUGH THE ARCHITECT/ENGINEER WITH THE DEPARTMENT.
 - THE CONTRACTOR SHALL FAMILIARIZE HIMSELF WITH THE REQUIREMENTS OF ARTICLE 19 "SAFETY OF PUBLIC AND PROPERTY DURING CONSTRUCTION OPERATIONS" AND SHALL BE HELD RESPONSIBLE FOR THE SAFE MAINTENANCE AS PRESCRIBED THEREIN UNTIL COMPLETION OF THE WORK.
 - CONTRACTOR SHALL PROVIDE ALL SHORING, BRACING, BARRICADES, TEMPORARY FENCES, PARTITIONS AND EXCAVATION, ETC. TO ACCOMPLISH ALL OF THE WORK IN AN APPROVED MANNER, AS PER SECTION 27-102.2 (C28-1906.2).
 - NO DRAWINGS TO BE SCALED, DIMENSIONS ARE TO BE USED.
 - THE CONTRACTOR OR PERSON WHO SUPERVISED OR SUPERINTENDED THE WORK IS REQUIRED TO BE PRESENT AT FINAL INSPECTION WITH BUILDING DEPARTMENT INSPECTOR, SECTION 27-210 (C28-120.6).
 - ALL CONSTRUCTION SHALL BE IN ACCORDANCE WITH THE RULES AND REGULATIONS OF THE NEW YORK CITY BUILDING CODE.
 - ALL ELECTRICAL WORK TO COMPLY WITH THE N.Y.C. E.C.
 - THE CONTRACTOR SHALL UPON COMPLETION OF THE WORK SEE THAT THE JOB IS BROOM SWEPT.
 - THE ARCHITECT/ENGINEER HAS NOT BEEN RETAINED TO SUPERVISE ANY CONSTRUCTION OR INSTALLATION FOR ANY EQUIPMENT.

TABLE 601 FIVE RESISTANCE RATINGS

| BUILDING ELEMENT | TYPE | | | | | PROPOSED FIVE RESISTANCE RATING |
|---|---------------|---|---|---|---|---------------------------------|
| | A | B | C | D | E | |
| STRUCTURAL FRAME AND COLUMN GENERAL TRUSSES | 3 | 2 | 1 | 0 | 0 | 3 |
| BEARING WALLS EXTERIOR INTERIOR | 3 | 2 | 1 | 0 | 0 | 3 |
| NON BEARING WALLS EXTERIOR | SEE TABLE 602 | | | | | |
| NONBEARING WALLS AND PARTITIONS INTERIOR | 0 | 0 | 0 | 0 | 0 | 0 |
| FLOOR CONSTRUCTION INC BEAMS AND JOISTS | 2 | 2 | 1 | 0 | 0 | 2 |
| ROOF CONSTRUCTION INC BEAMS AND JOISTS | 1 | 1 | 1 | 0 | 0 | 1 |

TABLE 602 FIVE RESISTANCE RATING -NON BEARING WALLS EXTERIOR

| FIRE SEPARATION DISTANCE (FT) | TYPE OF CONSTRUCTION | OCCUPANCY GROUP H | OCCUPANCY GROUP F-1, M, S-1 | OCCUPANCY GROUP A, B, E, F-1, F-2, L, R, T, U | OCCUPANCY GROUP I | PROPOSED FIVE RESISTANCE RATING |
|-------------------------------|----------------------|-------------------|-----------------------------|---|-------------------|---------------------------------|
| < 8 | ALL | 3 | 2 | 2 | 2 | 3 |
| 8 TO < 10 | IA OTHER | 3 | 2 | 1 | 1 | 2 |
| 10 TO < 20 | IA, IB OR OTHER | 2 | 1 | 1 | 1 | 2 |
| 20 TO < 30 | ALL | 0 | 0 | 0 | 0 | 0 |

TABLE 704.4 FIVE WALL FIVE RESISTANCE RATING

| GROUP | FIVE RESISTANCE RATING (R) | GROUP | FIVE RESISTANCE RATING (R) |
|---------------------------|----------------------------|-------|----------------------------|
| A, B, E, H-1, L, R-1, U-1 | 3 | | |
| F-1, H-2, H-3, M, S-1 | 3 | M | 3 |
| H-1, H-2 | 4 | | |
| F-2, S-2, R-2, R-4 | 2 | | |



NOTE:
 THIS PLAN IS APPROVED ONLY FOR WORK INDICATED ON THE APPLICATION SPECIFICATION SHEET. ALL OTHER MATTERS SHOWN ARE NOT TO BE RELEI UPON, OR TO BE CONSIDERED AS EITHER BEING APPROVED OR IN ACCORDANCE WITH APPLICABLE CODES.

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 108-10 METROPOLITAN AVE
 QUEENS NY 11375
 TEL: 718-266-1800

