REMEDIAL ACTION WORK PLAN
FOR
AAFES STATION BUILDING 200
U.S. ARMY GARRISON FORT HAMILTON
BROOKLYN, NEW YORK
(NYSDEC Spill # 9802727)

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Final

Prepared For:

DEPARTMENT OF THE ARMY
BALTIMORE DISTRICT
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ABBREVIATIONS AND ACRONYMS

°F	Degrees Fahrenheit
AAFES	Army Air Force Exchange Service
ACFM	Actual Cubic Feet per Minute
AGS	Above Ground Surface
AMSL	Above Mean Sea Level
bgs	Below Ground Surface
BTEX	Benzene, Toluene, Ethylbenzene, Xylene
CAP	Corrective Action Plan
CD-ROM	Compact Disk-Read Only Memory
cfm	Cubic Feet per Minute
CMS	Corrective Measures Study
COC	Contaminants of Concern
DPW	Department of Public Works
EA	EA Engineering, Science, and Technology
EPA	Environmental Protection Agency
FPS	Feet Per Second
FSP	Field Sample Plan
ft	foot
GAC	Granular Activated Carbon
GP	General Physics
gpm	gallons per minute
HASP/APP	Health and Safety Plan/Accident Prevention Plan
HDPE	High Density Polyethylene
Hg	Mercury
HP	Horsepower
HVLS	High Vacuum Liquid Separator
Hz	Hertz
lbs/hr	pounds per hour
LEL	Lower Explosive Limit
LNAPL	Light Non-Aqueous Phase Liquid
mg/kg	milligrams per kilogram
mg/l	milligrams per liter
MPE	Multi-Phase Extraction
MTBE	Methyl tert-Butyl Ether
ND	Non-detect
NYC	New York City
NYSDEC	New York State Department of Environmental Conservation
NYSDOT	New York State Department of Transportation
O&M	Operation and Maintenance
OSHA	Occupational Safety and Health Administration

OWS	Oil Water Separator
PID	Photo-ionization Detector
Plexus	Plexus Scientific Corporation
POTW	Publicly Owned Treatment Works
ppb	parts per billion
ppm	parts per million
ppmv	parts per million (volume to volume)
PSI	Pounds per Square Inch
PVC	Polyvinyl Chloride
QAPP	Quality Assurance Project Plan
RAWP	Remedial Action Work Plan
SCGs	Standards, Criteria, and Guidance
SOW	Scope of Work
STARS	Spill Technology Remediation Series
SVE	Soil Vapor Extraction
SVOC	Semi-volatile organic compounds
TRC	TRC Environmental Corporation
ug/kg	micrograms per kilogram
ug/l	micrograms per liter
USACE	United States Army Corps of Engineers
UST	Underground Storage Tank
V	Volt
VFD	Variable Frequency Drive
VOCs	Volatile organic compounds

1.0 INTRODUCTION

The United States Army Corps of Engineers, Baltimore District (USACE) has contracted Plexus Scientific Corporation (Plexus) to design and install a remedial system for the Army Air Force Exchange Service (AAFES) Station - Building 200 site, U.S. Army Garrison at Fort Hamilton in Brooklyn, New York. This system installation will be conducted under Contract Number: W912DR-04-0013 Delivery Order Number: 0006. This document constitutes the Remedial Action Work Plan for the remedial system installation.

1.1 Site Background and Description

The AAFES station is located at 200 General Lee Avenue in Fort Hamilton, Brooklyn, New York. The station was constructed in the 1960s as a service station with 2 service bays, 3 gasoline underground storage tanks (USTs), and 1 waste oil UST. The 3 gasoline USTs (two 3,000-gal and one 4,000-gal) were replaced in 1991. Soil staining from petroleum leaks was noted during tank removal. The new tanks were located in the existing excavation; however, some contaminated soil remained. During 1999-2000, the service station was converted into a convenience store. The site is currently operating as an active retail gasoline service station. A site location map is provided as Figure 2-1 and a Site Layout Map is provided as Figure 2-2. Existing conditions are described on Drawing C-1 in Appendix A. The discussion below is further summarized and supported by Table 1, Groundwater Monitoring Well Analytical Summary; Table 2, Historic and Current Free Product and Water Gauging; Figure 2-3, Groundwater Concentration Map; and Figure 2-4, Groundwater Elevation Contour Map. Note that copies of the previous investigation reports are contained in PDF format on a CD-ROM appended to this document (Appendix F).

Previous investigations

TRC Environmental Corporation (TRC) conducted a site investigation in June 1997, including installation and sampling of three soil borings using hollow-stem auger methods. The results indicated elevated benzene, toluene, ethylbenzene, and total xylene (BTEX) concentrations in soil at approximately 19-31 ft below ground surface (bgs). In particular, a sample from boring TRC-2 contained significant concentrations of BTEX, totaling 11,160 mg/kg. Groundwater samples were not collected during the investigation.

Parsons Engineering Science (Parsons) conducted a site investigation from March to May 2000. The Parsons investigation included installation and sampling of five monitoring wells using hollow-stem auger methods. Ten soil samples were collected and analyzed for the New York State Department of Environmental Conservation (NYSDEC) Spill Technology Remediation Series (STARS) volatile organic compounds and base neutral compounds. None of the base neutral compounds were detected above method detection limits. Benzene, total BTEX, and methyl tertiary-butyl ether (MTBE) concentrations detected in the soil samples collected from MW-05 ranged from non-detect (ND) to a maximum of 12,237 mg/kg, 69,669 mg/kg, and 4,554 mg/kg, respectively. Monitoring well MW-05 is located adjacent to soil boring TRC-2, which exhibited the highest concentrations during the TRC investigation.

General Physics (GP) completed a site assessment in June 2003, including the installation and sampling of nine direct-push soil borings and two additional monitoring wells to delineate the down gradient extent of impacted soil and groundwater. The analytical results indicated that soil is impacted at the site in an area approximately 100 ft × 75 ft extending down gradient from the

UST pit. The vertical extent of impacted soil is between 15 and 30 ft bgs. Groundwater impacts (i.e., BTEX, MTBE, and naphthalene) were reported at concentrations above NYDEC Class GA standards extending from the tank pit to the northeast site boundary along General Lee Avenue. Light non-aqueous phase liquid (LNAPL) was observed in MW-01 and MW-05. General Physics estimated that 2,020 gal of LNAPL and 210 lb of BTEX compounds were present at the site.

Based on the results of the June 2003 site assessment, GP proposed implementing mobile high vacuum extraction as a corrective action for the site. During September and October 2003, GP installed three additional soil borings, collected two geotechnical samples, performed a short-term pumping test on MW-07, performed in situ respirometry tests, and performed high vacuum extraction tests on MW-01, MW-04, and MW-05 using a mobile unit. Following the additional field activities, GP completed a Corrective Action Plan (CAP) for the site in June 2004. The CAP evaluated remedial alternatives and recommended that a bioslurping/multiphase extraction (MPE) treatment system be installed to address areas of the site impacted by LNAPL.

EA Engineering, Science, and Technology (EA) conducted an MPE optimization study at the AAFES station site in 2005 to evaluate the technology as a potential component of the corrective measures to address petroleum-impacted soil and groundwater. The estimated radius-of-influence of the MPE system was assessed, with respect to induced subsurface vacuum and groundwater depression, using one of the existing monitoring wells at the site. In addition, the MPE technology was evaluated based on contaminant recovery rates. Based on the subsurface vacuum measurements, the estimated radius-of-influence for the AAFES station site ranged from 28 to 41 ft (average: 34 ft) during five independent tests conducted on MW-03. Maximum estimates of contaminant recovery of 14.63 lb/day from the dissolved and 17.4 lb/day from the vapor phase were calculated. These estimates were based on samples collected during the MPE test on MW-05 where nearly 5 ft of LNAPL was observed. Significantly lower vapor phase recovery rates were calculated during the tests on MW-03 where LNAPL was not observed. The highest vapor phase contaminant recovery rate on MW-03 was observed while the drop-tube was positioned at the maximum depth (i.e., 5 ft below static groundwater table), with the maximum vacuum applied to the well. The results of the optimization study indicate that MPE is a viable remedial option for the AAFES station site.

Nature and Extent of Impacts

Based on an August 2007 gauging event, LNAPL is currently observed in MW-01, MW-04 and MW-05, see Figure 2-3. The intermittent presence of LNAPL in MW-02 and MW-03 could be attributed to seasonal water table fluctuations. Of the three wells which exhibit LNAPL, all three have had LNAPL in them since 2005, and two of them (MW-1 and MW-5) have had LNAPL present since 2003. It does not appear the LNAPL plume is migrating.

Although the thickness of a layer of free product in a monitor well can be measured with high accuracy and precision, the measured thickness is usually larger (sometimes by a factor of as much as 4) than the thickness that exists in the surrounding soil. The water table in the monitoring well (where the product collects) can be depressed by the weight of the column of LNAPL. To account for this, Table 2 includes a corrected groundwater elevation where LNAPL was present in the well, and based on the corrected groundwater elevation, a LNAPL formation thickness is estimated.

The observed groundwater impacts are likely the result of groundwater contact with LNAPL and/or residual petroleum. Based on multiple water level measurements, the groundwater flow direction is toward the north-northeast. The fine-grained silty sand and clayey sand facies that comprise the water table aquifer result in a low groundwater yield. The horizontal extent of soil contamination is approximately 100 ft × 75 ft, with the major axis of the plume in the north-south direction. Benzene contamination is limited to the vicinity of MW-05 near the tank pit. Shallow contamination, from 10 to 15 ft bgs, appears to exist in the vicinity of the tank pit. The vertical extent of contamination in the remainder of the area is from 15 to 30 ft bgs, with the majority of the impact observed near the water table.

Recent Groundwater Sampling

Plexus collected four groundwater samples from monitoring wells MW-2, MW-3, MW-6 and MW-7 on August 6, 2007. The samples were submitted to Analytical Laboratory Services, Inc. of Middletown, PA for analysis of New York State Department of Environmental Conservation (NYSDEC) Spill Technology Remediation Series (STARS) list volatile organic compounds (VOCs) using U.S. EPA Method 8260. Groundwater samples were not collected from MW-1, MW-4, and MW-5 due to the presence of free product.

A copy of the laboratory analytical report is included on the CD-ROM previously identified. A summary of the laboratory results are included as Table 1 and depicted on Figure 2-3.

MW-6 has historically been a "clean" well and the recent sampling did not detect any contaminants of concern (COC). MW-7 historically had low levels of COCs. The data from the August 6, 2007 sampling only detected MTBE, at 2 ug/l. The data from these two wells indicate that the plume has not migrated off-site in the north / northwest directions. This is important since groundwater flows to the northwest.

Analytical data from the two "source area" wells sampled, MW-2 and MW-3, indicate dissolved concentrations are steadily decreasing in the vicinity of these two wells, based on data collected in 2003 and 2005.

Groundwater Elevations

All of the site's monitoring wells were gauged on August 6, 2007. Groundwater and free product elevations are summarized in Table 2. Depth to groundwater ranges from 17.41 to 24.01 feet below-land-surface. Groundwater flow direction is to the northwest. A groundwater contour map is presented as Figure 2-4.

Standard, Criteria, and Guidance

Applicable standards, criteria, and guidance (SCGs) are identified in the bullet list below. They have been limited to those applicable to this installation and do not necessarily include those applicable to previous activities or other remedial activities that may be considered at a future date.

- STARS #1 – Petroleum-Contaminated Soil Guidance Policy
- Spill Response Guidance Manual
- TOGS 1.1.1 – Ambient Water Quality Standards & Guidance Values and Groundwater Effluent Limitations
- Air Guide 1 – Guidelines for Control of Toxic Ambient Air Contaminants

- 6 NYCRR Part 371 Identification and Listing of Hazardous Wastes (November 1998)
- 6 NYCRR Subparts 374-2 – Standards for Management of Used Oil (November 1998)
- 6 NYCRR Parts 700-706 – Water Quality Standards (June 1998)
- 40 CFR Part 280 – Technical Standards and Corrective Action Requirements for Owners and Operators of Underground Storage Tanks
- 29 CFR Part 1910.120 – Hazardous Waste Operations and Emergency Response
- 6 NYCRR Part 175 – Special Licenses and Permits – Definitions and Uniform Procedures
- 6 NYCRR PRT 372 – Hazardous Waste Manifest System and Related Standards for Generators, Transporters and Facilities (November 1998)
- 6 NYCRR Part 376 – Land Disposal Restrictions
- 6 NTCRR Part 750 through 758 – Implementation of NPDES Program in NYS
- TAGM 4032 – Disposal of Drill Cuttings (November 1989)
- TOGS 1.3.8 – New Discharges to POTWs
- OSWER Directive 9200.4-17 – Use of Monitored Natural Attenuation at Superfund Sites, RCRA Corrective Action, and Underground Storage Tank Sites (November 1997)
- NYSDOH Environmental Health Manual CSFP-530 – Individual Water Supplies – Activated Carbon Treatment Systems
- Groundwater Monitoring well Decommissioning Procedures (May 1995)

1.2 Scope and Objectives

Site remediation, which is based on both the GP CAP (2004) and the Pilot Study performed by EA during August 2005, will address LNAPL and vadose zone contamination. The media targeted for remediation under this Scope of Work (SOW) for the Building 200 site includes source area unsaturated soils, LNAPL, and the associated smear zone. The recommended remediation method identified in the CAP will be constructed using the following components to address these media:

- *In situ* physical and biological remediation of constituents of concern in source area soil, LNAPL, and smear zone areas.
- Multi-phase Extraction (MPE), which may include elements of LNAPL recovery, soil vapor extraction (SVE), and bioventing implemented to remediate the vadose zone contamination and recover vapor and LNAPL.
- *Ex situ* physical treatment of constituents of concern in soil vapor (catalytic/thermal oxidation/activated carbon filtration of extracted soil vapor).
- *Ex situ* physical treatment of constituents of concern in groundwater via air stripping and activated carbon filtration of extracted groundwater.

The purpose of this Remedial Action Work Plan (RAWP) is to describe the means and methods for the design/construction of the MPE system at Building 200. This RAWP includes design documents together with drawings, and project/system descriptions.

The objectives of this system are to:

1) Target the main contaminant sources: LNAPL, the associated smear zone, and contaminated soils
2) Optimize the removal/recovery efficiency of the system (see Appendix G Field Sample Plan)

These main contaminant sources will be targeted by physical and biological remediation via MPE.

1.3 Report Structure

This Work Plan is divided into the following chapters:

- Section 1 provides an introduction to the project, a description of the system, and the system operation strategy.
- Section 2 presents a detailed description of the MPE Equipment and Process.
- Section 3 presents the construction methods to be employed during construction of the MPE remediation system and its components.
- Section 4 presents References that are incorporated in this Work Plan.

