FINAL (100%)

DESIGN REPORT

STANDARD MOTOR PRODUCTS, INC. SITE
Long Island City, Queens, NY
Site No. 2-41-016

Prepared for:
Standard Motor Products, Inc.
37-18 Northern Boulevard
Long Island City, New York 11101

Prepared by:
Camp Dresser & McKee, Inc.
110 Fieldcrest Avenue, 6th Floor
Edison, New Jersey 08837

October 2011

CDM

CERTIFICATION

I, Matthew D. Millias, certify that I am currently a NYS registered professional engineer and that this Remedial Design was prepared in accordance with all applicable statutes and regulations and in substantial conformance with the DER Technical Guidance for Site Investigation and Remediation (DER-10).

I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class "A" misdemeanor, pursuant to Section 210.45 of the Penal Law. I, Matthew D. Millias, of Camp Dresser & McKee, am certifying as Owner's Designated Site Representative for the site.

077468	10/12/11	Matthew D. Millias
NYS Professional Engineer #	Date	Signature

It is a violation of Article 145 of New York State Education Law for any person to alter this document in any way without the express written verification of adoption by any New York State licensed engineer in accordance with Section 7209(2), Article 145 of New York State Education Law.

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(Site No. 2-41-016)
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Prepared for

Standard Motor Products, Inc.
37-18 Northern Boulevard
Long Island City, New York 11101

Prepared by

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October 12, 2011

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Acronyms

AS	air sparge
AWS	air/water separator
BIS	Building Information System
BTEX	benzene, toluene, ethylbenzene, and xylenes
CDM	Camp Dresser & McKee Inc.
CVOC	chlorinated volatile organic compound
DO	dissolved oxygen
FS	feasibility Study
ft	feet
GAC	granular activated carbon
GPM	gallons per minute
HSA	hollow-stem auger
HOA	hand/off/auto
hp	horsepower
IRM	interim remedial measure
lb	pound
LPGAC	liquid-phase granular activated carbon
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYSDOH	New York State Department of Health
O&M	operations and maintenance
OM&M	operation, maintenance, and monitoring
ORP	oxidation-reduction potential
P&ID	process and instrumentation diagram
PID	photo-ionization detector
PLC	programmable logic controller
psig	pounds per square inch (gauge)
PVC	polyvinyl chloride
RD	remedial design
RI	remedial investigation
ROD	Record of Decision
ROI	radius of influence
rpm	rotations per minute
SMP	Standard Motor Products, Inc.
SSDS	sub-slab depressurization system
scfm	standard cubic feet per minute
sf	square feet
SCG	standards, criteria, and guidance
SPDES	State Pollution Discharge Elimination System
SVE	soil vapor extraction
TEFC	totally-enclosed fan-cooled
VOC	volatile organic compound
VPGAC	vapor-phase granular activated carbon
VZMP	vadose zone monitoring point
''WC	inches water column
ZOI	zone of influence

Section 1
Introduction

On behalf of Standard Motor Products, Inc. (SMP), Camp Dresser & McKee Inc. (CDM) is pleased to submit this Final (100%) Design Report for the property located at 37-18 Northern Boulevard in Long Island City, New York (herein referred to as the "Site"). The remedial design (RD) has been developed in accordance with the Order on Consent and Administrative Settlement (Index No. R2-0637-04-10) between the New York State Department of Environmental Conservation (NYSDEC) and SMP.

This report is in accordance with the New York State Environmental Conservation Law and is consistent with the National Oil and Hazardous Substances Pollution Contingency Plan of March 8, 1990 (40CFR300), as amended. The report was developed in accordance with the New York State guidance entitled "*DER-10 Technical Guidance for Site Investigation and Remediation"*, dated May 2010 (NYSDEC 2010).

In March 2009 the NYSDEC issued a Record of Decision (ROD) selecting to install an Air Sparging (AS) and Soil Vapor Extraction (SVE) system to treat the contaminated groundwater and capture the associated soil vapor (NYSDEC 2009). The objective of this report is to describe the basis of design for the AS/SVE system.

1.1 Site Background

The SMP property is in the northwestern section of Queens County, New York and is located at 37-18 Northern Boulevard in Long Island City, New York (**Figures 1-1 and 1-2**). The property was owned and operated by SMP until March 2008 and is located in an urban and industrial area. The property is rectangle-like in shape and occupies approximately one acre of land (**Figure 1-3**). The property contains a large, six-story, industrial building with approximately 42,000 square feet per floor. The building occupies most of the property and houses several commercial tenants. SMP manufactured automobile parts until March 2008 at this facility, and the building still serves as the SMP corporate headquarters. A narrow strip of land on the south side of the property contains a loading dock and a dirt access path for vehicles. The dirt path and loading dock are periodically used for truck traffic associated with the renovation of portions of the building. There is a possibility that the dirt path may be paved and used as a parking area in the future. Contamination has been identified in the groundwater adjacent to the loading dock. A fence separates the south yard area from a rail yard south of the Site. The site layout is shown in **Figure 1-3**.

Investigations at the Site have identified chlorinated volatile organic compound (CVOC) contamination in the groundwater beneath the Site. Benzene, toluene, ethylbenzene, and xylene (BTEX) contamination was also identified in the groundwater. The BTEX contamination is not believed to be related to operations at the Site, and is likely part of a plume originating from the gas station immediately to the east of the Site. The location of contamination on-site in excess of remedial objectives is depicted in **Figure 1-4**, which shows groundwater volatile organic

compound (VOC) exceedances in samples collected during the Remedial Investigation (RI) Phase IV direct push sampling event. The vertical extent of contamination is depicted by **Figures 1-5, 1-6, and 1-7**. An isocontour map depicting the horizontal extent of trichloroethylene (TCE) contamination is provided as **Figure 1-8.**

An Interim Remedial Measure (IRM) was implemented because vapor concentrations under the building slab exceeded New York State Department of Health (NYSDOH) screening criteria. The system consists of a sub-slab depressurization system (SSDS), which was completed in September of 2009, with continuous operation initiated in December of 2009. The system is currently operating as specified in the Final Interim Remedial Measure Work Plan (CDM 2009c). In March 2009, the NYSDEC issued a ROD selecting the continuation of the operation, maintenance, and monitoring of the IRM. This measure will be supplemented with the installation of an AS/SVE system designed to treat the contaminated groundwater and capture the associated contaminated soil vapors from groundwater sparging (NYSDEC 2009).

Detailed descriptions of the Site history and previous investigations are included in the RI Report for SMP, "*Final Comprehensive Remedial Investigation Report*, *Standard Motor Products, Inc. Site (Site No. 2-41-016),"* dated February 6, 2009 (CDM 2009a).

1.2 Scope and Objectives

This design report has been developed to provide a performance-based design description and implementation plan, which includes the installation of an AS/SVE system at the Site. Additionally, this report may be used as part of the bid solicitation scope of work for the system construction and installation. The Operation, Maintenance, and Monitoring (OM&M) plan will be developed separately following construction of the AS/SVE system.

The overall objective of the AS/SVE system is to remediate subsurface contamination impacting the onsite soils and groundwater, and to prevent migration of contaminated subsurface vapors onsite and offsite. This engineering control will be implemented until the contamination is mitigated or until the NYSDEC determines that continued operation is technically impractical or not feasible.

The AS system will treat the contaminated groundwater in situ by volatilizing contaminants from the groundwater for removal by SVE, and the SVE system will capture and remove contaminated soil vapor thereby preventing it from migrating offsite. Additionally, the IRM SSDS will continue to operate, eliminating all potential human exposure pathways for soil vapor intrusion in the onsite building. Following the installation and initial operation of the AS/SVE system, long-term monitoring will be performed to support engineering control efforts, providing an understanding of changes in contaminant concentrations, degradation, and distribution over time.

1.3 Design Report Organization

The design report contains the following sections, which are based on the DER-10 requirements for Remedial Action Work Plans:

Section 1: Introduction

Section 2: Basis of Design

Section 3: Standards, Criteria, and Guidance

Section 4: System Construction and Engineering Controls

Section 5: Confirmation and Documentation Sampling

Section 6: Site Restoration

Section 7: Schedule

Section 8: Post-Construction Plans

Section 9: References

Section 2
Basis of Design

The design basis presented in this section is meant to provide the performance requirements and general specifications for the full-scale AS/SVE system at the site. It is not intended to comprise a detailed design with detailed drawings and specifications. It is recommended that bidders be required to include a detailed technical proposal. The technical proposals should be reviewed by the engineer to ensure each bidder's complete technical understanding of design intent and verify that the technical approach will fulfill the performance goals specified herein.

A comprehensive four-phase investigation has been performed for the Site as presented in the RI Report (CDM 2009a). In the RI, geology and hydrogeology were identified, the nature and extent of contamination were determined, and fate and transport of contaminants were evaluated. Groundwater quality was assessed utilizing the results of both the direct push boring investigations conducted during the Phase I and IV Field Investigations and the monitoring well investigations conducted during the Phase II, III, and IV Field Investigations. These data pertaining to physical properties or contaminant distribution on the Site were used during design activities.

For the development of the IRM, a radius of influence (ROI) test was performed on the Site for the SSDS. A larger ROI was observed than would typically be expected considering site-specific conditions, and the SSDS has been effective as an interim measure since its installation. It is anticipated that the SVE system will also operate with a larger ROI than is typical, and that the AS/SVE system will be an effective remedy for groundwater contamination on the Site. Because a pilot test was performed for the SSDS, the treatment area is relatively small, and the system was conservatively designed and includes operational flexibility/functionality, the system will achieve the performance objectives. A pre-design pilot test for SVE is not necessary. An air sparge well performance test will be conducted during construction (**see Section 2.2.2**).

2.1 Site Plan Layout

Based on a conservative 20-foot ROI estimated for each AS well, a site plan was developed to determine the AS well and SVE trench locations. The existing site conditions and site plan are shown on **Sheets C-2 and C-3** of the Contract Drawings, respectively. The design includes ten AS wells and two horizontal SVE wells (collectively referred to as the SVE trench). AS wells are located in the rear building yard targeting the groundwater contaminant plume which exceeds 20 times the site specific criteria ("the treatment area"). The SVE trench is positioned in the center of the treatment area. Asphalt paving will be installed over the treatment area to increase the collection efficiency of the SVE trench and prevent stormwater infiltration into the treatment area.

Four new groundwater monitoring wells will be installed. The locations of the new monitoring wells were selected to provide good coverage of the treatment area when used in conjunction with the preexisting monitoring wells. These wells will be sampled to monitor the contaminant plume over time and used to evaluate dissolved oxygen (DO) and water levels as indicators of AS area of influence during startup testing and system optimization. The monitoring wells will be screened across the zones where contamination currently exceeds 20 times the site specific criteria. Six vadose zone monitoring points (VZMPs) will be installed to evaluate applied vacuum of the SVE system.

2.2 Air Sparging

Air sparging involves injection of pressurized air into the contaminated aquifer via injection wells so that it migrates horizontally and vertically through the subsurface, creating an underground stripper that removes VOCs and some SVOCs by volatilization. In addition to removal of contaminants by volatilization, the resulting increase in DO in the groundwater enhances aerobic biodegradation.

As pressurized air is forced into the saturated zone via an air sparging well, the air fills some of the soil voids and causes the groundwater surface to mound as the air attempts to escape to the vadose zone. During this time, the maximum number of air channels is established, and there is maximum surface area contact between contaminated groundwater and sparge air. The channels soon consolidate, finding the most direct route to the vadose zone, and the surface of the groundwater returns close to its original level. The introduction of air and the rise and fall of the groundwater surface enhance mixing of the groundwater and help distribute contaminants evenly throughout the water. After the air sparging groundwater system reaches a state of equilibrium, there is less air to water contact (because there are fewer channels), and less volatilization of contaminants occurs. It is therefore advantageous to pulse the system at a relatively rapid rate in order to improve groundwater mixing and establish new air channels with each new introduction of air. Pulsing also has the advantage of allowing smaller compressors and less electricity to be used, as all air sparging wells will not be active at the same time.

If too high of a sparge pressure is used, preferential pathways may be formed, thus reducing the efficiency of air sparging. For this reason it is desirable to operate the system at a pressure only slightly above the air entry pressure, which can be approximated by the following equation:

$$P_{entry}(psig) = 0.43H_h$$

Where H_h is the depth in feet below the water table to the top of the injection well screened section. This equation assumes negligible contribution by the air entry pressures for the well annulus packing material and the formation.

Generally, increasing the sparge flowrate will increase the ROI and stripping of VOCs. However, when using SVE to capture sparge vapors, the vapor stream typically requires ex-situ treatment to remove stripped contaminants. Because the

sparge vapor concentrations will be highest during initial startup, it can be advantageous to sparge at a relatively low flowrate (i.e., bio-sparge) initially when bringing an air sparge system online. This has the benefit of stimulating in-situ aerobic biodegradation of some contaminants, such as vinyl chloride, which will aerobically biodegrade quickly but are difficult to remove ex-situ (e.g., vinyl chloride is not removed by granular activated carbon (GAC)). In addition, many aromatic compounds will biodegrade, reducing the concentration levels of many site contaminants in-situ before they are extracted. This startup approach is recommended for the SMP site.

2.2.1 Air Sparge Wells

Sheet C-5 of the Contract Drawings provides the AS well construction details.

The boreholes for the AS wells will be advanced using the hollow-stem auger (HSA) drilling method through the soils consisting predominantly of sand and gravel. The depth of the AS wells will vary from across the Site, dependent upon the depth of the contaminant plume. Coordinates for the proposed AS well locations and depths are provided on **Sheets C-3 and C-5** of the Contract Drawings, respectively.

The wells will be constructed of 2-inch diameter threaded PVC pipe. The well screens will be 0.010-inch slot (10-slot). The screen length will be 2 feet, and the screen bottom will be located at approximately 1 foot above the bottom of the 7-inch diameter borehole. Riser pipe will be installed from the top of screen to the surface well vault. Each AS wells is designed for compressed air to enter the aquifer approximately five feet below the contaminant plume. The 5-foot distance will allow for greater horizontal dispersion of the injected air, resulting in a larger area of influence.

The annular space between the borehole and screen/riser pipe will be backfilled as follows:

- Packing (Filpro #1 Sand) – From bottom of borehole to approximately 1 foot above the top of screen.
- Bentonite seal - 1 foot thick from top of packing
- Bentonite/cement grout – From top of bentonite seal to the well vault.

The wells will be lightly developed to remove fines from the well and borehole annulus packing. Air sparge wells will have 12-inch diameter bolting well vaults.

2.2.2 Air Compressor and Distribution Manifold

The air sparge system will consist of an intake filter, oil free air compressor, receiving tank (depending on the type of compressor selected), particulate filter, and distribution manifold.

To optimize the size of the air compressor, air sparge well performance testing will be conducted during construction to determine the injection pressure-well capacity

relationship. Based on the results of testing, an air compressor will be selected. It is anticipated that the compressor will be capable of sparging two wells simultaneously at approximately 10-20 standard cubic feet per minute (scfm) per well at a pressure of approximately 10-15 pounds per square inch gauge (psig) at the well head.

Each air sparge well will have an individual conveyance line for maximum operational flexibility and simplified O&M. The air sparge manifold inside the building will include 10 separate lines, one for each of the air sparge wells. Each line will include an isolation valve, solenoid valve, rotameter with flow control valve, pressure gauge, and check valve connected to a 1" inner diameter air supply hose. The 10 air supply lines will run through the SVE trench to each of the 10 air sparge wells. The air sparge manifold detail is shown on **Sheet M-2** of the Contract Drawings.

The design air sparge flow rate is 5-20 cfm per well delivered at a pressure slightly above the minimum air entry pressure. The minimum air entry pressure will vary from well to well depending on the depth to the top of the screen and the depth to groundwater. At the start-up of each injection cycle, the sparge pressure may exceed the minimum entry pressure by 1-2 psi to initiate flow. The air pressure and flow supplied to each individual well will be adjusted at the air sparge manifold.

2.3 Soil Vapor Extraction

SVE uses vacuum to mobilize soil gas and remove volatile organic contaminants in the vadose zone by vaporization and volatilization. The SVE trench will draw in mobilized VOCs and prevent soil vapor from migrating off site. The system will utilize the existing SSDS blowers for inducing a vacuum on the extraction trench. The SSDS currently operating onsite has excess capacity, and will also be used for treatment of SVE vapors and condensate. The current system includes an air/water separator (AWS) for collection of soil vapor condensate, a vapor-phase granular activated carbon (VPGAC) unit to remove VOCs prior to atmospheric discharge, and a liquid-phase granular activated carbon (LPGAC) unit to treat AWS water effluent before surface discharge to the south yard. The process & instrumentation diagram (P&ID) for the system is presented on **Sheets I-1 and I-2** of the Contract Drawings. The major components of this system are described in detail in this section.

2.3.1 SVE Trench

Two horizontal SVE wells will be installed in a single trench running though the center of the treatment area oriented parallel to the loading dock. Both SVE wells will run parallel to each other. One well will be screened over the eastern portion of the treatment area, while the second trench is screened over the western portion of the treatment area. This design will help apply vacuum evenly over the length of the treatment area and reduce loss of vacuum along the SVE wells.

The SVE trench will be constructed as shown on **Sheet C-7** of the Contract Drawings. Both individual SVE wells will connect to a header above ground adjacent to the treatment system. The header pipe will enter the east face of the treatment system and connect to the SSDS via an existing blind flange. Each SVE branch will be equipped

with a sample port, vacuum gauge, and a butterfly valve. The flow from each well will be balanced during startup testing for optimum system performance. The SVE screen and pipe will be Schedule 80 PVC and will have a 1% minimum pitch toward the well to prevent condensation from collecting in the lines. SVE well screen will have a slot size of 0.050-inch (50-slot). The proposed piping layout may be modified in the field as necessary to avoid existing obstructions.

2.3.2 Asphalt Cap

An asphalt cap will be constructed to optimize efficiency of the SVE system. The purpose of the cap is to reduce SVE short circuiting, assist in the collection of AS vapors, and to reduce rainwater infiltration, which reduces the effectiveness of SVE. Stormwater management is discussed in **Sections 2.6 and 4.3**.

2.3.3 Utilization of Existing Components from the SSDS

2.3.3.1 Blowers

The system includes two Roots URAI 711 rotary lobe-type blowers. The blowers are equipped with silencers at the influent and effluent to reduce nuisance noise exposure to building occupants.

Each blower is capable of approximately 970 cfm at 1 pound/square inch (psi) (combined vacuum and back pressure) when operated at 1400 rotations per minute (rpm). The approximate operating conditions of each blower are:

- 1-2 psi
- 800-1,000 cfm

The SSDS is currently operating effectively using only one blower at a time.

The use of two blowers provides the flexibility to operate the SSDS and SVE system with one blower if the targeted influence is attained with less applied vacuum and vapor flow. In this case, the second blower will serve as a backup, which would be used to prevent system downtime if the first blower requires servicing. If higher applied vacuums are required to achieve complete influence, both blowers may be used. The system is equipped with a dilution valve that can be used for rough control of applied vacuum. Each blower is driven by a 20 hp totally-enclosed fan-cooled (TEFC) motor coupled to drive the blower at 1535 rotations per minute (rpm). The use of indirect-drive blowers permits easy modification of the drive ratio/motors in the future if more or less applied vacuum is needed. At anticipated operating conditions, the temperature rise across the blowers will be less than 30˚F.

2.3.3.2 VPGAC Unit

The effluent from the blowers is treated with a VPGAC adsorber (Calgon HFVS2000) to remove VOCs prior to atmospheric discharge. The VPGAC unit is box-type, top-load carbon steel rated for a maximum flow of 2,000 cfm and pressure-rated to a minimum of 3 psi. The unit contains 2,000 pounds (lbs) of carbon. The pressure drop across the unit is less than 15" WC at a flow rate of 2,000 cfm.

2.3.3.3 Air/Water Separator

An air/water separator is used to remove entrained moisture in the extracted vapor stream. This prevents moisture from entering blowers and VPGAC units. The steel AWS has a volume of 60 gallons and is rated for a flow of up to 2,000 cfm and over -50" WC vacuum. The AWS is equipped with a sight glass and low, high, and high-high level sensors. A condensate transfer pump is used to automatically pump accumulated condensate from the AWS.

2.3.3.4 Liquid Phase Granular Activated Carbon Unit

The water effluent from the AWS will require treatment with LPGAC prior to surface discharge to the south yard. The LPGAC unit (Carbonair PC1) is rated for a maximum flow of 10 gallons/minute (gpm) and holds 90 lbs of carbon.

2.4 Process Instrumentation and Control

The process instrumentation for the existing SSDS and proposed AS/SVE system is shown on **Sheets I-2 and I-2** of the Contract Drawings.

2.4.1 Control Panel

2.4.1.1 SSDS/SVE Systems

The SSDS/SVE systems and the AS system will be managed from two separate control panels. The existing control panel will control the SSDS and SVE systems and autodialer functions.

2.4.1.2 AS System

A new control panel will be installed to control the AS system. The new panel will include hand/off/auto (HOA) switches for each air sparge well. Each switch will be equipped with an indicator lights that illuminates when the well is sparging. The panel will also include a fault indicator/reset button and an HOA switch for the air compressor.

The air sparge manifold solenoid valves will be controlled by the programmable logic controller (PLC) in the new AS control panel. Initially, the 10 sparge wells will be separated into five groups. The groups will be sequenced such that each group will be supplied with compressed air for 5 minutes at a time, thus operating for 5 out of every 25 minutes. Previous experience has shown that cycling provides efficient mixing of groundwater while minimizing air channel consolidation and electrical costs. The PLC will include the capability to change the well grouping and cycle time to provide additional operational flexibility. Adjacent wells will not be on the same group, so they will not operate at the same time.

The air sparge system will be tied into the existing autodialer so that the status of the air compressor can be monitored remotely and the operator can be notified if there is an air compressor fault.

2.4.2 High Groundwater Level Switch

Occasional high water table elevations may cause the SVE wells to be partially or completely flooded. In this circumstance, the SVE effectiveness would be reduced. In order to prevent continued operation of the AS system when the SVE wells are flooded, a high groundwater switch will be installed in one of the new monitoring wells. The switch will consist of a reliable, low-maintenance conductivity probe which is controlled by a separate sensor box tied into the AS PLC. Upon detection of high groundwater level, the PLC will immediately shut down the AS system. The elevation of the conductivity probe will be adjustable.

2.5 Startup Testing and Optimization

Because the system is being designed with flexibility in mind, startup testing and fine-tuning will be required to optimize the system's operation. Startup testing and optimization will include the following activities:

- Pre-test groundwater monitoring – Water quality parameters, groundwater elevations, and samples for VOC analysis will be collected at newly installed and existing monitoring wells prior to startup and used to establish baseline conditions for assessing performance of AS/SVE.

- SVE step-test – This test will be performed on the SVE trenches and will be used to delineate the relationship between vapor flow rate, applied vacuum, and SVE zone of influence (ZOI) (as monitored by vacuum readings at vadose zone monitoring points).

- AS step-test – This test will delineate the relationship between air injection flow, applied pressure, and AS ROI (as monitored by water table elevations, DO, and ORP).

- Optimization – The SVE and AS flow rates will be fine tuned until the system approaches stabilization. At this point, optimization will take place for a period of up to 1-2 days to ensure capture of all air sparge vapors. Vacuum/pressure readings should demonstrate capture under all operating scenarios (i.e., alternating pairs of sparge wells). This time will also be used to characterize changes in system performance (e.g., flow rates, ZOI/ROI) over a longer period. The data gathered during this period will be used to support practical O&M decisions regarding sparge flow rates, SVE flow rates, valve settings, etc.

Several field parameters will be collected during startup testing. A brief summary is provided below.

- Water quality parameters – Parameters include DO, conductivity, oxidation-reduction potential (ORP), temperature, and pH. These measurements will be taken at the nearby monitoring wells. The data will be used to confirm the AS ROI and evaluate changes in groundwater quality caused by AS.

- Water levels – Depth to groundwater will provide a measure of AS ROI and provide information regarding aquifer response to air injection. These measurements will be taken at the nearby monitoring wells.

- Pressure/vacuum and flow rates – Pressure and vacuum measurements will be collected on the SVE lines, at AS wells, and at VZMPs. These data will be used in conjunction with AS and vapor flow rates to support O&M decisions, specifically regarding flow rates. Pressure/vacuum measurements at VZMPs will be used to confirm SVE ZOI.

- VOCs (via PID), Oxygen (O_2), Carbon monoxide (CO), and Lower Explosive Limit (LEL) – These readings, taken from the SVE influent stream with a field multi-meter, will provide data regarding the soil vapor influent quality. The data will be used to evaluate changes in soil vapor quality. Photoionization detector (PID) data will also be used to monitor for VPGAC breakthrough.

The following table summarizes the analytical samples which will be collected during startup testing and optimization activities.

Sample Type	Sample Locations	Frequency	Matrix	Analysis
Groundwater - Baseline	MW-10, 11S, 14S, 15-20	Once, prior to startup	Aqueous	VOCs via EPA 8260B
Process Vapor Samples	SVE headers 1, 2, & 3; SSDS header; VPGAC influent & effluent	Once, following optimization and stabilization at final operational setpoints	Air	VOCs via EPA TO-15
Process Water Samples	LPGAC influent & effluent	Once, during first run of condensate transfer pump	Aqueous	VOCs via EPA 8260B

2.6 Stormwater Management Design

Stormwater management controls will be implemented to address the increase in stormwater runoff that will result from the construction of the asphalt cap. The 39th Street Bridge discharges stormwater runoff onto the Site and is known to cause localized flooding. The scope of work for this project states that the AS/SVE construction will not be designed to alleviate flooding related to pre-existing runoff conditions. Accordingly, stormwater management controls only address the increase in runoff associated with the asphalt cap; stormwater runoff from the bridge was not quantified.

Stormwater management controls were designed in accordance with guidance provided in the New York State Stormwater Management Design Manual, dated August 2010, for redevelopment projects, to the maximum extent practicable. To provide treatment and reduce post-construction peak discharge rates to existing peak discharge rates, an infiltration trench will be constructed adjacent to the chain link fence located along the southern edge of the Site. The bituminous pavement at the Site will be graded from a constant elevation of 21.3 feet (ft) at the loading dock to a constant elevation of 20.7 ft at the northern edge of the infiltration trench. The

infiltration trench has a total depth of 1.5 ft and has a surface area of approximately 920 square feet (sf). The depth to high groundwater from the bottom of the infiltration trench ranges between 2.5 and 3.3 ft. A grass filter strip is typically recommended to provide pre-treatment for the infiltration trench. However, because of the space needed for the asphalt cover required to increase the effectiveness of the SVE system, a grass filter strip cannot be provided. This may make the infiltration trench more prone to clogging, requiring more frequent maintenance to preserve trench performance. Modeling results indicate that peak flow rates are attenuated to existing conditions for the 1-, 10- and 100-year rainfall events.

Stormwater runoff from the 39th Street Bridge will discharge onto the Site. To capture and infiltrate this runoff to the extent practicable, approximately 1,800 sf of granular pavement will be constructed under the bridge. The granular pavement is comprised of a 6-inch-thick cellular confinement load support system under a 2-inch thick layer of crushed stone. A cellular confinement load support system is an assembly of HDPE sheet strips connected in series, that, when expanded, form walls of a flexible, three dimensional cellular confinement structure in which 1.5 to 2.5-inch diameter crushed stone will be placed. This system will allow vehicular traffic, while also providing infiltration of the stormwater runoff from the bridge. As previously stated, the scope of work did not include determining peak discharge rates from the bridge in order to design a stormwater management control to alleviate the flooding; thus, the granular pavement was not designed to capture, treat, or infiltrate a calculated volume of stormwater runoff but rather alleviate existing conditions to the extent practicable.

2.7 Permitting

The substantive permit requirements and authorizations necessary for remedial activities at the site are summarized below. The substantive permit requirements/approvals, and permitting authorities, are listed on **Table 2-1**.

A stormwater permit and a soil erosion and sediment control plan will not be required for this remedial action. The stormwater permit and the soil erosion and sediment control plan are only required when the disturbed area is greater than one acre. Less than 9,000 sf of area will be disturbed during this remedial action. Therefore, a stormwater permit and a soil erosion and sediment control plan will not be prepared for the planned construction activities.

A NYSDEC State Pollution Discharge Elimination System (SPDES) permit will not be required. The current discharge of water from the existing SSDS is less than 20 gallons per month. The addition of the AS/SVE system is not expected to increase the discharge rate significantly. Under Chapter X, Part 750-1.5, discharges of less than 1,000 gallons per day do not require a SPDES permit. Therefore, a SPDES permit will not be prepared. However, it is understood by NYSDEC and SMP that the effluent discharge to groundwater must meet NYS groundwater quality standards. Therefore, to be conservative a LPGAC unit was installed prior to discharge of effluent to groundwater to meet NYS groundwater quality standards.

2.7.1 Substantive requirements of an Air Permit

The remedial design is required to meet the substantive requirements of a NYSDEC Air Permit for discharge of offgas. A Draft NYSDEC Air Permit application has been completed to demonstrate compliance with the substantive requirements of the New York Air Quality Standards (6 NYCRR Part 257). The NYSDEC air permit application and supporting calculations have been included in **Appendix C**.

2.7.2 Construction Work Permit

A Construction Work Permit will be required by the New York City Department of Buildings. Construction plans, including energy calculations, a PW-1 form (Plan/Work application), an asbestos form, and entry of construction information into NYC Building Information System (BIS) will be submitted for pre-filing and Department review. This is to ensure they comply with the Building Code and local zoning laws. The Contractor will be responsible for submitting the application.