APPROVALS

DOB
 JOB NO #

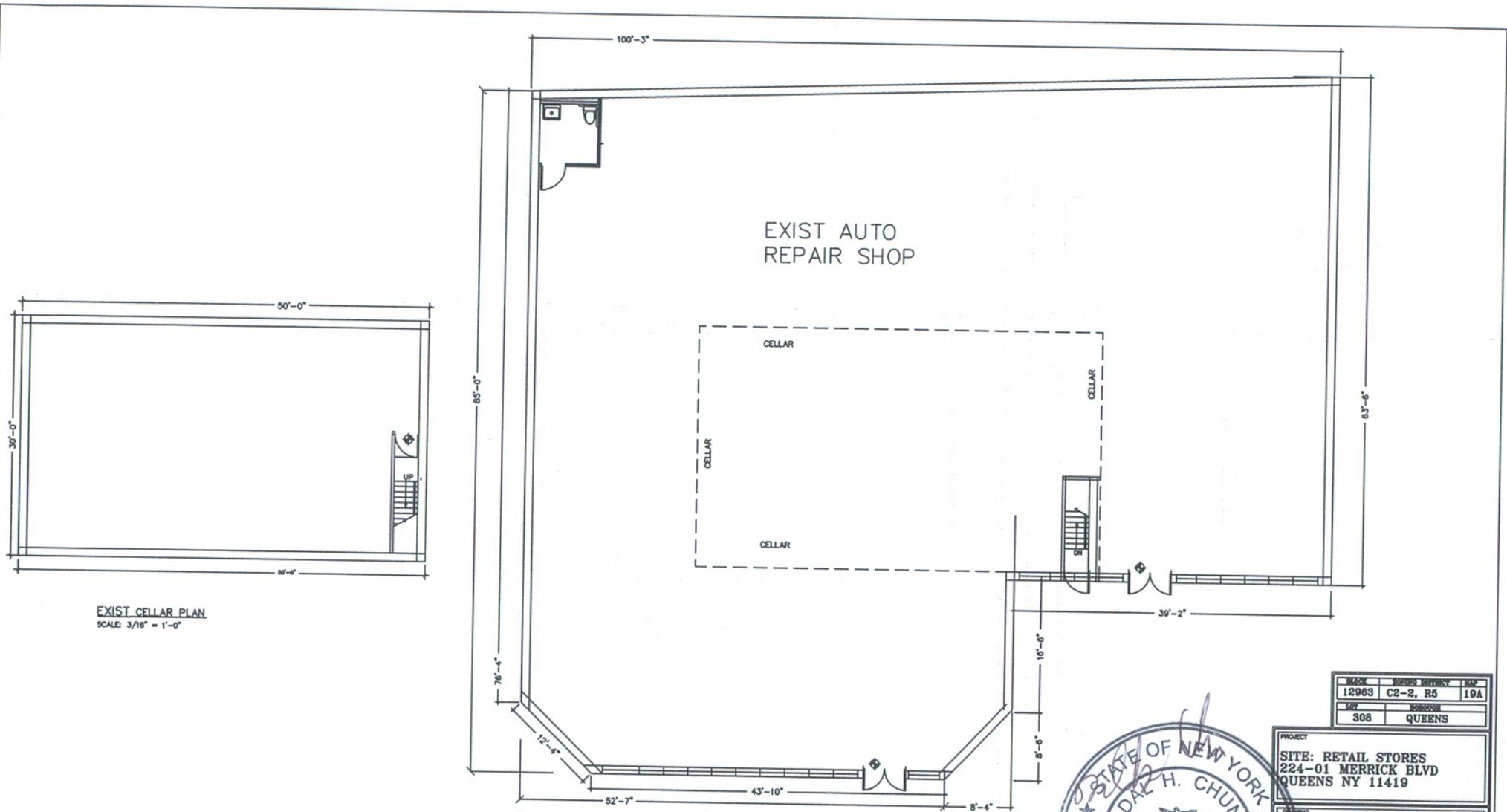
CONTROLLED INSPECTIONS

SPECIAL INSPECTION ITEMS

| NO | SPECIAL INSPECTIONS | CODE SECTION |
|-----|------------------------|--------------|
| 1 | Steel Deck Connections | BC 1004.1 |
| 2 | Steel Deck Connections | BC 1004.1 |
| 3 | Steel Deck Connections | BC 1004.1 |
| 4 | Steel Deck Connections | BC 1004.1 |
| 5 | Steel Deck Connections | BC 1004.1 |
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| 98 | Steel Deck Connections | BC 1004.1 |
| 99 | Steel Deck Connections | BC 1004.1 |
| 100 | Steel Deck Connections | BC 1004.1 |

PROGRESS INSPECTION ITEMS

| NO | SPECIAL INSPECTIONS | CODE SECTION |
|----|------------------------|--------------|
| 1 | Steel Deck Connections | BC 1004.1 |
| 2 | Steel Deck Connections | BC 1004.1 |
| 3 | Steel Deck Connections | BC 1004.1 |
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| 94 | Steel Deck Connections | BC 1004.1 |
| 95 | Steel Deck Connections | BC 1004.1 |
| 96 | Steel Deck Connections | BC 1004. |



EXIST CELLAR PLAN
SCALE 3/16" = 1'-0"

EXIST - FIRST FLOOR PLAN
SCALE 3/16" = 1'-0"

NOTE:
THIS PLAN IS APPROVED ONLY FOR THE WORK SHOWN ON THE APPLICATION AND SPECIFICATIONS. THE ARCHITECT'S MATTERS SHOWN ARE NOT TO BE RELIED UPON, NOR SHALL BE CONSIDERED AS EITHER BEING APPROVED OR IN ACCORDANCE WITH APPLICABLE CODES.



APPROVALS: 080675
DOB
JOB NO #

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CLIENT
SANKHO ARAMBAYEV
102-10 METROPOLITAN AVE
QUEENS NY 11375
TEL: 718-265-1200

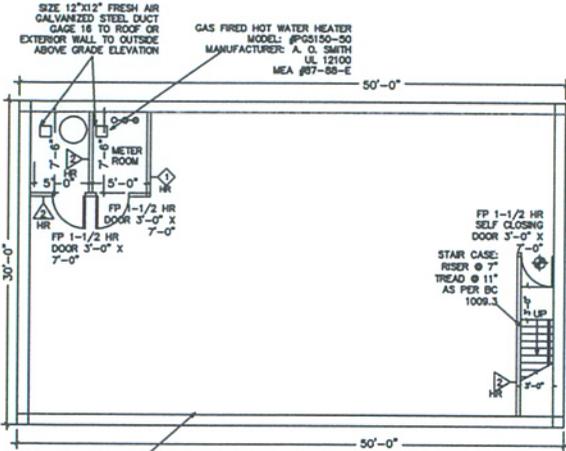
| | | | |
|-------|----------|----------|-----|
| BLK | ZONE | DISTRICT | MAP |
| 12963 | C2-2, R5 | | 19A |
| LAT | BOROUGH | | |
| 308 | QUEENS | | |

PROJECT
SITE: RETAIL STORES
224-01 MERRICK BLVD
QUEENS NY 11419

DRAWING
EX CEEL, FIRST FLOOR
ARCHITECT FLOOR PLAN

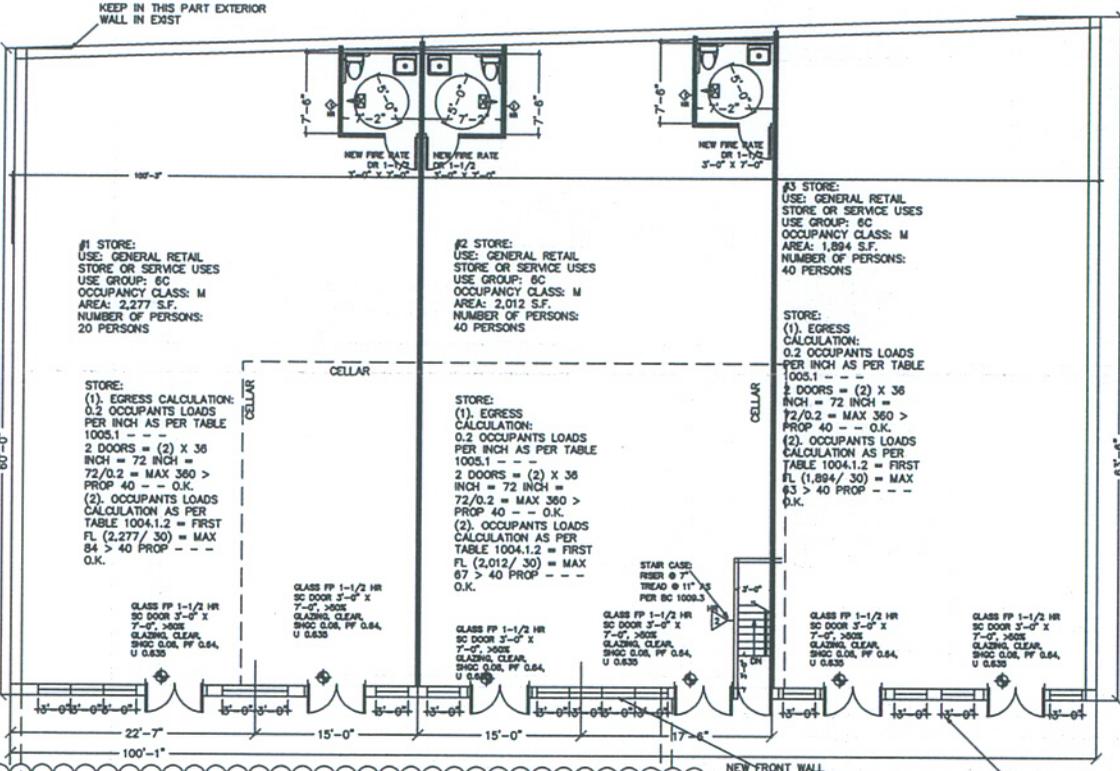
DATE: 06-15-12
PROJECT NO.: B-494-C1
DRAWING BY: DC
CHK BY: DC
DRAWING NO.:
A-001.00
2 of 9