1.4 Construction Overview

Construction of the remedial system will include:

- Surveying,
- installation of the MPE wells,
- installation of associated piping and related infrastructure,
- installation of the Prefabricated Treatment Unit,
- installation of additional treatment equipment (i.e., thermal/catalytic oxidizer).

1.5 Multi-Phase Extraction Well Field

The proposed remedial system consists of 7 new MPE wells (and extension of piping to MW-5) for vapor, LNAPL, and/or groundwater extraction). The MPE wells will be installed throughout the LNAPL plume as identified on Drawing C-2, Appendix A. A comparison of the multi-phase extraction system to the free product and dissolved phase plumes is shown in Figure 2-5. The multi-phase extraction system's zone-of-influence fully encompasses the dissolved contaminant plume. This comparison demonstrates that the proposed network of MPE wells is adequate to achieve remediation of the hydrocarbon-impacted area.

The MPE wells are intended to remove vapor, LNAPL and small volumes of groundwater contaminated by petroleum compounds, through a single point. Vapor will be extracted by inducing a vacuum at the MPE well. LNAPL and groundwater will be extracted by inducing an air velocity in the drop-tube capable of entraining liquids within the air stream.

Pilot test data (EA, 2005) indicated that approximately 90 inches of water vacuum is required to remove vapor at the site and induce the desired influences. During the pilot test 25 cubic-feet-

per-minute (cfm) of vapor was removed at a wellhead vacuum of 90-inches of water. The achieved radius of influence at this vacuum was between 28 and 41 feet.

The extracted flow rate necessary for liquid removal must be equal to or greater than 16 cfm to entrain liquid in a 1-inch diameter drop tube.

The MPE wells will be constructed of 4-inch PVC and installed in a 10 ¼ -inch borehole. Each MPE well will have a 20-feet screen section with a 0.010-inch continuous wrap screen. Sand pack will be of #0 size. The location of the screen interval extends from 10 – 30 feet bgs. The highest LNAPL/water level measurements have indicated that the maximum water table elevations recorded averaged 16 feet below grade.

The 4-inch MPE wells will be finished below grade. The MPE well head will be constructed of PVC pipe, fittings, and valves as shown on the construction drawings (Sheet C-3). The system as designed will use the 4-inch MPE well to extract soil vapor and incorporate a "drop tube" to address removal of LNAPL.

The pipe from the wellhead to the header (termed lateral) will be 3-inch diameter PVC piping. From the header to the treatment system, the pipe will vary in size from 3-inch to 4-inch in diameter. The use of varying pipe sizes is intended to minimize frictional losses and therefore minimize blower requirements.

1.6 Multi-Phase Extraction

The objective of the MPE system is to physically remove contaminant mass from the subsurface. The contaminant mass will be removed in the form of vapor, LNAPL, and petroleum hydrocarbons dissolved in groundwater. Contaminant mass in the vapor phase is the easiest to treat and the majority of mass removed from the site is anticipated to be in the vapor phase. LNAPL is also relatively easy to remove, but volatizes within the process piping and equipment. Groundwater is easy to remove but may be difficult to treat (e.g., fouling issues). The intent of the MPE system is to maximize mass removal in the vapor and LNAPL phases and minimize groundwater extraction and treatment.

Vapor will be extracted by applying a vacuum to the well. As observed in the pilot study (EA, 2005), the subsurface conditions are favorable for vapor extraction at the site.

The removal of LNAPL and groundwater is accomplished by entraining these liquids within the vapor stream. The entrainment of liquids in the air stream is a function of air velocity, and the critical air velocity for liquid entrainment is approximately 16 cfm (for a 1-inch drop tube).

The focus of the MPE system design is to remove vapor from all wells and liquids from only those wells that contain LNAPL.

The proposed remedial equipment has been sized to extract a total vapor flow rate of 256 cfm utilizing one vacuum blower. A Variable Frequency Drive (VFD) may be utilized to operate the blower motor. The primary purpose of the VFD would allow operation of a 3-phase motor (for the blower) via a 1-phase electrical service. Three-phase power is currently not available at the site but would have to be extended from White Ave. Since both electrical service options (3 phase or 1 phase) are technically acceptable, the decision will be based on cost effectiveness at the time of construction. Operational flexibility can be attained through the adjustment of valves located at the well heads.

The vacuum blower is sized to provide 12.8-inches of mercury vacuum at the blower at the design flow rate. Based on the pilot study, a minimum of approximately 90-inches of water vacuum is required to extract vapor at the anticipated flow rate. The 12.8-inch of mercury vacuum at the blower will be ample to overcome system frictional losses and still provide the desired vacuum at the wellheads.

A rotary-lobe blower was selected as the best type of vacuum blower for the given flow and vacuum requirements of the MPE system. Rotary-lobe blowers are better suited for lower vacuum applications (i.e., less than 15 inches of mercury). Compared to liquid-ring vacuum pumps, rotary-lobe blowers have a lower capital cost, are easier to maintain, and require less power, resulting in lower O&M costs. However, unlike liquid-ring pumps, rotary-lobe blowers *cannot* handle liquids in the vapor stream. Therefore, it is critical that all liquids be removed from the vapor stream prior to entering the blower.

One of the key items in successfully operating a MPE system is the separation of the liquids from the air via a Liquid/Vapor Separator (a.k.a., knockout tank). One of the most important aspects is to ensure that no liquids get through the Liquid/Vapor Separator to the blower. Liquids downstream of the Liquid/Vapor Separator could cause severe, if not fatal, damage to the rotary-lobe vacuum blower and catalytic oxidation unit. To prevent this, a high vacuum liquid separator (HVLS) was sized large enough to handle the anticipated flow. In addition, each tank will be fitted with three level controls: low-level, high-level, and high-high-level. The first two (low-level and high-level) level controls will control operation of the liquid transfer. Should the liquid flow into the separator cause the high-high level to go off, then the entire system will be shut down.

Further, sections of header piping (those closest to the treatment system) from the MPE wellheads will be maintained at a specified grade (0.5 – 2%) underground, to the treatment system in order to avoid any depressions that could provide locations for the storage of liquids and potential liquid surges to the treatment system.

1.7 Vapor Treatment System

1.7.1 High Vacuum Liquid Separator (HVLS)

As contaminated air and vapor is recovered from the MPE wells, it is drawn through the HVLS. In the HVLS, entrained water will be centrifugally separated. Before exiting the vessel, extracted vapor will pass through a mist eliminator to remove any remaining small water droplets. Separated water is contained within the vessel's holding tank.

An explosion-proof level switch terminates operation of the vacuum extraction and vapor treatment components when the HVLS reaches a high-high liquid level. When the liquid level in the tank reaches the high water level, a pneumatic transfer of water automatically starts. If the liquid level reaches the high-high level in the tank, then the entire system shuts down to prevent liquids from flowing downstream of the HVLS.

Effluent water is transferred from the HVLS to the isolation tank by pneumatic displacement. From the isolation tank, effluent water is transferred to the oil water separator (OWS) via gravity flow.

Effluent vapor is transferred from the HVLS to the vapor treatment train via the rotary-lobe vacuum blower.

1.7.2 Vacuum Blower

One vacuum blower will be used for the MPE system at Building 200 and will be capable of handling the full system flow. The blower is sized for 256 cfm at 12.8-inches of mercury vacuum. The motor size for this blower is 20 HP.

The MPE vacuum extraction blower will have an inlet filter and an outlet silencer. A second silencer will be installed prior to the dilution valve.

The inlet filter shall have an operational capacity of 150% of the design flow for that location and include a 10 micron polyester element.

1.7.3 Thermal/Catalytic Oxidizer

Initially, extracted vapors will be treated using a dual-mode (thermal/catalytic) oxidizer. The objective of the thermal/catalytic oxidizer is to convert the contaminants in the air stream to carbon dioxide and water vapor. As the contaminated air leaves the HVLS, it will pass through the blower prior to entering the thermal/catalytic oxidizer. The thermal/catalytic oxidizer is designed to operate in both high temperature (thermal, 1400° - 1500°F) and low temperature (catalytic, 500° - 600°F) modes for maximum operational flexibility. The system also includes counter current passing of the exhaust and inlet gases through a heat exchanger. The contaminated air is drawn through the system fan, and then enters the burner (i.e., combustion chamber) where it is heated and oxidized. When operating in catalytic mode, the catalyst modules are used to decrease the operating temperature of the burner. After combustion, the oxidized air travels through the heat exchanger and finally through the exhaust stack to the atmosphere.

During startup and early in system operation, when the VOC concentrations in the vapor stream are high (up to 50% LEL), the thermal/catalytic oxidizer will operate in thermal mode. Later in the lifecycle of the site, as the VOC concentrations decrease, the catalyst modules will be employed to decrease the operating temperature of the burner.

When the concentration of VOCs in the contaminated air decreases significantly and does not provide enough energy, natural gas will be used as a supplemental fuel source for the system. Natural gas is available at the site.

1.7.4 Vapor Concentration Reduction

The thermal/catalytic oxidizer unit will be started and operated in thermal mode. As vapor concentrations reduce, the unit will be modified to operate in catalytic mode. At this time an economic analysis of off-gas treatment will be performed based on current costs of carbon and natural gas to determine if keeping the oxidizer running by burning natural gas or if using vapor-phase GAC is more cost effective. Vapor-phase GAC is typically more efficient if the vapor concentrations in the off-gas are below 100 ppmv. Performing an economic analysis at a time nearer to the conversion point will be more efficient due to the fluctuating prices of natural gas and carbon. If it is discovered that utilization of vapor-phase GAC is the more cost effective method of treatment, then the vapor-phase GAC unit(s), located inside of the treatment system enclosure, will be utilized.

1.8 Liquid Treatment System

Oil/water separated fuel, carbon canisters, and other waste will be recycled and therefore can be manifested as non-regulated non-hazardous waste in New York State. The DPW shall be informed if any hazardous waste might be generated.

1.8.1 Oil/Water Separation

The oil water separator (OWS) is designed for gravity separation of LNAPL from the liquid stream effluent of the HVLS. The liquids are pneumatically transferred from the HVLS knockout tank to the Isolation Tank. The Isolation Tank allows the emulsified contaminants to coagulate, and the liquid stream will flow by gravity to the OWS. The LNAPL from the OWS will be manually drained from the oil sump (if necessary, a product storage tank will be added to the system). The water will be pumped from the OWS to the air stripper system. When the water level in the OWS reaches a predetermined level, the transfer pump will turn on. When the water level in the OWS decreases to a predetermined level, the transfer pump will turn off.

1.8.2 Air Stripper

Water from the OWS will be pumped to the air stripper. The air stripper process will involve influent water flowing over a weir and through a series of sieve/aeration trays as it descends to a sump at the bottom of the unit. Air is forced by a blower upward through the sieve holes in each tray and forms a froth of bubbles, generating a gas/liquid contact surface for mass transfer of contaminants from the water into the rising air. Off-gas from the air stripper is exhausted from the top of the unit to the atmosphere.

The air stripper effluent water will be pumped through liquid-phase activated carbon and discharged to the local Publicly Owned Treatment Works (POTW) facility via sanitary sewer lines. The discharge will be via a transfer pump to transfer the water in the sump of the air stripper through the liquid-phase GAC and then to the POTW line. The transfer pump will turn on when the level in the sump reaches a predetermined level and will turn off when the level in the sump reaches a low level switch.

1.8.3 Discharge Criteria

Fort Hamilton, Department of Public Works, has been requested to enter into a Stipulation Agreement with NYSDEC. The purpose of the Stipulation Agreement is “to effectuate the remediation of this discharge in an expeditious fashion”. If this agreement is executed, no separate permits will be required. Although permits will not be required, the remediation system will be designed to generate air and water discharge of sufficient quality that would meet the permit standards.

Treated groundwater from the system is proposed to be discharged to the New York City (NYC) Publicly Owned Treatment Works (POTW) Facility. The table below indicates the City’s discharge criteria. The required discharge permit has been applied for and a copy of the permit will be appended to this document upon receipt (Appendix J).

The air and water discharge criteria are evaluated using NYSDEC’s “SVES Data Sheet" and “Air Stripper Data Sheet" and are provided in Appendix E. The SVES Data Sheet concludes that the dual-mode oxidizer should be successful in reducing the MPE off-gas to the permissible air output concentration of 1.6 ppmv benzene. The permissible output concentration is obtained from NYSDEC’s Memo of Understanding between the Division of Air Resources and the

NEW YORK CITY DEPARTMENT OF ENVIRONMENTAL PROTECTION
BUREAU OF WASTEWATER TREATMENT

LIMITATIONS FOR EFFLUENT TO ***SANITARY OR COMBINED*** SEWERS

Parameter[1]	**Daily Limit**	**Units**	**Sample Type**	**Monthly Limit**
Non-polar material[2]	50	mg/l	Instantaneous	---
pH	5-11	SU's	Instantaneous	---
Temperature	< 150	°F	Instantaneous	---
Flash Point	> 140	°F	Instantaneous	---
Cadmium	2 0.69	mg/l mg/l	Instantaneous Composite	--- ---
Chromium (VI)	5	mg/l	Instantaneous	---
Copper	5	mg/l	Instantaneous	---
Lead	2	mg/l	Instantaneous	---
Mercury	0.05	mg/l	Instantaneous	---
Nickel	3	mg/l	Instantaneous	---
Zinc	5	mg/l	Instantaneous	---
Benzene	134	ppb	Instantaneous	57
Carbontetrachloride	---	---	Composite	---
Chloroform	---	---	Composite	---
1,4 Dichlorobenzene	---	---	Composite	---
Ethylbenzene	380	ppb	Instantaneous	142
MTBE (Methyl-Tert-Butyl-Ether)	50	ppb	Instantaneous	---
Naphthalene	47	ppb	Composite	19
Phenol	---	---	Composite	---
Tetrachloroethylene (PERC)	20	ppb	Instantaneous	---
Toluene	74	ppb	Instantaneous	28
1,2,4 Trichlorobenzene	---	---	Composite	---
1,1,1 Trichloroethane	---	---	Composite	---
Xylenes (Total)	74	ppb	Instantaneous	28
PCB's (Total)[3]	1	ppb	Composite	---
Total Suspended Solids (TSS)	350[4]	mg/l	Instantaneous	---
CBOD[5]	---	---	Composite	---
Chloride[5]	---	---	Instantaneous	---
Total Nitrogen[5]	---	---	Composite	---
Total Solids[5]	---	---	Instantaneous	---
Other				

Continued on next page.