2.7.3 Electrical Permit

An electrical permit will be required by the New York City Department of Buildings' Electrical Division for all electrical work to be performed as part of installation of the AS/SVE system. An electrician licensed by the Depart of Buildings must be used to perform the work. The Contractor will be responsible for submitting the application and using a licensed electrician for the work.

2.7.4 Construction Noise Mitigation Plan

In accordance with Section 24-220 of the New York City Administrative Code, a noise mitigation plan will be implemented for construction site. The noise mitigation plan will include a list of the devices that are being used on site, and the mitigation strategies and best management practices that will be employed. The plan does not require filing but it shall be accessible to inspectors. The Contractor will be responsible for preparing and implementing the Noise Mitigation Plan.

2.8 Green and Sustainable Remediation

In accordance with NYSDEC DER-31 Green Remediation Program Policy, CDM considered green remediation principles during the design and incorporated green elements where feasible. These elements fall into the following general categories:

- Reducing direct and indirect greenhouse gas and other emissions;
- Increasing energy efficiency;
- Conserving and efficiently managing resources and materials;
- Reducing waste and increasing reuse of materials;
- Integrating the remedy with the end use of the site;
- Reducing erosion and offsite water quality impacts.

The design includes the following specific green remediation elements:

- Vehicle idling will not be allowed for any longer than 5 minutes.
- Contractors and subcontractors will be required to certify that only Ultra-Low Sulfur Diesel will be used on the project.
- The grass restoration area seed specification is a low-maintenance no-mow mix.
- The asphalt SVE area cover system is designed to enhance the function of the SVE system and serve a dual purpose as a surface for parking vehicles, which is consistent with the contemplated reuse of the site.
- A low-maintenance stormwater infiltration trench was designed to capture increased runoff resulting from the installation of the asphalt SVE cover. This will recharge the aquifer and reduce site stormwater runoff without additional loading on storm sewers.
- As an alternative to asphalt pavement, which would create impervious surface area and increase stormwater runoff, permeable granular pavement was designed for the east site access beneath the 39th Street bridge. This is expected to partially alleviate the existing flooding issues associated with the stormwater runoff from the bridge.
- Final grades were designed to provide positive drainage and to yield near zero net fill for the project. This reduces transportation costs associated with bringing fill to the site or disposing of excess soils.
- The air sparge system was designed to operate in pulse mode with only two wells operating at a time. Because it enhances groundwater mixing and minimizes preferential air channeling, this technique has been shown to provide equal or better mass removal compared to continuously sparging all wells. This results in a smaller required air compressor and energy savings for the system. In addition, as certain areas of the site are cleaned up, individual sparge wells may be turned off, thereby reducing the energy demand of the air compressor.
- The air sparge well spacing was made more dense in the area of highest contamination. This will more aggressively treat the hot-spot and result in reduced remedy duration and ultimately, lower long-term operation costs.
- Pipe sizes were designed to reduce frictional loss, increasing the energy efficiency of the SVE blower system.
- The air compressor will be sized based on actual field data obtained during air sparge well performance testing. This will allow the compressor to be sized for most efficient operation without oversizing.
- The SVE blower system is designed to be adaptable to changing site conditions. The SVE trench system is divided into three separate headers, which can be shut off individually when SVE is no longer warranted for certain areas of the site. Likewise, the dual blower configuration allows the blowers to be operated individually or in parallel to optimize blower capacity to the requirements of the system.
- In addition, the housing for the system is a refurbished shipping container located on the existing loading dock beneath an existing overhang. Beneficial reuse of the shipping container and use of existing structures to support the system reduces the environmental footprint associated with constructing new structures to house and support the system.

- The system was designed with reduced O&M visit frequency as a goal. O&M visits are only expected to be required on a monthly basis. The reduced O&M frequency results in a reduction of fuel consumption associated with travel to and from the site.
- The environmental footprint of the remedial action was assessed using the SiteWise™ Environmental Assessment Tool.

In addition, the following green remediation elements will be incorporated into the Site Management Plan:

- Incorporation of sustainability evaluation into periodic reviews;
- Annual evaluation of system performance to improve operational efficiency;
- Five-year completion of the Remedial Site Optimization Process;
- Periodic assessment of whether an energy intensive remedy is still appropriate for the site (e.g., it may be recommended to discontinue operation of the AS/SVE system when mass removal rates have reached asymptotic or very low levels).

2.8.1 SiteWise™ Environmental Assessment

The SiteWise™ Environmental Assessment Tool was used to quantitatively assess the green metrics of the remedial action. This tool was used to evaluate the remedy throughout its entire life cycle, including remedial action construction, operations, and long-term monitoring. The input assumptions, input summary sheets, and output summary sheets are provided in **Appendix D**. The primary conclusion from the assessment is that the vast majority of greenhouse gas emissions and energy used result from running equipment (two rotary lobe blowers and one air compressor) during the operation phase of the remedy. It is recommended that periodic reviews focus on equipment energy use reduction as the primary method to reduce the environmental footprint of the remedy. This can be achieved by:

- Evaluating sub-slab and soil vapor capture zones to determine if effective capture can be maintained using a single blower instead of both blowers.
- Turning off individual sub-slab extraction points and SVE extraction wells as those portions of the site are cleaned up. This may allow the system to operate with a single blower, instead of two blowers, and significantly reduce electricity consumption.
- Turning off individual sparge wells as portions of the site are cleaned up. This, coupled with reducing the pulse frequency of the sparge wells, may allow the air compressor to run on an intermittent basis, reducing electrical demand.
- Evaluating mass recovery of the system as a whole. When the mass recovery rate reaches asymptotic or very low levels, it may be feasible to stop active remediation and implement a long-term monitoring approach for the site.

Section 3
Standards, Criteria, & Guidance

3.1 Standards, Criteria, and Guidance (SCGs)

The most recent Phase IV soil sampling round did not identify soil contamination above screening levels in the subsurface unsaturated soils (CDM 2009a). Because there is no soil contamination in the zone of influent of the treatment system, SCGs are considered for groundwater only. To determine the extent of groundwater impacted at levels of concern, contaminant concentrations were compared to State and Federal SCGs for each medium. The regulatory SCGs identified for groundwater and the applicability of these SCGs to the Site are summarized in the following sections.

3.1.1 Chemical-specific Standards, Criteria, and Guidance

Chemical-specific SCGs are health- or technology-based numerical values that establish concentration or discharge limits for specific chemicals or classes of chemicals.

3.1.1.2 New York Standards, Criteria, and Guidance

Groundwater Standards and Guidance

- New York State Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations (Technical and Operational Guidance Series (TOGS) 1.1.1). Used for setting numerical criteria for groundwater cleanups.

- New York State Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations (6 New York Environmental Conservation Rules and Regulations (NYCRR Part 703). Applicable for assessing water quality at the Site during remedial activities.

3.1.2 Action-specific Standards, Criteria, and Guidance

Action-specific SCGs are requirements which set controls and restrictions to particular remedial actions, technologies, or process options. These regulations do not define Site cleanup levels but do affect the implementation of specific remedial technologies. These action-specific SCGs were considered in the screening and evaluation of various technologies and process options in the Feasibility Study (CDM 2009b) report.

3.1.2.1 Federal Standards, Criteria, and Guidance

General - Site Remediation

- Occupational Safety and Health Administration (OSHA) Worker Protection (29 CFR 1904, 1910, 1926)

- Federal Resource Conservation and Recovery Act - Identification and Listing of Hazardous Waste (40 CFR 261); Standards Applicable to Generators of Hazardous Waste (40 CFR 262); Standards Applicable to Owners and Operators of Treatment, Storage, and Disposal Facilities (40 CFR 264)

Transportation of Hazardous Waste

- Hazardous Materials Transportation Regulations (49 CFR 107, 171, 172, 177, and 179)
- Federal Resource Conservation and Recovery Act - Standards Applicable to Transporters of Hazardous Waste (40 CFR 263)

Disposal of Hazardous Waste

- Federal Resource Conservation and Recovery Act - Land Disposal Restrictions (40 CFR 268)

3.1.2.2 New York Standards, Criteria, and Guidance

New York Solid and Hazardous Waste Management Regulations (6 NYCRR)

- Hazardous Waste Management System - General (Part 370)
- Solid Waste Management Regulations (Part 360)
- Identification and Listing of Hazardous Waste (Part 371)

Transportation of Hazardous Waste (6 NYCRR)

- Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities (Part 372)
- Waste Transporter Permit Program (Part 364)

Disposal of Hazardous Waste (6 NYCRR)

- Standards for Universal Waste (Part 374-3)
- Land Disposal Restrictions (Part 376)

Discharge of Groundwater (6 NYCRR)

- The New York State Pollutant Discharge Elimination System (SPDES) (Part 750-757)
- New York State Surface Water and Groundwater Quality Standards and Groundwater Effluent Limitations (6 NYCRR Part 703)
- New York State Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations (TOGS 1.1.1)

Off-Gas Management

- New York General Provisions (6 NYCRR Part 211)
- New York Air Quality Standards (6 NYCRR Part 257)
- New York State Department of Environmental Conservation (DAR-1) Air Guide 1, Guidelines for the Control of Toxic Ambient Contaminants
- New York State Department of Health Generic Community Air Monitoring Plan

Section 4
System Construction and Engineering Controls

4.1 Temporary Construction Facilities & Treatment Units

No temporary construction facilities or treatment units will be required to implement the remedial action.

4.2 Soil & Sediment Erosion Control

Soil and sediment erosion will be controlled by the use of silt fence and hay bales during construction activities in the rear lot. Tarps will be used to cover all material stockpiles at the end of each work day.

4.3 Stormwater Management and Monitoring

During construction, berms will be placed around excavated areas to prevent stormwater runoff from entering these areas. Covers may also be used if necessary.

As described in **Section 4.2**, silt fences located around construction activities will capture sediment in the stormwater runoff, prior to the stormwater runoff discharging off-site. The silt fences will be maintained during construction to ensure functionality.

Lastly, diversion berms around the infiltration trench will be used during construction to prevent sediment from entering the infiltration trench and clogging it. The infiltration trench will not be put into service until the site has been stabilized.

4.4 Dust, Odor, and Organic Vapor Control

If required, water will be sprayed for dust suppression during construction activities in the rear lot of the SMP site. The SSDS will continue to operate during construction, minimizing potential for exposure to sub-surface vapors. Vapor exposure will be monitored during construction via PID per an approved HASP. If action levels are exceeded, precautions will be taken including evacuating the affected work area or requiring respirators for affected workers, according to the HASP. If, during intrusive activities, action levels are exceeded at the site perimeter, open excavations will be covered with plastic sheeting. Based on historical investigations at the site and excavation being limited to unsaturated soils which were shown to have low levels of VOCs during the RI, elevated levels of VOCs in outdoor air are not anticipated.

4.5 Monitoring Procedures

Since the remedy results in untreated constituents remaining at the site, a long-term monitoring program will be instituted. This will consist of periodic sampling and analysis of the groundwater to determine the efficacy of the remedy in terms of

reduction in the contaminant concentrations and mass loadings. The emissions from the SSDS/SVE system will also be sampled to estimate the quantity of contaminants being captured and to determine whether treatment of the system emissions is warranted. This long term monitoring program will allow the effectiveness of the AS/SVE systems to be monitored and will be a component of the long-term management for the site. The monitoring plan will be described in detail in the Site Management Plan to be developed prior to construction completion.

4.6 Health and Safety

The current health and safety plan for the Site is included as **Appendix A**.

Section 5
Confirmation and Documentation Sampling

This remedial action (AS/SVE) is designed to address site groundwater and soil vapor. Unsaturated contaminated soils have been addressed as a part of an earlier remedial action at the Site. Thus, confirmation and documentation sampling are not applicable to this remedial action.

Section 6
Site Restoration

The existing conditions on the site are being modified as a part of the remedial construction, including conversion of existing vegetated non-vegetated areas to asphalt paving, a pervious granular pavement access area, and a stormwater infiltration area. Permanent restoration after achievement of the remedial objectives will be determined at that time based on future site use.

Section 7
Schedule and Cost

7.1 Schedule

The following schedule outlines the sequence of general remedial construction milestones and their anticipated duration:

1. NYSDEC review/acceptance of Final Design (1 month)
2. Submit the Draft Site Management Plan (3 months, beginning with Department approval of Final Design)
3. Procure RA contractor (4 months, beginning with Department approval of Final Design)
4. Notice to proceed and pre-construction meetings and submittals (1 month)
5. Complete remedial construction (3 months).

Total duration from NYSDEC review of the Draft Final Design to completion of remedial construction is expected to be 8 months.

7.2 Cost

The cost estimate for AS/SVE construction and operation that was prepared during the FS is attached as **Appendix B**. The actual remedial construction cost will be documented in the remedial action report.

Section 8
Post Construction Plans
8.1 Requirements for the Site Management Plan

A Site Management Plan will be developed in accordance with the New York State requirements set forth in Section 6 of the "*DER-10 Technical Guidance for Site Investigation and Remediation*", dated May 2010 (NYSDEC 2010). An outline of the Site Management Plan follows:

1.0 INTRODUCTION AND DESCRIPTION OF REMEDIAL PROGRAM
- 1.1 INTRODUCTION
  - 1.1.1 General
  - 1.1.2 Purpose
  - 1.1.3 Revisions
- 1.2 SITE BACKGROUND
  - 1.2.1 Site Location and Description
  - 1.2.2 Site History
  - 1.2.3 Geologic Conditions
- 1.3 SUMMARY OF REMEDIAL INVESTIGATION FINDINGS
- 1.4 SUMMARY OF REMEDIAL ACTIONS
  - 1.4.1 Removal of Contaminated Materials from the Site
  - 1.4.2 Site-Related Treatment Systems
  - 1.4.3 Remaining Contamination

2.0 ENGINEERING AND INSTITUTIONAL CONTROL PLAN
- 2.1 INTRODUCTION
  - 2.1.1 General
  - 2.1.2 Purpose
- 2.2 ENGINEERING CONTROLS
  - 2.2.1 Engineering Control Systems
  - 2.2.2 Criteria for Completion of Remediation/Termination of Remedial Systems
- 2.3 INSTITUTIONAL CONTROLS
  - 2.3.1 Excavation Work Plan
  - 2.3.2 Soil Vapor Intrusion Evaluation
- 2.4 INSPECTIONS AND NOTIFICATIONS
  - 2.4.1 Inspections
  - 2.4.2 Notifications
- 2.5 CONTINGENCY PLAN
  - 2.5.1 Emergency Telephone Numbers
  - 2.5.2 Map and Directions to Nearest Health Facility
  - 2.5.3 Response Procedures

3.0 SITE MONITORING PLAN
- 3.1 INTRODUCTION
  - 3.1.1 General

8.1.1 Schedule for Submission of the Final Site Management Plan

The Site Management Plan will be prepared sufficiently in advance of construction completion so as not to delay the execution of the environmental easement and subsequent approval of the FER and Certificate of Completion (COC).

8.2 Institutional Controls

Institutional controls will be imposed in the form of an environmental easement with the following requirements:

- Limiting the use and development of the property to commercial use, which will also permit industrial use;
- Compliance with the approved site management plan;
- Restricting the use of groundwater as a source of potable or process water, without necessary water quality treatment as determined by NYSDOH;
- The property owner will complete and submit to the NYSDEC a periodic certification of institutional and engineering controls.

8.3 Optimization and Shutdown

The system's performance will be evaluated during annual periodic review reports to ensure the system continues to function as designed and determine whether optimizations can be implemented. Optimization of the system may include such activities as:

- Taking individual sparge wells or SVE trenches offline as portions of the site are remediated.
- Closing off individual SVE trench sections if mass removal from that section is negligible or asymptotic and sparge vapor capture can be achieved without that section online.
- Modifying air sparge well pulse pairings and duration to enhance mass recovery.
- Adjusting sparge and/or SVE flow rates to enhance mass recovery or reduce electrical use without reducing system performance.

Shutdown of the systems will be evaluated and proposed when groundwater contamination levels are reduced below cleanup criteria or the mass recovery rate of the systems becomes negligible or reaches asymptotic levels. Shutdown may include taking the entire system offline or just shutting down individual systems (AS/SVE/SSDS).

Section 9
References

Camp Dresser and McKee Inc. (CDM). 2009a. *Final Comprehensive Remedial Investigation Report, Standard Motor Products, Inc Site.* February 6, 2009.

Camp Dresser and McKee Inc. (CDM). 2009b. *Final Feasibility Study Report, Standard Motor Products, Inc Site.* February 6, 2009.

Camp Dresser and McKee Inc. (CDM). 2009c. *Final Interim Remedial Measure Work Plan, Standard Motor Products, Inc Site.* February 6, 2009.

New York State Department of Environmental Conservation. Division of Environmental Remediation. *Record of Decision : Standard Motor Products, Inc. Site. Long Island City, Queens County, New York. Site Number 241016.* March 2009.

New York State Department of Environmental Conservation. *DER-10: Technical Guidance for Site Investigation and Remediation.* May 3, 2010.

Tables

Table 2-1
Summary of Permit and Authorizations
AS/SVE Remedial Design
Standard Motor Products, Long Island City, New York

Permit/Authorization	Authority
Air Pollution Control Permit	Remedial Action Bureau B Department of Environmental Remediation NYSDEC
Construction Permit	New York City Department of Buildings Queens Borough Office
Electrical Permit	New York City Department of Buildings Queens Borough Office Electrical Division
Construction Noise Mitigation Plan	New York City Department of Environmental Protection

Figures

NEW YORK

NEW JERSEY

ROCKLAND

WESTCHESTER

BRONX

NEW YORK CITY

QUEENS

NASSAU

SUFFOLK

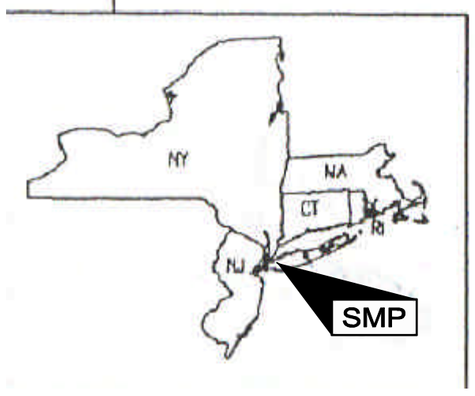
KINGS

Long Island

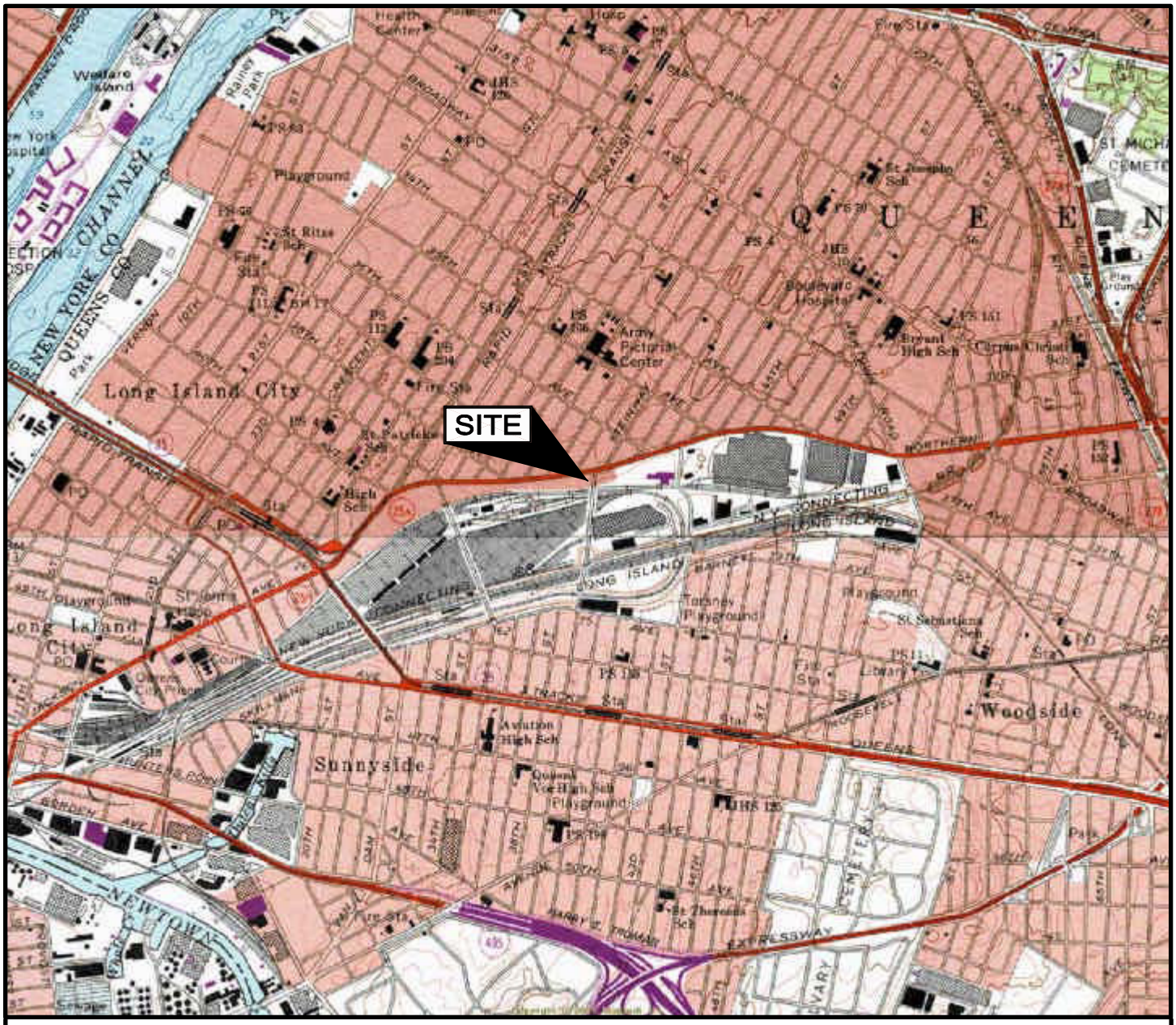
RICHMOND

STANDARD MOTOR PRODUCTS (SMP)

A T L A N T I C O C E A N



DRAFTED BY: W.G.S (N.J.)	REGIONAL SITE LOCATION MAP
CHECKED BY: DP	FINAL (100%) DESIGN STANDARD MOTOR PRODUCTS, INC. SITE LONG ISLAND CITY, NEW YORK
REVIEWED BY: JVB	CDM
NORTH	NOT TO SCALE / DATE 7-1-11 / FIGURE 1–1



SOURCE: USGS 7.5 MINUTE SERIES
TOPOGRAPHIC QUADRANGLE 1979
CENTRAL PARK, N.Y. – N.J.
CONTOUR INTERVAL = 10'

QUADRANGLE LOCATION

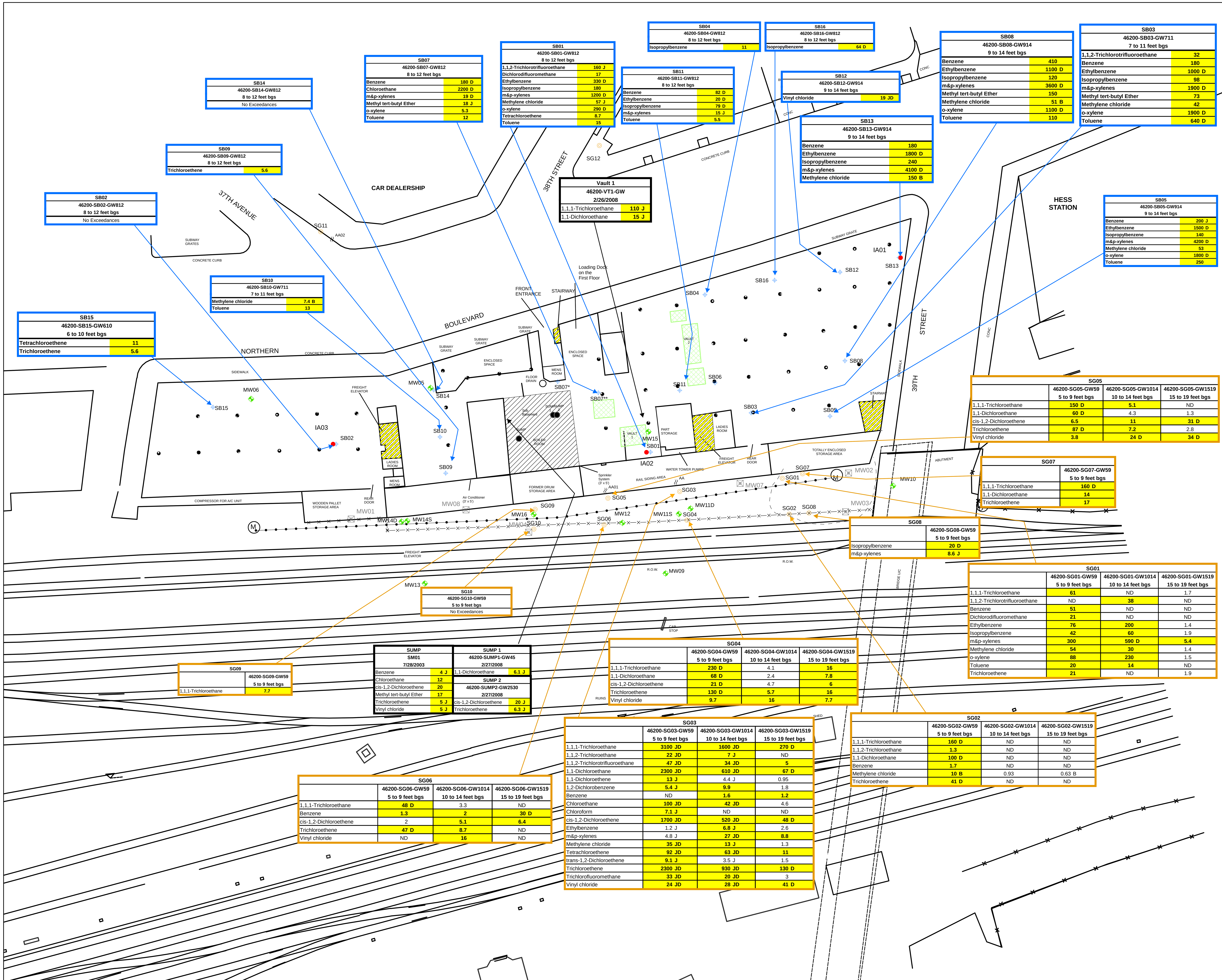
DRAFTED BY: W.G.S. (N.J.)	SITE LOCATION MAP
CHECKED BY: DP	FINAL (100%) DESIGN STANDARD MOTOR PRODUCTS, INC. SITE LONG ISLAND CITY, NEW YORK
REVIEWED BY: JVB	CDM
NORTH	SCALE IN FEET: 0 – 2000 / DATE: 7-1-11 / FIGURE: 1–2

- INDOOR AIR (IA) SAMPLE LOCATION
- AMBIENT AIR (AA) SAMPLE LOCATION
- DESTROYED MONITORING WELLS (MW)
- MONITORING WELL (MW)
- SUB-SLAB (SB) SAMPLE LOCATION
- SOIL GAS (SG) SAMPLE LOCATION
- (M) SEWER MANHOLE (APPROX 12' DEEP)
- (D) APPROX LOCATION OF DRAIN SPOUT
- R.O.W. RIGHT OF WAY
- SUPPORT COLUMN
- FENCE LINE
- UNDERGROUND STORM SEWER
- APPROX. VICINITY OF PREVIOUSLY EXCAVATED SOILS
- RECESS EQUIPMENT PAD/VAULT

NOTES:
SB07* - AIR SAMPLE
SB07** - SOIL/GW SAMPLE

DRAFTED BY: CJ	**SITE LAYOUT**
CHECKED BY: DP	**FINAL (100%) DESIGN STANDARD MOTOR PRODUCTS, INC. SITE LONG ISLAND CITY, NEW YORK**
REVIEWED BY: JVB	CDM

NORTH	SCALE IN FEET	DATE	FIGURE
	0 50	7-1-11	1-3



SB14	
46200-SB14-GW812	
8 to 12 feet bgs	
No Exceedances	

SB07	
46200-SB07-GW812	
8 to 12 feet bgs	
Benzene	180 D
Chloroethane	2200 D
m&p-xylenes	19 D
Methyl tert-butyl Ether	18 J
o-xylene	5.3
Toluene	12

SB01	
46200-SB01-GW812	
8 to 12 feet bgs	
1,1,2-Trichlorotrifluoroethane	160 J
Dichlorodifluoromethane	17
Ethylbenzene	330 D
Isopropylbenzene	180
m&p-xylenes	1200 D
Methylene chloride	57 J
o-xylene	290 D
Tetrachloroethene	8.7
Toluene	15

SB04	
46200-SB04-GW812	
8 to 12 feet bgs	
Isopropylbenzene	11

SB16	
46200-SB16-GW812	
8 to 12 feet bgs	
Isopropylbenzene	64 D

SB11	
46200-SB11-GW812	
8 to 12 feet bgs	
Benzene	82 D
Ethylbenzene	20 D
Isopropylbenzene	79 D
m&p-xylenes	15 J
Toluene	5.5

SB12	
46200-SB12-GW914	
9 to 14 feet bgs	
Vinyl chloride	19 JD

SB13	
46200-SB13-GW914	
9 to 14 feet bgs	
Benzene	180
Ethylbenzene	1800 D
Isopropylbenzene	240
m&p-xylenes	4100 D
Methylene chloride	150 B