NOTE: E-DESIGNATION DISTRICT NOISE E - PROVIDE WITH A MINIMUM 35DB(A) OF WINDOW WALL ATTENUATION TO MAINTAIN AN INTERIOR NOISE LEVEL OF 45DB(A) OR LESS, WITH WINDOW CLOSED, AND SHALL PROVIDE AN ALTERNATE MEANS OF VENTILATION



PROPOSED CELLAR PLAN
SCALE: 3/16" = 1'-0"

KEEP IN ALL EXTERIOR WALL IN EXIST ON THE CELLAR

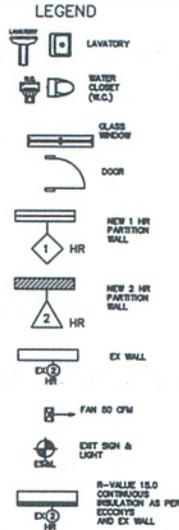


PROPOSED FIRST FLOOR PLAN
SCALE: 3/16" = 1'-0"

E-DESIGNATION DISTRICT NOISE E - PROVIDE WITH A MINIMUM 35DB(A) OF WINDOW WALL ATTENUATION TO MAINTAIN AN INTERIOR NOISE LEVEL OF 45DB(A) OR LESS, WITH WINDOW CLOSED, GLASS WINDOW WITH METAL FRAME WITH THERMAL BREAK DOUBLE PANE GLASS, CLEAR SING. SING. DUAL, PF 0.84, U-FACTOR 0.633.

KEEP IN THIS PART WALL IN EXIST

REMOVAL IN THIS PART EXTERIOR WALL



| BOOK | SECTION NUMBER | MAP |
|-------|----------------|-----|
| 12963 | C2-2, R5 | 19A |
| TWP | SUBZONE | |
| 308 | QUEENS | |

PROJECT
SITE: RETAIL STORES
224-01 MERRICK BLVD
QUEENS NY 11419

DRAWING
PROP CEL, FIRST FLOOR
ARCHITECT FLOOR PLAN

CONSULTING ENGINEER
DAL H CHUN PE
DAL H CHUN ENGINEER PC
157 LEXLEW ST #8C
NEW YORK NY 10005
TEL: 212-254-6801

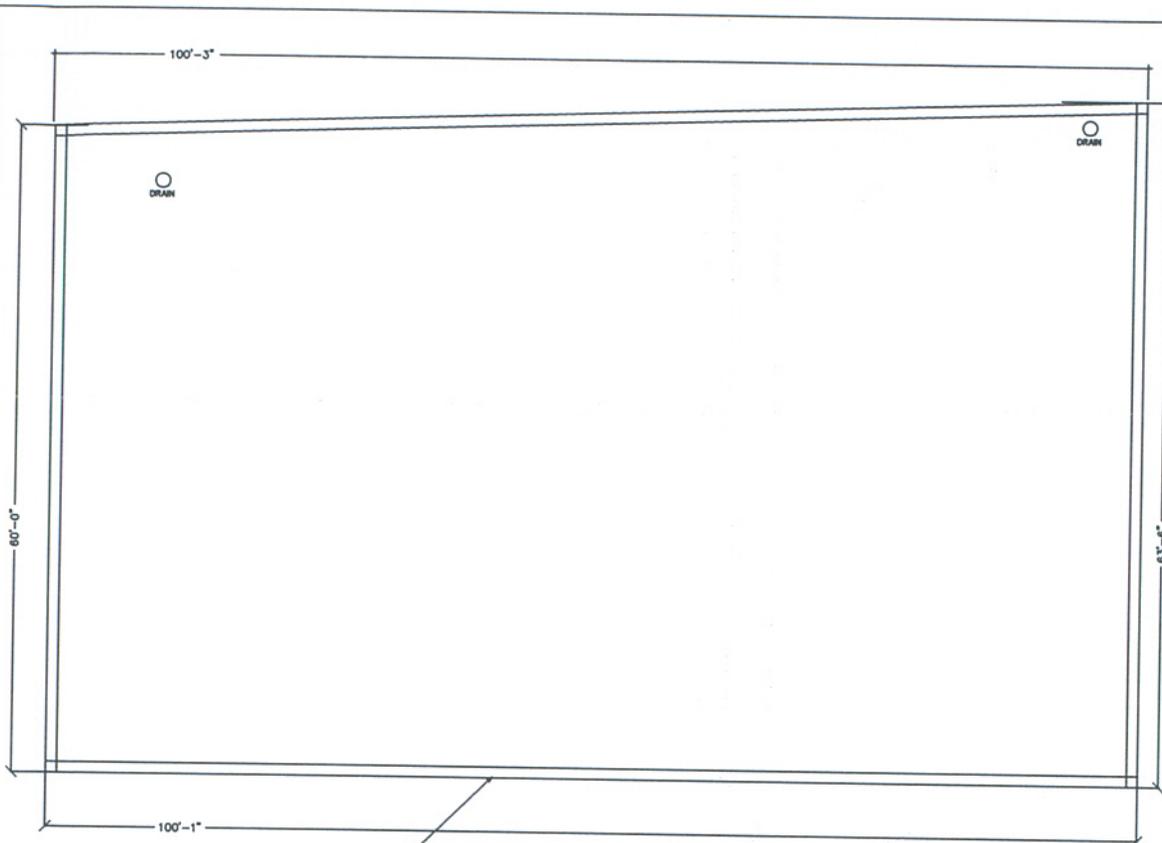
CLIENT
SIBERGO ARAMBAYE
108-10 METROPOLITAN AVE
QUEENS NY 11378
TEL: 718-362-1900



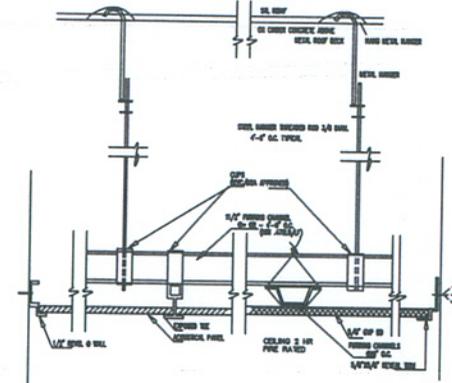
APPROVALS

DOB
JOB NO #

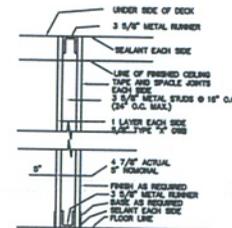
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| DATE | 02-22-12 |
| PROJECT NO. | B-454-01 |
| DRAWING BY | DC |
| CHK BY | DC |
| DRAWING TITLE | A-002.00 |
| | 3 of 9 |



REMOVAL AND REPLACE ROOF MATERIAL



C-3 DETAIL FOR SUPPORTING CEILING (TYP.) AND CEILING 2 HR FIRE RATED
N.T.S.



PARTITION 1
N.T.S.