LIMITATIONS FOR EFFLUENT TO SANITARY OR COMBINED SEWERS (Cont.)

1. All handling and preservation of collected samples and laboratory analyses of samples shall be performed in accordance with 40 C.F.R. pt. 136. If 40 C.F.R. pt. 136 does not cover the pollutant in question, the handling, preservation, and analysis must be performed in accordance with the latest edition of "Standard Methods for the Examination of Water and Wastewater." All analyses shall be performed using a detection level less than the lowest applicable regulatory discharge limit. If a parameter does not have a limit, then the detection level is defined as the least of the Practical Quantitation Limits identified in NYSDEC's Analytical Detectability and Quantitation Guidelines for Selected Environmental Parameters, December 1988
2. Analysis for ***non-polar materials*** must be done by EPA method 1664 Rev. A. Non-Polar Material shall mean that portion of the oil and grease that is not eliminated from a solution containing N–Hexane, or any other extraction solvent the EPA shall prescribe, by silica gel absorption.
3. Analysis for PCBs is required if ***both*** conditions listed below are met:

   1) if proposed discharge ≥ 10,000 gpd;
   2) if duration of a discharge > 10 days.

   Analysis for PCBs must be done by EPA method 608 with MDL=<65 ppt. PCB's (total) is the sum of PCB-1242 (Arochlor 1242), PCB-1254 (Arochlor 1254), PCB-1221 (Arochlor 1221), PCB-1232 (Arochlor 1232), PCB-1248 (Arochlor 1248), PCB-1260 (Arochlor 1260) and PCB-1016 (Arochlor 1016).
4. For discharge ≥ 10,000 gpd, the TSS limit is 350 mg/l. For discharge < 10,000gpd, the limit is determined on a case by case basis.
5. Analysis for Carbonaceous Biochemical Oxygen Demand (CBOD), Chloride, Total Solids and Total Nitrogen are required if proposed discharge ≥ 10,000 gpd.

Effective from May 1, 2005

Division of Spills Management (Stipulation Guidance) and is based on 250 cfm and a stack height of 15 feet. The analysis is based on an influent concentration of 27 ppmv benzene from an air sample collected during EA's pilot test. Assuming 99% removal efficiency from the oxidizer specifications, the oxidizer discharge concentration should be <0.27 ppmv benzene, which is significantly less than the permissible output concentration of 1.6 ppmv benzene.

A model provided by Shallow Tray (Air Stripper manufacturer) was utilized to select the number of trays required to achieve required contaminant reductions to meet the NYC POTW standards. The POTW target levels presented in Section 1.83 include 134 ppb benzene, 380 ppb ethylbenzene, 74 ppb toluene, and 74 ppb Total Xylenes. An influent concentration of 20,000 ppb (20 ppm) Total BTEX was used as the model input. This is twice the highest documented BTEX concentration of approximately 10,000 ppb detected in MW-4 in January 2004. Based on the Shallow Tray Model, with three trays and a 150 cfm blower, the stripper should be 99.99% efficient and generate an effluent close to 0 ppm. It should be noted that the stripper effluent will be polished with activated carbon prior to discharge to the POTW.

The Air Stripper Data Sheet concludes that the off-gas loading from the air stripper should be below the permissible air output loading of 0.00494 lbs/hr benzene. The permissible output load is obtained from NYSDEC's Memo of Understanding between the Division of Air Resources and the Division of Spills Management (Stipulation Guidance) and is based on 150 cfm and a stack height of 15 feet. The analysis is based on an influent loading of 0.00198 lbs/hr benzene. The 0.00198 lbs/hr is based on an average flow rate of 6.25 gpm and an influent benzene concentration of 700 ppb (MW-4 / January 2004). Assuming 99% removal efficiency from the air stripper and no "control equipment", the air stripper off-gas discharge loading should be 0.00198 lbs/hr benzene, which is less than the permissible output loading of 0.00494 lbs/hr benzene.

Off-gas from air stripper will be monitored during system operation. If at any point target levels are exceeded or an odor complaint is made, off-gas treatment will be added to the air stripper. This will be in the form of activated carbon utilizing a Carbtrol canister or equivalent.

1.9 Heat Tracing System

Self-regulating heating cables are included to provide freeze protection to the MPE piping within the well head vaults and where piping is exposed to enter/exit the enclosure. The heat output of the cable varies in response to the surrounding conditions along the entire length of a circuit. Whenever the heat loss of the pipe increases (as ambient temperature drops), the heat output of the cable increases. Conversely, when the heat loss decreases (as the ambient temperature rises or product flows), the cable reacts by reducing its heat output.

1.10 Treatment Equipment Electrical System

The remediation equipment will be a prefabricated system and completely wired. The system includes a 460V breaker panel, step-down transformer (460V to 208V), 208V breaker panel, and equipment control panel mounted on the inside of the treatment enclosure. A thermal catalytic oxidizer will be incorporated into the treatment train and will be separate from the equipment enclosure. The majority of the equipment will operate at 460V, 3-phase. The following voltages will be available at the treatment system: 460V, 3-phase; 460V, 1-phase; 208V, 3-phase; 208V, 1-phase; and 120V, 1-phase. All voltages will operate at 60 Hz. The existing overhead 3-phase, Y-configuration, 4,160V electric lines will be utilized along White Avenue, along with

transformers (to be installed), to provide electric service to the treatment system. A schedule and electrical line diagram are shown on Drawing E-1, Appendix A.

A transformer will be installed to convert the 4,160V overhead electrical lines to 460V, 3-phase electrical service for the treatment system.

1.11 Treatment Plant Instrumentation Systems

1.11.1 MPE Well Field Instrumentation

Each MPE wellhead will be equipped with a sample port. The sample port will consist of a 0.75-inch ball valve. The purpose of this sample port is to allow measurement of flow, vacuum, and contaminant vapor concentrations at the wellhead.

1.11.2 Vapor Treatment Instrumentation

The entrained liquids will enter the HVLS. The piping to and from the HVLS will be fitted with pressure indicators. If the level in the separator reaches high-high, the system will shut down.

The vapor stream will be drawn through the vacuum extraction blower and into the vapor treatment equipment. A flow indicator will display the SVE flow rate.

The blower shall be provided with Local/Manual control, Remote/Manual control and Remote/Auto control modes.

All equipment will be provided with instrumentation and interlocks as shown in the construction Drawing M-3 to insure their safe operation.

1.11.3 Liquid Treatment Instrumentation

The liquid effluent of the HVLS will be discharged to the OWS as discussed above. A flow indicator/totalizer/recorder will record the total amount of liquid recovered by the system. The LNAPL collected in the OWS will be contained in the oil sump (or flow via gravity to an LNAPL storage container) and the water will be pumped to the air stripper system. The OWS will be provided with a high level switch to indicate that the system requires maintenance.

The transfer pump will operate based on the water level in the OWS. If the level in the OWS reaches high-high, the system will shut down.

The water from the OWS will be pumped to the top of the air stripper in which the contaminants will be transferred from the liquid phase to the vapor phase. The air stripper effluent will be pumped from the air stripper sump through liquid-phase GAC to the sanitary sewer lines. The pump will operate based on the water level in the sump. The sump will also be provided with a high level shut down.

All equipment will be provided with instrumentation and interlocks as shown in the construction drawings (P&ID Sheet M-3) to insure their safe operation.

1.12 Operation Strategy

1.12.1 MPE System Operation Strategy

One of the overall themes in the MPE system design is operator flexibility. The intent is to have the operation of the MPE system evolve with the remedial strategy, as the contaminants and their availability in various phases change at the site.

Initially, the focus will be on product recovery as vapor while gross residual contamination in the vadose zone is remediated. The majority of mass will likely be recovered in the vapor phase while the amount of extracted liquids during this phase will likely be low. Any extraction well that exhibits LNAPL will be configured with a drop-tube to facilitate LNAPL recovery.

During the second stage, the petroleum hydrocarbon vapor concentrations will decrease and the oxidizer will begin to use supplemental fuel. The focus of this stage is to continue removing mass from the vapor phase and commence the recovery of LNAPL. During this stage, flows from the well field will need to be balanced. This will require measuring the flow, vapor concentrations with a photo-ionization detector (PID), and presence of LNAPL, of each individual well. If LNAPL is present, then drop tubes will be used to increase LNAPL recovery. If there is no LNAPL, but the PID readings are high (e.g., > 250 ppm), then the extracted air flow rate should be set to at least 32 cfm if not higher (SVE). If there is no LNAPL and the PID readings are low, then the extracted airflow rate should be set at 32 cfm or lower (bioventing). The balancing of the system will typically be required at least monthly.

During the third stage, the petroleum hydrocarbon vapor concentrations will have reached an asymptotic level. At this point, balancing of the system will yield only minor increases in vapor concentrations. At this time an economic analysis of off-gas treatment will be performed based on current costs of carbon and natural gas to determine if keeping the oxidizer running by burning natural gas or if using vapor-phase GAC is more cost effective, as previously discussed. The well field will continue to be balanced, but the presence of LNAPL will become more critical than vapor concentrations.

Once LNAPL is no longer detected at the site and petroleum hydrocarbon vapor concentrations are very low, then the MPE system may either be shut off or operated in bioventing mode (i.e., lower flow rates).

After reduction in vapor concentrations soil samples should be collected throughout the site to evaluate the performance of the MPE system. The analytical data will be used: (1) to evaluate trends, (2) to compare actual levels to cleanup standards, and (3) target the MPE system to treat areas of higher concentrations.

Weekly inspections of the well field will be performed during operation of the system.

1.12.2 Vapor Treatment System Operation Strategy

The vapor treatment system will change as the MPE system operation evolves. During the first stage, when vapor concentrations are high (e.g. greater than 2,000 ppmv), the vapors will be treated with a thermal/catalytic oxidation unit.

During the second stage, the vapor concentrations will likely reach an asymptotic level. An economic analysis of off-gas treatment should be performed to determine if keeping the oxidizer running by burning natural gas or if using vapor-phase GAC is more cost effective.

1.12.3 Liquid Treatment System Operation Strategy

During the first stage, when vapor concentrations are very high, the amount of liquids to be extracted will be low (likely less than 10 percent of the design flow).

During the second stage, (when vapor concentrations decrease and stabilize) when the remedial focus will be on LNAPL recovery, more liquids will likely be treated. The amount of liquids being extracted will be a function of many factors (e.g., water levels, LNAPL thickness, system

balancing). The operator, therefore, must be aware that the remedial strategy is to maximize mass removal through LNAPL recovery and minimize groundwater removed. If little to no LNAPL is being recovered through the MPE system, even after well field balancing, then the system should be adjusted to discontinue removing liquids.

The design assumes that iron fouling may be an issue and the best way to handle equipment fouling would be by following a rigid maintenance schedule. Therefore, the system has been designed to allow for regular maintenance intervals with ease-of-access to the treatment system components.

If the iron fouling issue becomes too costly to manage through a scheduled maintenance program, then employment of a chemical removal system to minimize iron fouling may be warranted. The type of chemical removal system will be dependent on the type and amount of fouling.

2.0 DESCRIPTION OF MPE EQUIPMENT AND PROCESS

2.1 Description of Equipment and Components

The following details the operation of major components within the Multi Phase Extraction Unit.

2.1.1 High Vacuum Liquid Separator

The High Vacuum Liquid Separator (HVLS) is located upstream of the vacuum pump. The HVLS design serves to separate the extracted aqueous and non-aqueous liquids (i.e., droplets) from the vapor phase stream. The HVLS implements a two-tank design and a combination of floats and timer activated pneumatic actuators to conduct the simultaneous removal of liquid from the bottom tank of the HVLS while allowing concurrent vacuum extraction and accumulation of liquid droplets in the upper tank. The HVLS is equipped with two control floats (F1& F2), two pneumatically operated wafer valves and one electrically operated solenoid.

The uppermost float (F1), located in the upper tank, is an overflow control and deactivates the system if the HVLS becomes over-filled with liquid. This prevents any potential breakthrough of liquid into the vacuum pump. A 2-second time delay exists for all high level alarm floats.

The lower float (F2), located in the bottom tank of the separator, serves to cycle the HVLS and evacuate all accumulated liquid from the bottom tank. There is a three step cycle that the HVLS performs to evacuate all of the accumulated liquid from the bottom tank.

Step 1: The isolation valve (Sol 1) located between the upper and lower tanks, and the 3-way valve (Sol 2), located on the end of the lower tank, close simultaneously to isolate the upper and lower tanks. The lower tank is immediately vented to achieve atmospheric pressure. This allows the continuous accumulation of liquid in the upper tank at the operating vacuum. The duration of this step is approximately 10 seconds.

Step 2: While the upper and lower tanks remain isolated, the bottom tank is pressurized with compressed air supplied by the compressor. This step transfers liquids from the HVLS downstream to the Isolation tank. This is achieved upon the pressurization valve (Sol 3) being opened for approximately 10 seconds.

Step 3: The 3-way valve re-opens allowing the build-up of pressurized air in the lower tank to pass around the upper tank. This allows the two tanks to achieve the same operating vacuum - duration, approximately 7 seconds. Upon equalization of the negative pressure in the two tanks, the isolation valve re-opens allowing all accumulated liquid in the upper tank to drain to the lower tank, thus terminating the cycle.

The HVLS is activated through an entire cycle upon the following conditions being achieved:

i) Panel switch "on".

ii) Outputs activated

iii) High level floats in the Isolation Tank, and Oil/Water Separator tank are not activated. All high level floats have a two second time delay before activating.

iv) Proper supply of compressed air to each actuator from the compressor (low pressure alarm not activated).

v) Activation of F2 in lower tank of HVLS or activating HVLS JOG push button.

2.1.2 Positive Displacement Vacuum Blower

The driving system of the Multi Phase Vacuum Extraction Unit is a *Positive-Displacement Vacuum Blower*. The specifications and the performance curve for the blower will be located in the technical specifications of the O&M manual.

The vacuum blower is equipped with these safety features:

- An LEL switch that serves to deactivate the system upon explosive levels of vapors in the extracted air, typically set at 20% LEL.
- A Vacuum switch that is adjustable from 0 to 29" Hg. Max setting should be 14.5" Hg. There is also a mechanical relief valve that is factory set at 14.5" Hg.
- A pressure switch that is adjustable from 0 to 80" H2O. This should be set at 60" H2O and will deactivate the blower if the line to the oxidizer becomes restricted or some other restriction occurs in the off-gas line.