SB08	
46200-SB08-GW914	
9 to 14 feet bgs	
Benzene	410
Ethylbenzene	1100 D
Isopropylbenzene	120
m&p-xylenes	3600 D
Methyl tert-butyl Ether	150
Methylene chloride	51 B
o-xylene	1100 D
Toluene	110

SB03	
46200-SB03-GW711	
7 to 11 feet bgs	
1,1,2-Trichlorotrifluoroethane	32
Benzene	180
Ethylbenzene	1000 D
Isopropylbenzene	98
m&p-xylenes	1900 D
Methyl tert-butyl Ether	73
Methylene chloride	42
o-xylene	1900 D
Toluene	640 D

SB09	
46200-SB09-GW812	
8 to 12 feet bgs	
Trichloroethene	5.6

SB02	
46200-SB02-GW812	
8 to 12 feet bgs	
No Exceedances	

Vault 1	
46200-VT1-GW	
2/26/2008	
1,1,1-Trichloroethane	110 J
1,1-Dichloroethane	15 J

SB10	
46200-SB10-GW711	
7 to 11 feet bgs	
Methylene chloride	7.4 B
Toluene	13

SB15	
46200-SB15-GW610	
6 to 10 feet bgs	
Tetrachloroethene	11
Trichloroethene	5.6

SB05	
46200-SB05-GW914	
9 to 14 feet bgs	
Benzene	200 J
Ethylbenzene	1500 D
Isopropylbenzene	140
m&p-xylenes	4200 D
Methylene chloride	53
o-xylene	1800 D
Toluene	250

SG05	46200-SG05-GW59 5 to 9 feet bgs	46200-SG05-GW1014 10 to 14 feet bgs	46200-SG05-GW1519 15 to 19 feet bgs
1,1,1-Trichloroethane	150 D	5.1	ND
1,1-Dichloroethane	60 D	4.3	1.3
cis-1,2-Dichloroethene	6.5	11	31 D
Trichloroethene	87 D	7.2	2.8
Vinyl chloride	3.8	24 D	34 D

SG07	46200-SG07-GW59 5 to 9 feet bgs
1,1,1-Trichloroethane	160 D
1,1-Dichloroethane	14
Trichloroethene	17

SG08	46200-SG08-GW59 5 to 9 feet bgs
Isopropylbenzene	20 D
m&p-xylenes	8.6 J

SG01	46200-SG01-GW59 5 to 9 feet bgs	46200-SG01-GW1014 10 to 14 feet bgs	46200-SG01-GW1519 15 to 19 feet bgs
1,1,1-Trichloroethane	61	ND	1.7
1,1,2-Trichlorotrifluoroethane	ND	38	ND
Benzene	51	ND	ND
Dichlorodifluoromethane	21	ND	ND
Ethylbenzene	76	200	1.4
Isopropylbenzene	42	60	1.9
m&p-xylenes	300	590 D	5.4
Methylene chloride	54	30	1.4
o-xylene	88	230	1.5
Toluene	20	14	ND
Trichloroethene	21	ND	1.9

SG10	
46200-SG10-GW59	
5 to 9 feet bgs	
No Exceedances	

SUMP	
SM01	
7/28/2003	
Benzene	4 J
Chloroethane	12
cis-1,2-Dichloroethene	20
Methyl tert-butyl Ether	17
Trichloroethene	5 J
Vinyl chloride	5 J

SUMP 1	
46200-SUMP1-GW45	
2/27/2008	
1,1-Dichloroethane	6.1 J

SUMP 2	
46200-SUMP2-GW2530	
2/27/2008	
cis-1,2-Dichloroethene	20 J
Trichloroethene	6.3 J

SG09	46200-SG09-GW59 5 to 9 feet bgs
1,1,1-Trichloroethane	7.7

SG04	46200-SG04-GW59 5 to 9 feet bgs	46200-SG04-GW1014 10 to 14 feet bgs	46200-SG04-GW1519 15 to 19 feet bgs
1,1,1-Trichloroethane	230 D	4.1	16
1,1-Dichloroethane	68 D	2.4	7.8
cis-1,2-Dichloroethene	21 D	4.7	6
Trichloroethene	130 D	5.7	16
Vinyl chloride	9.7	16	7.7

SG03	46200-SG03-GW59 5 to 9 feet bgs	46200-SG03-GW1014 10 to 14 feet bgs	46200-SG03-GW1519 15 to 19 feet bgs
1,1,1-Trichloroethane	3100 JD	1600 JD	270 D
1,1,2-Trichloroethane	22 JD	7 J	ND
1,1,2-Trichlorotrifluoroethane	47 JD	34 JD	5
1,1-Dichloroethane	2300 JD	610 JD	67 D
1,1-Dichloroethene	13 J	4.4 J	0.95
1,2-Dichlorobenzene	5.4 J	9.9	1.8
Benzene	ND	1.6	1.2
Chloroethane	100 JD	42 JD	4.6
Chloroform	7.1 J	ND	ND
cis-1,2-Dichloroethene	1700 JD	520 JD	48 D
Ethylbenzene	1.2 J	6.8 J	2.6
m&p-xylenes	4.8 J	27 JD	8.8
Methylene chloride	35 JD	13 J	1.3
Tetrachloroethene	92 JD	63 JD	11
trans-1,2-Dichloroethene	9.1 J	3.5 J	1.5
Trichloroethene	2300 JD	930 JD	130 D
Trichlorofluoromethane	33 JD	20 JD	3
Vinyl chloride	24 JD	28 JD	41 D

SG02	46200-SG02-GW59 5 to 9 feet bgs	46200-SG02-GW1014 10 to 14 feet bgs	46200-SG02-GW1519 15 to 19 feet bgs
1,1,1-Trichloroethane	160 D	ND	ND
1,1,2-Trichloroethane	1.3	ND	ND
1,1-Dichloroethane	100 D	ND	ND
Benzene	1.7	ND	ND
Methylene chloride	10 B	0.93	0.63 B
Trichloroethene	41 D	ND	ND

SG06	46200-SG06-GW59 5 to 9 feet bgs	46200-SG06-GW1014 10 to 14 feet bgs	46200-SG06-GW1519 15 to 19 feet bgs
1,1,1-Trichloroethane	48 D	3.3	ND
Benzene	1.3	2	30 D
cis-1,2-Dichloroethene	2	5.1	6.4
Trichloroethene	47 D	8.7	ND
Vinyl chloride	ND	16	ND

INDOOR AIR (IA) LOCATION
AMBIENT AIR (AA) LOCATION
DESTROYED MONITORING WELL (MW)
MONITORING WELL (MW)
SUB-SLAB (SB) LOCATION
SOIL GAS (SG) LOCATION
SEWER MANHOLE (APPROX 12' DEEP)
APPROX LOCATION OF DRAIN SPOUT
SUPPORT COLUMN
R.O.W. RIGHT OF WAY
FENCE LINE
UNDERGROUND STORM SEWER
RECESS EQUIPMENT PAD/VAULT
APPROX. VICINITY OF PREVIOUSLY EXCAVATED SOIL

NOTES:
SB07* - AIR SAMPLE
SB07** - SOIL/GW SAMPLE

Site Specific Groundwater Delineation Criteria	
1,1,1-Trichloroethane	5
1,1,2-Trichloroethane	1
1,1,2-Trichlorotrifluoroethane	5
1,1-Dichloroethane	5
1,1-Dichloroethene	5
1,2-Dichlorobenzene	3
1,2-Dichloropropane	1
Benzene	1
Bromochloromethane	5
Chloroethane	5
Chloroform	7
cis-1,2-Dichloroethene	5
Dichlorodifluoromethane	5
Ethylbenzene	5
Isopropylbenzene	5
m&p-xylenes	5
Methyl tert-butyl Ether	10
Methylene chloride	5
o-xylene	5
Tetrachloroethene	5
Toluene	5
trans-1,2-Dichloroethene	5
Trichloroethene	5
Trichlorofluoromethane	5
Vinyl chloride	2

RESULTS ARE IN µg/L.
BOLD EXCEED SITE SPECIFIC CRITERIA

DRAFTED BY: BK
CHECKED BY: DP
REVIEWED BY: JVB

PHASE IV DIRECT PUSH GROUNDWATER VOC EXCEEDANCES

FINAL (100%) DESIGN
STANDARD MOTOR PRODUCTS, INC. SITE
LONG ISLAND CITY, NEW YORK

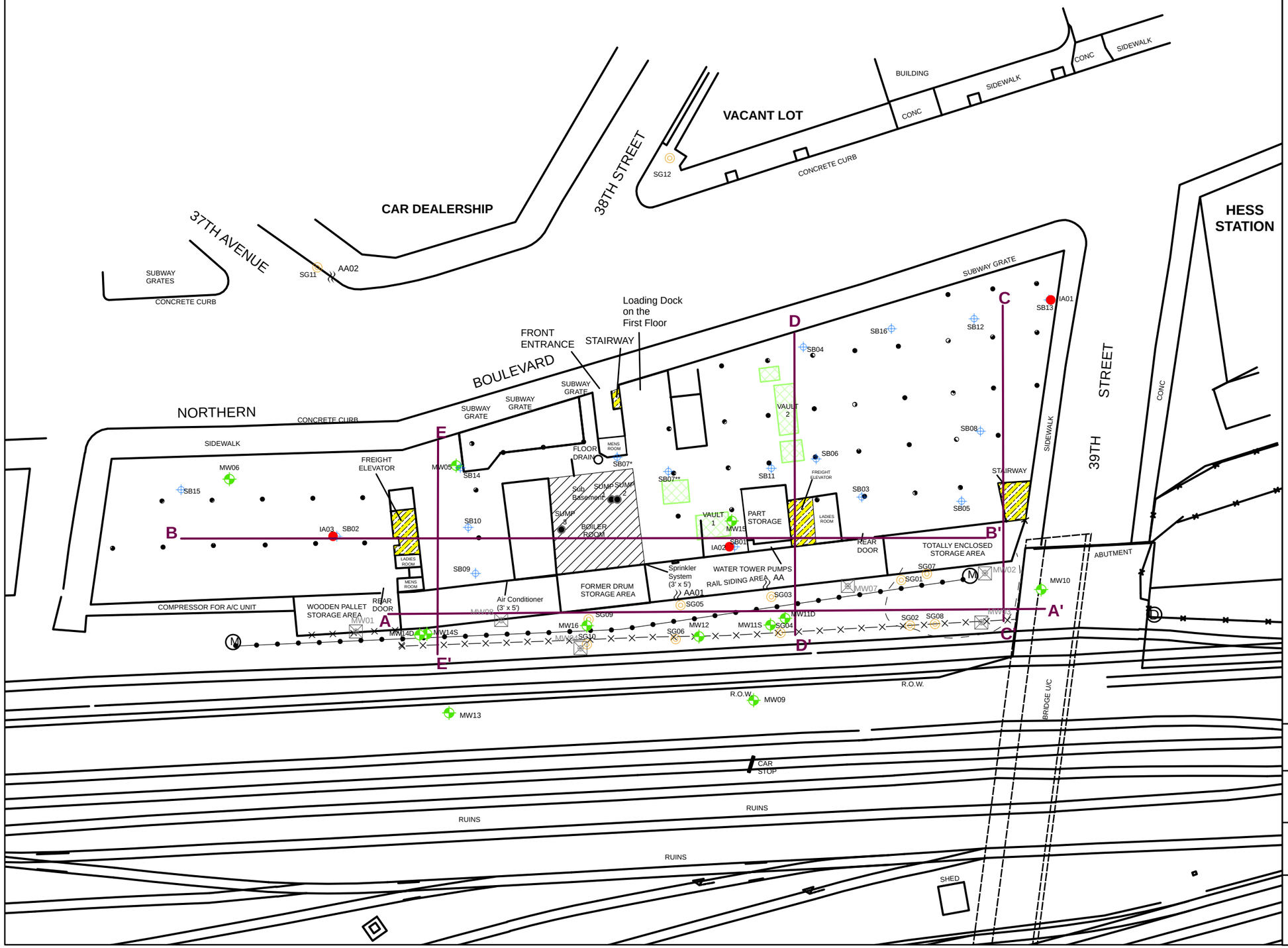
CDM

NORTH

SCALE IN FEET
0 50

DATE 7-1-11

FIGURE 1-4



- INDOOR AIR (IA) SAMPLE LOCATION
- AMBIENT AIR (AA) SAMPLE LOCATION
- DESTROYED MONITORING WELLS (MW)
- MONITORING WELL (MW)
- SUB-SLAB (SB) SAMPLE LOCATION
- SOIL GAS (SG) SAMPLE LOCATION
- (M) SEWER MANHOLE (APPROX 12' DEEP)
- (D) APPROX LOCATION OF DRAIN SPOUT
- R.O.W. RIGHT OF WAY
- SUPPORT COLUMN
- FENCE LINE
- UNDERGROUND STORM SEWER
- APPROX. VICINITY OF PREVIOUSLY EXCAVATED SOILS
- RECESS EQUIPMENT PAD/VAULT
- A — A' CROSS SECTION

NOTES:
SB07* - AIR SAMPLE
SB07** - SOIL/GW SAMPLE

DRAFTED BY: CJ	**CROSS SECTION LOCATION MAP**
CHECKED BY: DP	**FINAL (100%) DESIGN STANDARD MOTOR PRODUCTS, INC. SITE LONG ISLAND CITY, NEW YORK**
REVIEWED BY: JVB	CDM

NORTH	SCALE IN FEET	DATE	FIGURE
	0 50	7-1-11	1-5

West
A

East
A'

Loading Dock

36" RCP
STORM SEWER

MW14D
MW14S
SG10
SG09
SG05
MW12
SG03
MW11S
MW11D
SG01
SG07
MW10

Elevation (feet above mean sea level)

Vertical Scale (feet)

Distance Along Baseline (ft)

Cross Section Location

MW 14D
MW 14S
SG 09
SG 10
SG 05
MW 12
SG 03
MW 11S
MW 11D
SG 01
SG 07
MW 10

Site Map Scale 1 inch equals 130 feet

Vertical Exaggeration: 2.5x

LEGEND:

- USCS Poorly-graded Sand
- USCS Well-graded Sand
- USCS Well-graded Gravel
- Fill (made ground)
- USCS Low Plasticity Clay
- USCS Silty Sand
- USCS Poorly-graded Gravel
- USCS Peat
- USCS Clayey Sand
- Blank Riser Pipe
- Well Screen
- Ground surface elevation created using the minimum curvature algorithm in Surfer.
- Water table elevation created in Surfer using the minimum curvature algorithm. Data from the following wells were used: MW06, 10, 11S, 12, 14S, 15, 16.

Groundwater (GW) Sample Results
Trichloroethene
cis-1,2-Dichloroethene
Total Xylenes

All GW sample results in micrograms per liter, µg/L

U - not detected, detection limit is value to left
J - estimated concentration
D - sample diluted

Approximate location of sub-basement as projected onto cross-section (sub-basement is to the north).

Water Level Elevation (feet above mean sea level) Date: 2/25/2008

Screened Interval

Water Level in Shallow Well Representative of Water Table Date: 2/25/2008

Groundwater Sample Interval

Potentiometric Contours — 16.1 —

Groundwater Isoconcentration Contours, µg/L
Trichloroethene
Total Xylenes

NOTE: Data from MW11S, MW11D and MW12 were not used to draw isoconcentration contours.

CDM

DRAFTED BY: CNR	VOC PLUME CROSS SECTION A - A'
CHECKED BY:	FINAL (100%) DESIGN STANDARD MOTOR PRODUCTS, INC. SITE LONG ISLAND CITY, NEW YORK
REVIEWED BY:	CDM
NORTH	SCALE IN FEET 0 25 (Horizontal)
	DATE 7-1-2011
	FIGURE 1-6

SMP CROSS SECTION SMP1.GPJ SMP1.GPJ 6/5/08 REV.

North D — D' South

Building — Loading Dock

36" RCP STORM SEWER

SB04 | SB06 | SB11 | MW15 | SB01 | SG03 | MW11D | MW11S | SG04

Elevation (feet above mean sea level)

Vertical Scale (feet)

Distance Along Baseline (ft)

Vertical Exaggeration: 1.5x

Cross Section Location

SB 04, SB 06, SB 11, MW 15, SB 01, SG 03, SG 04, MW 11D, MW 11S

Site Map Scale
1 inch equals 75 feet

N

LEGEND:

- USCS Well-graded Sand
- USCS Poorly-graded Sand
- USCS Poorly-graded Gravel
- Blank Riser Pipe
- Well Screen
- USCS Well-graded Gravel
- Fill (made ground)
- Asphalt
- USCS Silty Sand

Ground surface elevation created using the minimum curvature algorithm in Surfer.

Water table elevation created in Surfer using the minimum curvature algorithm. Data from the following wells were used: MW06, 10, 11S, 12, 14S, 15, 16.

Groundwater (GW) Sample Results
Trichloroethene
cis-1,2-Dichloroethene
Total Xylenes

All GW sample results in micrograms per liter, µg/L

U - not detected, detection limit is value to left
J - estimated concentration
D - sample diluted

Approximate location of sub-basement as projected onto cross-section (sub-basement is to the west).

Water Level Elevation (feet above mean sea level) — Date: 2/25/2008

Screened Interval

Water Level in Shallow Well Representative of Water Table — Date: 2/25/2008

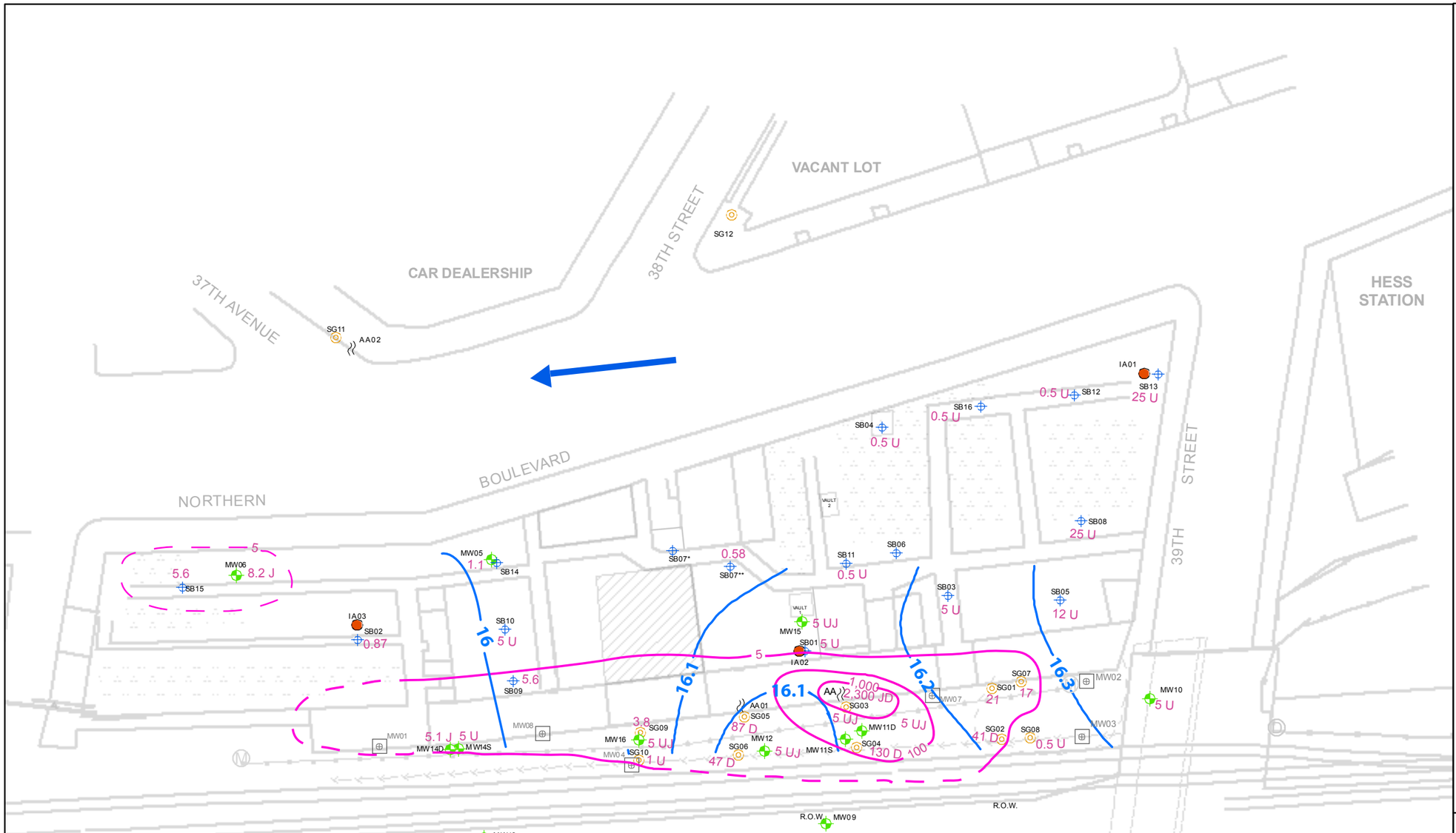
Groundwater Sample Interval

Groundwater Isoconcentration Contours, µg/L
Trichloroethene
Total Xylenes

CDM

DRAFTED BY: CNR	VOC PLUME CROSS SECTION D - D'
CHECKED BY:	FINAL (100%) DESIGN STANDARD MOTOR PRODUCTS, INC. SITE LONG ISLAND CITY, NEW YORK
REVIEWED BY:	CDM
NORTH	SCALE IN FEET 0 — 15 (Horizontal)
	DATE 7-1-2011
	FIGURE 1-7

SMP CROSS SECTION SMP1.GPJ SMP1.GPJ 6/5/08 REV.



INDOOR AIR (IA) SAMPLE LOCATION

AMBIENT AIR (AA) SAMPLE LOCATION

DESTROYED MONITORING WELLS (MW)

MONITORING WELL (MW)

SUB-SLAB (SB) SAMPLE LOCATION

SOIL GAS (SG) SAMPLE LOCATION

(M) SEWER MANHOLE (APPROX 12' DEEP)

(D) APPROX LOCATION OF DRAIN SPOUT

R.O.W. RIGHT OF WAY

FENCE LINE

UNDERGROUND STORM SEWER

BUILDING - PROCESS EQUIPMENT

APPROX. VICINITY OF PREVIOUSLY EXCAVATED SOILS

16.3 POTENTIOMETRIC CONTOUR, FEET AMSL

TCE ISOCONCENTRATION CONTOUR (MICROGRAMS/LITER) (MAXIMUM TOTAL TCE CONCENTRATION AT EACH LOCATION WERE USED TO CREATE CONTOURS)

2,300 JD TCE, MICROGRAMS/LITER

D DILUTED SAMPLE

U NOT DETECTED, VALUE REPORTED IS THE DETECTION LIMIT

J ESTIMATED CONCENTRATION

NOTES:
SB07* - AIR SAMPLE
SB07** - SOIL/GW SAMPLE

DRAFTED BY: BK	**2008 TCE GROUNDWATER ISOCONCENTRATION CONTOUR MAP**
CHECKED BY: DP	**FINAL (100%) DESIGN** **STANDARD MOTOR PRODUCTS, INC. SITE** **LONG ISLAND CITY, NEW YORK**
REVIEWED BY: JVB	CDM
NORTH	Feet 50
	DATE 7-1-11
	FIGURE 1-8

Appendix A

Health and Safety Plan

HEALTH AND SAFETY PLAN FORM CDM Health and Safety Program	*This document is for the exclusive use of CDM and its subcontractors*	CDM (Camp Dresser & McKee) PROJECT DOCUMENT #:

PROJECT NAME	Standard Motor Products, Inc.	PROJECT#	46200	REGION	New York
SITE ADDRESS	37-18 Northern Blvd. Queens, NY 11101	CLIENT ORGANIZATION		Standard Motor Products, Inc.	
		CLIENT CONTACT		Robert Martin	
		CLIENT CONTACT PHONE #		718-316-4276	

(x) AMENDMENT TO EXISTING APPROVED H&SP?

(x) H&SP AMENDMENT NUMBER? 1 (x) DATE OF PREVIOUS H&SP APPROVAL 12/29/2009

OBJECTIVES OF FIELD WORK:
(e.g. collect surface soil samples):

The site has an active sub-slab depressurization system (SSDS). The objective of field work is to perform monitoring activities and oversight of the SSDS operations and maintenance subcontractor. Work may include collection of SSDS operating parameters, sub-slab soil pressures, water samples, and vapor samples.

SITE TYPE: *Check as many as applicable*

Active	( )	Landfill	( )	Unknown	( )
Inactive	(X)	Uncontrolled	( )	Military	( )
Secure	(X)	Industrial	( )	Operating Treatment	
Unsecure	( )	Recovery	( )	System	(X)
Enclosed space	( )	Well Field	(X)		

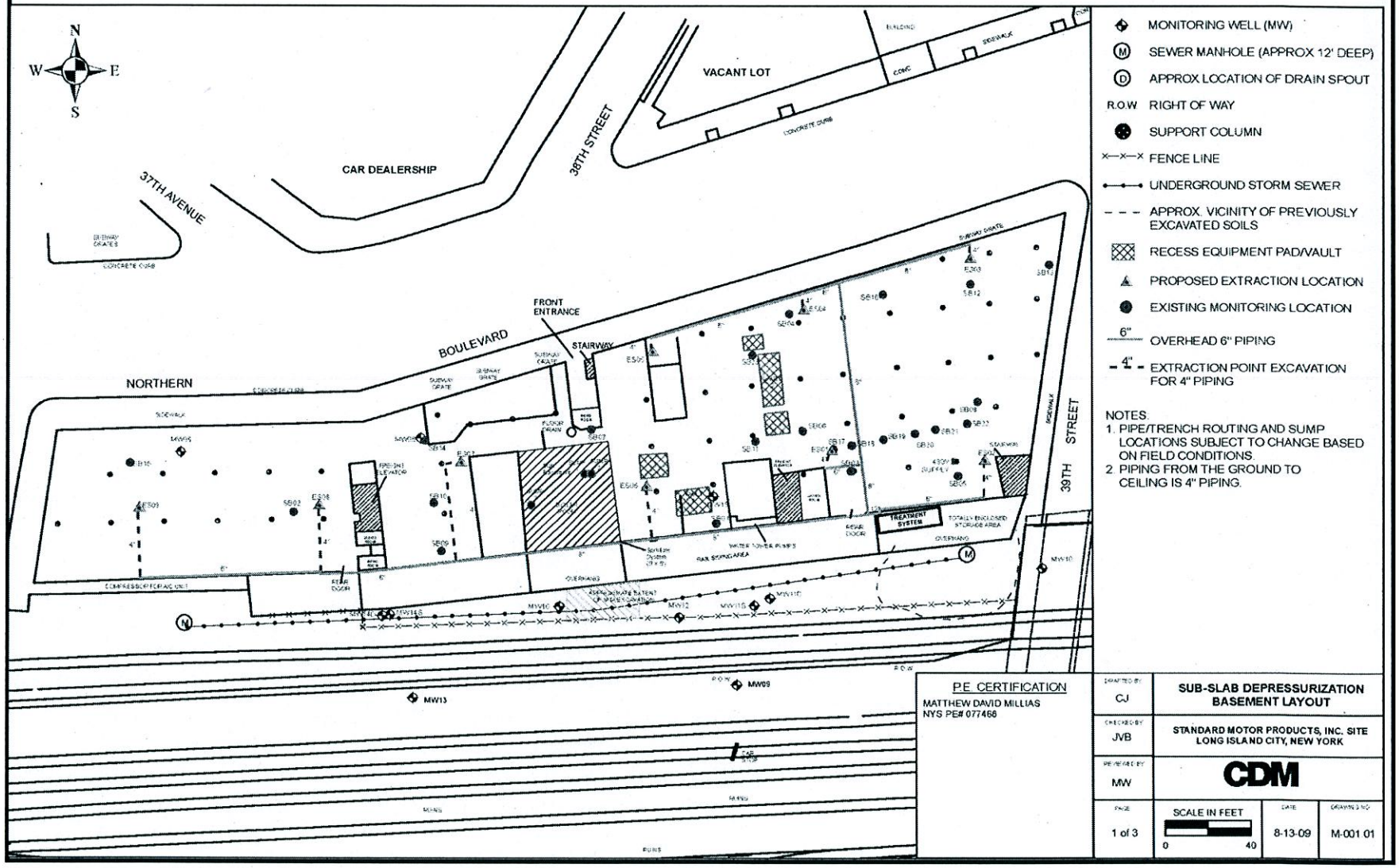
All requirements described in the **CDM Health and Safety Manual** are incorporated in this health and safety plan by reference.