REFERENCE: FIRE RESISTANCE DESIGN MANUAL
THICKNESS 4 7/8"
FIRE TEST: UL R1319, 948K40088
SOUND TEST: USD-68709, 7-18-99
S.T.C. RATING: 50-59
FIRE RATING: 1 HOUR
LISTING HEIGHT: 17'-2"

| | | |
|-------|----------|-----|
| BLK | BOARD | MAP |
| 12963 | C2-2, R5 | 19A |
| 308 | QUEENS | |

PROJECT
SITE: RETAIL STORES
224-01 MERRICK BLVD
QUEENS NY 11419

DRAWING
ROOF
ARCHITECT FLOOR PLAN

NOTE: THIS PLAN IS APPROVED ONLY FOR WORK INDICATED ON THE APPLICATION SPECIFICATION SHEET. ALL OTHER WORKERS SHOWS ARE NOT TO BE RELIED UPON OR TO BE CONSIDERED AS ENTERING INTO APPROVAL OR IN CONFORMANCE WITH APPLICABLE CODES.

APPROVALS
STATE OF NEW YORK
DAL H. CHUN
080675
REGISTERED PROFESSIONAL ENGINEER

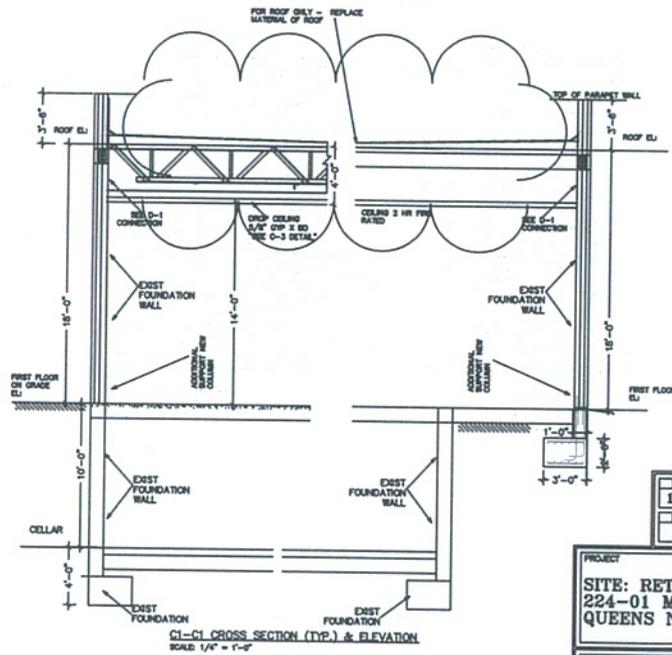
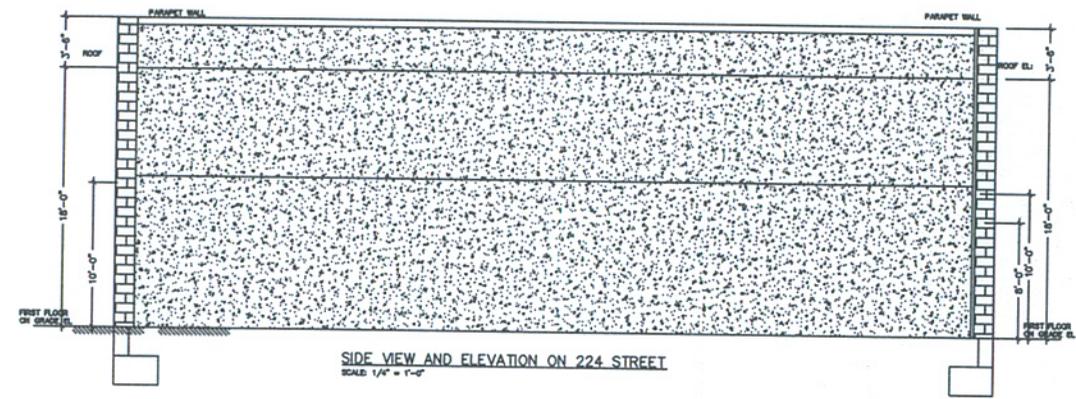
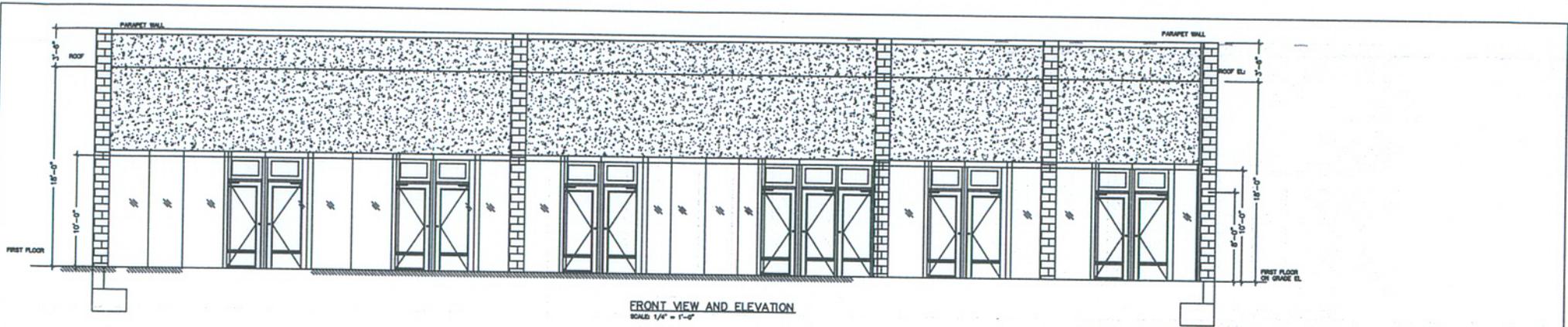
CONSULTING ENGINEER
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QUEENS NY 11375
TEL: 718-266-1200

DOB
JOB NO #

| | |
|-------------|----------|
| DATE | 02-22-02 |
| PROJECT NO. | B-494-CJ |
| DRAWING BY | DC |
| CHK BY | DC |
| DRAWING NO. | A-003.00 |

4 of 9



| | | |
|-------|----------------|-----|
| BLOCK | BOARD DISTRICT | MAP |
| 12963 | C2-2, R5 | 19A |
| LVT | RECORD | |
| 308 | QUEENS | |

PROJECT
SITE: RETAIL STORES
224-01 MERRICK BLVD
QUEENS NY 11419

DRAWING
FRONT AND SIDE VIEW
ELEVATION PLAN

NOTE:
 THIS PLAN IS APPROVED ONLY FOR WORK INDICATED ON THE APPLICATION SPECIFICATION SHEET. ALL OTHER MATTERS SHOWN ARE NOT TO BE RELIED UPON, OR TO BE CONSIDERED AS EITHER BEING APPROVED OR IN ACCORDANCE WITH APPLICABLE CODES.