The vacuum blower operates upon having achieved the following conditions:

i) Panel switch "on".

ii) Pilot switch at blower "on".

iii) Overloads to Vacuum Blower are not "tripped".

iv) Any of the High alarm level floats in the downstream process tanks, compressor low pressure, are not activated. All high level floats have a two second time delay before activating.

v) Temperature Switch, vacuum switch and pressure switch on the Blower are not activated.

vi) If all the above conditions are satisfied, the system reset button on the panel must be pushed to initially start the blower. If the pilot or panel switch is used to deactivate the blower, the reset is not required.

2.1.3 Isolation Tank

The process liquid is transferred from the HVLS to the Isolation Tank for the purpose of stabilizing flow to allow for sediment precipitation as well as emulsion breaking.

The tank is equipped with two weirs with adjustable gates. The gates should be set to allow floating product to pass while emulsified product and suspended solids remain. The tank is equipped with a 4" manual wafer style valve for flow stabilization. The tank is also equipped with a High/High float to protect against System overflow.

2.1.4 Oil/Water Separator

The process liquid is gravity drained from the Isolation Tank into the Oil/Water Separator. All phase separated product is collected in the oil chamber of the Oil Water Separator (potentially transferred to an LNAPL storage container, via gravity line). The separated water is then pumped to an air stripper for treatment. The Oil/Water Separator is equipped with a High/High float, which acts as an overflow control and deactivates the system if the Oil/Water Separator water or oil sumps become over-filled with liquid. This prevents any potential loss of separated product into the water chambers, or from the tank.

2.1.5 Water Transfer Pump

A centrifugal pump is used to remove accumulated process liquid from the secondary chamber of the OWS Tank upon activation of the high float. The pump is activated by the float and the sump includes a low float used as a safety shut off to protect the pump from running dry.

2.1.6 Compressor

A compressor supplies the Vacuum Enhanced Multi Phase Extraction Treatment Unit with a supply of compressed air used to operate the HVLS. The compressor is fitted with a non-incendiary pressure switch (P1) which regulates the internal pressure of the compressor to maintain a minimum of approximately 110 psi.

The Compressor is activated upon the following conditions being achieved:

i) Panel switch "on".
ii) Pressure switch pilot "on".
iii) Thermal overloads not “tripped”.
iv) Pressure switch being activated.

2.1.7 Flow Meter

The water flow meter is located in-line after the transfer pump and before the air stripper. It is equipped with a y-strainer and pressure gauge.

2.1.8 Detection Device

An LEL alarm detector is set at 5% LEL and located in the process room. It is installed as a safety measure which shuts down the recovery and process systems and activates the auto dialer if VOC vapors exist at levels greater or equal to 5% LEL. This is in addition to the LEL sensor that screens the extracted vapor stream.

2.2 Start-Up Procedure

The initial start-up of the Multi Phase Extraction Unit requires a multi-step protocol. First, the user should become familiar with the programmable logic controller (PLC) indicator lights and panel hand switches, as well as the specification of each component supplied in the operation manual. The indicator lights on the face of the PLC are used to display the operating state of all internal components.

Upon becoming familiar with the indicator devices on the control panel, knowledge of the general flow and process components is necessary to properly operate and calibrate the Unit.

The following is a step by step guide to a typical start-up of the system. This procedure assumes that the valve positions are in the last operating position.

1. Panel

Begin the start-up procedure by ensuring that all panel hand switches on the control panel are in the "off" position. Ensure that all equipment pilot switches located in the equipment room (“local pilot switches”), are in the "off” position.

Return to the control panel and switch the main power disconnect to the "on" position. Turn PLC to “on” position, this should immediately activate the PLC.

2. Vacuum Blower

To operate the Vacuum Pump, begin by turning panel switch “MPE Blower” to the “on” position.

Turn Outputs switch to “on” position.

The blower should now be ready to run upon the reset button being depressed and the local pilot switch being activated.

For initial start up of a new installation or if the power supply has been manipulated since the last period of operation, proper rotation of the pump should be confirmed during the system start-up.

3. Water Transfer Pump

To operate the Transfer Pump, turn the panel switch and the local pilot switch to the on position. The transfer pump should now be ready to run upon the activation of the high float in the OWS. For initial start up of a new installation, the rotation of the pump must be confirmed and corrected if necessary.

4. Compressor

To operate the Compressor, begin by turning the panel switch to the “on” position. Turn the pressure switch pilot located on the compressor, to the "on" position. The compressor should now be ready to run when the tank pressure falls below the pressure switch “cut in” point.

There is a second pressure switch on the outlet line of the compressor. This is to alarm the system in case of loss of or low pressure in the compressor and does not affect the operation of the compressor itself.

3.0 TECHNICAL OPERATIONS PLAN

The SOW for this project consists of the following definable features of work:

- Mobilization/Site Preparation
- Well Installation
- Excavation/Trenching
- Pipeline Installation
- Backfilling and Compaction
- Insulation and Freeze Protection
- Well Vault Installation
- Treatment System Installation
- Waste Disposal
- Site Restoration
- Demobilization

The activities related to these definable features of work are discussed in the following subsections.

3.1 Design Documents

Design documents for this project include drawings and project specifications. Drawings will include a site plan, system layout plan and sections and details. The Construction Drawings are provided in Appendix A. The manufacturer's product sheets and materials to be used for this project are located in Appendix B. Technical specifications are included in Appendix C.

3.2 Construction Sequence and Description

All remedial activities will be conducted in accordance with this RAWP and associated documents such as the Field Sampling Plan (FSP), Health and Safety Plan/Accident Prevention Plan (HASP/APP) and Quality Assurance Project Plan (QAPP) developed for the site. The FSP is in Appendix G, the HASP/APP is in Appendix H, and the QAPP is in Appendix I.

Plexus will verify site access with the USACE Representative. The remedial action will be performed following the construction sequence detailed in the following subsections.

3.3 Mobilization

The Plexus project field team will be selected to optimize the efficient execution of each phase of the remedial action.

Equipment mobilization is anticipated to include the following (at minimum):

- Personnel/area monitoring equipment (as discussed in the HASP/APP)
- Personnel and equipment
- Sampling Equipment
- Well Drilling Rigs
- Miscellaneous construction materials (hand tools, shovels, hoses, etc.)
- Backhoe, Excavator, Compactor

3.4 Site Preparation

Site preparation will consist of the construction of support features such as temporary drilling decontamination area, and utility clearance investigations.

3.5 Utility Clearance

Prior to the initiation of field activities, the construction area will be surveyed and marked in the field. Plexus will contact New York "Call Before You Dig" system (1-800-962-7962) and receive utility clearance for the construction area. Plexus will also obtain an excavation permit from Fort Hamilton, and an Underground Utility Excavation Assessment form will be completed in accordance with the USACE, Baltimore District. Intrusive field activities will not commence until utility clearance activities are complete.

3.6 Well Installation

Plexus will install seven (7) multi-phase extraction (MPE) wells (identified as MPE-1 through MPE-7) to remediate the vadose zone contamination and recover vapor and LNAPL at the Building 200 site. Drawing C-2, located in Appendix A, indicates the proposed well locations.

One of seven MPE wells (MPE-7) will serve as a dual purpose well and will be also sampled as a monitoring well prior to system installation to further delineate the plume to the southeast (hydraulically upgradient) of MW-4, which contains a small amount of free product.

In addition, to further evaluate the extent of the petroleum-impacted groundwater plume, three supplemental monitoring wells will be installed in conjunction with the MPE well installation event. As illustrated on Drawing C-2 (Appendix A), these monitoring wells will be installed at the following locations:

- One monitoring well will be installed at the southeastern end of the grass strip along General Lee Avenue.
- A second monitoring well will be installed to the south of the tank farm near the location of previously installed Geoprobe® boring #11 (on the hillside above the existing retaining wall).
- A third monitoring well will be installed approximately 10 to 15 feet to the northeast of proposed well MPE-1 (toward General Lee Avenue) (see Drawing C-2).

A total of 10 MPE and monitoring wells will be installed during the well installation event. The monitoring wells will be constructed the same as the MPE wells, if it is later determined that the monitoring wells are needed for extraction.

The MPE wells will convey contaminated vapors and liquids to the treatment system. The extracted vapor and liquids will be treated with the remediation equipment to be installed at the site. The treated liquid will be discharged to the sanitary sewer system, and the treated vapors will be exhausted to the atmosphere.

Sequence

To meet the well construction objective Plexus will subcontract a well driller to perform the following tasks:

- Mobilize the drill rigs field crew and materials to drill the wells;

- Decontaminate all down-hole equipment using a high pressure steam power washer before and after each borehole;
- Drill borings using a hollow stem auger drill rig at the remaining well locations;
- Collect and properly store all drill cuttings, and liquids generated during drilling operations using polyethylene sheeting for drill cuttings and polyethylene tanks for liquids.

Permitting

Prior to the commencement of the drilling operations, an excavation permit will be obtained from Fort Hamilton. Upon the completion of all wells, a completion report will be filed with Fort Hamilton. The completion report will consist of a geologic log and well construction diagram of the wells including the size and depth of the well.

Sampling

Soil samples will be collected on 5-foot centers from ground surface to the bottom of the borehole. A split-barrel sampler driven with a hammer falling 30-inches will be used to collect the samples. The soil samples collected during sampling will be described by the site geologist in accordance with the ASTM D-2488 Standard Practice for Description and Identification of Soils (Visual-Manual Procedure) along with the number of blows required to effect each 6 inches of penetration. Other data such as description of the sample will be logged in the boring log.

Collected soil samples will be screened for total hydrocarbons using a PID and soil samples will be collected for laboratory analysis. Specifically, from each boring one soil samples for laboratory analysis will be collected from the depth interval with the highest PID reading, and a second soil sample will be collected from the depth interval directly above the water table. If no elevated PID readings are detected, only one soil sample will be collected from the depth interval directly above the water table. The soil samples will be submitted to a laboratory for analysis of NYSDEC STARS list VOCs using U.S. EPA Method 8260.

Decontamination

A temporary decontamination pad will be constructed at the site. The pad will be of sufficient size to allow the drill augers access for steam cleaning. The pad will be walled on three sides and consist of a plastic sheeting liner. All equipment will be decontaminated prior to the commencement of drilling and between each hole, as deemed necessary by the site geologist. All decontamination water will be collected in the decontamination pad and pumped into a polyethylene tank or 55-gal drums for off-site treatment. Sampling equipment will be decontaminated after each sample and as deemed necessary by the site geologist. Several clean split spoon samplers shall be available.

Well Casing

The proposed well design for the wells is shown in Drawing C-3 located in Appendix A. The casing (4-inch ID) will consist of schedule 40 PVC casing above the well screens. The selected PVC casing will conform to ASTM F 480 and ASTM D 1785.

Well Screen

The well screen will be continuous wrap (4-inch ID) schedule 40 PVC conforming to ASTM F 480 and ASTM D 1785. The recommended slot size of 0.010-inches will be maintained unless a

significant change in local geology is observed by the site geologist. The screen length will be approximately 20-feet. The screen size was selected based on the existing monitoring wells utilized in the EA pilot test. According to the GP assessment report, the wells were constructed using 0.010-inch slot screen. A #0 sand (commonly used in conjunction with 0.010-inch slot screen)will be used for the filter pack.

Well Installation

A boring will be advanced from ground surface to the proposed well depth using a drill rig equipped with a hollow stem auger at each well location. After borehole completion, the wells will be installed in each borehole. The screen and casing will be lowered into the hole using the drill rig winch cable to control the rate of fall. The bottom of the well screen will be placed one-foot above the bottom of the borehole. After the wells are set to the proper depth, the filter pack will be placed around the well screen. The entire space between the screen and the wall of the borehole will be filled with the filter pack. The filter pack will be placed in the annular space directly from the bag. The sand will be fed at a uniform rate. The filter pack will be installed continuously and without interruption until the gravel has been placed approximately 2 feet above the well screen.

After the filter pack is installed, a seal of bentonite will be added above the filter pack to a thickness of 2-feet. This will protect the filter pack from cement grout intrusion. The depth to the top of the bentonite seal will be measured and recorded directly following placement.

After the bentonite seal has been placed above the filter pack, the well will be completed with a cement/bentonite grout to 4 feet below ground surface. The cement/bentonite grout will be composed, by weight, of 20 parts Portland cement-Type II, and 1 part bentonite, with a maximum of 6 gallons of approved water per 94 pound bag of cement. Neither additives nor borehole cuttings shall be mixed with the grout. Bentonite shall be added after the required amount of cement is mixed with water. All grout materials shall be combined in an above-ground rigid container and mechanically blended on-site to produce a thick, lump-free mixture throughout the mixing container. The grout shall be placed in the annular space in one continuous operation above the bentonite seal by using a commercially available grout pump and tremie pipe. The bottom of the tremie pipe will be configured to allow discharge of the grout to the sides rather than downward. The discharge end shall remain submerged at all times during grout placement. Additional work on the well (i.e., development) will not be conducted until 24 hours after cement grouting placement.

Alignment

The alignment of the wells will be visually verified by means of observing the plumbness of the drill augers as they are advancing the borehole, and during well development procedures.

3.6.1 Well Vault Installation

Well heads will be protected from weather and traffic by installing steel well vaults surrounded by concrete over each MPE well. Vault covers for all wells will be rated for H20 loading. Well vault and cover details are shown in Drawing C-3 included in the construction drawings located in Appendix A.

3.7 Pipeline Installation

After all wells are installed, Plexus will begin the pipeline installation phase of the project. Pipeline installation procedures will be performed as detailed in the following sections:

3.7.1 Handling and Storage

Each load of pipe delivered to the jobsite will be inspected, and any damages such as cuts, abrasions, scrapes, gouges, tears, and punctures will be noted on the Bill of Lading, and the damaged items will not be accepted. Quantities will be checked against the shipping list.

3.7.2 Excavation/Trenching

The approximate location of the MPE pipeline trench and excavation trench details for Building 200 are shown on the construction drawings (System Installation Plan Sheet C-2) in Appendix A. Excavated material will be segregated to identify unsuitable backfill material.

An excavator will be used to excavate the pipeline trench. Trench widths will vary from 2 to 3 feet in width according to the depth of the pipeline being installed at different locations of the pipeline layout. The depth of the trench should be no greater than 5-feet deep, but all trenches/excavations deeper than 4-feet will be benched and/or sloped. The trench bottom will be continuous, relatively smooth, and free of rocks. In the unlikely event that hardpan or boulders are encountered, the trench bottom will be padded using a minimum of 4-inches of tamped sand beneath the pipe. The trench depth will allow for the top of the pipe to be at least 3-feet below ground surface.

The trench will be excavated to the required alignment and depth shown on the construction drawings (see Sheets C-2 and C-3), and only so far in advance of pipe laying that will allow for testing and backfilling operations to occur while new trench is being excavated.