PERSONNEL AND RESPONSIBILITIES NAMES OF WORK CREW MEMBERS	Company / Division / Office	Current Training & Medical?	Project or Site Responsibilities	Tasks On Site?
Randy Kullman	EDN	No	Client Officer	None
Maria Watt	EDN	No	Project Manager	None
Warren Newman	EDN	Yes	Proj. Engineer/H&S Coordinator	1-2-3-4
Paresh Patel	EDN	Yes	Site Engineer	1-2-3-4
Jonathan Lee	NYC	Yes	Site Engineer	1-2-3-4
INTEX Environmental Group, Inc.	Pipersville, PA	Site Worker	Subcontractor	1-2-3-4

BACKGROUND REVIEW: (X) Complete ( ) Incomplete

HEALTH AND SAFETY PLAN FORM | *This document is for the exclusive* | **CDM** (Camp Dresser & McKee)
CDM Health and Safety Program | *use of CDM and its subcontractors* | **PROJECT DOCUMENT #:**

SITE MAP: *Show Exclusion, Contamination Reduction, and Support Zones. Indicate Evacuation and Reassembly Points*



HEALTH AND SAFETY PLAN FORM	*This document is for the exclusive*	**CDM** (Camp Dresser & McKee)
CDM Health and Safety Program	*use of CDM and its subcontractors*	**PROJECT DOCUMENT #:**

HISTORY: *Summarize conditions that relate to hazard. Include citizen complaints, spills, previous investigations or agency actions, known injuries, etc.*

The site was historically involved in industrial and manufacturing activities since 1919. Most recently, SMP produced automobile parts and components. The manufacturing operations included metal fabrication and machining, plastic injection molding, and assembly. These operations used lubricating oils for machinery, caustics for degreasing, phenolics used in molding processes, epoxies for coil production, and water-based inks involved in their small scale printing. All wastes were temporarily stored on-site in secure containers prior to off-site disposal at a licensed treatment, storage, and disposal (TSD) facility. Manufacturing operations at the site ceased in 2008, and the building is currently used for mixed commercial offices. Several investigations of groundwater contamination in the vicinity of the SMP site have been conducted. The primary results can be found in the Remedial Investigation Report for Remedial Investigation/ Feasibilty Study, SMP Site. A sub-slab depressurization system, constructed in 2009 to address indoor air vapor intrusion, is currently operating at the site.

WASTE TYPES: (X) Liquid (X) Solid ( ) Sludge (X) Gas ( ) Unknown ( ) Other, specify:

WASTE CHARACTERISTICS: *Check as many as applicable.*

( ) Corrosive	( ) Flammable	( ) Radioactive
( ) Toxic	(X) Volatile	( ) Reactive
( ) Inert Gas	( ) Unknown	
( ) Other:		

WORK ZONES:

The work being conducted consists of general operations, maintenance, and monitoring activities. Since no work is being conducted directly with hazardous waste, separate work zones are not necessary.

HAZARDS OF CONCERN: *Check as many as applicable.*

(X) Heat Stress	CDM Guideline	(X) Noise	CDM Guideline
(X) Cold Stress	CDM Guideline	( ) Inorganic Chemicals	
( ) Explosive/Flammable		( ) Organic Chemicals	
( ) Oxygen Deficient		( ) Motorized Traffic	
( ) Radiological		( ) Heavy Machinery	
( ) Biological		(X) Slips & Falls	CDM Guideline
(X) Other: Electrical			
( ) Other:			

FACILITY'S PAST AND PRESENT DISPOSAL METHODS AND PRACTICES:

See Site History above.

This plan incorporates CDM's procedure for: *(Click on the relevant topics to download the hazard guideline. Delete irrelevant topics.)*

Housekeeping	Tools and Power Equipment
Electrical Safety	Hazardous Waste Site Controls
Lock Out/Tag Out	Hazardous Waste Site Decontamination

HEALTH AND SAFETY PLAN FORM **CDM Health and Safety Program**	*This document is for the exclusive use of CDM and its subcontractors*	**CDM** (Camp Dresser & McKee) **PROJECT DOCUMENT #:**

DESCRIPTION AND FEATURES: *Include principal operations and unusual features (containers, buildings, dikes, power lines, hillslopes, rivers, etc.)*

The SMP site is located at 37-18 Northern Boulevard in Long Island City, New York. The site is located in an urban and industrial area. The property is approximately rectangular in shape and occupies more than 1 acre. The site property contains a large, six-story, commercial office building with approximately 42,000 square feet per floor. Bordering the site is Northern Boulevard to the north; Sunnyside Freight Railroad Yard to the south; 39th Street, an automobile dealership and a Hess gasoline station to the east; and commercial and industrial properties to the west. Various industrial, commercial, and residential properties are located across from SMP on Northern Boulevard. A narrow strip of land on the south side of the property contains a loading dock and a dirt access path for vehicles. Contamination has been identified in the soil adjacent to the loading dock. This area is mostly dirt and gravel covered with some concrete remaining from a nearby road-paving project. The means of access to this area is from doors at the rear of the SMP building, a locked access gate located on nearby the automobile dealership property, and to railroad personnel by way of the Sunnyside Yard to the south.

SURROUNDING POPULATION: ( ) Residential (X) Industrial (X) Commercial ( ) Rural (X) Urban OTHER:

HAZARDOUS MATERIAL SUMMARY: ***Highlight or bold waste types and estimate amounts by category.***

CHEMICALS: *Amount/Units:*	**SOLIDS:** *Amount/Units:*	**SLUDGES:** *Amount/Units:*	**SOLVENTS:** *Amount/Units:*	**OILS:** *Amount/Units:*	**OTHER:** *Amount/Units:*
Acids	Flyash	Paints	Ketones	Oily Wastes	Laboratory
Pickling Liquors	Mill or Mine Tailings	Pigments	**Aromatics**	Gasoline	Pharmaceutical
Caustics	Asbestos	Metals Sludges	**Hydrocarbons**	Diesel Oil	Hospital
Pesticides	Ferrous Smelter	POTW Sludge	Alcohols	**Lubricants**	Radiological
Dyes or Inks	Non-Ferrous Smelter	Distillation Bottoms	**Halogenated (chloro, bromo)**	Polynuclear Aromatics	Municipal
Cyanides	Metals	Aluminum	Esters	PCBs	Construction
Phenols	Dioxins		Ethers	Heating Oil	Munitions
Halogens					
Other - *specify*	Other - *specify*	Other - *specify*	Other - *specify*	Other - *specify*	Other - *specify*

HEALTH AND SAFETY PLAN FORM **CDM Health and Safety Program**			*This document is for the exclusive use of CDM and its subcontractors*		**CDM** (Camp Dresser & McKee) **PROJECT DOCUMENT #:**	
KNOWN CONTAMINANTS	**HIGHEST OBSERVED CONCENTRATION**	**PEL/TLV** *ppm or mg/m3 (specify)*	**IDLH** *ppm or mg/m3 (specify)*	**Warning Concent'n**	**SYMPTOMS & EFFECTS OF ACUTE EXPOSURE**	**PHOTO IONIZATION POTENTIAL**
Chloroethane	0.012 ppm - GW	100 ppm	3,800 ppm	NA	Incoordination, stomach cramps, Cardiac arrhythmia	10.97
cis 1,2 Dichloroethene	0.093 ppm - GW			1.1 ppm		
Tetrachloroethene	0.01 ppm - GW	25 ppm	150 ppm	47 ppm	Irritated eyes, nose, throat, flushed face & neck, dizziness	9.32
1,1,1 - Trichloroethane	0.013 ppm - GW	350 ppm	700 ppm	400 ppm	Headache, CNS depression, loss of balance, eye irritation	11.00
Trichloroethene	0.018 ppm - GW	50 ppm	1,000 ppm	82 ppm	Vertigo, visual disturbance, headache, drowsiness	9.45
Vinyl Chloride	0.031 ppm - GW	1 ppm	Carc.	NA	Weakness, stomach pain, cancer	10.00
Benzene	0.008 ppm - GW	0.5 ppm	500 ppm	61 ppm	Eye & nose irritation, headache, giddiness, nausea, fatigue	9.25
Ethylbenzene	0.48 ppm - GW	100 ppm	800 ppm	200 ppm	Eye & nose irritation, headache, narcosis	8.76
Isopropylbenzene	0.021 ppm - GW	50 ppm	900 ppm	0.03 ppm	Irritated eyes, headache, narcosis	8.80
Methyl tert-Butyl ether	1 ppm - GW	50 ppm	NE	<0.5 ppm	Drowsiness, eye irritation, incoordination, rapid breathing	<9.40
Toluene	0.25 ppm - GW	50 ppm	500 ppm	1.7 ppm	Fatigue, confusion, euphoria, dizziness, headache, tears	8.82
Xylenes (total)	1.7 ppm - GW	100 ppm	900 ppm	5 ppm	Eye, nose & throat irritation, drowsiness, nausea, incoordination	8.44

NA = Not Available **NE = None Established** **U = Unknown**

Verify your access to an MSDS for each chemical you will use at the site.

S = Soil SW = Surface Water T = Tailings W = Waste TK = Tanks SD = Sediment
A = Air GW = Ground Water SL = Sludge D = Drums L = Lagoons OFF = Off-Site

HEALTH AND SAFETY PLAN FORM **CDM Health and Safety Program**	*This document is for the exclusive use of CDM and its subcontractors*	**CDM** (Camp Dresser & McKee) **PROJECT DOCUMENT #:**	
SPECIFIC TASK DESCRIPTIONS	**Disturbing the Waste?**	**TASK - SPECIFIC HAZARDS**	**HAZARD & SCHEDULE**
1 O&M supervision - This task involves oversight of O&M contractor performing routine maintenance tasks on the system (e.g., belt tensioning and oil changes).	**Non-intrusive**	Hazards include exposure to process vapor and water, loud noise, trips and falls, and maneuvering in tight spaces. Work may be in close proximity to rotating equipment, electrical sources, and power tools. Temperatures may be hot during the warmer months.	**Low Hazard** 1/2010-12/2011
2 Measure and record operating parameters - This task involves recording values from process gauges, using a handheld manometer, and a PID.	**Non-intrusive**	Hazards include exposure to process vapor and water, loud noise, trips and falls, and maneuvering in tight spaces. Work may be in close proximity to rotating equipment. Temperatures may be hot during the warmer months.	**Low Hazard** 1/2010-12/2011
3 Process vapor sample collection - Summa canisters will be used to collect samples from vapor sample ports on the system with dedicated tubing.	**Intrusive**	Hazards include exposure to process vapor and water, loud noise, trips and falls, and maneuvering in tight spaces. Work may be in close proximity to rotating equipment and involve the use of hand tools. Temperatures may be hot during the warmer months.	**Moderate Hazard** 1/2010-12/2011
4 Process water sample collection - Water samples will be collected from sample ports on the system with dedicated tubing and pre-preserved bottleware.	**Intrusive**	Hazards include exposure to process vapor and water, splashing, acid preservatives, loud noise, trips and falls, and maneuvering in tight spaces. Work may be in close proximity to rotating equipment. Temperatures may be hot during the warmer months.	**Moderate Hazard** 1/2010-12/2011
5			
6			
SPECIALIZED TRAINING REQUIRED: None		**SPECIAL MEDICAL SURVEILLANCE REQUIREMENTS:** **None required. Normal requirements, as listed in Section 8 of the Corporate H&S Manual, will be followed.**	
OVERALL HAZARD EVALUATION: ( ) High ( ) Medium (X) Low ( ) Unknown *(Where tasks have different hazards, evaluate each.)*			
JUSTIFICATION: Mechanical work will be performed by subcontractor. Process streams being sampled have very low concentration of VOCs.			
FIRE/EXPLOSION POTENTIAL: ( ) High ( ) Medium (X) Low ( ) Unknown			

HEALTH AND SAFETY PLAN FORM | *This document is for the exclusive* | **CDM** (Camp Dresser & McKee)

CDM Health and Safety Program | *use of CDM and its subcontractors* | **PROJECT DOCUMENT #:**

PROTECTIVE EQUIPMENT: *Specify by task. Indicate type and/or material, as necessary. Group tasks if possible. Use copies of this sheet if needed.*

BLOCK A

TASKS: 1 - 2
LEVEL: D - Modified
(X) Primary ( ) Contingency

Respiratory: (X) Not needed
( ) SCBA, Airline:
( ) APR:
( ) Cartridge:
( ) Escape Mask:
( ) Other:

Head and Eye: ( ) Not needed
(X) Safety Glasses:
( ) Face Shield:
( ) Goggles:
(X) Hard Hat:
( ) Other:

Boots: ( ) Not needed
(X) Steel-Toe ( ) Steel Shank
( ) Rubber ( ) Leather
( ) Overboots:

Prot. Clothing: (X) Not needed
( ) Encapsulated Suit:
( ) Splash Suit
( ) Apron:
( ) Tyvek Coverall or
( ) Saranex Coverall
( ) Cloth Coverall:
( ) Other:

Gloves: ( ) Not needed
( ) Undergloves:
(X) Gloves: work gloves
( ) Overgloves:

Other: specify below
( ) Tick Spray
( ) Flotation Device
(X) Hearing Protection
( ) Sun Screen

BLOCK B

TASKS: 1 - 2
LEVEL:
( ) Primary (X) Contingency

Respiratory: ( ) Not needed
( ) SCBA, Airline:
( ) APR:
( ) Cartridg
( ) Escape
( ) Other:

Head and Eye: ( ) Not needed
( ) Safety Glasses:
( ) Face Shield:
( ) Goggles:
( ) Hard Hat:
( ) Other:

Boots: (
( ) Stee nk
( ) Ru
( ) Overboots: Latex

Prot. Clothing: ( ) Not needed
( ) Encapsulated Suit:
( ) Splash Suit
( ) Apron:
( ) ve ll or
( ) an verall
( ) th ll:
( ) Other:

Gloves: ( ) Not needed
( ) Undergloves:
( ) Gloves: work gloves
( ) Overgloves:

( ) Hearing Protection
( ) Sun Screen

BLOCK C

TASKS: 3 - 4
LEVEL: D - Modified
(X) Primary ( ) Contingency

Respiratory: (X) Not needed
( ) SCBA, Airline:
( ) APR:
( ) Cartridge:
( ) Escape Mask:
( ) Other:

Head and Eye: ( ) Not needed
(X) Safety Glasses:
( ) Face Shield:
( ) Goggles:
(X) Hard Hat:
( ) Other:

Boots: ( ) Not needed
(X) Steel-Toe ( ) Steel Shank
( ) Rubber (■) Leather
( ) Overboots:

Prot. Clothing: (X) Not needed
( ) Encapsulated Suit:
( ) Splash Suit
( ) Apron:
( ) Tyvek Coverall or
( ) Saranex Coverall
() Cloth Coverall:
( ) Other:

Gloves: ( ) Not needed
(■) Undergloves: nitrile surgical
(■) Gloves: 9-mil nitrile
( ) Overgloves:

Other: specify below
( ) Tick Spray
( ) Flotation Device
(X) Hearing Protection
( ) Sun Screen

BLOCK D

TASKS: 3 - 4
LEVEL:
( ) Primary (X) Contingency

Respiratory: ( ) Not needed
( ) SCBA, Airline:
( ) APR:
( ) Cartridge
( ) Escape M
( ) Other:

Head and Eye: ( ) Not needed
( ) Safety Glasses:
( ) Face Shield:
( ) Goggles:
( ) Hard Hat:
( ) Other:

Boots: ( )
( ) Steel
( ) Rub
( ) Overboots: Latex

Prot. Clothing: ( ) Not needed
( ) Encapsulated Suit:
( ) h Suit
( ) Apron
( ) k or
( ) ex erall
( ) C
( ) Other:

Gloves: ( ) Not needed
( ) Undergloves:
( ) Gloves: work gloves
( ) Overgloves:

( ) Hearing Protection
( ) Sun Screen

Exit Area

Exit Area

This health and safety plan form constitutes hazard analysis per 29 CFR 1910.132

HEALTH AND SAFETY PLAN FORM CDM Health and Safety Program		*This document is for the exclusive use of CDM and its subcontractors*		CAMP DRESSER & McKEE INC. PROJECT DOCUMENT #:
MONITORING EQUIPMENT: *Specify by task. Indicate type as necessary. Attach additional sheets if needed.*				
INSTRUMENT	**TASK**	**ACTION GUIDELINES**		**COMMENTS** *(When and how will you use the monitor?)*
Combustible Gas Indicator		0 - 10% LEL 10 - 25% LEL > 25% LEL 21.0% O2 < 21.0% O2 < 19.5% O2	*No explosion hazard* *Potential explosion hazard; notify SHSC* *Explosion hazard; interrupt task/evacuate* *Oxygen normal* *Oxygen deficient; notify SHSC* *Interrupt task/evacuate*	( ) Not Needed
Radiation Survey Meter		3 x Background: > 2 mR/hr:	*Notify HSM* *Establish REZ*	( ) Not Needed
Photoionization Detector 10.6 eV Lamp Type: OVM	**3 & 4**	0 to 1 ppm: Level D. 1 to 20 ppm: Level D, use detector tubes (See comments) > 20 ppm: Leave area. Call HSM.		Monitor breathing zone continuously. Compare action levels to time-averaged breathing zone measurements. Team may rely on instruments operated by subcontractor. If PID reading at downwind perimeter of work area exceeds 5 ppm above background for 15-minutes average, open excavations will be covered with plastic until PID readings fall below 5 ppm.
Single Gas Vinyl chloride	**3 & 4**	< 0.5 ppm: Level D > 0.5 ppm: Leave area. Call HSM.		Team will draw detector tubes for vinyl chloride whenever PID levels rise.
Respirable Dust Monitor	**3 & 4**	If team observes visible concentrations of airborne dust or dry, windy conditions that stir dust up, team will leave area.		
Other:	**3 & 4**	If team observes dust or if team experiences dizziness or irritation of eyes and throat, they will upgrade to Level C or exit area.		Page 8 of 12

HEALTH AND SAFETY PLAN FORM **CDM Health and Safety Program**	*This document is for the exclusive use of CDM and its subcontractor*	**CDM** (Camp Dresser & McKee) **PROJECT DOCUMENT #:**

DECONTAMINATION PROCEDURES

ATTACH SITE MAP INDICATING EXCLUSION, DECONTAMINATION, & SUPPORT ZONES AS PAGE TWO

Personnel Decontamination *Summarize below or attach diagram;*	**Sampling Equipment Decontamination** *Summarize below or attach diagram;*	**Heavy Equipment Decontamination** *Summarize below or attach diagram;*
Any in the event of a spill/splash contacting personnel, the affected clothing should be removed and excess spill material wiped off person with a clean cloth. Personal decontamination should proceed as follows: hand wash, face wash, shower (ASAP). ( ) Not Needed	Sampling ports and tubing will be dedicated and remain in place at each sampling location, thus will not require decontamination. Contaminated gloves should be removed and disposed of as below. Laboratories will be responsible for decon and disposal of Summa canisters and bottleware. ( ) Not Needed	There will be no heavy equipment used for these tasks. (X) Not Needed
Containment and Disposal Method	**Containment and Disposal Method**	**Containment and Disposal Method**
Clothing and contaminated towels should be disposed of in a correctly labelled drum for PPE.	Used PPE should be disposed of in a labelled drum for PPE disposal.	NA

]

Preservatives		*Decontamination*		*Calibration*	
(X) Hydrochloric Acid	( ) Zinc Acetate	( ) Alconox ™	( ) Hexane	(X) 100 ppm isobutylene	(X) Hydrogen Sulfide
( ) Nitric Acid	( ) Ascorbic Acid	( ) Liquinox ™	( ) Isopropanol	( ) Methane	( ) Carbon Monoxide
( ) Sulfuric Acid	( ) Acetic Acid	( ) Acetone	( ) Nitric Acid	( ) Pentane	( ) pH Standards
( ) Sodium Hydroxide	( ) Other:	( ) Methanol	( ) Other:	( ) Hyrogen	( ) Conductivity Std
		( ) Mineral Spirits		( ) Propane	( ) Other:

HEALTH AND SAFETY PLAN FORM *This document is for the exclusive* **CDM** (Camp Dresser & McKee)

CDM Health and Safety Program *use of CDM and its subcontractors* **PROJECT DOCUMENT #:**

EMERGENCY CONTACTS	
Water Supply	212-639-9675
EPA Release Report #:	800 / 424 - 8802
CDM 24-Hour Emergency #:	NSG 732 / 539 - 8128
Facility Management	
Other (specify)	
CHEMTREC Emergency #:	800 / 424 - 9300

SAFETY NARRATIVE: *Summarize below*

Evacuate site if any unexpected hazardous conditions are encountered. If staff observe hazards for which they have not been prepared, they will withdraw from the area and call CDM Health & Safety Manager, Chris Marlowe. Without regard to monitoring instrument reading, CDM personnel will leave site if they experience nausea or dizziness. In the event of an emergency, all employees will evacuate the area.

EMERGENCY CONTACTS	NAME	PHONE
Health and Safety Manager	Chris Marlowe	732 / 590 - 4632
Site Safety Coordinator	Maria Watt	
Client Contact	Robert Martin	718-316-4276
Other *(specify)*		
Environmental Agency	Shaun Bollers (NYSDEC)	718-482-4096
State Spill Number	New York	(800) 457 - 7362
Fire Department		911
Police Department		911
State Police		911
Health Department	Nassau County	212-639-9675
Poison Control Center	Nationwide	800 / 222 - 1222
Occupational Physician	Dr. Jerry Berke	800 / 350 - 4511

MEDICAL EMERGENCY	PHONE
Hospital Name:	Elmhurst Hospital Center
Hospital Address:	79-01 Broadway
Name of Contact at Hospital:	
Name of 24-Hour Ambulance:	
Route to Hospital:	

Take Northern Boulevard going East. At the intersection of 54th Street (about a mile) bear to the right onto Broadway. Travel about a mile southeast on Broadway to the hospital.

Distance to Hospital 2.3 miles

HEALTH AND SAFETY PLAN APPROVALS (H&S Mgr must sign each plan)

Prepared by Josh Van Bogaert Date 29-Dec-09

HSC Signature

HSM Signature  Chris Marlowe 2009.12.30 16:44:47 -05'00'

HEALTH AND SAFETY PLAN SIGNATURE FORM

CDM Health and Safety Plan

All site personnel must sign this form indicating receipt of the H&SP. Keep this original on site. It becomes part of the permanent project files. Send a copy to the Health and Safety Manager (HSM).

SITE NAME/NUMBER: Standard Motor Products, Inc.

DIVISION/LOCATION: Queens, NY

CERTIFICATION:

I understand, and agree to comply with, the provisions of the above referenced H&SP for work activities on this project. I agree to report any injuries, illnesses or exposure incidents to the site Health and Safety Coordinator (SHSC). I agree to inform the SHSC about any drugs (legal and illegal) that I take within three days of site work.

PRINTED NAME	SIGNATURE	DATE

Appendix B

Feasibility Study Cost Estimate

Alternative G3 - SVE/AS Cost Estimate Summary
Standard Motor Products, Inc. Site, Long Island City, New York

Item No.	Item Description	Quantity	Unit Cost	Unit	Extension
CAPITAL COSTS					
1. General Requirements					
1a.	Mobilization	1	$ 8,000	LS	$ 8,000
1b.	Work Plan/Health and Safety Plan	1	$ 43,800	LS	$ 43,800
1c.	Subsurface Utility Clearance	1	$ 3,500	LS	$ 3,500
1d.	Construction Management	1	$ 45,800	LS	$ 45,800
2. Construction Costs					
2a.	Pilot Study	1	$ 50,000	LS	$ 50,000
2b.	Erosion Control	1	$ 3,800	LS	$ 3,800
2c.	Staging Area	1	$ 10,000	LS	$ 10,000
2d.	Air Sparge Well Installation	1	$ 9,300	LS	$ 9,300
2e.	Trenching and Compressed Air Hose	1	$ 800	LS	$ 800
2f.	Soil-Vapor Extraction Trench Installation	1	$ 20,000	LS	$ 20,000
2g.	Miscellaneous	1	$ 5,000	LS	$ 5,000
3. Transportation & Disposal					
3a.	Non Hazardous, Subtitle D	1	$ 9,900	LS	$ 9,900
4. Treatment System					
4a.	SVE and AS System	1	$ 55,600	LS	$ 55,600
4b.	Vapor Treatment	1	$ 2,800	LS	$ 2,800
4c.	Hookup/Setup/Startup Testing	1	$ 29,000	LS	$ 29,000
	SUBTOTAL CAPITAL COSTS				**$ 297,300**
5.	General Contractor Profit (10% capital)				$ 29,730
6.	Design Engineering (15% capital)				$ 44,595
7.	Contingency (15% capital)				$ 44,595
	TOTAL CAPITAL COSTS				**$ 416,220**
ANNUAL O&M COSTS					
8.	Total O&M Costs	1	$ 69,200	LS	$ 69,200
	TOTAL ANNUAL O&M COSTS				**$ 69,200**
QUARTERLY/ANNUAL MONITORING COSTS					
9.	Project Planning and Organizing	1	$ 7,200	LS	$ 7,200
10.	Field Sampling Labor	1	$ 5,300	LS	$ 5,300
11.	Travel Expense and per Diem	1	$ 2,200	LS	$ 2,200
12.	Sampling Equipment, Shipping, Consumable Supplies	1	$ 1,900	LS	$ 1,900
13.	Sample Analysis and Data Validation	1	$ 3,000	LS	$ 3,000
14.	Data Evaluation and Reporting	1	$ 32,400	LS	$ 32,400
	TOTAL QUARTERLY/ANNUAL MONITORING COSTS				**$ 52,000**
FIVE-YEAR REVIEW					
15.	**Five-Year Review Report**	1	$ 33,600	LS	**$ 33,600**
PRESENT WORTH OF COSTS					
16.	Total Capital Costs				$ 416,220
17.	Total O&M Costs (3 year duration)				$ 181,603
18.	Total Monitoring Costs (5 year duration)				$ 504,256
19.	Total Five-Year Review Costs (5 year duration)				$ 23,956
20	**TOTAL PRESENT WORTH**				**$ 1,126,035**

Assume: $ 1,130,000

CDM

1a Mobilization

Equipment mob and demob						$ 8,000
	Assume:	**$**	**8,000**			

1b Work Plans/Health and Safety Plan

This occurs at the beginning						
Project Manager	$	150	per hour x	40	hours =	$ 6,000
Engineer	$	90	per hour x	200	hours =	$ 18,000
Scientist	$	90	per hour x	120	hours =	$ 10,800
Air Permitting	$	90	per hour x	100	hours =	$ 9,000
						$ 43,800
	Assume:	**$**	**43,800**			

1c Subsurface Utility Clearance

Assume 2 workers for 1 day						
Mobilization	$	1,000				$ 1,000
Labor	$	90	per hour x	16	hours =	$ 1,440
Analysis/reporting	$	1,000				$ 1,000
						$ 3,440
	Assume:	**$**	**3,500**			

1d Construction Management

Assume 4-week duration						
Project Manager (20 hrs/week)	$	150	per hour x	80	hours =	$ 12,000
On-site Engineer (1 @ full-time)	$	90	per hour x	160	hours =	$ 14,400
Off-site Engineer (1 @ full-time)	$	90	per hour x	160	hours =	$ 14,400
Miscellaneous	$	5,000	LS			$ 5,000
						$ 45,800
	Assume:	**$**	**45,800**			

2a Pilot Study

Assume $50,000 based on past experience						$	50,000
Assume:	**$**	**50,000**					

2b Erosion Control

Assume silt fence around West, South, and East perimeter of work area

Silt fence	$	0.58	per foot x	200	feet =	$	116
2 laborers 1 day to install	$	75	per hour x	16	hours =	$	1,200
1 laborer 2 hrs/wk to maintain	$	75	per hour x	16	hours =	$	1,200
2 laborers 1 day to remove	$	75	per hour x	16	hours =	$	1,200
						$	3,716
Assume:	**$**	**3,800**					

2c Staging Area

Equipment set-up						$	10,000
Assume:	**$**	**10,000**					

2d Air Sparge Well Installation

Assume 4 AS wells, 30' deep, required, 1 was installed for pilot

Mob/Demob	$	3,000	LS			$	3,000
Drilling and well install	$	46	per foot x	90	feet =	$	4,140
Well vault	$	500	each x	3	=	$	1,500
Decon/well development	$	190	per hour x	3	hours =	$	570
						$	9,210

Recent drilling costs

Assume:	**$**	**9,300**					

2e Trenching and Compressed Air Hose

Assume hose is run through north SVE trench where possible

Side trenching to AS wells	$	10.70	per foot x	40	feet =	$	428
Compressed air hose	$	0.60	per foot x	500	feet =	$	300
						$	728

Must buy 500-ft minimum of hose
Trenching G1030-805-1310, RSMeans 2008, $2.14/LF, includes backfill/compaction
Multiply trenching cost by 5 for small job

Assume:	**$**	**800**					

2f Soil-Vapor Extraction Trench Installation

Assume 2.5 feet wide, 2.5 feet deep

Trenching, backfill, compact	$	6.47	per foot x	285	feet =	$	1,844
4" PVC pipe, slotted	$	16.36	per foot x	261	feet =	$	4,270
4" PVC pipe	$	8.18	per foot x	206.5	feet =	$	1,689
Bedding/filter pack	$	50	per CY x	31	CY =	$	1,550
Plastic liner	$	2.03	per SF x	712.5	SF =	$	1,446
Clay backfill	$	50	per CY x	36	CY =	$	1,800
Asphalt paving (cap)	$	2.82	per SF x	2600	SF =	$	7,332
						$	19,931

Asphalt paving 32-12-16.14.0020, RSMeans 2008, includes base and binder
Trenching G1030-805-1410, RSMeans 2008, includes backfill/compaction
Plastic liner 07-13-53.10.2700, RSMeans 2008, includes installation
4" PVC, 33-26-0430, RSMeans 2005, assume double for slotted