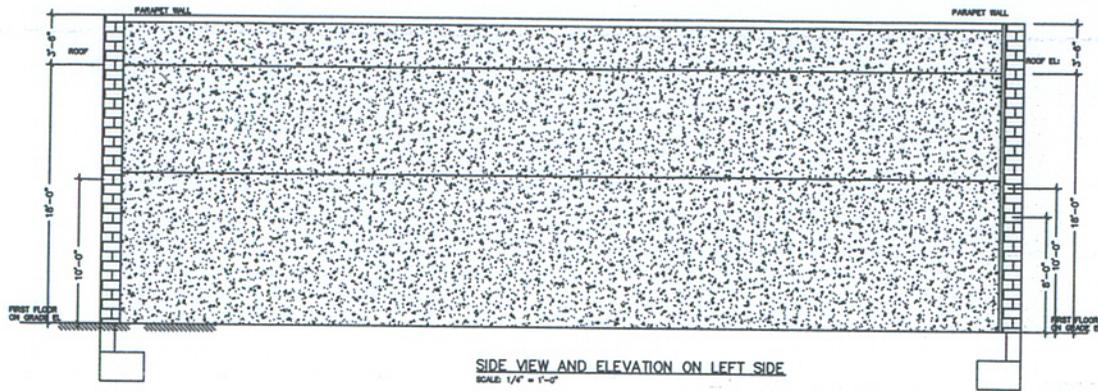
CONSULTING ENGINEER
 DAL H CHUN PE
 DAL H CHUN ENGINEER PC
 187 LUDLOW ST #3C
 NEW YORK NY 10002
 TEL: 212-264-6801

CLIENT
 SIKKHO ARAMBAYE
 102-10 METROPOLITAN AVE
 QUEENS NY 11375
 TEL: 718-268-1200

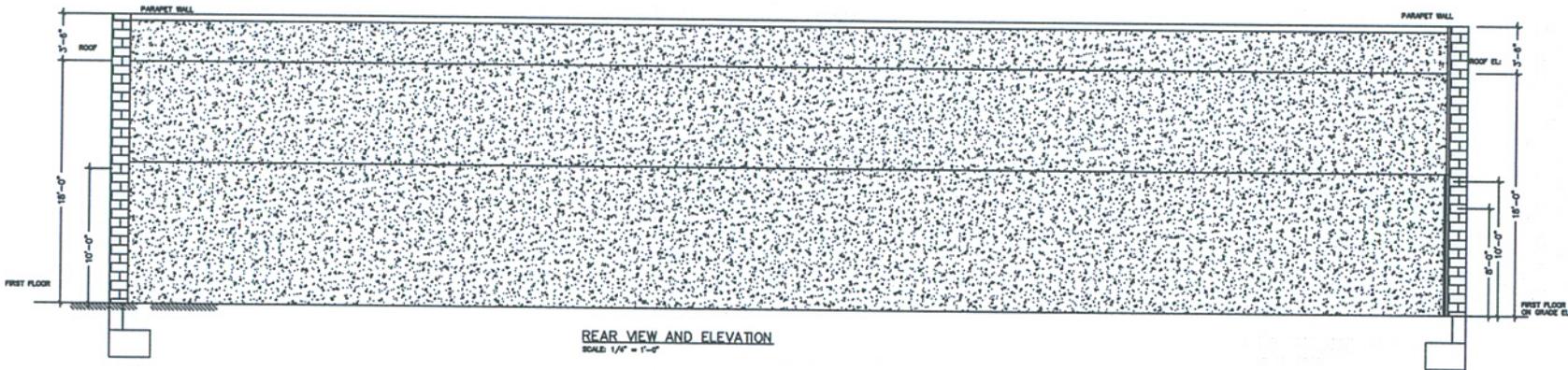
APPROVALS

DOB
 JOB NO #

DATE 06-15-12
PROJECT NO. B-454-C1
DRAWING BY DC
CHK BY DC
DRAWING NO.
A-004.00
 5 of 9



SIDE VIEW AND ELEVATION ON LEFT SIDE
SCALE: 1/4" = 1'-0"



REAR VIEW AND ELEVATION
SCALE: 1/4" = 1'-0"

| | | |
|-------|----------------|-----|
| BLOCK | BLOCK DISTRICT | MAP |
| 12963 | C2-2, R5 | 19A |
| LOT | ADDRESS | |
| 308 | QUEENS | |

PROJECT
SITE: RETAIL STORES
224-01 MERRICK BLVD
QUEENS NY 11419

DRAWING
FRONT AND SIDE VIEW
ELEVATION PLAN



NOTE:
THIS PLAN IS APPROVED ONLY FOR WORK INDICATED ON THE
APPLICATION SPECIFICATION SHEET. ALL OTHER MATTERS
SHOWN, AND NOT TO BE REPRODUCED OR THE CONTRARY,
AS EITHER BEING APPROVED OR IN ACCORDANCE WITH
APPLICABLE CODES.

APPROVALS 080675

CONSULTING ENGINEER
DAL H CHUN PE
DAL H CHUN ENGINEER PC
187 LUDLOW ST #2C
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SANGHO ARANDRAYEV
108-10 METROPOLITAN AVE
QUEENS NY 11376
TEL: 718-268-1500

DOB
JOB NO #

DATE: 06-15-12
PROJECT NO.: B-494-0
DRAWING BY: DC
CHK BY: DC

DRAWING NO.:
A-005.00
5 of 9



(D) FORWARD REACH LIMIT



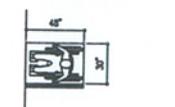
(E) FORWARD REACH LIMIT



(A) MAX FORWARD REACH OVER AN OBSTRUCTION



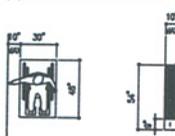
(B) FORWARD REACH LIMIT



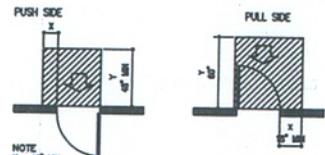
(C1) SIDE REACH CLEAR FLOOR SPACE: PARALLEL APPROACH



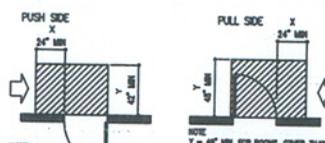
(C2) SIDE REACH HIGH AND LOW REACH LIMITS



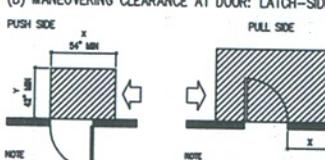
(C3) SIDE REACH MAX REACH OVER OBSTRUCTION



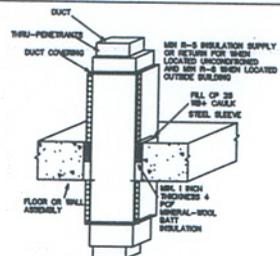
(A) MANEUVERING CLEARANCE AT DOOR: FRONT APPROACH



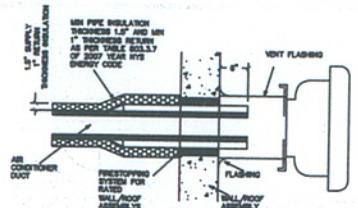
(B) MANEUVERING CLEARANCE AT DOOR: LATCH-SIDE APPROACH



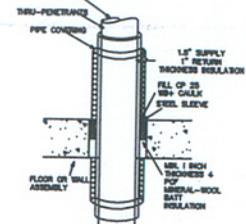
(C) MANEUVERING CLEARANCE AT DOOR: HINGE-SIDE APPROACH



DUCT PENETRATION AND FIREPROOFING 1 HOUR TO 2 HOUR RATED LISTED FIRE RESISTANCE MANUFACTURERS AND TECHNOLOGIES, LTD. APARTADO NORRIS, ESTAFETA EL GORDO, REPUBLICA OF PANAMA FOR 3M FIRE PROTECTION PRODUCTS U.L. 725 UEA 25-65-M