At areas requiring excavation located directly above or adjacent to marked underground utilities, hand tools will be employed. The marked-out utility will be hand excavated until found and then protected before excavation with equipment will be performed.

3.7.3 Dewatering

Pipe trenches will be kept free from water during pipe laying, jointing, and until sufficient backfill has been placed to prevent flotation of the pipe. In the event that dewatering of the trench is required (due to rain events), sump pumps will be used to remove water from the trench bottom. The trench water will be considered "storm water" and will be pumped onto the ground and allowed to drain away from any adjacent open trench, or areas where it may collect and pool.

3.7.4 Installation of MPE Piping

The pipe will be placed in the trench using ropes or by hand. The pipe will be placed on the bottom of the excavated trench. After placement into the trench the pipe and fittings will be inspected to ensure there are no damaged materials. The natural granular material will be placed around the pipe in a manner as to not to disturb the pipe. The material will be placed using shovel slicing to remove void space. The material placed to the sides of the pipe from the bedding to the center line is intended to help the pipe support vertical loads. The initial backfill will be placed to a height of six to twelve inches over the crown of the pipe. The backfill will consist of native material free from large stones, not frozen and free of debris or organic material.

Each MPE well will be connected to the treatment system via a common header as shown in the drawings (see Sheets C-2 and C-3). Independent 3-inch Sch. 40 PVC pipe will act as lateral from the header to the well head. The lateral piping will be slightly sloped towards the header piping at 1-inch per 100-feet to allow drainage towards the header. The header piping will be set at a specified grade in locations near the treatment system locations as indicated in the construction drawings (Sheet C-2). This method allows for liquids removal from the header piping through a "Stinger" configuration at the treatment system as shown in the construction drawings (Sheet C-3). At header pipe locations further from the treatment system, the pipe will be sloped at a grade of 0.5%, or as otherwise indicated on the constructions drawings. This will allow for proper drainage of liquids collected within the piping network. Work will begin at the well head and progress towards the treatment system pad location. The ends of the conduits will be finished approximately 3-feet above the level of the equipment pad, capped and sealed to prevent clogging during construction of the concrete pad.

3.7.5 Leak Testing

After the pipe has been installed, joints completed and 1.5 times the pipe diameter of backfill has been placed over the pipe to prevent lifting of the pipe, leaving joints exposed for examination, a leak test will be performed. The pipeline will be subjected to a test pressure of 30 psi for a period of at least one-half hour. Pipe will be brought to the test pressure allowed; calibrated for 15 minutes; and tested for 15 minutes. The exposed pipe, joints, fittings, and valves will be examined for leaks. Leaks will be stopped and defective pipe, fittings, joints, or valves will be replaced. Acceptance of the test is based on zero pressure drop over the 15 minute testing period. A written record of the pressure testing results will be retained and submitted in the daily QC reports. Any leaks found during the test will be repaired and the test rerun.

3.7.6 Backfill and Compaction

The use of compaction equipment will be avoided directly above the pipe until 8-inches of backfill has been placed to ensure no local deformation of the pipe.

Compaction of initial backfill will be conducted at, or near (± 2%), the material's optimum moisture content. Backfill will be placed in 8-inch loose lifts (paved areas) and in 12-inch loose lifts (turfed areas), that are brought up evenly on both sides of the pipe and compacted using a vibratory plate compactor. Each lift will be thoroughly compacted prior to the placement of the next layer.

3.7.7 Pipe Marking

The locations of the MPE pipeline will be marked with a minimum 2-inch wide, metallic marking tape. The marking tape will be magnetic marking tape capable of being detected by a metal detector when buried at depths of 3 feet or less below grade. The marking tape will be buried directly above the pipe(s) at a depth of 18-inches below finished grade.

3.8 Equipment Pad Installation

The concrete pad design is included in Drawing C-3 located in Appendix A. Plexus will submit a certified mix to the USACE prior to commencement of work. The MPE conduit stub-up will be capped during concrete pouring operations to prevent clogging. The location of the concrete pad is shown on Drawing C-2.

3.9 Treatment System Installation

The equipment will be installed within an insulated and heated pre-engineered metal enclosure to protect the equipment from weather. The enclosure will be manufactured by and treatment system components will be installed by Plexus' subcontractor. The manufacturer's drawings and product data are included in Appendix B.

3.10 Equipment Installation

The equipment will be inspected during installation at the manufacturing facility and upon arrival at the site. Any damage or noncompliance observed during inspection(s) will be recorded and reported to the Project Manager. The mechanical piping connections and electrical control and power connections will be completed.

The thermal catalytic oxidizer will be a free standing unit located outside the treatment system enclosure. The unit will be placed adjacent to the equipment pad in the location as shown on Drawing C-2 included in Appendix A.

All components of the system, including the treatment system enclosure, will be fastened to the concrete pad to avoid shifting of equipment and potential stress on pipes, fittings, or manifolds.

3.11 Electrical Installation

The site will be supplied with 460-volt, 3-phase electrical power from transformers and run via underground conduit to the electrical service pedestal (w/ meter and disconnect switch) mounted adjacent to the treatment system enclosure. A distribution panel will be located inside the enclosure in the control room with the control panel for the MPE system.

- The MPE system and all electrical equipment inside the equipment room shown on the construction drawings (Sheet M-2) will be classified NFPA 70 Class 1 Division 2 Group D environment as defined by the current edition of the National Electric Code. A licensed electrician provided by Plexus' subcontractor will install the electrical components and make all electrical connections.

3.12 Site Restoration

Every effort will be made by Plexus personnel and its subcontractors to minimize the impact of field activities on facility operations and the surrounding natural environment. Plexus personnel will secure their equipment at the end of each day. Equipment will not be left unattended in the work zone. In addition to the normal housekeeping procedures typically employed on Plexus work sites, the work areas will be policed for any garbage and be completely picked up and restored to as natural a condition as practicable at the conclusion of daily activities. Excavations and any equipment or vehicular ruts which occur as a result of work performance will be backfilled and dressed to conform to the existing landscape.

3.13 Safety Requirements

All construction on site will strictly adhere to the Plexus HASP/APP, and USACE Safety Manual, EM 385-1-1. Activity hazard analysis sheets for the anticipated activities associated with excavation/trenching activities, construction and installation of the treatment system, electrical, and mechanical connections of the surface equipment have been developed by the Plexus Safety and Health Manager and are included in the USACE approved HASP/APP.

3.14 Monitoring and Maintenance Program

System monitoring should be performed on a regular basis to evaluate the operational parameters and influence of the MPE system and to identify potential maintenance issues. A summary of performance monitoring to be conducted during MPE system operation is presented in Table 4. Table 4 also summarizes the frequencies at which the data is proposed to be collected. Operational parameters normally monitored include flow rates, vacuums, temperatures, and VOC concentrations. In addition to information provided in Table 4, a Field Sampling Plan (FSP), which details the chemical measurements, sampling methods, and analytical requirements is in Appendix G of this document.

Water Level/Light, Non-Aqueous Phase Liquid Measurements

Water level measurements and LNAPL thickness will be determined using an oil/water interface probe. Periodic groundwater and LNAPL measurements should be collected from the extraction wells (static condition) and adjacent monitoring wells. Groundwater and LNAPL measurements will be recorded to within 0.01 ft.

Flow Rates

Groundwater

The volumes of extracted groundwater, LNAPL, and vapor will be measured at various locations during system operation. Recovered groundwater will be measured using a mechanical totalizer installed after the OWS. This totalizer is capable of displaying cumulative flow with a high degree of accuracy. The average flow rate for the MPE system will be determined by dividing the change in the total number of gallons pumped (between visits) by the amount of time elapsed between the visits.

LNAPL

LNAPL extracted by the MPE system will be contained in the oil sump of the OWS where it could be transferred to a product storage tank if necessary. The sump will be gauged periodically to determine the amount of LNAPL recovered.

Soil Vapor

Airflow rates will be measured in three areas: after the vacuum pump system, within the vacuum pump dilution piping, and at the wellhead/drop-tube. Airflow after the vacuum pump system will be measured using a pitot-tube mounted on the extraction line after the vacuum pump system. The pitot tube will be attached to a magnehelic pressure gauge to measure airflow rate (velocity). Airflow will be calculated by multiplying the measured velocity by the cross-sectional area of the corresponding pipe. The airflow rate within the vacuum pump dilution piping will be measured using a portable anemometer to measure air velocity, which will be used to calculate the air flow. Air flow in each wellhead will be measured using a portable apparatus consisting of a venturi-style air flowmeter, moisture knockout, flexible hose, and camlock fittings. To obtain a flow measurement, the apparatus will be temporarily connected to camlock fittings inside the wellhead between the drop tube and air supply piping. The throttle valve would be adjusted as necessary to achieve the desired flow, and the plumbing would be reconnected once the flow measurement has been obtained. The same apparatus will be used at each MPE well location for this purpose.

Vacuum

Vacuum will be recorded in two areas, at the wellhead/drop tube and at the vacuum pump. The wellhead will be equipped with a measurement port to allow a reading to be collected using a portable magnehelic gauge. Vacuum in the system will be measured prior to and after the vacuum pump with a direct reading gauge.

Hydrocarbon Concentrations

Extracted Vapor

Vapor samples will be collected before and after the oxidizer and screened for total hydrocarbons using a PID. In addition, vapor samples collected from before and after the oxidizer will be submitted during the first month then quarterly thereafter for laboratory analysis of NYDEC STARS list petroleum-related VOCs using U.S. EPA Method TO-3.

Air Stripper Off-Gas

A vapor sample will be collected at the off-gas vent of the air stripper and screened for total hydrocarbons using a photoionization detector. In addition, a vapor sample collected at the off-gas vent of the air stripper will be submitted during the second week then quarterly thereafter for laboratory analysis of NYDEC STARS list petroleum-related VOCs using U.S. EPA Method TO-3.

Extracted Groundwater

Influent and effluent groundwater samples will be collected after the first month then quarterly thereafter. The samples will be submitted for laboratory analysis of NYDEC STARS list petroleum-related volatile organic compounds by U.S. EPA Method 8021.

Monitoring Well Sampling

Groundwater samples will be collected from site monitoring wells that do not have LNAPL present in them after the first month of operation, then quarterly thereafter. The samples will be submitted for laboratory analysis of NYDEC STARS list petroleum-related VOCs by U.S. EPA Method 8021.

Additional, one round of ground water samples will be collected within three months prior to system startup and will serve as a baseline.

Reporting

During implementation and operation of the remedial system at AAFES Station (Building 200), described in this Remedial Action Work Plan, a start-up report (after the first month of O&M) and quarterly status and annual reports will be prepared and submitted to Ft. Hamilton, U.S. Army Corps of Engineers and New York State Department of Environmental Conservation. The quarterly/annual reports will summarize all remedial activities and will contain, at a minimum, the following data:

- Startup dates
- Contaminant group(s) (petroleum products contaminants of concern)
- Hydrocarbon constituents within vapor emissions

- Groundwater concentrations of petroleum products contaminants of concern in the selected observation/monitor wells, together with water table elevations (water table contour)
- System operation progress/problems
- Frequency of site inspections.

4.0 REFERENCES

TRC Environmental Corporation 1997. Site Investigation at AAFES Station – Building 200, Fort Hamilton - Brooklyn, New York.

Parsons Engineering 2000. Site Investigation at AAFES Station – Building 200, Fort Hamilton – Brooklyn, New York.

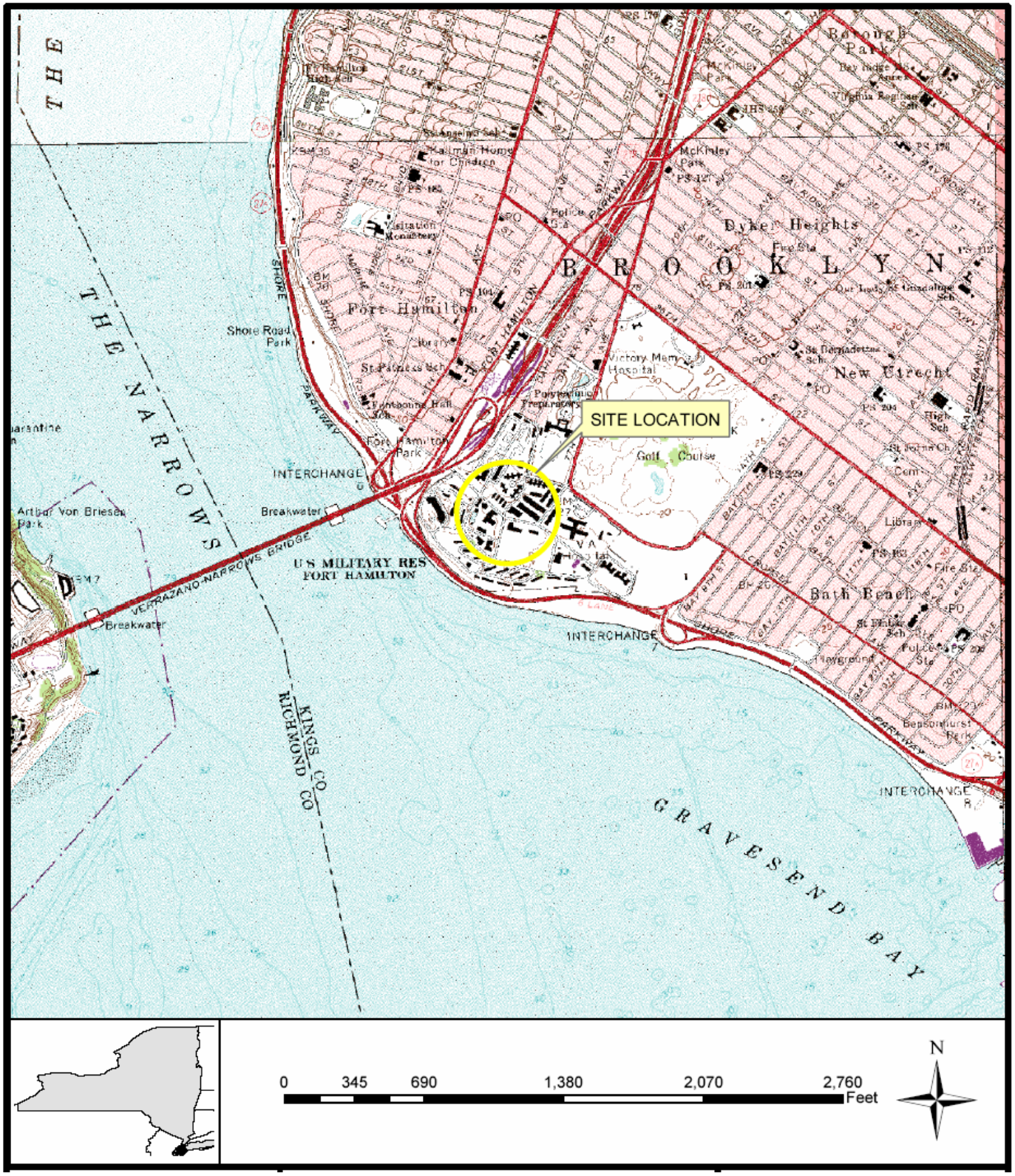
General Physics Corporation 2003. Site Investigation at AAFES Station – Building 200, Fort Hamilton – Brooklyn, New York.