Assume:	**$**	**20,000**					

2g Miscellaneous

Transducer, wiring, other						$	5,000
Assume:	**$**	**5,000**					

3 Non Hazardous, Subtitle D

285' long x 2.5' wide x 2.5' deep = 1781 CF = 66 CY

66 CY x 1.5 TON/CY = 99 TONS

$	100	per ton x	99	tons =	$ 9,896

Subtitle D Landfill Transportation & Disposal of Trench Spoils

Assume: $ 9,900

4a SVE and AS System

Engineer's estimate based on experience w/ recent costs

Blower	$	2,000	each x	1	=	$	2,000
Compressor	$	6,500	each x	1	=	$	6,500
KO tank	$	2,300	each x	1	=	$	2,300
Liquid GAC Unit	$	2,000	each x	1	=	$	2,000
Discharge pump	$	270	each x	1	=	$	270
Control panel	$	5,000	each x	1	=	$	5,000
PLC/Autodialer	$	5,000	each x	1	=	$	5,000
Instrumentation	$	2,000	LS			$	2,000
Piping	$	2,000	LS			$	2,000
Wiring	$	5,000	LS			$	5,000
Solenoid valves	$	100	each x	4	=	$	400
Gauges	$	75	each x	25	=	$	1,875
Flowmeters	$	150	each x	8	=	$	1,200
Skid and mounting	$	20,000	LS			$	20,000
						$	55,545

Assume: $ 55,600

4b Vapor Treatment

Engineer's estimate based on experience w/ recent costs

Assume two 125-lb VPGAC drums and two 400-lb PPZ drums

125- lb VPGAC drums	$	1.5	per lbs x	250	=	$	375
400-lb PPZ drums	$	3	per lbs x	800	=	$	2,400
						$	2,775

Assume: $ 2,800

4c Hookup/Setup/Startup Testing

For electrical, mechanical hookup, PLC programming, and testing

2 electricians for 1 week	$	85	per hour x	80	hours =	$	6,800
2 plumbers for 1 week	$	80	per hour x	80	hours =	$	6,400
1 programmer for 1 week	$	90	per hour x	40	hours =	$	3,600
2 engineers for 1 week	$	90	per hour x	80	hours =	$	7,200
Miscellaneous	$	5,000	LS			$	5,000
						$	29,000

Assume: $ 29,000

8 Annual O&M Cost

Vapor Treatment Media Replacement							
Monthly GAC changeout of lead unit - 125 lbs	$	1.5	per lb x	1500	lbs =	$	2,250
Quarterly PPZ changeout of lead unit - 400 lbs	$	3	per lb x	1600	lbs =	$	4,800
Characterization Testing	$	300	each x	16	=	$	4,800
						$	**11,850**
O&M Labor and Reporting							
Technician (8 hours per week)	$	720	per week x	52	weeks =	$	37,440
Engineer - Reporting (2 hours per month)	$	180	per month x	12	months =	$	2,160
Expenses	$	50	per week x	52	weeks =	$	2,600
Equipment and Supplies	$	25	per week x	52	weeks =	$	1,300
Sampling (quarterly condensate water sample)	$	200	per event x	4	events =	$	800
Sampling (quarterly influent/effluent vapor samples)	$	500	per event x	8	events =	$	4,000
Electric costs	$	750	per month x	12	months =	$	9,000
						$	**57,300**
					Total	**$**	**69,150**
	Assume:	**$**	**69,200**				

9 Project Planning and Organization (e.g., Staffing, Lab Procurement, Obtaining Equipment)

Assume annual monitoring on long-term basis

Project Manager	$	150	per hour x	12	hours =	$	1,800
Engineer	$	90	per hour x	40	hours =	$	3,600
Puchasing Specialist	$	90	per hour x	20	hours =	$	1,800
						$	7,200
Assume:	**$**	**7,200**	**per sampling event**				

10 Field Sampling Labor

Assume 3 day per sampling event

Assume 2-person crew

Mob/Demob	$	500	LS			$	500
Labor	$	80	per hour x	60	hours =	$	4,800
						$	5,300
Assume:	**$**	**5,300**	**per sampling event**				

11 Travel Expense and per Diem

Assume 2-person crew

Vehicle Rental	$	95	per day x	3	days =	$	285
Toll	$	50	per day x	3	days =	$	150
Meals	$	128	$64 per person/day	3	days =	$	384
Lodging	$	440	$220 per person/day	3	days =	$	1,320
						$	2,139
Assume:	**$**	**2,200**	**per sampling event**				

12 Sampling Equipment, Shipping, Consumable Supplies

Assume 3 day per sampling event

Assume sample shipping cost of $200 per day

Assume equipment (multi-meter, PID) @ $300 per day

Assume PPE @ $15 per person per day

Assume miscellaneous materials @ $100 per day

Shipping	$	200	per day x	3	days =	$	600
Equipment	$	300	per day x	3	days =	$	900
PPE	$	30	$15 per set/2 set /day x	3	days =	$	90
Misc	$	100	per day x	3	days =	$	300
						$	1,890
Assume:	**$**	**1,900**	**per sampling event**				

13 Sample Analysis and Data Validation

Groundwater

Assume

9	Samples
1	Field Duplicate
1	MS/MSD
3	Field Blank
3	Trip Blank
17	Total Samples Per Sampling Event

Groundwater Analysis Cost:

VOC	$	120	per samples x	17	samples =	$	2,040

Chemtech Proposal

Assume samples validated @ $50 per sample

Validation Cost:	$	50	per sample x	17	samples +	5% management fee
=	$	893	per sampling event			

Data Validation Services Proposal

Total Analysis & Validation: $ 2,933

Assume:	**$**	**3,000**	**per sampling event**

14 Data Evaluation and Reporting

Assume annual monitoring on long-term basis

Project Manager	$	150	per hour x	24	hours =	$	3,600
Engineer	$	90	per hour x	160	hours =	$	14,400
Scientist	$	90	per hour x	160	hours =	$	14,400
						$	32,400
Assume:	**$**	**32,400**	**per sampling event**				

15 Five-Year Review

Assume a review will be conducted every 5 years.
Work includes review of groundwater monitoring data and preparation of report

Project Manager	$	150	per hour x	32	hours =	$	4,800
Engineer	$	90	per hour x	200	hours =	$	18,000
Scientist	$	90	per hour x	120	hours =	$	10,800
						$	33,600

Assume: $ 33,600

Present Worth Calculations

Assume discount rate is 7%

17 Total O&M Costs

This is a recurring cost every year for 3 years (years 1-3)

$$P = A \times \frac{(1+i)^n - 1}{i(1+i)^n}$$

n = 3
i = 7%
The multiplier for (P/A) = 2.624

18 Total Monitoring Costs

Total Quarterly Monitoring Costs

This cost occurs every quarter for the first 2 years (years 1 and 2)

$$P = A \times \frac{(1+i)^n - 1}{i(1+i)^n}$$

n = 8
quarterly rate i = 1.75%
The multiplier for (P/A) = 7.405

Total Annual Monitoring Costs

This is a recurring cost every year for the following 3 years (year 3-5)

$$P = A \times \frac{(1+i)^n - 1}{i(1+i)^n}$$

n = 3
i = 7%
The multiplier for $(P/A)_2$ = 2.624

Future cost

$$P = F \times \frac{1}{(1+i)^n}$$

n = 2
i = 7%
The multiplier for (P/F) = 0.873

The total multiplier for (P/A) = $(P/A)_1 + (P/F) \times (P/A)_2$ = 9.697

19 Total 5-year review costs

This cost occurs once after 5 years

$$P = F \times \frac{1}{(1+i)^n}$$

n = 5
i = 7%
The multiplier for (P/F) = 0.713

Appendix C

NYSDEC Air Permit Application and Supporting Calculations

New York State Department of Environmental Conservation
Air Permit Application

DEC ID	APPLICATION ID	OFFICE USE ONLY
- -	- - /	/ /

Section I - Certification

Title V Certification

I certify under penalty of law that this document and all attachments were prepared under my direction or supervision in accordance with a system designed to assure that qualified personnel properly gather and evaluate the information submitted. Based on my inquiry of the person or persons directly responsible for gathering the information [required pursuant to 6 NYCRR 201-6.3(d)] I believe the information is, true, accurate and complete. I am aware that there are significant penalties for submitting false information, including the possibility of fines and imprisonment for knowing violations.

Responsible Official	Title
Signature	Date / /

State Facility Certification

I certify that this facility will be operated in conformance with all provisions of existing regulations.

Responsible Official Maria D. Watt	Title Project Manager
Signature	Date / /

Section II - Identification Information

Title V Facility Permit	State Facility Permit
" New " Significant Modification " Administrative Amendment	X New " Modification
" Renewal " Minor Modification General Permit Title:	General Permit Title:
" Application involves construction of new facility	" Application involves construction of new emission unit(s)

Owner/Firm

Name Standard Motor Products, Inc.

Street Address 37-18 Northern Blvd.

City	State	Country	Zip
Long Island City	New York	USA	11010

Owner Classification " Federal " State " Municipal X Corporation/Partnership " Individual

Taxpayer ID

Facility " Confidential

Name Standard Motor Products, Inc.

Location Address 37-18 Northern Blvd.

" City / " Town / " Village Long Island City, New York Zip 11101

Project Description " Continuation Sheet(s)

The project involves the remediation of historical groundwater contamination with air sparging and soil vapor extraction (SVE). A sub-slab depressurization system prevents vapor intrusion into indoor air.

Owner/Firm Contact Mailing Address

Name (Last, First, Middle Initial) Robert Martin		Phone No. (718)-316-4276
Affiliation Standard Motor Products,Inc.	Title CFO	Fax No. (718)-784-3284
Street Address 37-18 Northern Blvd.		

City	State	Country	Zip
Long Island City	NY	USA	11101

Facility Contact Mailing Address

Name (Last, First, Middle Initial) Chris Wendt		Phone No. (718)-316-4651
Affiliation Standard Motor Products,Inc.	Title Facility Mgr.	Fax No. ( )
Street Address 37-18 Northern Blvd.		

City	State	Country	Zip
Long Island City	NY	USA	11101

New York State Department of Environmental Conservation
Air Permit Application

DEC ID
- -

Section III - Facility Information

Classification					
" Hospital	" Residential	" Educational/Institutional	" Commercial	X Industrial	" Utility

Affected States (Title V Only)				
" Vermont	" Massachusetts	" Rhode Island	" Pennsylvania	Tribal Land:_____
" New Hampshire	" Connecticut	" New Jersey	" Ohio	Tribal Land:_____

SIC Codes												
3714												

Facility Description	" Continuation Sheet(s)
The facility was previously used for manufacture of motor products and is now primarily used as commercial office space. A SSDS is currently installed onsite to remedy vapor intrusion. An AS/SVE system will be installed to remedy groundwater contamination.	

Compliance Statements (Title V Only)

I certify that as of the date of this application the facility is in compliance with all applicable requirements: " YES " NO

If one or more emission units at the facility are not in compliance with all applicable requirements at the time of signing this application (the 'NO' box must be checked), the noncomplying units must be identified in the "Compliance Plan" block on page 8 of this form along with the compliance plan information required. For all emission units at this facility that are operating in compliance with all applicable requirements complete the following:

- " This facility will continue to be operated and maintained in such a manner as to assure compliance for the duration of the permit, except those units referenced in the compliance plan portion of Section IV of this application.
- " For all emission units, subject to any applicable requirements that will become effective during the term of the permit, this facility will meet all such requirements on a timely basis.
- " Compliance certification reports will be submitted at least once a year. Each report will certify compliance status with respect to each requirement, and the method used to determine the status.

Facility Applicable Federal Requirements " Continuation Sheet(s)

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause

Facility State Only Requirements " Continuation Sheet(s)

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause

New York State Department of Environmental Conservation
Air Permit Application

DEC ID
- -

Section III - Facility Information (continued)

Facility Compliance Certification ❝ Continuation Sheet(s)

Rule Citation

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause

❝ Applicable Federal Requirement
❝ State Only Requirement

❝ Capping

CAS No.	Contaminant Name
- -	

Monitoring Information

❝ Ambient Air Monitoring ❝ Work Practice Involving Specific Operations ❝ Record Keeping/Maintenance Procedures

Description

Work Practice Type	Process Material Code	Process Material Description	Reference Test Method

Parameter Code	Parameter Description	Manufacturer Name/Model No.

Limit Upper	Limit Lower	Limit Units Code	Limit Units Description

Averaging Method Code	Averaging Method Description	Monitoring Frequency Code	Monitoring Frequency Description	Reporting Requirements Code	Reporting Requirements Description

Facility Emissions Summary X Continuation Sheet(s)

CAS No.	Contaminant Name	PTE (lbs/yr)	PTE Range Code	Actual (lbs/yr)
NY075 - 00 - 5	PM-10			
NY075 - 00 - 0	PARTICULATES			
7446 - 09 - 5	SULFUR DIOXIDE			
NY210 - 00 - 0	OXIDES OF NITROGEN			
630 - 08 - 0	CARBON MONOXIDE			
7439 - 92 - 1	LEAD			
NY998 - 00 - 0	VOC	106		
NY100 - 00 - 0	HAP	35.7		
71 - 55 - 6	1,1,1-Trichloroethane	21.1		
79 - 01 - 6	Trichloroethylene	7.34		
75 - 34 - 3	1,1-Dichloroethane	3.05		
108 - 38 - 3 106 - 42 - 3	m&p Xylenes	0.95		
100 - 41 - 4	Ethylbenzene	0.37		

New York State Department of Environmental Conservation
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Section IV - Emission Unit Information

Emission Unit Description

“ Continuation Sheet(s)

EMISSION UNIT 1-00EU1

A sub-slab depressurization and air sparge/soil vapor extraction system is driven by two blowers installed in parallel. Collected vapors are treated with a vapor phase granular activated carbon unit. The effluent of the VPGAC unit is the point of emission.

Building

“ Continuation Sheet(s)

Building	Building Name	Length (ft)	Width (ft)	Orientation
BLDG-1	Packaged Treatment System	30	8	90

Emission Point

“ Continuation Sheet(s)

EMISSION PT. 00EP1

Ground Elev. (ft)	Height (ft)	Height Above Structure (ft)	Inside Diameter (in)	Exit Temp. (EF)	Cross Section	
					Length (in)	Width (in)
22.5	15	5	12	75		

Exit Velocity (FPS)	Exit Flow (ACFM)	NYTM (E) (KM)	NYTM (N) (KM)	Building	Distance to Property Line (ft)	Date of Removal
19.1	900			BLDG-1	36.5	

EMISSION PT.

Ground Elev. (ft)	Height (ft)	Height Above Structure (ft)	Inside Diameter (in)	Exit Temp. (EF)	Cross Section	
					Length (in)	Width (in)

Exit Velocity (FPS)	Exit Flow (ACFM)	NYTM (E) (KM)	NYTM (N) (KM)	Building	Distance to Property Line (ft)	Date of Removal

Emission Source/Control

“ Continuation Sheet(s)

Emission Source ID	Emission Source Type	Date of Construction	Date of Operation	Date of Removal	Control Type Code	Control Type Description	Manufacturer's Name/Model No.
GAC-1	I	NOV-2009	DEC-09	NA	048	Granular activated carbon	Calgon HFVS2000

Design Capacity	Design Capacity Units Code	Design Capacity Units Description	Waste Feed Code	Waste Feed Description	Waste Type Code	Waste Type Description

Emission Source ID	Emission Source Type	Date of Construction	Date of Operation	Date of Removal	Control Type Code	Control Type Description	Manufacturer's Name/Model No.

Design Capacity	Design Capacity Units Code	Design Capacity Units Description	Waste Feed Code	Waste Feed Description	Waste Type Code	Waste Type Description

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Section IV - Emission Unit Information (continued)

Process Information

“ Continuation Sheet(s)

EMISSION UNIT 1-00EU1 PROCESS SVE

Description

The treatment facility will consist of 10 air sparge wells, 2 horizontal soil vapor extraction wells, and 9 sub-slab depressurization extraction points. Vapors will be extracted from the subsurface by two blowers installed in parallel and treated with air/water separation, particulate filtration, and vapor phase GAC prior to discharge from stack 00EP1. The vapor phase GAC unit is rated with a maximum capacity of 2000 CFM.

Source Classification Code (SCC)	Total Thruput		Thruput Quantity Units	
	Quantity/Hr	Quantity/Yr	Code	Description

“ Confidential X Operating at Maximum Capacity “ Activity with Insignificant Emissions	Operating Schedule		Building	Floor/Location
	Hrs/Day	Days/Yr		
	24	365	BLDG-1	Main

Emission Source/Control Identifier(s)							

EMISSION UNIT - PROCESS

Description

Source Classification Code (SCC)	Total Thruput		Thruput Quantity Units	
	Quantity/Hr	Quantity/Yr	Code	Description

“ Confidential “ Operating at Maximum Capacity “ Activity with Insignificant Emissions	Operating Schedule		Building	Floor/Location
	Hrs/Day	Days/Yr		

Emission Source/Control Identifier(s)							

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Air Permit Application

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Section IV - Emission Unit Information (continued)

Emission Unit	Emission Point	Process	Emission Source	Emission Unit Applicable Federal Requirements “ Continuation Sheet(s)									
				Title	Type	Part	Sub Part	Section	Sub Division	Parag.	Sub Parag.	Clause	Sub Clause
-													
-													
-													
-													

Emission Unit	Emission Point	Process	Emission Source	Emission Unit State Only Requirements “ Continuation Sheet(s)									
				Title	Type	Part	Sub Part	Section	Sub Division	Parag.	Sub Parag.	Clause	Sub Clause
-													
-													
-													
-													

Emission Unit Compliance Certification “ Continuation Sheet(s)

Rule Citation

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause
6	NYCRR	257							

“ Applicable Federal Requirement “ State Only Requirement “ Capping

Emission Unit	Emission Point	Process	Emission Source	CAS No.	Contaminant Name
1-00EU1	00EP1	SVE		- -	

Monitoring Information

“ Continuous Emission Monitoring
X Intermittent Emission Testing
“ Ambient Air Monitoring
“ Monitoring of Process or Control Device Parameters as Surrogate
“ Work Practice Involving Specific Operations
“ Record Keeping/Maintenance Procedures

Description

GAC unit influent and effluent will be performed annually for TCL VOCs. Samples will be collected with Summa Canisters. Monthly monitoring for total VOCs will be performed with a photoionization detector

Work Practice Type	Process Material Code	Process Material Description	Reference Test Method

Parameter Code	Parameter Description	Manufacturer Name/Model No.
23	Concentration	

Limit Upper	Limit Lower	Limit Units Code	Limit Units Description
20% of influent			

Averaging Method Code	Averaging Method Description	Monitoring Frequency Code	Monitoring Frequency Description	Reporting Requirements Code	Reporting Requirements Description
01	Instantaneous	09	Annually	09	Annually

New York State Department of Environmental Conservation
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Section IV - Emission Unit Information (continued)

Determination of Non-Applicability (Title V Only) “ Continuation Sheet(s)

Rule Citation

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause

Emission Unit	Emission Point	Process	Emission Source	“ Applicable Federal Requirement “ State Only Requirement
-				

Description

Rule Citation

Title	Type	Part	Sub Part	Section	Sub Division	Paragraph	Sub Paragraph	Clause	Sub Clause

Emission Unit	Emission Point	Process	Emission Source	“ Applicable Federal Requirement “ State Only Requirement
-				

Description

Process Emissions Summary “ Continuation Sheet(s)

EMISSION UNIT	1-00EU1				PROCESS	SVE
CAS No.	Contaminant Name	% Thruput	% Capture	% Control	ERP (lbs/hr)	ERP How Determined
71-55-6	1,1,1-Trichloroethane			80	0.290	02

PTE (lbs/hr)	PTE (lbs/yr)	PTE (standard units)	Standard Units	PTE How Determined	Actual (lbs/hr)	Actual (lbs/yr)
0.0024	21.1			02		

EMISSION UNIT	1-00EU1				PROCESS	SVE
CAS No.	Contaminant Name	% Thruput	% Capture	% Control	ERP (lbs/hr)	ERP How Determined
79-01-6	Trichloroethane			80	0.101	02

PTE (lbs/hr)	PTE (lbs/yr)	PTE (standard units)	Standard Units	PTE How Determined	Actual (lbs/hr)	Actual (lbs/yr)
0.0008	7.34			02		

EMISSION UNIT	1-00EU1				PROCESS	SVE
CAS No.	Contaminant Name	% Thruput	% Capture	% Control	ERP (lbs/hr)	ERP How Determined
75-34-3	1,1-Dichloroethane			80	0.042	02

PTE (lbs/hr)	PTE (lbs/yr)	PTE (standard units)	Standard Units	PTE How Determined	Actual (lbs/hr)	Actual (lbs/yr)
0.0003	3.05			02		

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Section IV - Emission Unit Information

Process Emissions Summary (continuation)

EMISSION UNIT	1 - 0 0 E U 1					PROCESS	
CAS No.	Contaminant Name		% Thruput	% Capture	% Control	ERP (lbs/hr)	ERP How Determined
108 - 38 - 3 106 - 42 - 3	m&p xylenes				80	0.013	02
PTE			Standard Units	PTE How Determined		Actual	
(lbs/hr)	(lbs/yr)	(standard units)				(lbs/hr)	(lbs/yr)
0.0001	0.94			02			

EMISSION UNIT	1 - 0 0 E U 1					PROCESS	
CAS No.	Contaminant Name		% Thruput	% Capture	% Control	ERP (lbs/hr)	ERP How Determined
100 - 41 - 4	Ethylbenzene				80	0.005	02
PTE			Standard Units	PTE How Determined		Actual	
(lbs/hr)	(lbs/yr)	(standard units)				(lbs/hr)	(lbs/yr)
0.00004	0.370			02			

EMISSION UNIT	-					PROCESS	
CAS No.	Contaminant Name		% Thruput	% Capture	% Control	ERP (lbs/hr)	ERP How Determined
- -							
PTE			Standard Units	PTE How Determined		Actual	
(lbs/hr)	(lbs/yr)	(standard units)				(lbs/hr)	(lbs/yr)

EMISSION UNIT	-					PROCESS	
CAS No.	Contaminant Name		% Thruput	% Capture	% Control	ERP (lbs/hr)	ERP How Determined
- -							
PTE			Standard Units	PTE How Determined		Actual	
(lbs/hr)	(lbs/yr)	(standard units)				(lbs/hr)	(lbs/yr)

EMISSION UNIT	-					PROCESS	
CAS No.	Contaminant Name		% Thruput	% Capture	% Control	ERP (lbs/hr)	ERP How Determined
- -							
PTE			Standard Units	PTE How Determined		Actual	
(lbs/hr)	(lbs/yr)	(standard units)				(lbs/hr)	(lbs/yr)

EMISSION UNIT	-					PROCESS	
CAS No.	Contaminant Name		% Thruput	% Capture	% Control	ERP (lbs/hr)	ERP How Determined
- -							
PTE			Standard Units	PTE How Determined		Actual	
(lbs/hr)	(lbs/yr)	(standard units)				(lbs/hr)	(lbs/yr)

New York State Department of Environmental Conservation
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Section IV - Emission Unit Information (continued)

EMISSION UNIT	Emission Unit Emissions Summary			“ Continuation Sheet(s)
-				
CAS No.	Contaminant Name			
- -				
ERP (lbs/yr)	PTE Emissions		Actual	
	(lbs/hr)	(lbs/yr)	(lbs/hr)	(lbs/yr)
CAS No.	Contaminant Name			
- -				
ERP (lbs/yr)	PTE Emissions		Actual	
	(lbs/hr)	(lbs/yr)	(lbs/hr)	(lbs/yr)
CAS No.	Contaminant Name			
- -				
ERP (lbs/yr)	PTE Emissions		Actual	
	(lbs/hr)	(lbs/yr)	(lbs/hr)	(lbs/yr)
CAS No.	Contaminant Name			
- -				
ERP (lbs/yr)	PTE Emissions		Actual	
	(lbs/hr)	(lbs/yr)	(lbs/hr)	(lbs/yr)

Compliance Plan

“ Continuation Sheet(s)

For any emission units which are <u>not in compliance</u> at the time of permit application, the applicant shall complete the following

Consent Order

Certified progress reports are to be submitted every 6 months beginning ____/____/____

Emission Unit	Process	Emission Source	Applicable Federal Requirement									
			Title	Type	Part	Sub Part	Section	Sub Division	Parag.	Sub Parag.	Clause	Sub Clause
-												

Remedial Measure / Intermediate Milestones	R/I	Date Scheduled

New York State Department of Environmental Conservation
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Section IV - Emission Unit Information (continued)

Request for Emission Reduction Credits

“ Continuation Sheet(s)

EMISSION UNIT -

Emission Reduction Description

Contaminant Emission Reduction Data

Baseline Period ___/___/___ to ___/___/___

Reduction Date	Reduction Method
___/___/___	

CAS No.	Contaminant Name	ERC (lbs/yr) Netting	ERC (lbs/yr) Offset
- -			
- -			
- -			

Facility to Use Future Reduction

Name | APPLICATION ID - - /

Location Address

“ City / “ Town / “ Village | State | Zip

Use of Emission Reduction Credits

“ Continuation Sheet(s)

EMISSION UNIT -

Proposed Project Description

Contaminant Emissions Increase Data

CAS No.	Contaminant Name	PEP (lbs/yr)
- -		

Statement of Compliance

“ All facilities under the ownership of this “ownership/firm” are operating in compliance with all applicable requirements and state regulations including any compliance certification requirements under Section 114(a)(3) of the Clean Air Act Amendments of 1990, or are meeting the schedule of a consent order.

Source of Emission Reduction Credit - Facility

Name | PERMIT ID - - /

Location Address

“ City / “ Town / “ Village | State | Zip

Emission Unit	CAS No.	Contaminant Name	ERC (lbs/yr) Netting	ERC (lbs/yr) Offset
-	- -			
-	- -			
-	- -			

DEC ID
- -

Supporting Documentation

- ❑ P.E. Certification (form attached)
- ❑ List of Exempt Activities (form attached)
- ❑ Plot Plan
- ❑ Methods Used to Determine Compliance (form attached)
- ☒ Calculations
- ❑ Air Quality Model (_____ / _____ / _____)
- ❑ Confidentiality Justification
- ❑ Ambient Air Monitoring Plan (_____ / _____ / _____)
- ❑ Stack Test Protocols/Reports (_____ / _____ / _____)
- ❑ Continuous Emissions Monitoring Plans/QA/QC (_____ / _____ / _____)
- ❑ MACT Demonstration (_____ / _____ / _____)
- ❑ Operational Flexibility: Description of Alternative Operating Scenarios and Protocols
- ❑ Title IV: Application/Registration
- ❑ ERC Quantification (form attached)
- ❑ Use of ERC(s) (form attached)
- ❑ Baseline Period Demonstration
- ❑ Analysis of Contemporaneous Emission Increase/Decrease
- ❑ LAER Demonstration (_____ / _____ / _____)
- ❑ BACT Demonstration (_____ / _____ / _____)
- ❑ Other Document(s): _____ (/ /)

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CDM

PROJECT:	SVE/AS Remedial Design	COMPUTED BY :	JVB	CHECKED BY:	
JOB NO.:	34433.46200	DATE :	12/8/2010	DATE CHECKED:	
CLIENT:	SMP			PAGE NO. :	1

Description: Calculation of SSDS and SVE influent concentrations estimates for use in Air Permit calculations.

1.0 Purpose

Estimate total influent concentrations to the existing treatment system from combined flows of the existing sub-slab depressurization system (SSDS) and proposed soil vapor extraction (SVE) system. Results will be used for completing air permit application and for predicting carbon usage rate and time to breakthrough for the existing GAC unit.

2.0 Procedure

(2.1) Determine average groundwater VOC concentration in the area of air-sparge/SVE treatment.

(2.2) Use Henry's Law to determine the maximum theoretical VOC concentrations in soil vapor, given the average groundwater VOC concentrations.

(2.3) Estimate air sparge vapor as some % of the maximum theoretical concentration. Take the SVE influent as a combination of the air sparge volume and a balance of clean vapor.

(2.4) Estimate average SSDS influent concentrations.

(2.5) Take the total system influent as the combination of the SVE and SSDS influents.

3.0 References & Data Sources

(3.1) Yaws' Handbook of Thermodynamic and Physical Properties of Chemical Compounds, 2003.

(3.2) SMP Phase IV Direct-Push Groundwater Sampling Results, January 2008.

(3.3) SMP 2010 SSDS Vapor Sampling Results, March 30 and October 13.

(3.4) Figure 3-1, Conceptual Design Layout, Remedial Design Work Plan, June 2010. (Attachment A)

(3.5) Handbook of Environmental Engineering Calculations (2nd Editon), 2007. (Attachment B)

4.0 Assumptions & Limitations

(4.1) The Phase IV direct-push groundwater sampling locations within the air-sparge/SVE treatment area are SG01, SG02, SG03, SG04, SG05, SG06, and SG07. See Attachment A. The average of all samples (at all depths) from these locations was taken as the average groundwater concentration. Compounds not detected in any samples were omitted from the analysis. Other non-detects were assumed to be 1/2 the detection limit. Duplicates were averaged.

(4.2) Assume that Henry's Law (see Attachment B) applies (dilute solution, none co-dissolved). Assume that groundwater and soil vapor conditions are sufficiently close to standard temperature and pressure such that no corrections for temperature and pressure need to be made.

(4.3) Assume that the sparged air reaches 25% of the Henry's Law equilibrium.

(4.5) Assume 40 cfm for total sparge flowrate, 200 cfm for total SVE flowrate, and 700 cfm for SSDS flowrate. Assume 100% of the sparge vapors are captured, and that the balance of the SVE flow is free from contaminants.

(4.6) Take the average of the 3-30-2010 and 10-13-2010 SSDS vapor sample results as the SSDS influent concentration.

(4.7) Assume that the SSDS and SVE flows are combined with no dilution air.

5.0 Results

See Attachment C. Total system influent/discharge to GAC concentrations were calculated in µg/L and ppbv. Mass flowrate was also calculated in lbs/day.