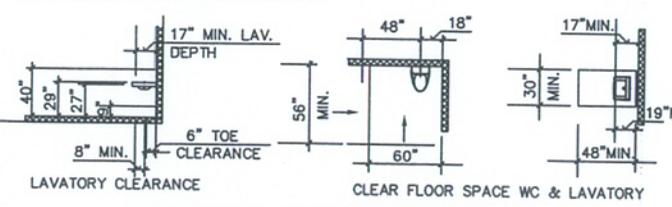
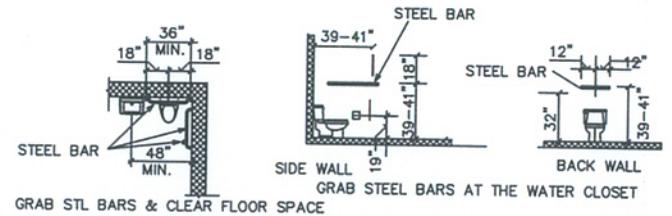
DUCT PENETRATION AND FIREPROOFING 1 HOUR TO 2 HOUR RATED LISTED FIRE RESISTANCE MANUFACTURERS AND TECHNOLOGIES, LTD. APARTADO NORRIS, ESTAFETA EL GORDO, REPUBLICA OF PANAMA FOR 3M FIRE PROTECTION PRODUCTS U.L. 725 UEA 25-65-M



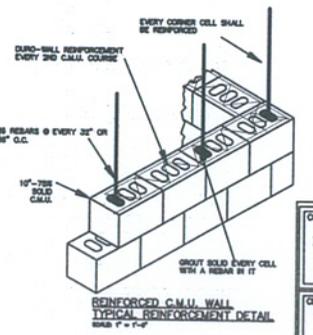
DUCT PENETRATION AND FIREPROOFING 1 HOUR TO 2 HOUR RATED LISTED FIRE RESISTANCE MANUFACTURERS AND TECHNOLOGIES, LTD. APARTADO NORRIS, ESTAFETA EL GORDO, REPUBLICA OF PANAMA FOR 3M FIRE PROTECTION PRODUCTS U.L. 725 UEA 25-65-M

2 PROTRUDING OBJECTS NOT TO SCALE

1 DOOR SWING REQUIREMENTS NOT TO SCALE



HANDICAPPED ACCESSIBLE BATHROOM DETAILS N.T.S.



REINFORCED C.M.U. WALL TYPICAL REINFORCEMENT DETAIL



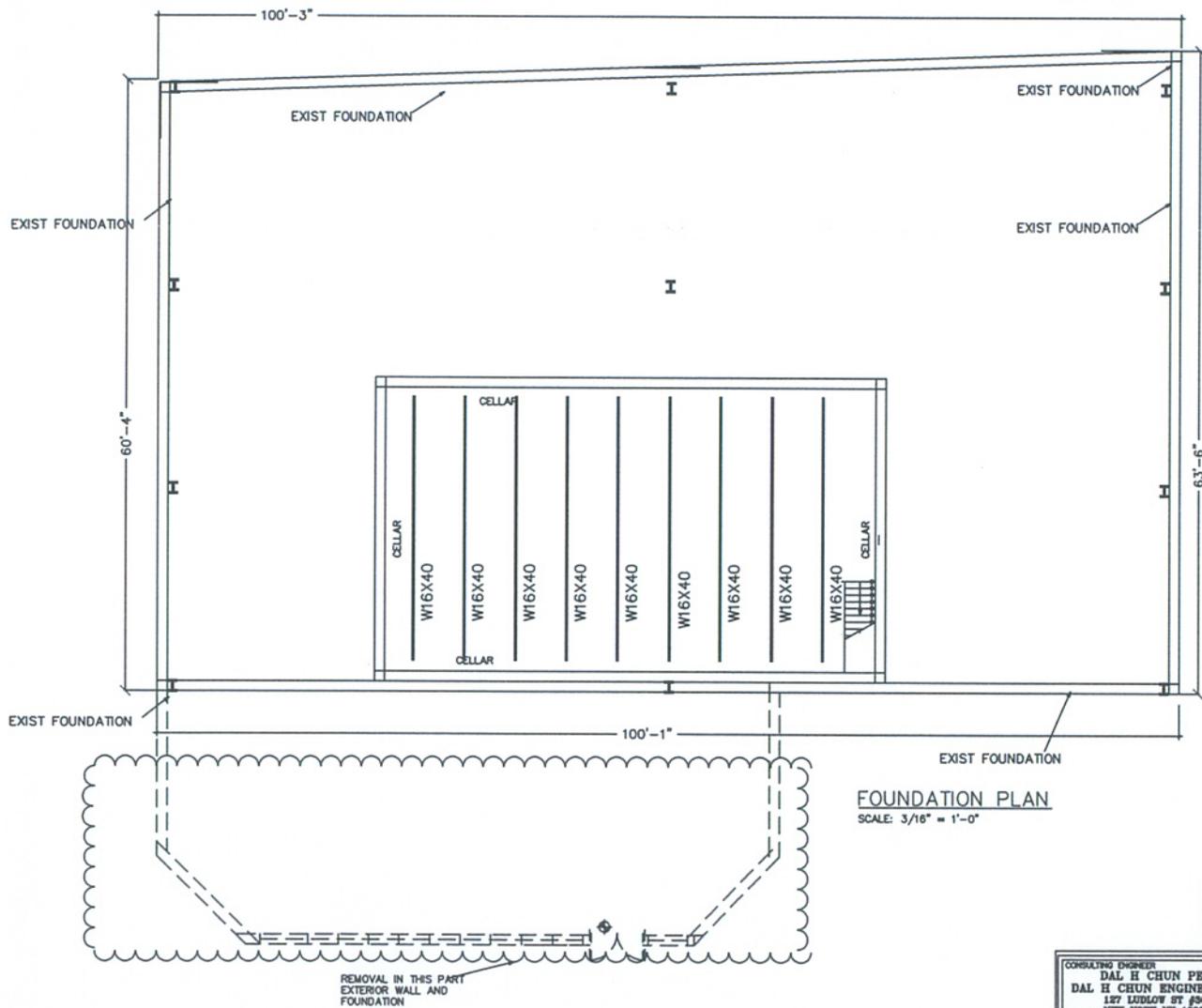
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|-------------|----------|
| BLK | 308 |
| DATE | 02-22-12 |
| PROJECT NO. | B-454-C1 |
| DRAWING BY | DC |
| CHEK BY | DC |
| DRAWING NO. | A-006.00 |
| | 6 of 9 |

PROJECT: RETAIL STORES
204-01 MERRICK BLVD
QUEENS NY 11419

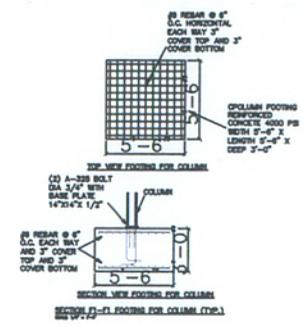
H/C ACCESS
DETAIL TYP.

NOTE:
THIS PLAN IS APPROVED ONLY FOR WORK INDICATED ON THE APPLICATION SPECIFICATION SHEET. ALL OTHER MATTERS SHOWN ARE NOT TO BE RELIED UPON, OR TO BE CONSIDERED AS EITHER BEING APPROVED OR IN ACCORDANCE WITH APPLICABLE CODES.