General Physics Corporation 2004. Corrective Action Plan for AAFES Station – Building 200, Fort Hamilton – Brooklyn, New York.

EA Engineering, Science, and Technology. 2005. Multi-Phase Extraction Design Optimization Study for AAFES Station – Building 200, Fort Hamilton, New York.

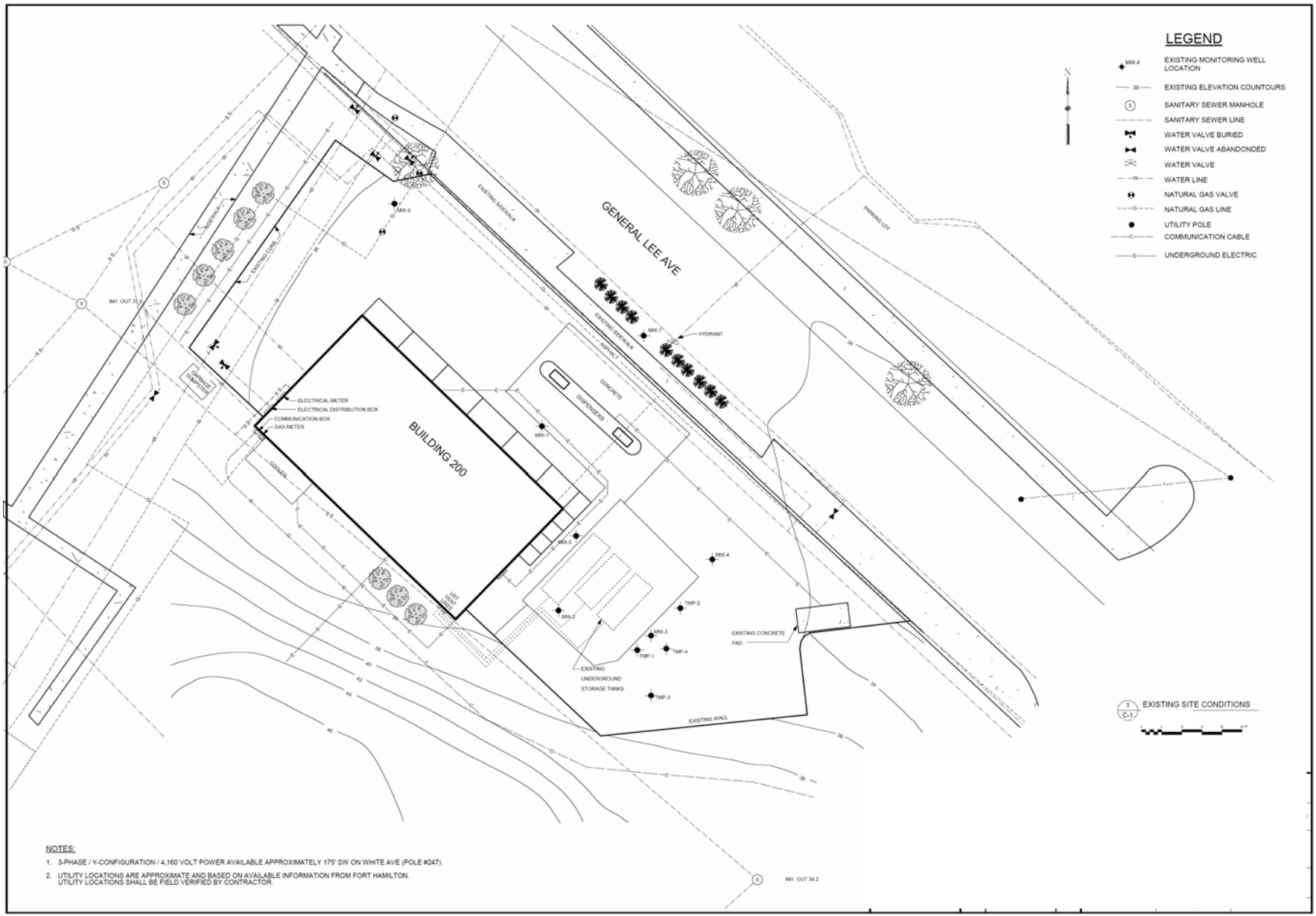
USACE, 1999. Multi-Phase Extraction Engineering and Design Manual. EM 1110-1-4010.

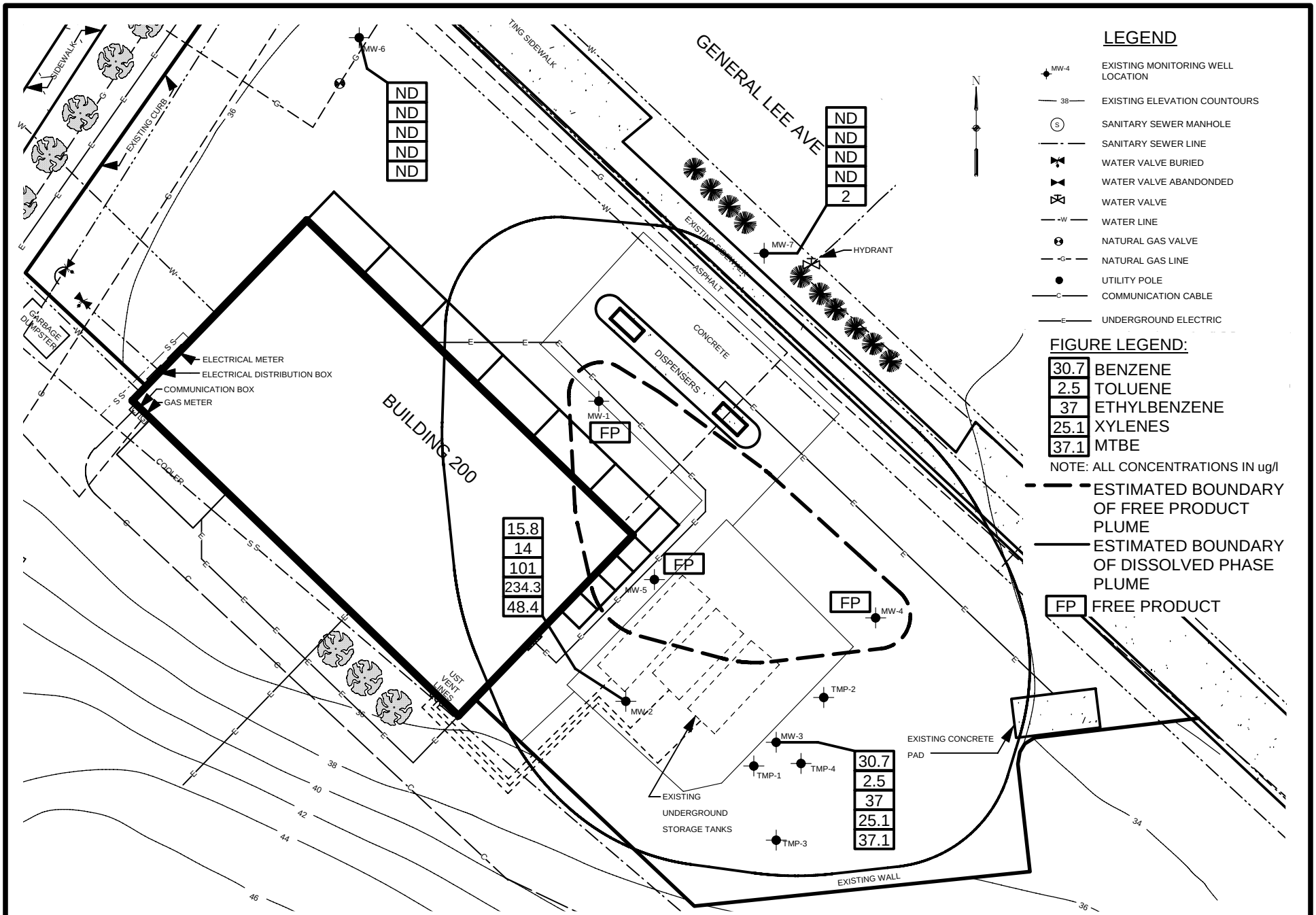
Figures



US ARMY ENGINEER DISTRICT, BALTIMORE CORPS OF ENGINEERS BALTIMORE, MARYLAND	FIGURE 2-1 SITE LOCATION MAP AAFES STATION – BUILDING 200, US ARMY GARRISON FORT HAMILTON – BROOKLYN, NEW YORK	PLEXUS SCIENTIFIC

Figure 2-2 Site Layout Map





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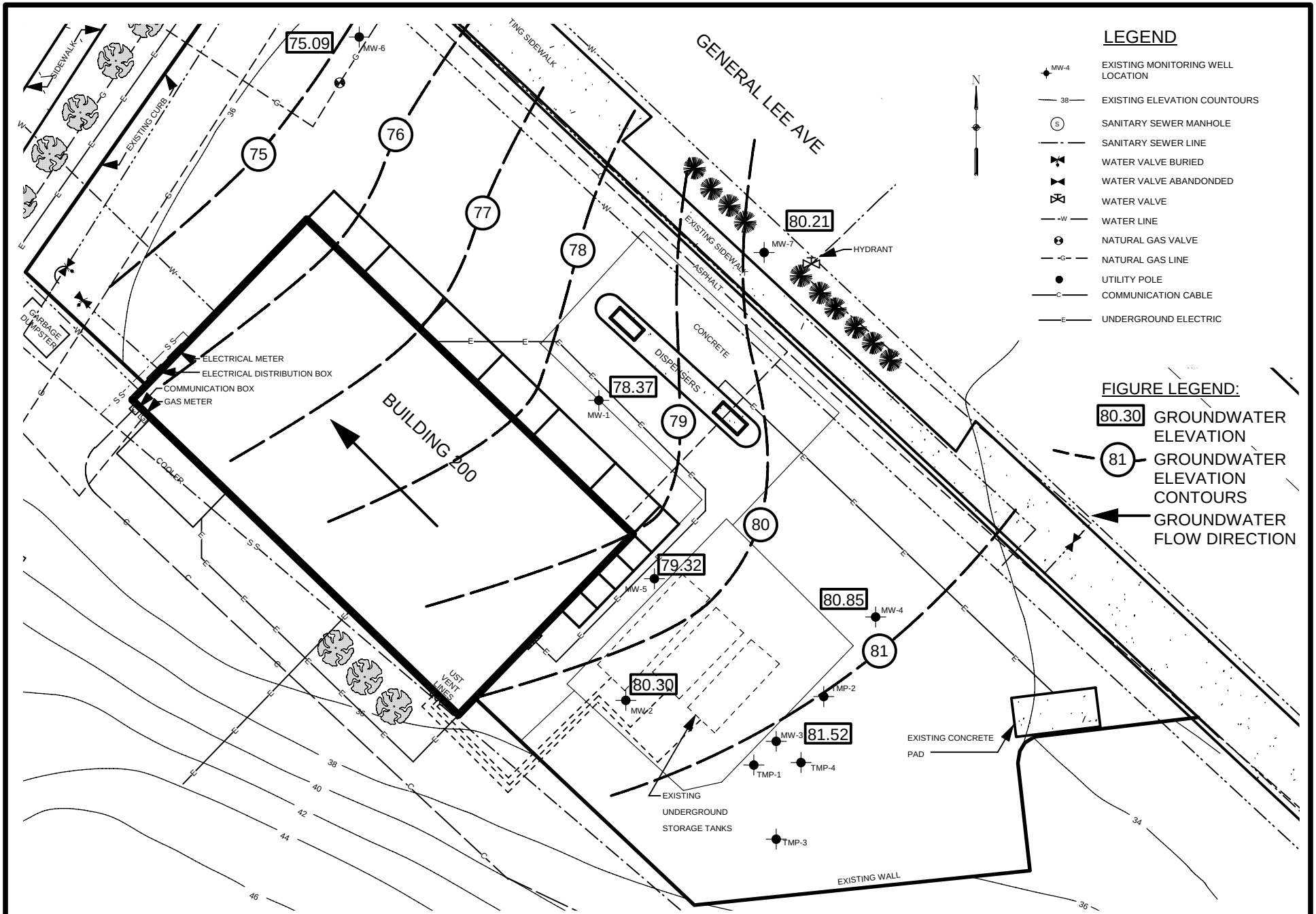
CORPS OF ENGINEERS
BALTIMORE, MARYLAND

US Army Corps of Engineers

FIGURE 2-3 - GROUNDWATER CONCENTRATION MAP
AAFES STATION – BUILDING 200, U.S. ARMY GARRISON
FORT HAMILTON – BROOKLYN, NEW YORK

ENVIRONMENTAL METHODS, INC.