ATTACHMENT A

- INDOOR AIR (IA) SAMPLE LOCATION
- AMBIENT AIR (AA) SAMPLE LOCATION
- DESTROYED MONITORING WELLS (MW)
- MONITORING WELL (MW)
- SUB-SLAB (SB) SAMPLE LOCATION
- SOIL GAS (SG) SAMPLE LOCATION
- SEWER MANHOLE (APPROX 12' DEEP)
- APPROX LOCATION OF DRAIN SPOUT
- R.O.W. RIGHT OF WAY
- SUPPORT COLUMN
- FENCE LINE
- UNDERGROUND STORM SEWER
- APPROX. VICINITY OF PREVIOUSLY EXCAVATED SOILS
- RECESS EQUIPMENT PAD/VAULT
- AREA EXCEEDS 20 TIMES CRITERIA
- PROPOSED AIR SPARGE (AS) WELL
- PROPOSED SOIL VAPOR EXTRACTION (SVE) TRENCH

NOTES:
SB07* - AIR SAMPLE
SB07** - SOIL/GW SAMPLE
CY = CUBIC YARD
SF = SQUARE FEET

DRAFTED BY: CJ	**CONCEPTUAL DESIGN LAYOUT**
CHECKED BY: DP	**REMEDIAL DESIGN WORK PLAN STANDARD MOTOR PRODUCTS, INC. SITE LONG ISLAND CITY, NEW YORK**
REVIEWED BY: JVB	CDM

NORTH	SCALE IN FEET	DATE	FIGURE
	0 20	6-9-10	3-1

ATTACHMENT B

2.26 Henry's Law

Henry's law states that the partial pressure of a solute in equilibrium in a solution is proportional to its mole fraction in the limit of zero concentration (dilute solution). In air pollution applications, the *solute* refers to the pollutant (EPA-81/12, p. 4-5).

For dilute solutions where the components do not interact, the resulting partial pressure (p) of a component "A" in equilibrium with other components in a solution can be expressed as:

$$p = x_A H$$

where p = equilibrium partial pressure of component A over a solution
x_A = mole fraction or concentration of A in the liquid phase, g-mole/cm^3
H = Henry's law constant (atm-cm^3)/(g-mole) of pure A at the same temperature and pressure as the solution

Unlike Henry's law, Raoult's law is for concentrated solutions (EPA-84/09, p. 39). For more information on H values, see 40CFR265.10-84 and Appendix VI to 40CFR265.

EXAMPLE: Henry's law
Given Henry's law constant and the partial pressure of a solute, determine the maximum mole fraction (concentration) of a solute that can be dissolved in solution (EPA-84/09, p. 39).

Given conditions

- Partial pressure of hydrogen sulfide, $H_2S = 0.01$ atm
- Total pressure = 1 atm
- Henry's law constant = 483 atm/mole fraction

Solution:

1. Write the equation describing Henry's law.

$$p(H_2S) = xH$$

where $p(H_2S)$ = partial pressure of H_2S, atm
H = Henry's law constant, atm/mole fraction
x = mole fraction of H_2S in solution

For an ideal gas, the partial pressure of a component in a gas mixture is given by

$$p(H_2S) = y(H_2S)P$$

where P = total pressure.

2. Calculate the maximum mole fraction of H_2S that can be dissolved in solution.

$$x(H_2S) = p(H_2S)/H$$
$$= 0.01/483$$
$$= 2.07 \times 10^{-5}$$

2.27 Ideal Gas

An ideal gas is an imaginary (or hypothetical) gas or vapor which obeys the ideal gas law at pressure approaching to zero (0) (very low density). No real gas obeys the ideal gas law exactly over all ranges of temperature and pressure. Although the lighter gases (hydrogen, oxygen, air, etc.) at ambient conditions approach ideal gas law behavior, the heavier gases such as sulfur dioxide and hydrocarbons, particularly at high pressures and low temperatures, deviate con-

ATTACHMENT C

Concentration and Mass Flowrate Calculations for Soil Vapor Extraction (SVE) System, Sub-Slab Depressurization Sytem (SSDS), and Combined Systems

									SVE SYSTEM CALCULATIONS									SSDS CALCULATIONS[7]			TOTAL SYSTEM CALCULATIONS		
Analyte	CAS#	Average Conc.[1,2,3] (µg/L)	Site-Specific Groundwater Delineation Criteria (µg/L)	Henry's Law Constant[4] k_H (atm m^3/mol)	@ Temp (˚C)	Mol. Weight	Theoretical Maximum Soil Vapor Partial Pressure of Compound (atm)	Theoretical Maximum Soil Vapor Conc. (µg/L)[5]	Total AS Flowrate[A] (cfm): 40			Soil Vapor Extraction Influent Concentration (ppbv)			SVE Mass Extracted (lbs/day)			SSDS Influent Concentration		SSDS Flowrate (cfm)[C]: 700	Total System Flowrate (cfm)[D]: 900		
									Total SVE Flowrate[B] (cfm): 200											SSDS Mass Extracted (lbs/day)	Total System Discharge to GAC[8]		
									Vapor Influent Concentration (µg/L)[6]														
									25% Eq.	50% Eq.	100% Eq.	25% Eq.	50% Eq.	100% Eq.	25% Eq.	50% Eq.	100% Eq.	(ppbv)	(µg/L)		(µg/L)	(ppbv)	(lbs/day)
1,1,1-Trichloroethane	71-55-6	330.9	5	2.1674E-02	25	133.4	5.4E-05	320.0	16.00	32.00	64.00	2688.1	5376.1	10752.3	0.288	0.575	1.151	4.98	0.02962	1.9E-03	3.58	601.2	0.290
Trichloroethylene	79-01-6	213.3	5	1.1565E-02	25	131.4	1.9E-05	110.1	5.50	11.01	22.01	938.8	1877.5	3755.0	0.10	0.20	0.40	4.45	0.02607	1.6E-03	1.24	212.1	0.101
1,1-Dichloroethane	75-34-3	176.5	5	5.8507E-03	25	99.0	1.0E-05	46.1	2.30	4.61	9.21	521.8	1043.5	2087.0	0.04	0.08	0.17	1.16	0.00512	3.2E-04	0.52	116.8	0.042
cis-1,2-Dichloroethylene	156-59-2	130.5	5	7.3643E-03	25	96.9	9.9E-06	42.9	2.14	4.29	8.58	495.7	991.3	1982.7	0.04	0.08	0.15	1.25	0.00542	3.4E-04	0.48	111.1	0.039
m&p-xylenes	179601-23-1	49.6	5	6.47E-03	25	106.2	3.0E-06	14.3	0.72	1.43	2.86	151.0	302.1	604.2	0.01	0.03	0.05	0.40	0.00189	1.2E-04	0.16	33.9	0.013
Cyclohexane	110-82-7	40.0	NL	1.9412E-01	25	84.2	9.2E-05	346.4	17.32	34.64	69.29	4613.1	9226.1	18452.3	0.31	0.62	1.25	0.28	0.00103	6.5E-05	3.85	1025.3	0.311
Methylcyclohexane	108-87-2	25.1	NL	4.2335E-01	25	98.2	1.1E-04	474.1	23.70	47.41	94.82	5411.1	10822.2	21644.4	0.43	0.85	1.70				5.27	1202.5	0.426
o-xylene	95-47-6	17.3	5	4.1895E-03	25	106.2	6.8E-07	3.2	0.16	0.32	0.65	34.1	68.3	136.5	2.9E-03	5.8E-03	1.2E-02	0.24	0.00111	7.0E-05	0.037	7.8	3.0E-03
Ethylbenzene	100-41-4	15.4	5	8.1413E-03	25	106.2	1.2E-06	5.6	0.28	0.56	1.12	59.0	118.1	236.2	5.0E-03	1.0E-02	2.0E-02	0.13	0.00059	3.7E-05	0.063	13.2	5.1E-03
Vinyl chloride	75-01-4	11.5	2	2.2389E-02	25	62.5	4.1E-06	11.5	0.57	1.15	2.30	206.0	412.0	823.9	1.0E-02	2.1E-02	4.1E-02	0.16	0.00045	2.8E-05	0.13	45.9	1.0E-02
Tetrachloroethylene	127-18-4	11.1	5	2.6942E-02	25	165.8	1.8E-06	13.3	0.67	1.33	2.67	90.2	180.3	360.7	1.2E-02	2.4E-02	4.8E-02	1.06	0.00786	4.9E-04	0.15	20.9	1.2E-02
Acetone	67-64-1	9.8	50	4.8412E-05	25	58.1	8.2E-09	0.02	0.001	0.002	0.004	0.4	0.8	1.6	1.9E-05	3.8E-05	7.6E-05	2.00	0.00518	3.3E-04	0.004	1.6	3.5E-04
Ethyl chloride	75-00-3	9.3	5	6.8549E-03	20	64.5	9.9E-07	2.8	0.14	0.28	0.57	49.4	98.8	197.6	2.6E-03	5.1E-03	1.0E-02	0.24	0.00069	4.3E-05	0.032	11.2	2.6E-03
Methyl ethyl ketone	78-93-3	8.7	50	1.2917E-04	25	72.1	1.6E-08	0.1	0.00	0.01	0.01	0.8	1.6	3.1	4.5E-05	9.0E-05	1.8E-04	0.57	0.00183	1.2E-04	0.002	0.6	1.6E-04
Dichloromethane	75-09-2	8.1	5	2.4567E-03	25	84.9	2.3E-07	0.9	0.04	0.09	0.18	11.7	23.4	46.9	8.0E-04	1.6E-03	3.2E-03	0.46	0.00173	1.1E-04	0.011	3.0	9.1E-04
1,1,2-trichloro-1,2,2-trifluoroethane	76-13-1	7.2	5	4.8031E-01	25	187.4	1.8E-05	154.3	7.71	15.43	30.86	922.8	1845.6	3691.2	1.4E-01	2.8E-01	5.5E-01	0.36	0.00303	1.9E-04	1.72	205.4	0.139
Cumene	98-82-8	6.2	5	1.4372E-02	25	120.2	7.4E-07	4.0	0.20	0.40	0.80	37.1	74.1	148.3	3.6E-03	7.1E-03	1.4E-02				0.044	8.2	3.6E-03
Benzene	71-43-2	5.1	1	5.5486E-03	25	78.1	3.6E-07	1.3	0.06	0.13	0.25	18.1	36.2	72.5	1.1E-03	2.3E-03	4.5E-03	0.30	0.00105	6.6E-05	0.015	4.3	1.2E-03
Trichlorofluoromethane	75-69-4	3.9	5	1.2301E-01	30	137.4	3.5E-06	21.4	1.07	2.14	4.28	174.6	349.2	698.5	1.9E-02	3.8E-02	7.7E-02	0.27	0.00164	1.0E-04	0.24	39.0	1.9E-02
Methyl tert-butyl Ether	1634-04-4	2.8	10	5.4106E-04	25	88.2	1.7E-08	0.1	0.00	0.01	0.01	0.9	1.7	3.4	6.1E-05	1.2E-04	2.4E-04				0.001	0.2	6.1E-05
1,1,2-Trichloroethane	79-00-5	2.4	1	9.2428E-04	25	133.4	1.7E-08	0.1	0.00	0.01	0.02	0.8	1.7	3.3	8.9E-05	1.8E-04	3.6E-04				0.001	0.2	8.9E-05
Toluene	108-88-3	2.2	5	6.3521E-03	25	92.1	1.5E-07	0.6	0.03	0.06	0.12	7.6	15.2	30.3	5.6E-04	1.1E-03	2.2E-03	0.88	0.0036	2.3E-04	0.010	2.4	7.9E-04
1,1-Dichloroethylene	75-35-4	2.2	5	2.2750E-02	25	96.9	5.2E-07	2.2	0.11	0.22	0.45	25.8	51.6	103.3	2.0E-03	4.0E-03	8.0E-03				0.025	5.7	2.0E-03
Dichlorodifluoromethane	75-71-8	1.8	5	3.9005E-01	25	120.9	5.8E-06	31.3	1.57	3.13	6.26	290.3	580.7	1161.3	2.8E-02	5.6E-02	1.1E-01	0.31	0.00165	1.0E-04	0.35	64.8	2.8E-02
trans-1,2-Dichloroethylene	156-60-5	1.7	5	6.7049E-03	25	96.9	1.2E-07	0.5	0.03	0.05	0.10	5.9	11.8	23.5	4.6E-04	9.1E-04	1.8E-03				0.006	1.3	4.6E-04
o-Dichlorobenzene	95-50-1	1.7	3	2.8363E-03	25	147.0	3.3E-08	0.2	0.01	0.02	0.04	1.6	3.3	6.6	1.9E-04	3.9E-04	7.7E-04				0.002	0.4	1.9E-04
Chloroform	67-66-3	1.2	7	3.8259E-03	25	119.4	3.8E-08	0.2	0.01	0.02	0.04	1.9	3.8	7.7	1.8E-04	3.7E-04	7.4E-04	0.78	0.00417	2.6E-04	0.006	1.0	4.5E-04
m-Dichlorobenzene	541-73-1	1.0	3	3.3688E-03	25	147.0	2.3E-08	0.2	0.01	0.02	0.03	1.1	2.3	4.6	1.4E-04	2.7E-04	5.4E-04				0.002	0.3	1.4E-04
p-Dichlorobenzene	106-46-7	1.0	3	4.2538E-03	25	147.0	2.9E-08	0.2	0.01	0.02	0.04	1.4	2.9	5.8	1.7E-04	3.4E-04	6.8E-04				0.002	0.3	1.7E-04
Carbon tetrachloride	56-23-5	0.9	5	2.9338E-02	25	153.8	1.7E-07	1.2	0.06	0.12	0.24	8.6	17.2	34.3	1.1E-03	2.1E-03	4.2E-03	0.07	0.00048	3.0E-05	0.013	2.0	1.1E-03
Methyl chloride	74-87-3	0.9	5	8.2520E-03	25	50.5	1.5E-07	0.3	0.02	0.03	0.07	7.4	14.7	29.4	3.0E-04	6.0E-04	1.2E-03	0.29	0.00064	4.0E-05	0.004	1.9	3.4E-04
TOTAL		**1099**					**3.4E-04**	**1609**	**80**	**161**	**322**	**16777**	**33554**	**67108**	**1.45**	**2.89**	**5.79**	**20.61**	**0.10**	**0.01**	**17.96**	**3744**	**1.45**

Notes

1. VOC data source is the 2008 Phase IV direct-push groundwater samples. The data set includes all sampling points within the treatment area and all depth intervals at each sampling point.

2. Compounds which were non-detect in all samples were omitted from the analysis. Remaining non-detects were assumed to be one-half the detection limit.

3. Duplicate sample results were relatively consistent with their parent samples. Calculation uses the average of the duplicate pair.

4. k_H reference is Yaws' Handbook of Thermodynamic and Physical Properties of Chemical Compounds. k_H values for p- and m-xylene were averaged.

5. The vapor concentrations are calculated by applying Henry's Law Constant to the average groundwater concentrations to determine the theoretical maximum concentration.

6. Vapor concentration and mass flowrates for SVE assumes that the sparged air reaches X% (25%, 50%, 100%) of the theoretical maximum equilibrium concentration and that 100% of the sparged air is recovered by the SVE system. The balance of the SVE volume is assumed to be free from contaminants.

7. The SSDS influent concentrations and mass flowrates are based on an average of sample results from the 3-30-2010 and 10-13-2010 sampling events. Non-detected compounds were omitted.

8. The total system discharge assumes that the sparged air reaches 25% of the Henry's Law equilibrium.

Flowrate Assumptions

A. The total sparge flow rate was assumed to be a conservatively high 40 cfm.

B. SVE flowrate is assumed to be 200 cfm total.

C. The SSDS flowrate assumes that one blower will be used for the combined SSDS/SVE System and that the current SSDS flow of ~862 cfm will be reduced to ~700 cfm when the SVE system is brought online.

D. The total system flowrate is the sum of the SVE and SSDS system flows.

NYSDEC Air Permit Calculations

Analyte	CAS#	Total System Discharge to GAC		Estimated Percent Reduction	Maximum Allowed Breakthrough Concentration		
		(ppmv)	(lbs/day)		(ppmv)	(lbs/hour)	(lbs/year)
VOCs							
1,1-Dichloroethane	75-34-3	0.6012	0.290	80%	0.120243965	0.002412582	21.13421736
Trichloroethylene	79-01-6	0.2121	0.101	80%	0.042414454	0.000838146	7.342155287
1,1-Dichloroethane	75-34-3	0.1168	0.042	80%	0.023369589	0.000347824	3.046938286
cis-1,2-Dichloroethylene	156-59-2	0.1111	0.039	80%	0.022224758	0.000324046	2.838643045
m&p-xylenes	179601-23-1	0.0339	1.3E-02	80%	0.006775305	0.000108186	0.947710544
Cyclohexane	110-82-7	1.0253	3.1E-01	80%	0.205067803	0.002595742	22.73870096
Methylcyclohexane	108-87-2	1.2025	4.3E-01	80%	0.240492955	0.003551517	31.11129274
o-xylene	95-47-6	0.0078	3.0E-03	80%	0.001553628	2.48079E-05	0.217317045
Ethylbenzene	100-41-4	0.0132	5.1E-03	80%	0.002643738	4.22145E-05	0.36979859
Vinyl chloride	75-01-4	0.0459	1.0E-02	80%	0.009179795	8.62884E-05	0.755886165
Tetrachloroethylene	127-18-4	0.0209	1.2E-02	80%	0.004172763	0.000104075	0.911694575
Acetone	67-64-1	0.0016	3.5E-04	80%	0.000329264	2.87623E-06	0.025195781
Ethyl chloride	75-00-3	0.0112	2.6E-03	80%	0.002233259	2.16694E-05	0.189823642
Methyl ethyl ketone	78-93-3	0.0006	1.6E-04	80%	0.0001233	1.33719E-06	0.011713774
Dichloromethane	75-09-2	0.0030	9.1E-04	80%	0.000591826	7.55994E-06	0.066225058
1,1,2-trichloro-1,2,2-trifluoroet	76-13-1	0.2054	1.4E-01	80%	0.041070185	0.001157421	10.13901085
Cumene	98-82-8	0.0082	3.6E-03	80%	0.001647455	2.97817E-05	0.260887739
Benzene	71-43-2	0.0043	1.2E-03	80%	0.000851697	1.00062E-05	0.087653899
Trichlorofluoromethane	75-69-4	0.0390	1.9E-02	80%	0.007802476	0.000161201	1.412121665
Methyl tert-butyl Ether	1634-04-4	0.0002	6.1E-05	80%	3.81917E-05	5.06342E-07	0.004435558
1,1,2-Trichloroethane	79-00-5	0.0002	8.9E-05	80%	3.69519E-05	7.41405E-07	0.006494707
Toluene	108-88-3	0.0024	7.9E-04	80%	0.000473146	6.55694E-06	0.057438776
1,1-Dichloroethylene	75-35-4	0.0057	2.0E-03	80%	0.001147295	1.6728E-05	0.146537525
Dichlorodifluoromethane	75-71-8	0.0648	2.8E-02	80%	0.012950937	0.00023552	2.063153183
trans-1,2-Dichloroethylene	156-60-5	0.0013	4.6E-04	80%	0.000261284	3.80962E-06	0.033372289
o-Dichlorobenzene	95-50-1	0.0004	1.9E-04	80%	7.28891E-05	1.61154E-06	0.014117112
Chloroform	67-66-3	0.0010	4.5E-04	80%	0.000207187	3.71991E-06	0.032586375
m-Dichlorobenzene	541-73-1	0.0003	1.4E-04	80%	5.09256E-05	1.12594E-06	0.009863249
p-Dichlorobenzene	106-46-7	0.0003	1.7E-04	80%	6.43041E-05	1.42173E-06	0.012454372
Carbon tetrachloride	56-23-5	0.0020	1.1E-03	80%	0.000392345	9.07689E-06	0.079513583
Methyl chloride	74-87-3	0.0019	3.4E-04	80%	0.000371229	2.81887E-06	0.024693302
Total HAPs		**1.0913**	**0.4886**	**80%**	**0.218268676**	**0.004072041**	**35.67107775**
Total VOCs		**3.7443**	**1.4533**	**80%**	**0.748854898**	**0.012110919**	**106.091647**

Notes:
1) Highighted cells indicated HAPs.

Appendix D

SiteWise™ Environmental Footprint Assessment Tool Input and Output Sheets

SITEWISE INPUT ASSUMPTIONS

Remedial Action Construction

Well Materials

- Average site elevation assumed to be 22' MSL including 6" new asphalt paving. Assume TIC 0.5' below grade (21.5' MSL).
- Well Types
    - Well Type 1: Air Sparge 1 (7 wells, bottom of screen depth @ -2' MSL, total depth 23.5')
    - Well Type 2: Air Sparge 2 (3 wells, bottom of screen depth @ -5' MSL, total depth 26.5')
    - Well Type 3: Monitoring Well 1 (3 wells, bottom of screen depth @ 8 MSL, total depth 13.5')
    - Well Type 4: Monitoring Well 2 (1 well, bottom of screen depth @ 5' MSL, total depth 16.5')
    - Well Type 5: SVE (total length of SVE pipe including all branches to treatment bldg: 425')

Construction Materials

- Material Types:
    - Material 1: HDPE Liner for SVE Trench
        - Area = 350 sq ft. (sum of areas in sub-bullets)
            - Area w/ 1 pipe: 14" * 105' = 122.5 sq ft
            - Area w/ 2 pipes: 22" * 15' = 27.5 sq ft
            - Area w/ 3 pipes: 30" * 80' = 200 sq ft
        - Depth: 0.06" thickness = 0.005'
    - Material 2: Crushed Stone for SVE Trench:
        - Area: 350 sq ft. (see calculation for Material 1)
        - Depth: 14" = 1.17'
    - Material 3: Crushed Stone for Infiltration Trench:
        - Area: 920 sq ft (calculated in Adobe Acrobat)
        - Depth: 18" = 1.5'
    - Material 4: Crushed Stone for Granular Pavement:
        - Area: 1850 sq ft (calculated in Adobe Acrobat)
        - Depth: 8" = 0.67'

    - Material 5: Bituminous Concrete Pavement:
        - Area: 4200 sq ft. (calculated in Adobe Acrobat)
        - Depth: 0.5' thickness

- The designation "gravel" was used as for the crushed stone to be installed.
- The designation "concrete" was used for the bituminous concrete pavement to be installed.

Personnel Transportation - Road

- Assume 3 months of construction, 60 work days, 12 weeks.
- Trip Types
    - Trip 1: Two cars with one passenger - assume Intex is the RA contractor commuting from Pipersville, PA (75 miles one way), 1 round trip per week.
    - Trip 2: One CCI vehicle with one passenger – assume CCI commuting from the Cambridge office (220 miles one way), 1 round trip per week.
    - Trip 3: Two RA contractor vehicles with 1 passenger, 1 CCI vehicle with 1 passenger - assume commuting from hotel (1 mile one way), 4 round trips per week.
    - Trip 4: One vehicle for 1 CDM Engineer – assume commuting from Edison office (35 miles one way), 2 round trips per week.

Equipment Transportation - Road

- Assume trips are one-way for delivery of supplies to be permanently left on site.
- Source for density estimations: http://www.simetric.co.uk/si_materials.htm
- Trip Types:
    - Trip 1: Drill Rig transport to site
        - Assume 50 miles 1 way, 1 round trip = 100 miles
        - Assume a 2-ton hollow stem auger rig
    - Trip 2: Mini-backhoe delivery
        - Assume 50 miles 1 way, 1 round trip = 100 miles
        - Assume small backhoe weighing approximately 3 tons
    - Trip 3: Concrete truck transport
        - Assume 50 miles, multiple 1 way deliveries = 50 miles/delivery
        - Assume 140 lbs/ft^3 as density, 2100 ft^3 as total volume needed (determined from Material 5 calculation above) = 147 tons

        - Given 2100 ft^3 as total volume, the number of 10 yd^3 concrete trucks delivered = 8
        - Tons per delivery: 147 tons / 8 trucks = 18.5
    - Trip 4: Crushed stone delivery
        - Assume 50 miles, multiple 1 way deliveries = 50 miles /delivery
        - Assume 125 lbs/ft^3 as density, 3029 ft^3 as total volume needed (determined from Materials 2-4 calculations above) = 190 tons
        - Given 3029 ft^3 as total volume, the number of 10 yd^3 containers delivered = 12
        - Tons per delivery: 190 tons / 12 trucks = 16
    - Trip 5: Delivery of miscellaneous supplies (well sand, air compressor, pipe, grass seed, topsoil, electrical and instrumentation)
        - Assume 50 miles, multiple 1 way deliveries = 50 miles/delivery
        - Assume 10 trips
        - Assume 1 ton per shipment
    - Trip 6: Roller compactor delivery
        - Assume 50 miles 1 way, 1 round trip = 100 miles
        - Assume small compactor weighing approximately 5 tons

Earthwork

- Total Volume Excavated = 118.5 cu yd
    - Total volume to be removed for stormwater controls & asphalt cap installation: 73.1 cu yd (calculated using Civil3D).
    - Total volume to be removed for SVE trench = 1225 cu ft = 45.4 cu yd (sum of sub-bullet totals)
        - 3.5' deep * 350 SF (from Material 1 calc) = 1225 cu ft
- Total Volume Backfilled = 118.5 cu yd (same as excavated)

Drilling

- Assume drilling events correspond to Well types 1-4 above. The SVE well is situated horizontally and will be installed via excavation.

Blower, Compressor, Mixer, and Other Equipment

- For system optimization testing an air compressor with approximately 10 hp output will be used. Two 8-hour days of testing will be performed.

Capping Equipment

- Trench compaction: 8 passes, 350 SF each = 2800 SF
- Asphalt area: 4 passes, 4200 SF = 16800 SF
- Granular pavement subgrade prep: 1850 SF
- Infiltration trench: 8 passes, 920 SF each = 7360 SF
- TOTAL AREA: 28810 SF, assume 20 work days

Remedial Action Operations

Assume operating period of 10 years

GAC

- Treatment 1: GAC, One 2000 lb VPGAC Unit, one 100 lb LPGAC unit, assume both replaced annually
- Total 10 years * (2100) = 21000 lbs GAC

Personnel Transportation - Road

- 10 years of operation, monthly O&M visits, 120 trips total
- Trip Types
    - Trip 1: 1 truck with two passengers - assume Intex is the O&M contractor commuting from Pipersville, PA (75 miles one way)

Pump Operation

- Pump 1: Condensate pump (1 HP): assume operates weekly for 5 minutes at 50% load
- 10 years * 52 weeks * 5 minutes * 1 hr / 60 minutes = 43 hours

Blower, Compressor, Mixer, and Other Equipment

- Equipment 1: (2) Rotary lobe blowers, 20 HP each, 40% load, running full time
    - 10 years * 365 days * 24 hours = 87600 hrs
- Equipment 1: (1) compressor, 5 HP, 85% load, running full time
    - 10 years * 365 days * 24 hours = 87600 hrs

Residue Disposal/Recycling

- Other residual (GAC), 1 ton, once annually for 10 years, assume 100 miles round trip

Longterm Monitoring

Assume operating period of 10 years

Well Decommissioning

- Assume all wells installed as described in Remedial Action Construction INPUT will need to be decommissioned following remedy shut down.
- Cement grout will be used for abandonment.

Personnel Transportation – Road

- Trip 1: One vehicle for 2 CDM staff for sampling events – assume commuting from Edison office (35 miles one way), 2 trips/year for the first year, then once/annually for the next 9 years. 11 trips total.