APPROVALS
CONSULTING ENGINEER
DAL H CHUN PE
DAL H CHUN ENGINEER PC
187 LAVELLO ST #3C
NEW YORK NY 10028
TEL: 212-254-0901
CLIENT
SIBIRIO ARANBAYE
108-10 METROPOLITAN AVE
QUEENS NY 11375
TEL: 718-266-1200
DOB
JOB NO #



FOUNDATION PLAN
SCALE: 3/16" = 1'-0"



| BLOCK | BOOKS | REVISION | MAP |
|-------|-----------|----------|-----|
| 12963 | C2-2, R5 | | 19A |
| LAW | NONPOLICE | | |
| 308 | QUEENS | | |

PROJECT
SITE: RETAIL STORES
224-01 MERRICK BLVD
QUEENS NY 11419

DRAWING
FIRST FLOOR
FOUNDATION PLAN

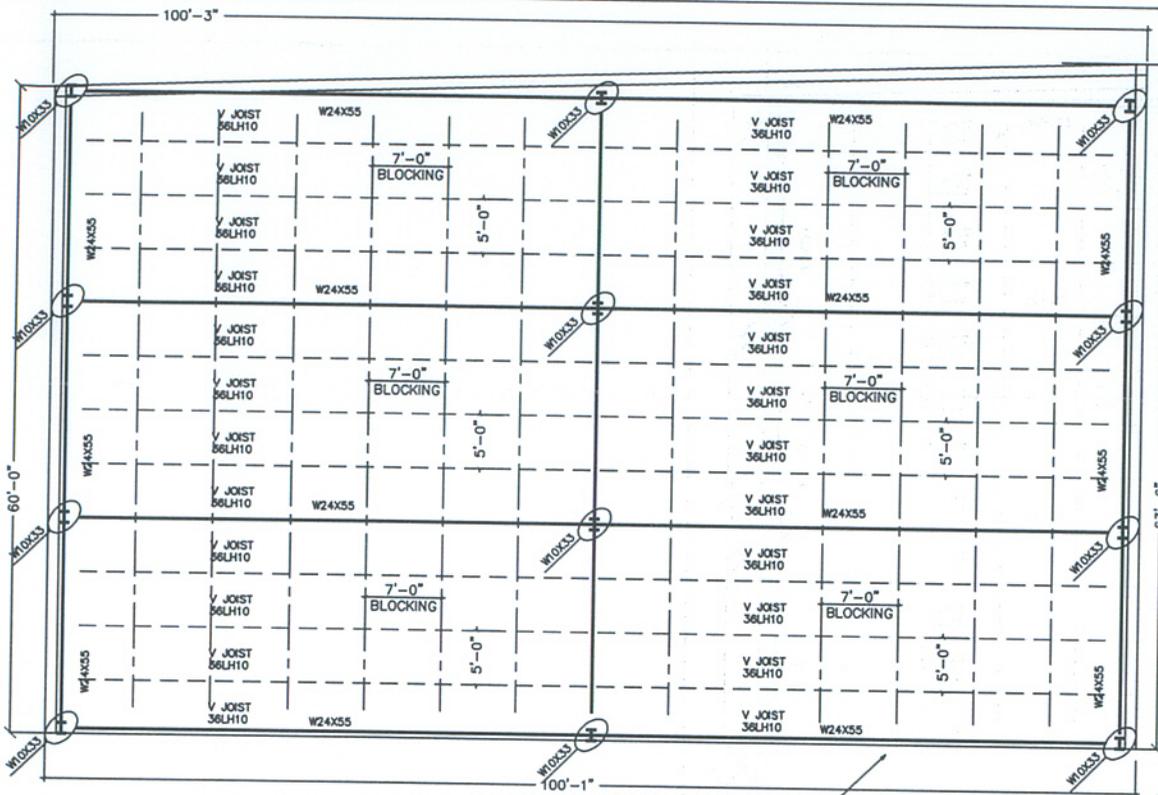


CONSULTING ENGINEER
DAL H CHUN PE
DAL H CHUN ENGINEER INC
187 LUDLOW ST #2C
NEW YORK NY 10008
TEL: 212-254-8801

CLIENT
SINGHO ARAMBAYE
108-10 METROPOLITAN AVE
QUEENS NY 11378
TEL: 718-268-1200

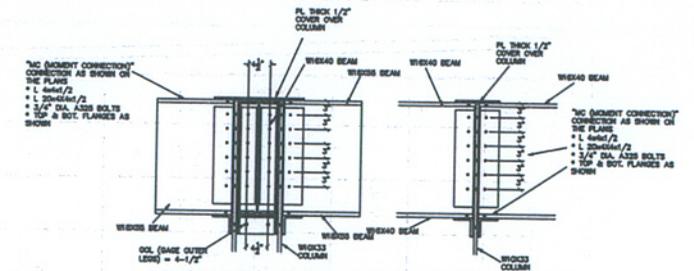
APPROVALS
080675
DOB
JOB NO #

| DATE | 07-22-02 |
|-------------|-----------|
| PROJECT NO. | B-454-0 |
| DRAWING BY | DC |
| CHK BY | DC |
| DRAWING NO. | FO-001.00 |
| | 8 of 9 |

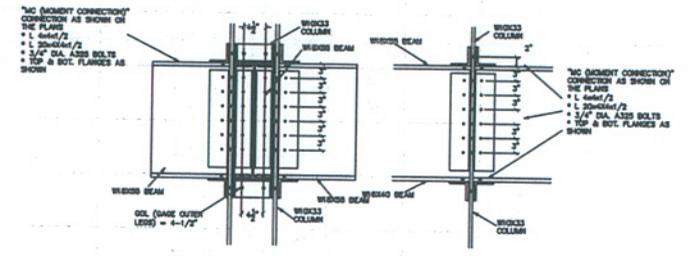


STRUCTURAL FRAMING PLAN BETWEEN
1ST FL. & ROOF FL.
SCALE: 3/16" = 1'-0"

REMOVAL AND REPLACE
ROOF MATERIAL



D-1-1 DETAIL: BEAM SHEAR CONNECTION TO COLUMN
N.T.S.



D-1-2 DETAIL: BEAM SHEAR CONNECTION TO COLUMN
N.T.S.



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APPROVALS

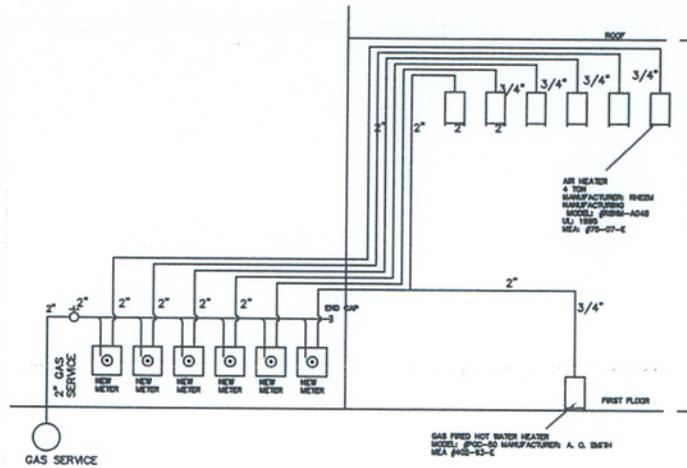
DOB
JOB NO #

| | | |
|-------|----------|------|
| BACK | REVISION | DATE |
| 12963 | C2-2, R5 | 19A |
| LOT | ADDRESS | |
| 308 | QUEENS | |

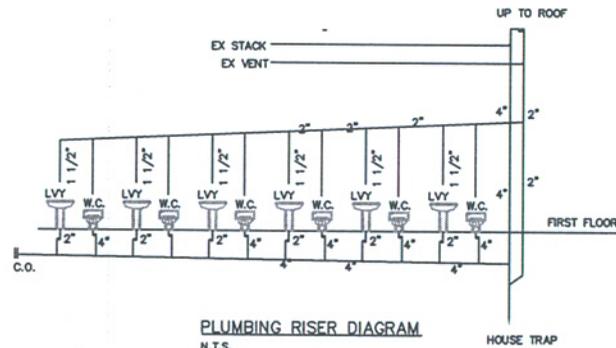
PROJECT
SITE: RETAIL STORES
224-01 MERRICK BLVD
QUEENS NY 11419

DRAWING
STRUCTURAL
FIRST FLOOR PLAN

| | |
|-------------|----------|
| DATE | 02-22-12 |
| PROJECT NO. | B-454-C3 |
| DRAWING BY | DC |
| CHK BY | DC |
| DRAWING NO. | S-001.00 |
| | 9 of 9 |



GAS RISER DIAGRAM
N.T.S.