SCALE: 1" = 20' | DATE: 08/07 | SHEET: FIGURE 2-3



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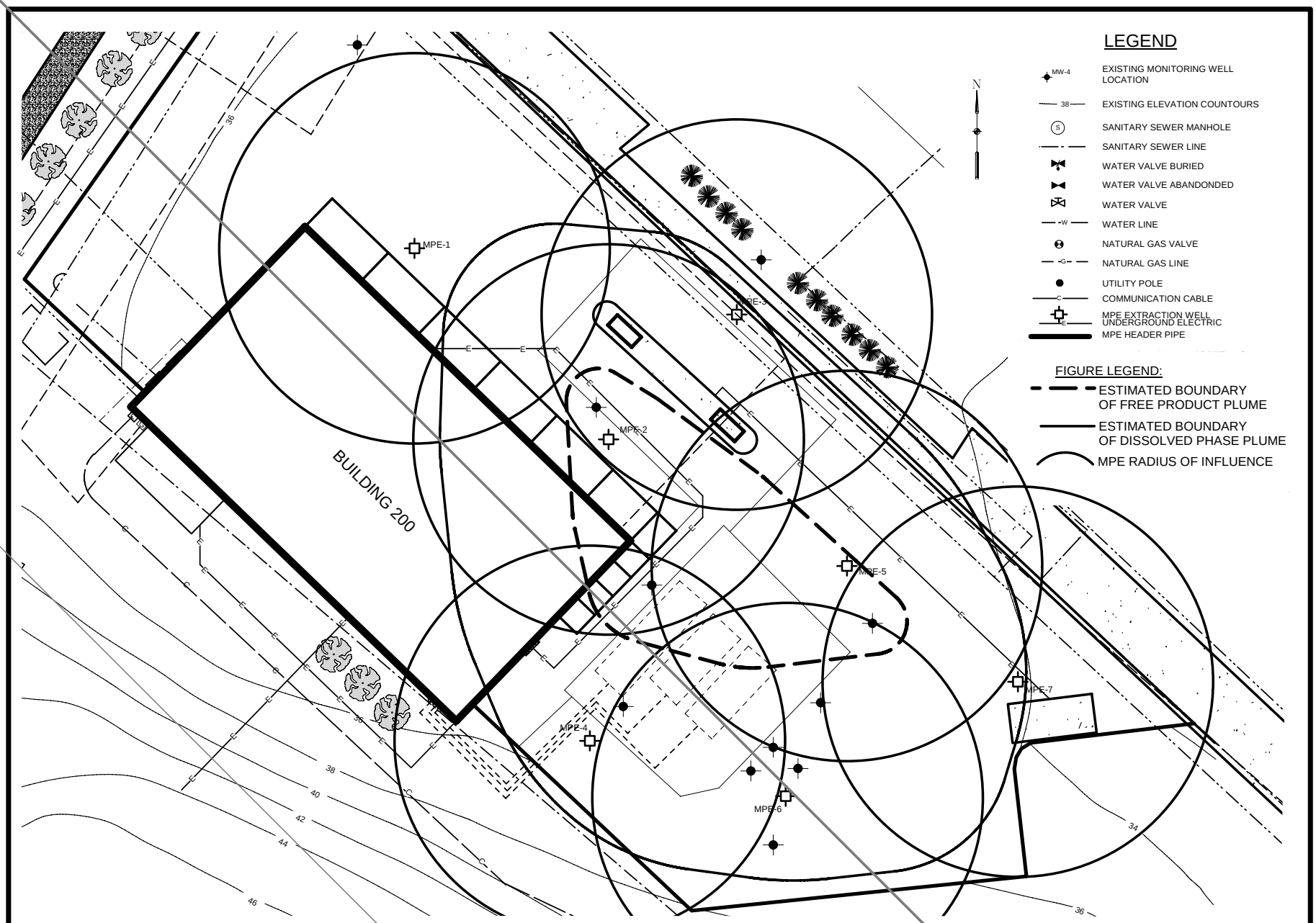
CORPS OF ENGINEERS
BALTIMORE, MARYLAND

US Army Corps of Engineers

FIGURE 2-4 - GROUNDWATER ELEVATION CONTOUR MAP
AAFES STATION – BUILDING 200, U.S. ARMY GARRISON
FORT HAMILTON – BROOKLYN, NEW YORK

ENVIRONMENTAL METHODS, INC.

SCALE: 1" = 20' | DATE: 08/07 | SHEET: FIG 2-4



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BALTIMORE, MARYLAND

US Army Corps of Engineers

FIGURE 2-5 - MPE WELL RADIUS OF INFLUENCE MAP
AAFES STATION – BUILDING 200, U.S. ARMY GARRISON
FORT HAMILTON – BROOKLYN, NEW YORK

ENVIRONMENTAL METHODS, INC.

SCALE: 1" = 20'	DATE: 08/07	SHEET: FIG 2-5

Tables

TABLE 1: GROUNDWATER MONITORING WELL ANALYTICAL SUMMARY

Facility Name: AAFES Station - Building 200
200 General Lee Avenue
Fort Hamilton - Brooklyn, NY

Sample Location	Sample Date	Benzene	Toluene	Ethylbenzne	Total Xylenes	MTBE	Naphthalene	n-Butyl benzene	sec-Butyl benzene	Isopropyl benzene	p-Isopropyl toluene	n-Propyl benzene	1,2,4-Trimethyl benzene	1,3,5-Trimethyl benzene
MW-1														
	1/21/2003	Not Sampled (due to presence of free product												
	8/6/2007	Not Sampled (due to presence of free product												
MW-2														
	1/21/2003	600	180	95	600	2100	240	1.0U	1.0U	41	1.0U	100	350	490
	8/9/2005	180	160	150	428	350	160	<0.49	21	110	27	120	250	170
	8/6/2007	15.8	14	101	234.3	48.4	194	35.5	21.1	106	13.6	110	240	215
MW-3														
	1/21/2003	1100	240	63	370	11000	110	1.0U	1.0U	80	1.0U	120	370	420
	8/9/2005	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS	NS
	8/6/2007	30.7	2.5	37	25.1	37.1	11.9	13.3	12	43.6	ND	55	ND	8
MW-4														
	1/21/2003	700	3300	640	5400	130	130	1.0U	1.0U	220	1.0U	160	790	1000
	8/9/2005	Not Sampled (due to presence of free product												
	8/6/2007	Not Sampled (due to presence of free product												
MW-5														
	1/21/2003	Not Sampled (due to presence of free product												
	8/6/2007	Not Sampled (due to presence of free product												
MW-6														
	1/21/2003	1.0U	1.0U	1.0U	2.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U	1.0U
	8/9/2005	<0.39U	<0.36U	<0.45U	<1.2U	<0.28U	<0.34U	<0.49U	<0.44U	<0.44U	<0.49U	<0.49U	<0.44U	<0.42U
	8/6/2007	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND	ND
MW-7														
	1/21/2003	1.0U	48	56	169	69	17	1.0U	1.0U	62	1.0U	1.0U	180	190
	8/9/2005	<0.39U	<0.36U	0.63J	1.9J	0.96J	<0.34U	1.4J	3.4J	1.8J	1.2J	4.5J	10	0.94J
	8/6/2007	ND	ND	ND	ND	2	ND	ND	ND	ND	ND	ND	ND	ND

NOTES:

NS = Not Sampled and/or Not Analyzed

"ND or <1.0U"- Less Than symbol indicates laboratory reported results as "Not Detected" or "Below Reported Detection Limit" of instrument used at value indicated

J = Estimated value. Less than the contract required detection limit, but greater than zero.

Table 2 Building 200-Ft. Hamilton Site Assessment Historic and Currnet Free Product and Water Level Gauging

Facility Name: AAFES Station - Building 200
200 General Lee Avenue
Fort Hamilton - Brooklyn, NY

Well Number	Reference* Elevation (Ft-MSL)	April 11, 2000					May 5, 2000				
		Depth to Product (ft)	Depth to Water (ft)	Groundwater Elevation (ft)	Apparent Product Thickness** (ft)	Formation Product Thickness^ (ft)	Depth to Product (ft)	Depth to Water (ft)	Groundwater Elevation (ft)	Apparent Product Thickness (ft)	Formation Product Thickness (ft)
MW-1	98.93	22.55	22.57	76.37	0.02	0.01	21.57	21.78	77.30	0.21	0.06
MW-2	99.44	NP	22.39	77.05	NP	NA	NP	21.34	78.10	NP	NA
MW-3	99.00	NP	21.07	77.93	NP	NA	NP	19.94	79.06	NP	NA
MW-4	98.10	20.63	20.91	77.39	0.28	0.08	19.42	20.05	78.51	0.63	0.17
MW-5	98.74	20.78	23.34	77.27	2.56	0.69	19.22	23.87	78.26	4.65	1.26
MW-6	99.10	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA
MW-7	99.47	NA	NA	NA	NA	NA	NA	NA	NA	NA	NA

Well Number	Reference* Elevation (Ft-MSL)	July 9, 2002					January 21, 2003				
		Depth to Product (ft)	Depth to Water (ft)	Groundwater Elevation (ft)	Apparent Product Thickness (ft)	Formation Product Thickness (ft)	Depth to Product (ft)	Depth to Water (ft)	Groundwater Elevation (ft)	Apparent Product Thickness (ft)	Formation Product Thickness (ft)
MW-1	98.93	24.73	26.64	73.68	1.91	0.52	20.3	20.35	78.6	0.05	0.01
MW-2	99.44	24.61	26.59	74.30	1.98	0.53	NP	17.85	81.59	NP	NA
MW-3	99.00	25.19	25.22	73.80	0.03	0.01	NP	17.4	81.6	NP	NA
MW-4	98.10	NP	24.24	NP	NP	NA	NP	17.77	80.33	NP	NA
MW-5	98.74	22.30	24.70	75.79	2.40	0.65	17.45	23.68	79.6	6.23	1.68
MW-6	99.10	NA	NA	NA	NP	NA	NP	18.95	80.15	NP	NA
MW-7	99.47	NA	NA	NA	NP	NA	NP	23.75	75.72	NP	NA

Well Number	Reference* Elevation (Ft-MSL)	**August 6, 2007**									
		Depth to Product (ft)	Depth to Water (ft)	Groundwater Elevation (ft)	Apparent Product Thickness (ft)	Formation Product Thickness (ft)	Depth to Product (ft)	Depth to Water (ft)	Groundwater Elevation (ft)	Apparent Product Thickness (ft)	Formation Product Thickness (ft)
MW-1	98.93	20.06	21.91	78.37	1.85	0.50					
MW-2	99.44	NP	19.14	80.30	NP	NP					
MW-3	99.00	NP	17.48	81.52	NP	NP					
MW-4	98.10	17.19	17.41	80.85	0.22	0.06					
MW-5	98.74	18.13	22.91	79.32	4.78	1.29					
MW-6	99.10	NP	24.01	75.09	NP	NP					
MW-7	99.47	NP	19.26	80.21	NP	NP					

Note: Water level corrected for depression by free product where applicable
*corrected water level = groundwater elevation + (product thickness * product specific gravity), estimated @ 0.86*
NA - Not Applicable
NP - No Product
* - Elevations are taken from the Parsons 2001 report and are relative to the southeast corner of building 200.
** -Apparent Product thichness = Depth to Product-Depth to Grounwater
^ - Formation Product thickness = (Well Elevation-Depth to product)- Corrected water level

TABLE 3

SOIL ANALYTICAL DATA SUMMARY
FORT HAMILTON SERVICE STATION
BUILDING 200
BROOKLYN, NEW YORK

Sample Location / Sample Depth / Sample Date / Parameters	MW01S2224 22'-23.2' 03/30/00	MW01S2426 24'-25.2' 03/30/00	MW02S0608 6'-7.5' 03/31/00	MW02S2426 24'-24.9' 03/31/00	MW03S0608 6.4'-7.3' 03/31/00	MW03S1416 14'-14.6' 03/31/00	MW04S0406 4'-5.1' 04/03/00	MW04S1820 18'-19.5' 04/03/00	MW05S2022 20'-21.2' 04/03/00	MW05S2224 22'-23.7' 04/03/00	TCLP NYSDEC Alternative Guidance Values
STARS Volatile Organic Compounds											
MTBE	141.3	126.2	<1.0	30.8	101.8	437	29.1	3.1	4,554.9	1,878.8	1,000.00
Benzene	10.4	176.6	<1.0	<1.0	15.3	<2.5	317.6	<1.0	1,012.1	12,236.9	14.0
Toluene	60.3	799.8	<1.0	<1.0	13.9	41.4	24.4	<1.0	3,254.4	11,560.2	100.0
Ethylbenzene	105.6	361.2	1.6	1.6	6.5	291.4	139.9	2.7	3,282.9	6,687.8	100.0
m&p Xylenes	582.9	1,429.5	4.3	7.4	21.0	169.3	63.3	7.6	12,213.5	34,312.0	100.0
o-Xylenes	287.5	581.9	1.5	3.2	8.2	65.5	23.7	3.5	2,767.2	4,872.5	100.0
Isopropylbenzene	27.6	78.7	<1.0	<1.0	<2.5	101.9	55.0	<1.0	2,075.5	4,197.3	100.0
n-Propylbenzene	73.6	151.4	2.4	<1.0	<2.5	153.7	144.4	1.9	6,830.5	12,946.3	100.0
1,3,5-Trimethylbenzene	152.2	222.5	2.9	1.3	3.2	92.8	26.6	5.2	2,809.2	18,849.6	100.0
tert-Butylbenzene	<1.0	<1.0	<1.0	<1.0	<2.5	<2.5	<2.5	<1.0	<13.3	<20.0	100.0
1,2,4-Trimethylbenzene	483.0	655.4	6.3	4.0	13.7	637.9	28.8	22.4	4,324.2	8,336.2	100.0
sec-Butylbenzene & 1,3-Dichlorobenzene	21.1	49.1	<2.0	<2.0	<5.0	241.5	23.2	<2.0	<687.9	<1056.1	100.0
Isopropyltoluene	6.3	14.9	<1.0	<1.0	<2.5	60.3	3.8	<1.0	951.1	1,236.5	100.0
n-Butylbenzene	43.6	73.7	<1.0	<1.0	<2.5	331.1	16.0	1.7	<13.3	<20	100.0
Naphthalene	19.4	93.4	<1.0	2.9	5.1	84.8	5.9	5.4	3,938.6	9,963.8	200.0
Total BTEX	1,046.7	3,349.0	<9.4	<14.2	64.9	<570.1	568.9	<15.8	22,530.1	69,669.4	NS
STARS PAHs											
Naphthalene	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	200.00
Acenaphthylene	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	NS
Acenaphthene	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	400.00
Fluorene	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	1,000.00
Phenanthrene	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	1,000.00
Anthracene	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	1,000.00
Fluoranthene	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	1,000.00
Pyrene	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	1,000.00
Benzo (a) anthracene	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	0.04
Chrysene	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	0.04
Benzo (b) fluoranthene	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	0.04
Benzo (k) fluoranthene	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	0.04
Benzo (a) pyrene	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	0.04
Indeno (1,2,3-c,d) pyrene	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	0.04
Dibenz(a,h) anthracene	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	1,000.00
Benzo (g,h,i) perylene	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	<0.167	0.04

NOTES: STARS Volatile Organic Compounds were analyzed by EPA Method 8021. Analytical results reported as ug/Kg (ppb).
STAR Base Neutral Compounds were analyzed by EPA Method 8270. Analytical results reported as ug/Kg (ppb).
NYSDEC TCLP Alternative Guidance Values reported as ppb.
< Concentration of parameter less than detected limit . Refer to Attachment B for further details.
NS No standard specified.