SiteWise Input

SITE INFORMATION	
Name	Standard Motor Products, Inc. Site
Date	7/1/2011
Site	Standard Motor Products, Inc. Site
Remedial Alternative Name	Soil Vapor Extraction / Air Sparging

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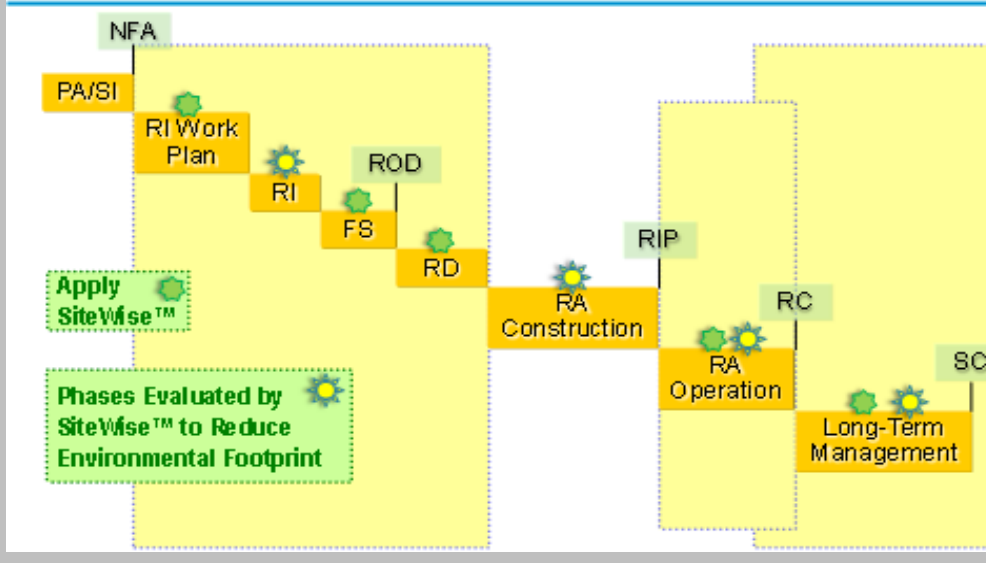


Input - Remedial Action Construction

This worksheet allows the user to define material production, transportation, equipment use, and residual handling variables for the remedial alternative
Yellow cells require the user to choose an input from a drop down menu
White cells require the user to type in a value

MATERIAL PRODUCTION

WELL MATERIALS	Well Type 1	Well Type 2	Well Type 3	Well Type 4	Well Type 5	Well Type 6
Input number of wells	7	3	3	1	1	
Input depth of wells (ft)	23.5	26.5	13.5	16.5	425	
Choose well diameter (in) from drop down menu	2	2	2	2	6	1/2
Choose material type from drop down menu	PVC	PVC	PVC	PVC	PVC	PVC
Choose specific material schedule from drop down menu	Schedule 40 PVC	Schedule 40 PVC	Schedule 40 PVC	Schedule 40 PVC	Schedule 80 PVC	Schedule 40 PVC

TREATMENT CHEMICALS & MATERIALS	Treatment 1	Treatment 2	Treatment 3	Treatment 4	Treatment 5	Treatment 6
Input number of injection points						
Choose material type from drop down menu	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide
Input amount of material injected at each point (pounds dry mass)						
Input number of injections per injection point						

GAC	Treatment 1	Treatment 2	Treatment 3	Treatment 4	Treatment 5	Treatment 6
Input weight of GAC used (lbs)						
Choose material type from drop down menu	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC

CONSTRUCTION MATERIALS	Material 1	Material 2	Material 3	Material 4	Material 5	Material 6
Choose material type from drop down menu	HDPE Liner	Gravel	Gravel	Gravel	General Concrete	HDPE Liner
Input area of material (ft^2)	350	350	920	1,850	4,200	
Input depth of material (ft)	0.005	1.17	1.5	0.67	0.5	

WELL DECOMMISSIONING	Well Type 1	Well Type 2	Well Type 3	Well Type 4	Well Type 5	Well Type 6
Input number of wells						
Input depth of wells (ft)						
Input well diameter (in)	1	1	1	1	1	1
Choose material from drop down menu	Soil	Soil	Soil	Soil	Soil	Soil

TRANSPORTATION

PERSONNEL TRANSPORTATION - ROAD	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	No	No	No	No	No	No
Choose vehicle type from drop down menu*	Cars	Cars	Cars	Cars	Cars	Cars
Choose fuel used from drop down menu	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Input distance traveled per trip (miles)	150	440	2	70		
Input number of trips taken	24	12	144	24		
Input number of travelers	1	1	1	1		
Input estimated vehicular fuel economy (mi/gal) (Input only if known for the vehicle selected, otherwise a default will be used by the tool)						

*For vehicle type 'Other' please enter values in Table 2b in the Look Up Table tab.

PERSONNEL TRANSPORTATION - AIR	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6
Input distance traveled (miles)						
Input number of travelers						
Input number of flights taken						

PERSONNEL TRANSPORTATION - RAIL	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6
Choose vehicle type from drop down menu	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail
Input distance traveled (miles)						
Input number of trips taken						
Input number of travelers						

EQUIPMENT TRANSPORTATION - ROAD	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	No	No	No	No	No	No
Choose fuel used from drop down menu	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Input distance traveled (miles)	100	100	400	600	500	100
Input weight of equipment transported (tons)	2	3	18.5	16	1	5

EQUIPMENT TRANSPORTATION - AIR	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6
Input distance traveled (miles)						
Input weight of equipment transported (tons)						

EQUIPMENT TRANSPORTATION - RAIL	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6
Input distance traveled (miles)						
Input weight of load (tons)						

EQUIPMENT TRANSPORTATION - WATER	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6
Input distance traveled (mile)						
Input weight of load (tons)						

EQUIPMENT USE

EARTHWORK	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6
Choose earthwork equipment type from drop down menu	Loader/Backhoe	Loader/Backhoe	Dozer	Dozer	Dozer	Dozer
Choose fuel type from drop down menu	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Input volume of material to be removed (yd^3)	118.5	119				
Will DIESEL-run equipment be retrofitted with a particulate reduction technology?	No	No	No	No	No	No
DRILLING	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**
Input number of drilling locations	7	3	3	1		
Choose drilling method from drop down menu	Hollow Stem Auger	Hollow Stem Auger	Hollow Stem Auger	Hollow Stem Auger	Direct Push	Direct Push
Input time spent drilling at each location (hr)	4	4	4	4		
Input depth of wells (ft)	23.5	26.5	13.5	16.5		
Choose fuel type from drop down menu	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel

For each pump, select only one of the three methods to calculate energy and GHG emissions
Enter "0" for all user input values for unused pump columns or unused methods

PUMP OPERATION	Pump 1	Pump 2	Pump 3	Pump 4	Pump 5	Pump 6
Choose method from drop down	Method 2	Method 1	Method 1	Method 1	Method 1	Method 1

Method 1 - ELECTRICAL USAGE IS KNOWN						
Input pump electrical usage (KWh)	0	0	0	0	0	0
Method 2 - PUMP HEAD IS KNOWN						
Input flow rate (gpm)	0	0	0	0	0	0
Input total head (ft)	0	0	0	0	0	0
Input number of pumps operating	0	0	0	0	0	0
Input operating time for each pump (hrs)	0	0	0	0	0	0
Pump efficiency times motor efficiency (default already present, user override possible)	0.51	0.51	0.51	0.51	0.51	0.51
Input specific gravity (default already present, user override possible)	1	1	1	1	1	1
Method 3 - NAME PLATE SPECIFICATIONS ARE KNOWN						
Input pump horsepower (hp)	0	0	0	0	0	0
Input number of pumps operating	0	0	0	0	0	0
Input operating time for each pump (hrs)	0	0	0	0	0	0
Input pump load (default already present, user override possible)	0.85	0.85	0.85	0.85	0.85	0.85
Input pump motor efficiency (default already present, user override possible)	0.85	0.85	0.85	0.85	0.85	0.85
Region						
Choose region from drop down menu (scroll right to see figure)	AKGD	AKGD	AKGD	AKGD	AKGD	AKGD

DIESEL AND GASOLINE PUMPS	Pump 1	Pump 2	Pump 3	Pump 4	Pump 5	Pump 6
Choose fuel type from drop down menu	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Choose horsepower range from drop down menu	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1
Equipment operating hours (hrs)						
Input estimated fuel consumption rate (gal/hr) (Input only if known for the pump selected, otherwise a default will be used by the tool)						

For each type of equipment, select only one of the methods to calculate energy and GHG emissions
Enter "0" for all user input values for unused equipment columns or unused methods

BLOWER, COMPRESSOR, MIXER, AND OTHER EQUIPMENT	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6
Choose type of equipment from drop down	Compressor	Blower	Blower	Blower	Blower	Blower
Choose method from drop down	Method 1	Method 1	Method 1	Method 1	Method 1	Method 1
Method 1 - NAME PLATE SPECIFICATIONS ARE KNOWN						
Input equipment horsepower (hp)	10	0	0	0	0	0
Input number of equipments operating	1	0	0	0	0	0
Input operating time for each equipment (hrs)	16	0	0	0	0	0
Input equipment load (default already present, user override possible)	0.85	0.85	0.85	0.85	0.85	0.85
Input motor efficiency (default already present, user override possible)	0.85	0.85	0.85	0.85	0.85	0.85
Method 2 - ELECTRICAL USAGE IS KNOWN						
Input equipment electrical usage, if known (KWh)	0	0	0	0	0	0
Region						
Choose region from drop down menu (scroll right to see figure)	NYLI	AKGD	AKGD	AKGD	AKGD	AKGD

GENERATORS	Generator 1	Generator 2	Generator 3	Generator 4	Generator 5	Generator 6
Choose fuel type from drop down menu	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Choose horsepower range from drop down menu	3 to 6	3 to 6	3 to 6	3 to 6	3 to 6	3 to 6
Input operating hours (hr)						

AGRICULTURAL EQUIPMENT	Tillage Tractor 1	Tillage Tractor 2	Tillage Tractor 3	Tillage Tractor 4	Tillage Tractor 5	Tillage Tractor 6
Choose fuel type from drop down menu	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Input area to till (acre)						
Choose soil condition from drop down menu	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil
Choose soil type from drop down menu	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil
Input time available (work days)						
Input depth of tillage (in)						

CAPPING EQUIPMENT	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6
Choose stabilization equipment type from drop down menu	Roller	Roller	Roller	Roller	Roller	Roller
Choose fuel type from drop down menu	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Input area (ft^2)	28,810					
Input time available (work days)	20					

MIXING EQUIPMENT	Mixer 1	Mixer 2	Mixer 3	Mixer 4	Mixer 5	Mixer 6
Choose fuel type from drop down menu	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Choose horsepower range from drop down menu	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3
Input volume (yd^3)						
Input production rate (yd^3/hr)						
Input estimated fuel consumption rate (gal/hr) (Input only if known for the mixer selected, otherwise a default will be used by the tool)						

RESIDUAL HANDLING

RESIDUE DISPOSAL/RECYCLING	Soil Residue	Residual Water	Material Residue	Other Residuals	Other Residuals	Other Residuals
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	No	No	No	No	No	No
Input weight of the waste transported to landfill or recycling per trip (tons)						
Choose vehicle type from drop down menu	On-road truck	On-road truck	On-road truck	On-road truck	On-road truck	On-road truck
Choose fuel used from drop down menu	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Input total number of trips						
Input number of miles per trip						

LANDFILL OPERATIONS	Operation 1	Operation 2	Operation 3	Operation 4	Operation 5	Operation 6
Input tons of soil or waste to be incinerated (user must input emission factors in the Look Up Table, Table 7a)						

THERMAL/CATALYTIC OXIDIZERS*	Oxidizer 1	Oxidizer 2	Oxidizer 3	Oxidizer 4	Oxidizer 5	Oxidizer 6
Choose oxidizer type from drop down menu	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer
Choose fuel type from drop down menu	natural gas	Propane	natural gas	natural gas	natural gas	natural gas
Input waste gas flow rate (scfm)						
Input time running (hours)						
Input waste gas inlet temperature (F)						
Input contaminant concentration (ppmV)						

*(Electric blowers are included in the analysis)

WATER CONSUMPTION	Treatment System 1	Treatment System 2	Treatment System 3	Treatment System 4	Treatment System 5	Treatment System 6
Input water disposed/collected during treatment (gal)						
Input water disposed/collected during site preparation (gal)						
Input water disposed/collected during sampling (gal)						
Input water disposed/collected during site demobilization (gal)						

LANDFILL METHANE EMISSIONS	Landfill 1	Landfill 2	Landfill 3	Landfill 4	Landfill 5	Landfill 6
Input landfill methane emissions (metric tons)						

OTHER KNOWN ONSITE ACTIVITIES	Entire Site
Input energy usage (MMBTU)	
Water consumption (gallon)	
Input CO_2 emission (metric ton)	
Input N_2O emission (metric ton CO_2 e)	
Input CH_4 emissions (metric ton CO_2 e)	
Input NOx emission (metric ton)	
Input SOx emission (metric ton)	
Input PM_{10} emission (metric ton)	
Input fatality risk	
Input injury risk	

Input - Remedial Action Operations

This worksheet allows the user to define material production, transportation, equipment use, and residual handling variables for the remedial alternative
Yellow cells require the user to choose an input from a drop down menu
White cells require the user to type in a value

MATERIAL PRODUCTION

WELL MATERIALS	Well Type 1	Well Type 2	Well Type 3	Well Type 4	Well Type 5	Well Type 6
Input number of wells						
Input depth of wells (ft)						
Choose well diameter (in) from drop down menu	1/2	1/2	1/2	1/2	1/2	1/2
Choose material type from drop down menu	PVC	PVC	PVC	PVC	PVC	PVC
Choose specific material schedule from drop down menu	Schedule 40 PVC	Schedule 40 PVC	Schedule 40 PVC	Schedule 40 PVC	Schedule 40 PVC	Schedule 40 PVC

TREATMENT CHEMICALS & MATERIALS	Treatment 1	Treatment 2	Treatment 3	Treatment 4	Treatment 5	Treatment 6
Input number of injection points						
Choose material type from drop down menu	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide
Input amount of material injected at each point (pounds dry mass)						
Input number of injections per injection point						

GAC	Treatment 1	Treatment 2	Treatment 3	Treatment 4	Treatment 5	Treatment 6
Input weight of GAC used (lbs)	21,000					
Choose material type from drop down menu	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC

CONSTRUCTION MATERIALS	Material 1	Material 2	Material 3	Material 4	Material 5	Material 6
Choose material type from drop down menu	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner
Input area of material (ft^2)						
Input depth of material (ft)						

WELL DECOMMISSIONING	Well Type 1	Well Type 2	Well Type 3	Well Type 4	Well Type 5	Well Type 6
Input number of wells						
Input depth of wells (ft)						
Input well diameter (in)	1	1	1	1	1	1
Choose material from drop down menu	Soil	Soil	Soil	Soil	Soil	Soil

TRANSPORTATION

PERSONNEL TRANSPORTATION - ROAD	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	No	No	No	No	No	No
Choose vehicle type from drop down menu*	Heavy Duty	Cars	Cars	Cars	Cars	Cars
Choose fuel used from drop down menu	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Input distance traveled per trip (miles)	150					
Input number of trips taken	120					
Input number of travelers	2					
Input estimated vehicular fuel economy (mi/gal) (Input only if known for the vehicle selected, otherwise a default will be used by the tool)						

*For vehicle type 'Other' please enter values in Table 2b in the Look Up Table tab.

PERSONNEL TRANSPORTATION - AIR	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6
Input distance traveled (miles)						
Input number of travelers						
Input number of flights taken						

PERSONNEL TRANSPORTATION - RAIL	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6
Choose vehicle type from drop down menu	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail
Input distance traveled (miles)						
Input number of trips taken						
Input number of travelers						

EQUIPMENT TRANSPORTATION - ROAD	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	No	No	No	No	No	No
Choose fuel used from drop down menu	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Input distance traveled (miles)						
Input weight of equipment transported (tons)						

EQUIPMENT TRANSPORTATION - AIR	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6
Input distance traveled (miles)						
Input weight of equipment transported (tons)						

EQUIPMENT TRANSPORTATION - RAIL	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6
Input distance traveled (miles)						
Input weight of load (tons)						

EQUIPMENT TRANSPORTATION - WATER	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6
Input distance traveled (mile)						
Input weight of load (tons)						

EQUIPMENT USE

EARTHWORK	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6
Choose earthwork equipment type from drop down menu	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer
Choose fuel type from drop down menu	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Input volume of material to be removed (yd^3)						
Will DIESEL-run equipment be retrofitted with a particulate reduction technology?	No	No	No	No	No	No
DRILLING	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**
Input number of drilling locations						
Choose drilling method from drop down menu	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push
Input time spent drilling at each location (hr)						
Input depth of wells (ft)						
Choose fuel type from drop down menu	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel

For each pump, select only one of the three methods to calculate energy and GHG emissions
Enter "0" for all user input values for unused pump columns or unused methods

PUMP OPERATION	Pump 1	Pump 2	Pump 3	Pump 4	Pump 5	Pump 6
Choose method from drop down	Method 3	Method 1	Method 1	Method 1	Method 1	Method 1

Method 1 - ELECTRICAL USAGE IS KNOWN						
Input pump electrical usage (KWh)	0	0	0	0	0	0
Method 2 - PUMP HEAD IS KNOWN						
Input flow rate (gpm)	0	0	0	0	0	0
Input total head (ft)	0	0	0	0	0	0
Input number of pumps operating	0	0	0	0	0	0
Input operating time for each pump (hrs)	0	0	0	0	0	0
Pump efficiency times motor efficiency (default already present, user override possible)	0.51	0.51	0.51	0.51	0.51	0.51
Input specific gravity (default already present, user override possible)	1	1	1	1	1	1
Method 3 - NAME PLATE SPECIFICATIONS ARE KNOWN						
Input pump horsepower (hp)	1	0	0	0	0	0
Input number of pumps operating	1	0	0	0	0	0
Input operating time for each pump (hrs)	43	0	0	0	0	0
Input pump load (default already present, user override possible)	0.5	0.85	0.85	0.85	0.85	0.85
Input pump motor efficiency (default already present, user override possible)	0.85	0.85	0.85	0.85	0.85	0.85
Region						
Choose region from drop down menu (scroll right to see figure)	NYLI	AKGD	AKGD	AKGD	AKGD	AKGD

DIESEL AND GASOLINE PUMPS	Pump 1	Pump 2	Pump 3	Pump 4	Pump 5	Pump 6
Choose fuel type from drop down menu	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Choose horsepower range from drop down menu	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1
Equipment operating hours (hrs)						
Input estimated fuel consumption rate (gal/hr) (Input only if known for the pump selected, otherwise a default will be used by the tool)						

For each type of equipment, select only one of the methods to calculate energy and GHG emissions
Enter "0" for all user input values for unused equipment columns or unused methods

BLOWER, COMPRESSOR, MIXER, AND OTHER EQUIPMENT	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6
Choose type of equipment from drop down	Blower	Compressor	Blower	Blower	Blower	Blower
Choose method from drop down	Method 1	Method 1	Method 1	Method 1	Method 1	Method 1
Method 1 - NAME PLATE SPECIFICATIONS ARE KNOWN						
Input equipment horsepower (hp)	20	20	0	0	0	0
Input number of equipments operating	2	1	0	0	0	0
Input operating time for each equipment (hrs)	87600	87600	0	0	0	0
Input equipment load (default already present, user override possible)	0.4	0.85	0.85	0.85	0.85	0.85
Input motor efficiency (default already present, user override possible)	0.85	0.85	0.85	0.85	0.85	0.85
Method 2 - ELECTRICAL USAGE IS KNOWN						
Input equipment electrical usage, if known (KWh)	0	0	0	0	0	0
Region						
Choose region from drop down menu (scroll right to see figure)	NYLI	NYLI	AKGD	AKGD	AKGD	AKGD

GENERATORS	Generator 1	Generator 2	Generator 3	Generator 4	Generator 5	Generator 6
Choose fuel type from drop down menu	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Choose horsepower range from drop down menu	3 to 6	3 to 6	3 to 6	3 to 6	3 to 6	3 to 6
Input operating hours (hr)						

AGRICULTURAL EQUIPMENT	Tillage Tractor 1	Tillage Tractor 2	Tillage Tractor 3	Tillage Tractor 4	Tillage Tractor 5	Tillage Tractor 6
Choose fuel type from drop down menu	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Input area to till (acre)						
Choose soil condition from drop down menu	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil	Firm untilled soil
Choose soil type from drop down menu	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil
Input time available (work days)						
Input depth of tillage (in)						

CAPPING EQUIPMENT	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6
Choose stabilization equipment type from drop down menu	Roller	Roller	Roller	Roller	Roller	Roller
Choose fuel type from drop down menu	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Input area (ft^2)						
Input time available (work days)						

MIXING EQUIPMENT	Mixer 1	Mixer 2	Mixer 3	Mixer 4	Mixer 5	Mixer 6
Choose fuel type from drop down menu	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Choose horsepower range from drop down menu	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3
Input volume (yd^3)						
Input production rate (yd^3/hr)						
Input estimated fuel consumption rate (gal/hr) (Input only if known for the mixer selected, otherwise a default will be used by the tool)						

RESIDUAL HANDLING

RESIDUE DISPOSAL/RECYCLING	Soil Residue	Residual Water	Material Residue	Other Residuals	Other Residuals	Other Residuals
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	No	No	No	No	No	No
Input weight of the waste transported to landfill or recycling per trip (tons)				1		
Choose vehicle type from drop down menu	On-road truck	On-road truck	On-road truck	On-road truck	On-road truck	On-road truck
Choose fuel used from drop down menu	Gasoline	Gasoline	Gasoline	Diesel	Gasoline	Gasoline
Input total number of trips				10		
Input number of miles per trip				100		

LANDFILL OPERATIONS	Operation 1	Operation 2	Operation 3	Operation 4	Operation 5	Operation 6
Input tons of soil or waste to be incinerated (user must input emission factors in the Look Up Table, Table 7a)						

THERMAL/CATALYTIC OXIDIZERS*	Oxidizer 1	Oxidizer 2	Oxidizer 3	Oxidizer 4	Oxidizer 5	Oxidizer 6
Choose oxidizer type from drop down menu	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer
Choose fuel type from drop down menu	natural gas	Propane	natural gas	natural gas	natural gas	natural gas
Input waste gas flow rate (scfm)						
Input time running (hours)						
Input waste gas inlet temperature (F)						
Input contaminant concentration (ppmV)						

*(Electric blowers are included in the analysis)

WATER CONSUMPTION	Treatment System 1	Treatment System 2	Treatment System 3	Treatment System 4	Treatment System 5	Treatment System 6
Input water disposed/collected during treatment (gal)						
Input water disposed/collected during site preparation (gal)						
Input water disposed/collected during sampling (gal)						
Input water disposed/collected during site demobilization (gal)						

LANDFILL METHANE EMISSIONS	Landfill 1	Landfill 2	Landfill 3	Landfill 4	Landfill 5	Landfill 6
Input landfill methane emissions (metric tons)						

OTHER KNOWN ONSITE ACTIVITIES	Entire Site
Input energy usage (MMBTU)	
Water consumption (gallon)	
Input CO_2 emission (metric ton)	
Input N_2O emission (metric ton CO_2 e)	
Input CH_4 emissions (metric ton CO_2 e)	
Input NOx emission (metric ton)	
Input SOx emission (metric ton)	
Input PM_{10} emission (metric ton)	
Input fatality risk	
Input injury risk	

Input - Longterm Monitoring

This worksheet allows the user to define material production, transportation, equipment use, and residual handling variables for the remedial alternative
Yellow cells require the user to choose an input from a drop down menu
White cells require the user to type in a value

MATERIAL PRODUCTION

WELL MATERIALS	Well Type 1	Well Type 2	Well Type 3	Well Type 4	Well Type 5	Well Type 6
Input number of wells						
Input depth of wells (ft)						
Choose well diameter (in) from drop down menu	4	4	4	4	4	4
Choose material type from drop down menu	PVC	PVC	PVC	PVC	PVC	PVC
Choose specific material schedule from drop down menu	Schedule 40 PVC	Schedule 40 PVC	Schedule 40 PVC	Schedule 40 PVC	Schedule 40 PVC	Schedule 40 PVC

TREATMENT CHEMICALS & MATERIALS	Treatment 1	Treatment 2	Treatment 3	Treatment 4	Treatment 5	Treatment 6
Input number of injection points						
Choose material type from drop down menu	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide	Hydrogen Peroxide
Input amount of material injected at each point (pounds dry mass)						
Input number of injections per injection point						

GAC	Treatment 1	Treatment 2	Treatment 3	Treatment 4	Treatment 5	Treatment 6
Input weight of GAC used (lbs)						
Choose material type from drop down menu	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC	Virgin GAC

CONSTRUCTION MATERIALS	Material 1	Material 2	Material 3	Material 4	Material 5	Material 6
Choose material type from drop down menu	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner	HDPE Liner
Input area of material (ft^2)						
Input depth of material (ft)						

WELL DECOMMISSIONING	Well Type 1	Well Type 2	Well Type 3	Well Type 4	Well Type 5	Well Type 6
Input number of wells	7	3	3	1	1	
Input depth of wells (ft)	24	27	14	17	425	
Input well diameter (in)	2	2	2	2	6	1
Choose material from drop down menu	Typical Cement	Typical Cement	Typical Cement	Typical Cement	Typical Cement	Soil

TRANSPORTATION

PERSONNEL TRANSPORTATION - ROAD	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	No	No	No	No	No	No
Choose vehicle type from drop down menu*	Light truck	Cars	Cars	Cars	Cars	Cars
Choose fuel used from drop down menu	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Input distance traveled per trip (miles)	70					
Input number of trips taken	11					
Input number of travelers	2					
Input estimated vehicular fuel economy (mi/gal) (Input only if known for the vehicle selected, otherwise a default will be used by the tool)						

*For vehicle type 'Other' please enter values in Table 2b in the Look Up Table tab.

PERSONNEL TRANSPORTATION - AIR	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6
Input distance traveled (miles)						
Input number of travelers						
Input number of flights taken						

PERSONNEL TRANSPORTATION - RAIL	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6
Choose vehicle type from drop down menu	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail	Intercity rail
Input distance traveled (miles)						
Input number of trips taken						
Input number of travelers						

EQUIPMENT TRANSPORTATION - ROAD	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	No	No	No	No	No	No
Choose fuel used from drop down menu	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Input distance traveled (miles)						
Input weight of equipment transported (tons)						

EQUIPMENT TRANSPORTATION - AIR	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6
Input distance traveled (miles)						
Input weight of equipment transported (tons)						

EQUIPMENT TRANSPORTATION - RAIL	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6
Input distance traveled (miles)						
Input weight of load (tons)						

EQUIPMENT TRANSPORTATION - WATER	Trip 1	Trip 2	Trip 3	Trip 4	Trip 5	Trip 6
Input distance traveled (mile)						
Input weight of load (tons)						

EQUIPMENT USE

EARTHWORK	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6
Choose earthwork equipment type from drop down menu	Dozer	Dozer	Dozer	Dozer	Dozer	Dozer
Choose fuel type from drop down menu	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Input volume of material to be removed (yd^3)						
Will DIESEL-run equipment be retrofitted with a particulate reduction technology?	No	No	No	No	No	No
DRILLING	**Event 1**	**Event 2**	**Event 3**	**Event 4**	**Event 5**	**Event 6**
Input number of drilling locations						
Choose drilling method from drop down menu	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push	Direct Push
Input time spent drilling at each location (hr)						
Input depth of wells (ft)						
Choose fuel type from drop down menu	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel

For each pump, select only one of the three methods to calculate energy and GHG emissions
Enter "0" for all user input values for unused pump columns or unused methods

PUMP OPERATION	Pump 1	Pump 2	Pump 3	Pump 4	Pump 5	Pump 6
Choose method from drop down	Method 1	Method 1	Method 1	Method 1	Method 1	Method 1

Method 1 - ELECTRICAL USAGE IS KNOWN						
Input pump electrical usage (KWh)	0	0	0	0	0	0
Method 2 - PUMP HEAD IS KNOWN						
Input flow rate (gpm)	0	0	0	0	0	0
Input total head (ft)	0	0	0	0	0	0
Input number of pumps operating	0	0	0	0	0	0
Input operating time for each pump (hrs)	0	0	0	0	0	0
Pump efficiency times motor efficiency (default already present, user override possible)	0.51	0.51	0.51	0.51	0.51	0.51
Input specific gravity (default already present, user override possible)	1	1	1	1	1	1
Method 3 - NAME PLATE SPECIFICATIONS ARE KNOWN						
Input pump horsepower (hp)	0	0	0	0	0	0
Input number of pumps operating	0	0	0	0	0	0
Input operating time for each pump (hrs)	0	0	0	0	0	0
Input pump load (default already present, user override possible)	0.85	0.85	0.85	0.85	0.85	0.85
Input pump motor efficiency (default already present, user override possible)	0.85	0.85	0.85	0.85	0.85	0.85
Region						
Choose region from drop down menu (scroll right to see figure)	AKGD	AKGD	AKGD	AKGD	AKGD	AKGD

DIESEL AND GASOLINE PUMPS	Pump 1	Pump 2	Pump 3	Pump 4	Pump 5	Pump 6
Choose fuel type from drop down menu	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Choose horsepower range from drop down menu	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1	2-Stroke: 0 to 1
Equipment operating hours (hrs)						
Input estimated fuel consumption rate (gal/hr) (input only if known for the pump selected, otherwise a default will be used by the tool)						

For each type of equipment, select only one of the methods to calculate energy and GHG emissions
Enter "0" for all user input values for unused equipment columns or unused methods

BLOWER, COMPRESSOR, MIXER, AND OTHER EQUIPMENT	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6
Choose type of equipment from drop down	Blower	Blower	Blower	Blower	Blower	Blower
Choose method from drop down	Method 1	Method 1	Method 1	Method 1	Method 1	Method 1
Method 1 - NAME PLATE SPECIFICATIONS ARE KNOWN						
Input equipment horsepower (hp)	0	0	0	0	0	0
Input number of equipments operating	0	0	0	0	0	0
Input operating time for each equipment (hrs)	0	0	0	0	0	0
Input equipment load (default already present, user override possible)	0.85	0.85	0.85	0.85	0.85	0.85
Input motor efficiency (default already present, user override possible)	0.85	0.85	0.85	0.85	0.85	0.85
Method 2 - ELECTRICAL USAGE IS KNOWN						
Input equipment electrical usage, if known (KWh)	0	0	0	0	0	0
Region						
Choose region from drop down menu (scroll right to see figure)	AKGD	AKGD	AKGD	AKGD	AKGD	AKGD

GENERATORS	Generator 1	Generator 2	Generator 3	Generator 4	Generator 5	Generator 6
Choose fuel type from drop down menu	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Choose horsepower range from drop down menu	3 to 6	3 to 6	3 to 6	3 to 6	3 to 6	3 to 6
Input operating hours (hr)						

AGRICULTURAL EQUIPMENT	Tillage Tractor 1	Tillage Tractor 2	Tillage Tractor 3	Tillage Tractor 4	Tillage Tractor 5	Tillage Tractor 6
Choose fuel type from drop down menu	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Input area to till (acres)						
Choose soil condition from drop down menu	Firm Untilled Soil	Firm Untilled Soil	Firm Untilled Soil	Firm Untilled Soil	Firm Untilled Soil	Firm Untilled Soil
Choose soil type from drop down menu	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil	Clay Soil
Input time available (work days)						
Input depth of tillage (in)						