PLUMBING RISER DIAGRAM
N.T.S.



NOTE:
THIS PLAN IS APPROVED FOR THE WORK INDICATED ON THE APPLICATION SPECIFICALLY SET FORTH. OTHER WORKERS SHOWN ARE NOT TO BE HELD RESPONSIBLE TO BE APPROVED AS EITHER BEING APPROVED OR IN ACCORDANCE WITH APPLICABLE CODES.

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APPROVALS

DOB
JOB NO #

| | | |
|-------|----------|-----|
| BLOCK | SECTION | MAP |
| 12963 | C2-2, R5 | 19A |
| LAW | BOOK | |
| 308 | QUEENS | |

PROJECT
SITE: RETAIL STORES
224-01 MERRICK BLVD
QUEENS NY 11419

DRAWING
FIRST FLOOR
PLUMBING PLAN

DATE: 02-22-12
PROJECT NO.: B-454-01
DRAWING BY: DC
CHK BY: DC
DRAWING NO.:

P-001.00
10 of 11

APPENDIX 6

**PREVIOUS ENVIRONMENTAL INVESTIGATIONS AND
REPORTS**

(Included in the June 2012 RIR)

APPENDIX 7

PREVIOUS REGULATORY CORRESPONDENCE

NONE AVAILABLE AT THIS TIME

APPENDIX 8

SPECIFICATIONS FOR VAPOR BARRIER/WATERPROOFING

MEMBRANE

(Vapor Barrier Drawings And Details Will Be Addressed During Public Comment Period In Stip List)

VAPORBLOCK® PLUS™ VBP20

Under-Slab Vapor / Gas Barrier



Product Description

VaporBlock® Plus™ 20 is a seven-layer co-extruded barrier made from state-of-the-art polyethylene and EVOH resins to provide unmatched impact strength as well as superior resistance to gas and moisture transmission. VaporBlock® Plus™ 20 is a highly resilient underslab / vertical wall barrier designed to restrict naturally occurring gases such as radon and/or methane from migrating through the ground and concrete slab. VaporBlock® Plus™ 20 is more than 100 times less permeable than typical high-performance polyethylene vapor retarders against Methane, Radon and other harmful VOCs.

VaporBlock® Plus™ 20 is one of the most effective underslab gas barriers in the building industry today far exceeding ASTM E-1745 (Plastic Water Vapor Retarders Used in Contact with Soil or Granular Fill Under Concrete Slabs) Class A, B and C requirements. Available in a 20 (Class A) mil thicknesses designed to meet the most stringent requirements. VaporBlock® Plus™ 20 is produced within the strict guidelines of our ISO 9001:2008 Certified Management System.

Product Use

VaporBlock® Plus™ 20 resists gas and moisture migration into the building envelop when properly installed to provide protection from toxic/harmful chemicals. It can be installed as part of a passive or active control system extending across the entire building including floors, walls and crawl spaces. When installed as a passive system it is recommended to also include a ventilated system with sump(s) that could be converted to an active control system with properly designed ventilation fans.

VaporBlock® Plus™ 20 works to protect your flooring and other moisture-sensitive furnishings in the building's interior from moisture and water vapor migration, greatly reducing condensation, mold and degradation.

Size & Packaging

VaporBlock® Plus™ 20 is available in 10' x 150' rolls to maximize coverage. All rolls are folded on heavy-duty cores for ease in handling and installation. Other custom sizes with factory welded seams are available based on minimum volume requirements. Installation instructions and ASTM E-1745 classifications accompany each roll.



Under-Slab Vapor/Gas Retarder

Product

Part

VaporBlock Plus 20 VBP 20

APPLICATIONS

- Radon Barrier Under-Slab Vapor Retarder
- Methane Barrier Foundation Wall Vapor Retarder
- VOC Barrier



VAPORBLOCK[®] PLUS[™] VBP20



Under-Slab Vapor / Gas Barrier

| PROPERTIES | TEST METHOD | VAPORBLOCK PLUS 20 | |
|---|---|---|--|
| | | IMPERIAL | METRIC |
| APPEARANCE | | White/Gold | |
| THICKNESS, NOMINAL | | 20 mil | 0.51 mm |
| WEIGHT | | 102 lbs/MSF | 498 g/m ² |
| CLASSIFICATION | ASTM E 1745 | CLASS A, B & C | |
| TENSILE STRENGTH LBF/IN (N/CM) AVERAGE MD & TD (NEW MATERIAL) | ASTM E 154 Section 9 (D-882) | 58 lbf | 102 N |
| IMPACT RESISTANCE | ASTM D 1709 | 2600 g | |
| MAXIMUM USE TEMPERATURE | | 180° F | 82° C |
| MINIMUM USE TEMPERATURE | | -70° F | -57° C |
| PERMEANCE (NEW MATERIAL) | ASTM E 154 Section 7 ASTM E 96 Procedure B | 0.0051 Perms grains/(ft ² ·hr·in·Hg) | 0.0034 Perms g/(24hr·m ² ·mm Hg) |
| RADON DIFFUSION COEFFICIENT | K124/02/95 | < 1.1 x 10 ⁻¹³ m ² /s | |
| METHANE PERMEANCE | ASTM D 1434 | < 1.7 x 10 ⁻¹⁰ m ² /d·atm 0.32 GTR (Gas Transmission Rate) ml/m ² ·D·ATM | |

VaporBlock[®] Plus[™] Placement

All instructions on architectural or structural drawings should be reviewed and followed.
Detailed installation instructions accompany each roll of VaporBlock[®] Plus[™] and can also be located on our website.
ASTM E-1643 also provides general installation information for vapor retarders.



VaporBlock[®] Plus[™] is a seven-layer co-extruded barrier made using high quality virgin-grade polyethylene and EVOH resins to provide unmatched impact strength as well as superior resistance to gas and moisture transmission.

Note: To the best of our knowledge, unless otherwise stated, these are typical property values and are intended as guides only, not as specification limits. Chemical resistance as well as other performance criteria is not implied or given and actual testing must be performed for applicability in specific applications and/or conditions. RAVEN INDUSTRIES MAKES NO WARRANTIES AS TO THE FITNESS FOR A SPECIFIC USE OR MERCHANTABILITY OF PRODUCTS REFERRED TO, no guarantee of satisfactory results from reliance upon contained information or recommendations and disclaims all liability for resulting loss or damage.



Engineered Films Division
P.O. Box 5107
Sioux Falls, SD 57117-5107
Ph: (605) 335-0174 • Fx: (605) 331-0333

Limited Warranty available at www.RavenEFD.com

Toll Free: 800-635-3456
Email: efdsales@ravenind.com
www.ravenefd.com
10/10 EFD 1125