CAPPING EQUIPMENT	Equipment 1	Equipment 2	Equipment 3	Equipment 4	Equipment 5	Equipment 6
Choose stabilization equipment type from drop down menu	Roller	Roller	Roller	Roller	Roller	Roller
Choose fuel type from drop down menu	Diesel	Diesel	Diesel	Diesel	Diesel	Diesel
Input area (ft)						
Input time available (work days)						

MIXING EQUIPMENT	Mixer 1	Mixer 2	Mixer 3	Mixer 4	Mixer 5	Mixer 6
Choose fuel type from drop down menu	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Choose horsepower range from drop down menu	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3	1 to 3
Input volume (yd)						
Input production rate (yd/hr)						
Input estimated fuel consumption rate (gal/hr) (input only if known for the mixer selected, otherwise a default will be used by the tool)						

RESIDUAL HANDLING

RESIDUE DISPOSAL/RECYCLING	Soil Residue	Residual Water	Material Residue	Other Residuals	Other Residuals	Other Residuals
Will DIESEL-run vehicles be retrofitted with a particulate reduction technology?	No	No	No	No	No	No
Input weight of the waste transported to landfill or recycling per trip (tons)						
Choose vehicle type from drop down menu	On-road truck	On-road truck	On-road truck	On-road truck	On-road truck	On-road truck
Choose fuel used from drop down menu	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline	Gasoline
Input total number of trips						
Input number of miles per trip						

LANDFILL OPERATIONS	Operation 1	Operation 2	Operation 3	Operation 4	Operation 5	Operation 6
Input tons of soil or waste to be incinerated (user must input emission factors in the Look Up Table, Table 7a)						

THERMAL/CATALYTIC OXIDIZERS*	Oxidizer 1	Oxidizer 2	Oxidizer 3	Oxidizer 4	Oxidizer 5	Oxidizer 6
Choose oxidizer type from drop down menu	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer	Simple Thermal Oxidizer
Choose fuel type from drop down menu	natural gas	Propane	natural gas	natural gas	natural gas	natural gas
Input waste gas flow rate (scfm)						
Input time running (hours)						
Input waste gas inlet temperature (F)						
Input contaminant concentration (ppmV)						

*(Electric blowers are included in the analysis)

WATER CONSUMPTION	Treatment System 1	Treatment System 2	Treatment System 3	Treatment System 4	Treatment System 5	Treatment System 6
Input water disposed/collected during treatment (gal)						
Input water disposed/collected during site preparation (gal)						
Input water disposed/collected during sampling (gal)						
Input water disposed/collected during site demobilization (gal)						

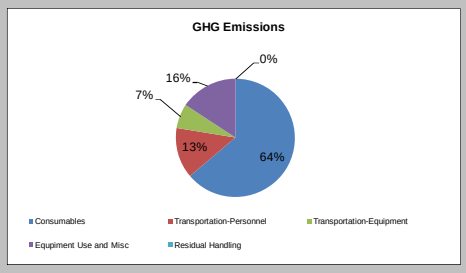
LANDFILL METHANE EMISSIONS	Landfill 1	Landfill 2	Landfill 3	Landfill 4	Landfill 5	Landfill 6
Input landfill methane emissions (metric tons)						

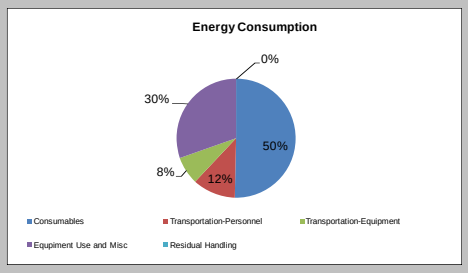
OTHER KNOWN ONSITE ACTIVITIES	Entire Site
Input energy usage (MMBTU)	
Water consumption (gallon)	
Input CO_2 emission (metric ton)	
Input N_2O emission (metric ton CO_2 e)	
Input CH_4 emissions (metric ton CO_2 e)	
Input NOx emission (metric ton)	
Input SOx emission (metric ton)	
Input PM_{10} emission (metric ton)	
Input fatality risk	
Input injury risk	

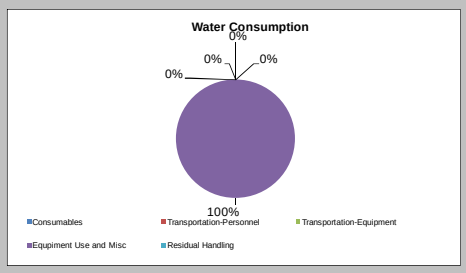
SiteWise
Output Summary Sheets

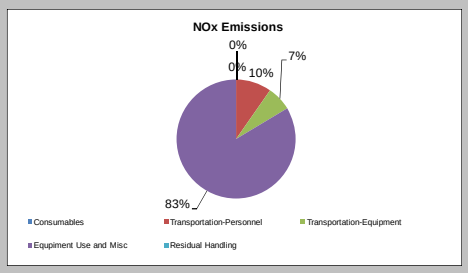
Sustainable Remediation Summary - Remedial Action Construction

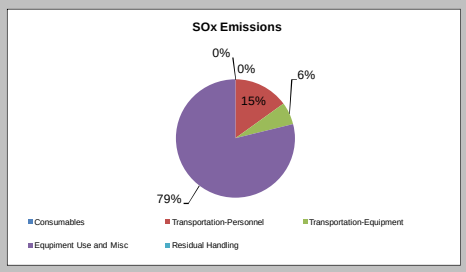
Activities	GHG Emissions	Percent Total	Total energy Used	Percent Total	Water Consumption	Percent Total	NOx emissions	Percent Total	SOx Emissions	Percent Total	PM10 Emissions	Percent Total	Accident Risk Fatality	Percent Total	Accident Risk Injury	Percent Total
	metric ton	%	MMBTU	%	gallons	%	metric ton	%	metric ton	%	metric ton	%		%		%
Consumables	24.21	63.9	2.4E+02	50.4	NA	NA	NA	-	NA	-	NA	-	NA	NA	NA	NA
Transportation-Personnel	5.16	13.6	5.6E+01	11.6	NA	NA	4.1E-03	9.6	1.3E-03	14.9	9.0E-04	20.6	9.2E-05	84.0	6.6E-03	50.1
Transportation-Equipment	2.52	6.7	3.7E+01	7.6	NA	NA	2.9E-03	6.8	5.5E-04	6.1	3.8E-04	8.7	4.3E-06	3.9	9.0E-04	6.8
Equipment Use and Misc	5.96	15.7	1.5E+02	30.3	6.1E+01	100.0	3.5E-02	83.5	7.1E-03	78.9	3.1E-03	70.7	1.3E-05	12.1	5.7E-03	43.1
Residual Handling	0.00	-	0.0E+00	-	NA	NA	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-
Total	37.86	100.0	4.83E+02	100.0	6.08E+01	100.0	4.21E-02	100.0	8.95E-03	100.0	4.38E-03	100.0	1.10E-04	100.0	1.32E-02	100.0

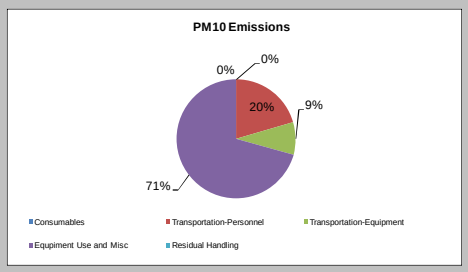


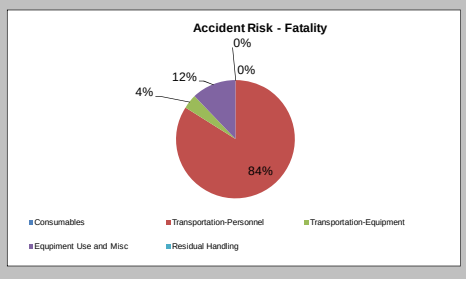


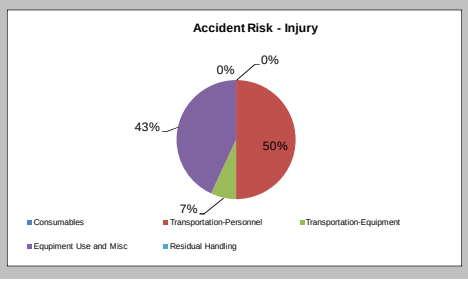






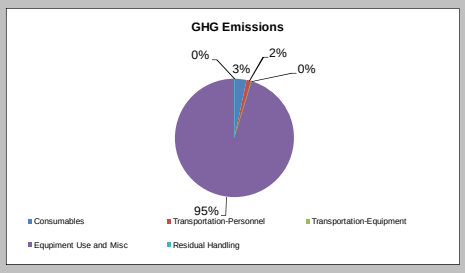


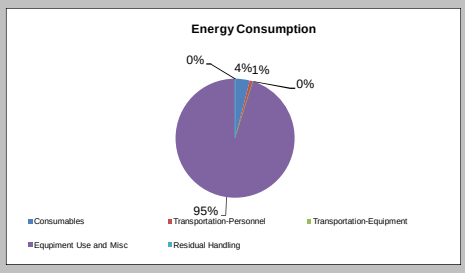


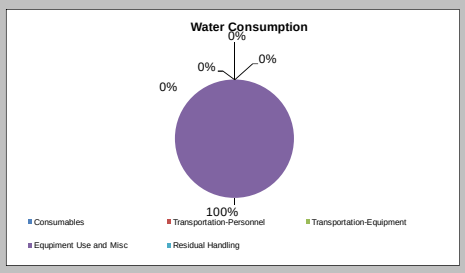


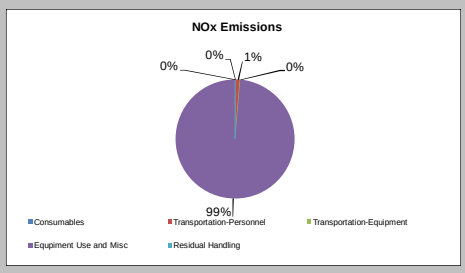
Sustainable Remediation Summary - Remedial Action Operations

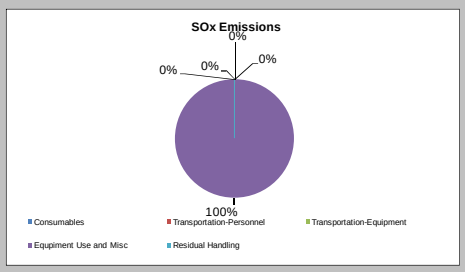
Activities	GHG Emissions	Percent Total	Total energy Used	Percent Total	Water Consumption	Percent Total	NOx emissions	Percent Total	SOx Emissions	Percent Total	PM10 Emissions	Percent Total	Accident Risk Fatality	Percent Total	Accident Risk Injury	Percent Total
	metric ton	%	MMBTU	%	gallons	%	metric ton	%	metric ton	%	metric ton	%		%		%
Consumables	61.44	3.3	1.1E+03	3.9	NA	NA	NA	-	NA	-	NA	-	NA	NA	NA	NA
Transportation-Personnel	25.51	1.4	2.8E+02	1.0	NA	NA	2.7E-02	1.4	6.6E-03	0.2	4.1E-03	95.8	3.1E-04	98.8	2.2E-02	96.5
Transportation-Equipment	0.00	-	0.0E+00	-	NA	NA	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-
Equipment Use and Misc	1,777.11	95.3	2.6E+04	95.0	1.3E+06	100.0	1.9E+00	98.5	4.3E+00	99.8	0.0E+00	-	0.0E+00	-	0.0E+00	-
Residual Handling	1.19	0.1	1.8E+01	0.1	NA	NA	1.4E-03	0.1	2.6E-04	0.0	1.8E-04	4.2	3.8E-06	1.2	7.9E-04	3.5
Total	1,865.24	100.0	2.76E+04	100.0	1.29E+06	100.0	1.91E+00	100.0	4.32E+00	100.0	4.30E-03	100.0	3.10E-04	100.0	2.27E-02	100.0

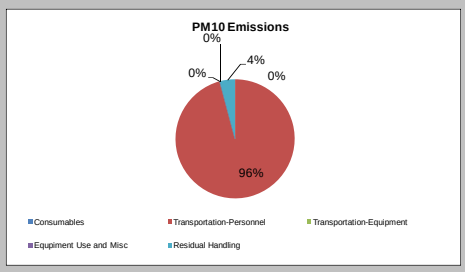


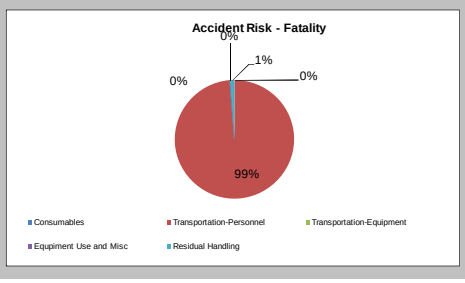


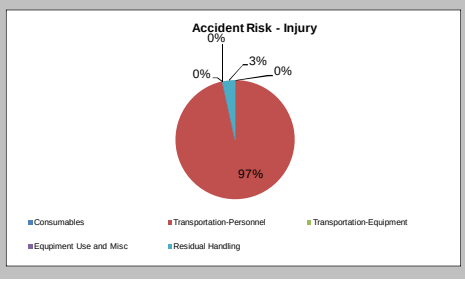






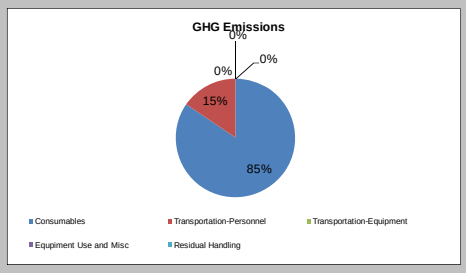


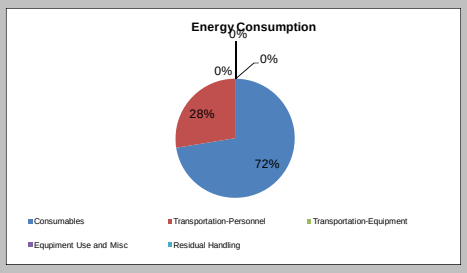


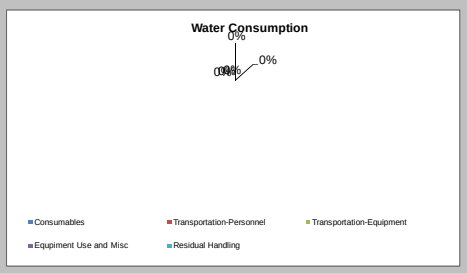


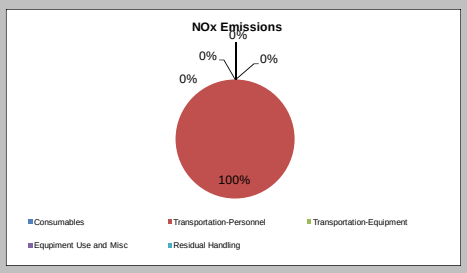
Sustainable Remediation Summary - Longterm Monitoring

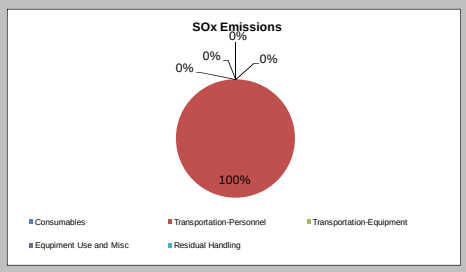
Activities	GHG Emissions	Percent Total	Total energy Used	Percent Total	Water Consumption	Percent Total	NOx emissions	Percent Total	SOx Emissions	Percent Total	PM10 Emissions	Percent Total	Collateral Risk Fatality	Percent Total	Collateral Risk Injury	Percent Total
	metric ton	%	MMBTU	%	gallons	%	metric ton	%	metric ton	%	metric ton	%		%		%
Consumables	3.18	84.5	1.7E+01	72.4	NA	NA	NA	-	NA	-	NA	-	NA	NA	NA	NA
Transportation-Personnel	0.58	15.5	6.4E+00	27.6	NA	NA	6.3E-04	100.0	1.5E-04	100.0	9.4E-05	100.0	1.3E-05	100.0	9.4E-04	100.0
Transportation-Equipment	0.00	-	0.0E+00	-	NA	NA	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-
Equipment Use and Misc	0.00	-	0.0E+00	-	0.0E+00	0.0	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-
Residual Handling	0.00	-	0.0E+00	-	NA	NA	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-	0.0E+00	-
Total	3.77	100.0	2.31E+01	100.0	0.00E+00	0.0	6.26E-04	100.0	1.50E-04	100.0	9.39E-05	100.0	1.31E-05	100.0	9.39E-04	100.0

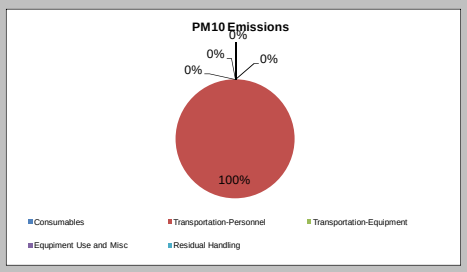


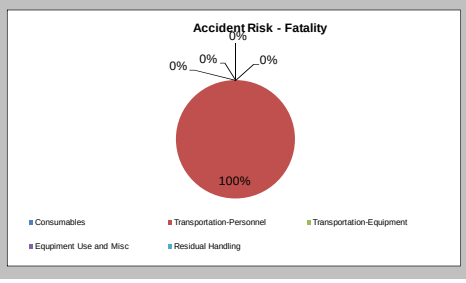


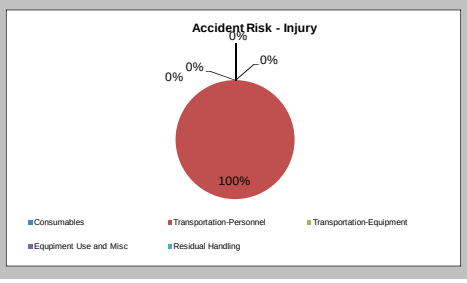






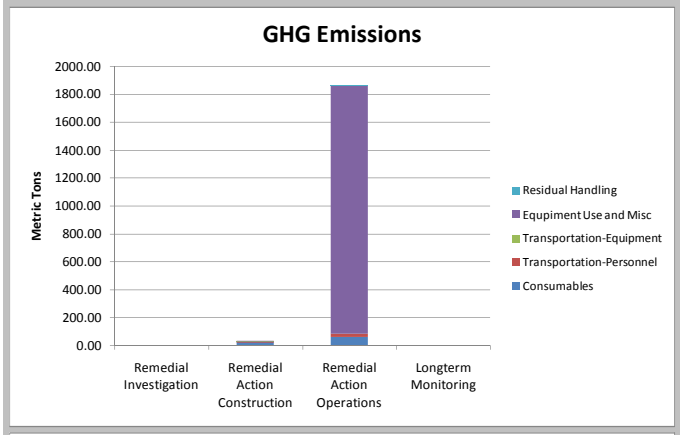


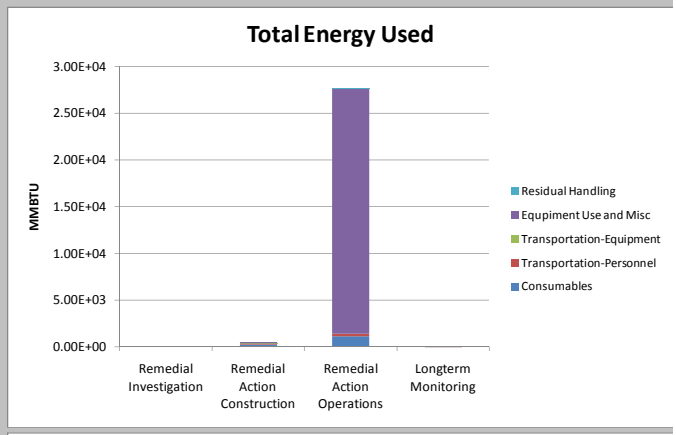


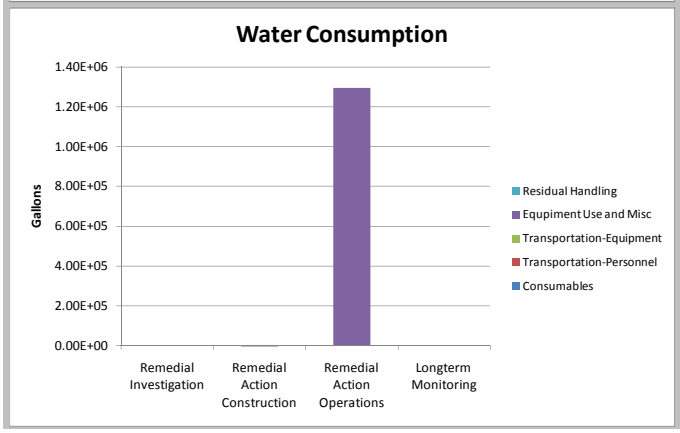


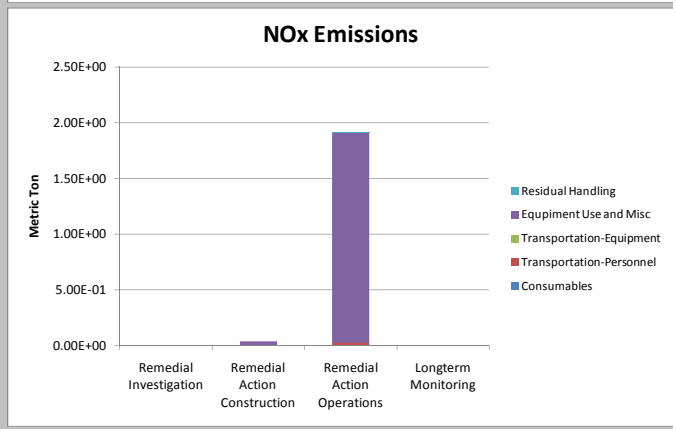
Sustainable Remediation - Environmental Footprint Summary
Soil Vapor Extraction / Air Sparging

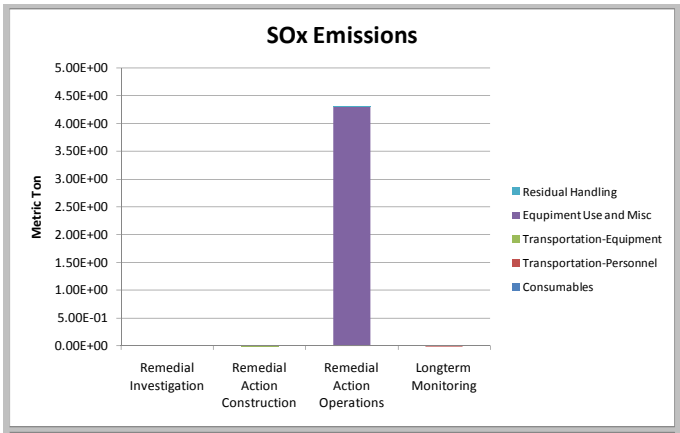
Phase	Activities	GHG Emissions	Total energy Used	Water Consumption	NOx emissions	SOx Emissions	PM10 Emissions	Accident Risk Fatality	Accident Risk Injury
		metric ton	MMBTU	gallons	metric ton	metric ton	metric ton		
Remedial Investigation	Consumables	0.00	0.0E+00	NA	NA	NA	NA	NA	NA
	Transportation-Personnel	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Transportation-Equipment	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Equpiment Use and Misc	0.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Residual Handling	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Sub-Total	0.00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00	0.00E+00
Remedial Action Construction	Consumables	24.21	2.4E+02	NA	NA	NA	NA	NA	NA
	Transportation-Personnel	5.16	5.6E+01	NA	4.1E-03	1.3E-03	9.0E-04	9.2E-05	6.6E-03
	Transportation-Equipment	2.52	3.7E+01	NA	2.9E-03	5.5E-04	3.8E-04	4.3E-06	9.0E-04
	Equpiment Use and Misc	5.96	1.5E+02	6.1E+01	3.5E-02	7.1E-03	3.1E-03	1.3E-05	5.7E-03
	Residual Handling	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Sub-Total	37.86	4.83E+02	6.08E+01	4.21E-02	8.95E-03	4.38E-03	1.10E-04	1.32E-02
Remedial Action Operations	Consumables	61.44	1.1E+03	NA	NA	NA	NA	NA	NA
	Transportation-Personnel	25.51	2.8E+02	NA	2.7E-02	6.6E-03	4.1E-03	3.1E-04	2.2E-02
	Transportation-Equipment	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Equpiment Use and Misc	1,777.11	2.6E+04	1.3E+06	1.9E+00	4.3E+00	0.0E+00	0.0E+00	0.0E+00
	Residual Handling	1.19	1.8E+01	NA	1.4E-03	2.6E-04	1.8E-04	3.8E-06	7.9E-04
	Sub-Total	1,865.24	2.76E+04	1.29E+06	1.91E+00	4.32E+00	4.30E-03	3.10E-04	2.27E-02
Longterm Monitoring	Consumables	3.18	1.7E+01	NA	NA	NA	NA	NA	NA
	Transportation-Personnel	0.58	6.4E+00	NA	6.3E-04	1.5E-04	9.4E-05	1.3E-05	9.4E-04
	Transportation-Equipment	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Equpiment Use and Misc	0.00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Residual Handling	0.00	0.0E+00	NA	0.0E+00	0.0E+00	0.0E+00	0.0E+00	0.0E+00
	Sub-Total	3.77	2.31E+01	0.00E+00	6.26E-04	1.50E-04	9.39E-05	1.31E-05	9.39E-04
Total		**1.9E+03**	**2.8E+04**	**1.3E+06**	**2.0E+00**	**4.3E+00**	**8.8E-03**	**4.3E-04**	**3.7E-02**

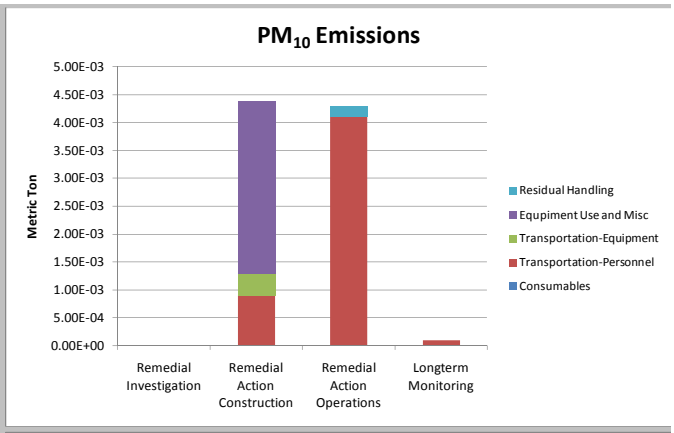


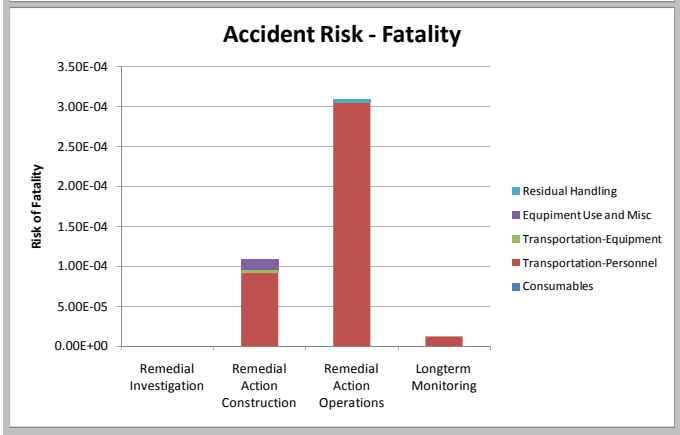


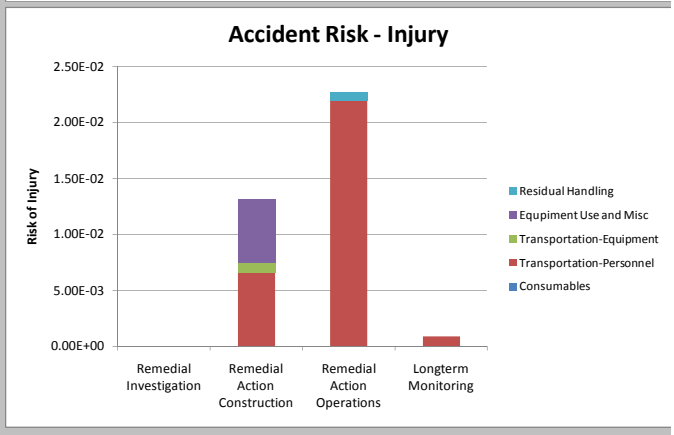





SOx Emissions
Metric Ton
5.00E+00
4.50E+00
4.00E+00
3.50E+00
3.00E+00
2.50E+00
2.00E+00
1.50E+00
1.00E+00
5.00E-01
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables


PM10 Emissions
Metric Ton
5.00E-03
4.50E-03
4.00E-03
3.50E-03
3.00E-03
2.50E-03
2.00E-03
1.50E-03
1.00E-03
5.00E-04
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables


Accident Risk - Fatality
Risk of Fatality
3.50E-04
3.00E-04
2.50E-04
2.00E-04
1.50E-04
1.00E-04
5.00E-05
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables


Accident Risk - Injury
Risk of Injury
2.50E-02
2.00E-02
1.50E-02
1.00E-02
5.00E-03
0.00E+00
Remedial Investigation
Remedial Action Construction
Remedial Action Operations
Longterm Monitoring
Residual Handling
Equipment Use and Misc
Transportation-Equipment
Transportation-Personnel
Consumables

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