Table 4
Monitoring and Maintenance Requirements for MPE System

	Frequency				
	30-day startup		During Operation		
	Weekly	Monthly	Monthly	Quarterly	Method
MPE well vacuum monitoring	X		X		Portable Magnehelic Gage
MPE well flow monitoring	X		X		Flow Meter or anemometer
MPE System (blower) vacuum monitoring	X		X		Dedicated Vacuum Gage
MPE System (blower) flow-rate monitoring	X		X		Dedicated Flow Meter
Soil vapor influent monitoring	X		X		OVA / PID
System vapor effluent monitoring	X		X		OVA / PID
Soil vapor influent sampling		X		X	Laboratory TO-3 (TPH) & TO-15 (BTEX & MTBE)
System vapor effluent sampling		X		X	Laboratory TO-3 (TPH) & TO-15 (BTEX & MTBE)
Air Stripper Off-gas sampling	week 2			X	Laboratory TO-3 (TPH) & TO-15 (BTEX & MTBE)
Air Stripper Off-gas monitoring	X		X		OVA / PID
Groundwater well monitoring (free product thickness, groundwater elevation)	X[1]		X		Interface Probe
Groundwater well sampling[2]		X[3]		X	USEPA Method 8021+MTBE & 8270
Total gallons of product collected	X		X		Gage oil sump in OWS
Total gallons of water discharged from system	X		X		Flow Totalizer
Water influent sampling (after oil/water separator, if present)	X		X		USEPA Method 8021+MTBE & 8270
System effluent water sampling	X		X		Analyzed for NYC DEP discharge parameters USEPA Method 8021+MTBE & 8270
Monitoring report[4]		X		X	
Maintenance of system components	X		X		Site inspection

[1] One round of groundwater elevation and free product monitoring should be performed prior to the system startup.
[2] Excluding extraction wells and wells with free product.
[3] One round of groundwater samples should be collected within three months prior to system startup.
[4] DEC must be notified of any system shutdown in excess of 48 hours. The anticipated duration of the shutdown, the reason and any corrective actions to be taken should be specified.
Rows shaded in gray indicate samples sent to the lab

APPENDIX A

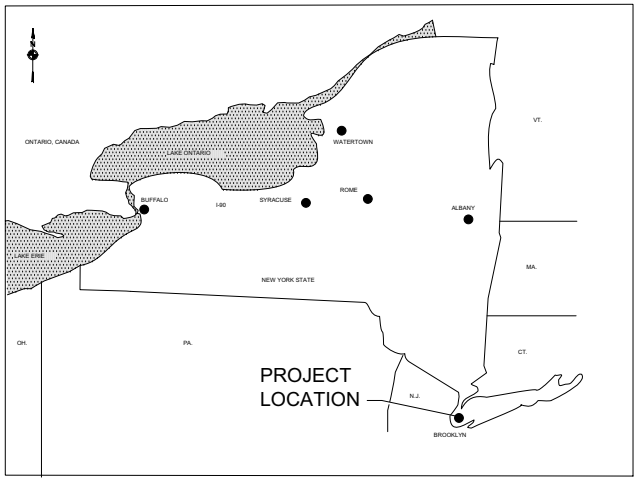
CONSTRUCTION DRAWINGS

T-1 Title Sheet
C-1 Existing Site Conditions
C-2 System Installation Plan
C-3 Construction Details
M-1 Typical System Process Flow Diagram
M-2 Equipment Layout and Schedule
M-3 Piping and Instrumentation Diagram
E-1 Treatment System Electrical Plan

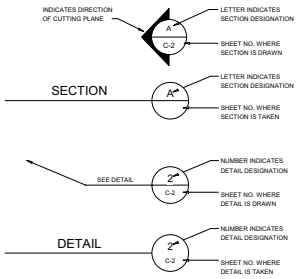
REMEDIAL SYSTEM CONSTRUCTION
AAFES STATION - BUILDING 200
U.S. ARMY GARRISON, FORT HAMILTON
BROOKLYN, NEW YORK

Prepared For
U.S. ARMY CORPS OF ENGINEERS - BALTIMORE DISTRICT
BALTIMORE, MARYLAND

Submitted By
PLEXUS SCIENTIFIC CORPORATION
ALEXANDRIA, VIRGINIA



LOCATION MAP



DRAWING INDEX		
SHEET	DRAWING	TITLE
1	T-1	TITLE SHEET
2	C-1	EXISTING SITE CONDITIONS
3	C-2	SYSTEM INSTALLATION PLAN
4	C-3	CONSTRUCTION DETAILS
5	M-1	TYPICAL SYSTEM PROCESS FLOW DIAGRAM
6	M-2	EQUIPMENT LAYOUT AND SCHEDULE
7	M-3	PIPING AND INSTRUMENTATION DIAGRAM
8	E-1	TREATMENT SYSTEM ELECTRICAL PLAN

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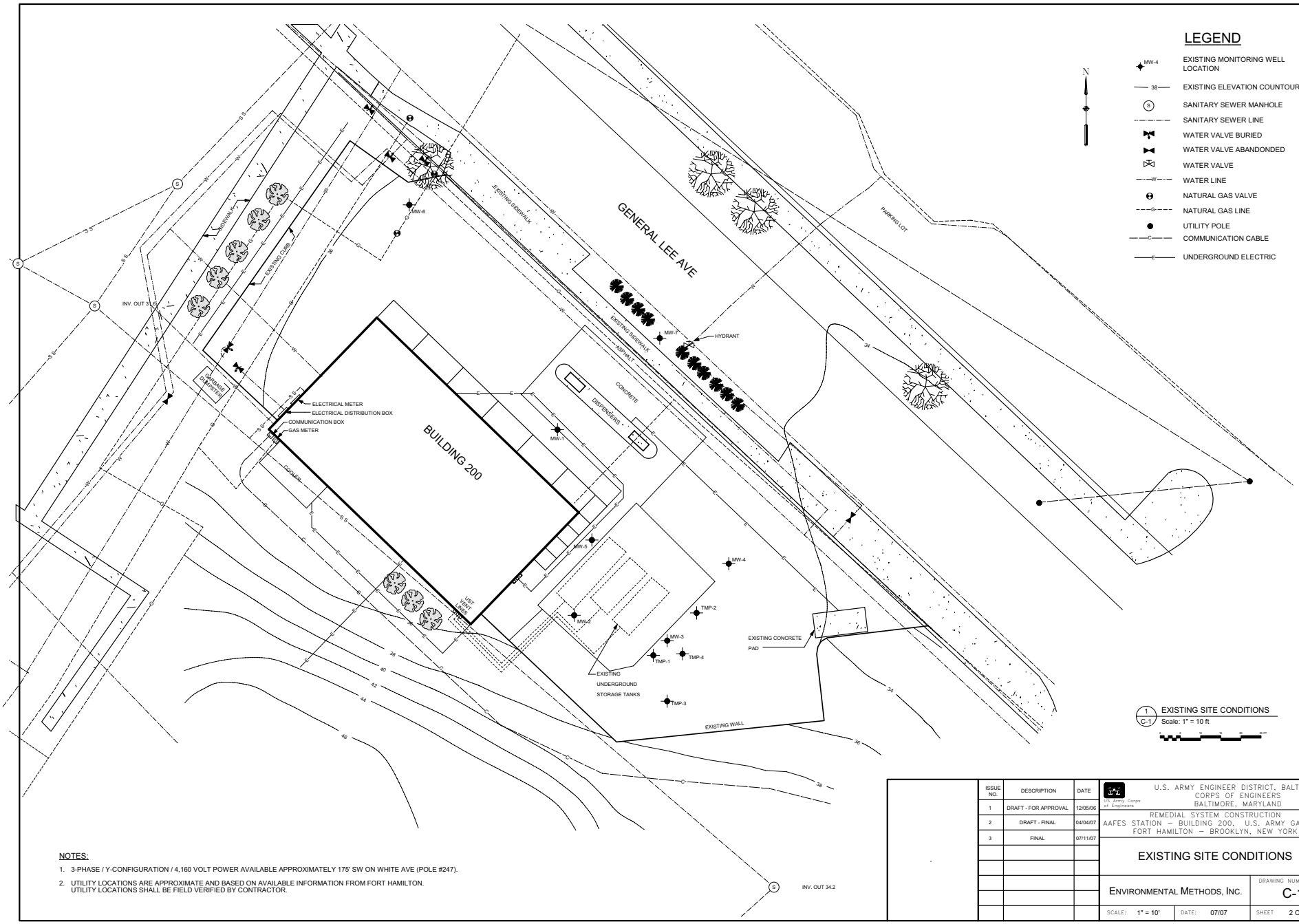
TITLE SHEET

ENVIRONMENTAL METHODS, INC.

DRAWING NUMBER T-1

SCALE: NO SCALE | DATE: 07/07 | SHEET 1 OF 8



NOTES:

1. 3-PHASE / Y-CONFIGURATION / 4,160 VOLT POWER AVAILABLE APPROXIMATELY 175' SW ON WHITE AVE (POLE #247).
2. UTILITY LOCATIONS ARE APPROXIMATE AND BASED ON AVAILABLE INFORMATION FROM FORT HAMILTON. UTILITY LOCATIONS SHALL BE FIELD VERIFIED BY CONTRACTOR.

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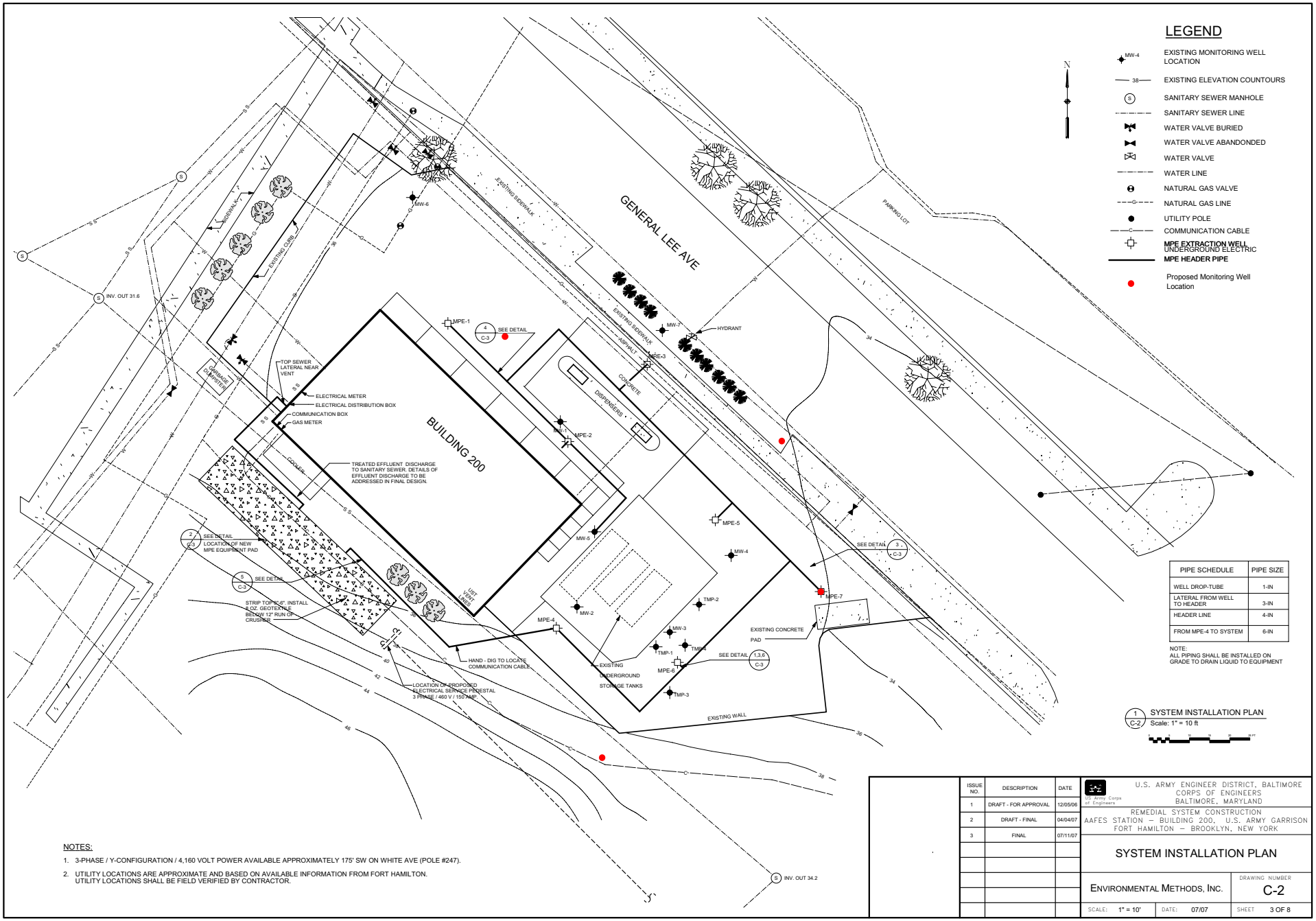
EXISTING SITE CONDITIONS

ENVIRONMENTAL METHODS, INC.

DRAWING NUMBER C-1

SCALE: 1" = 10' | DATE: 07/07 | SHEET 2 OF 8



PIPE SCHEDULE	PIPE SIZE
WELL DROP-TUBE	1-IN
LATERAL FROM WELL TO HEADER	3-IN
HEADER LINE	4-IN
FROM MPE-4 TO SYSTEM	6-IN

NOTE:
ALL PIPING SHALL BE INSTALLED ON GRADE TO DRAIN LIQUID TO EQUIPMENT

1/C-2 SYSTEM INSTALLATION PLAN
Scale: 1" = 10 ft

NOTES:

1. 3-PHASE / Y-CONFIGURATION / 4,160 VOLT POWER AVAILABLE APPROXIMATELY 175' SW ON WHITE AVE (POLE #247).
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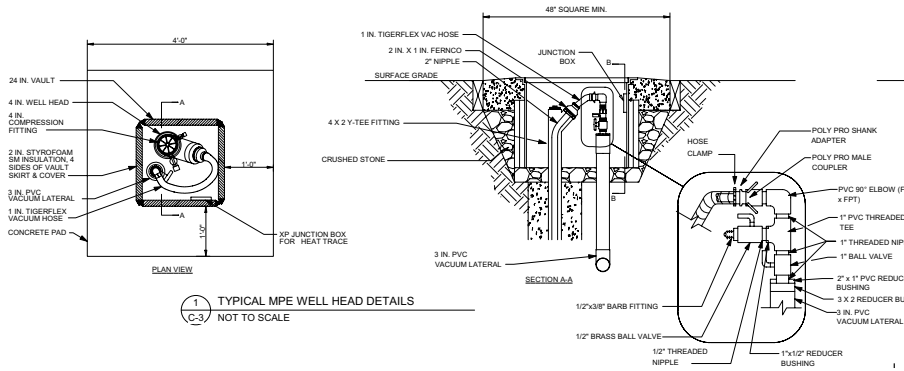
SYSTEM INSTALLATION PLAN

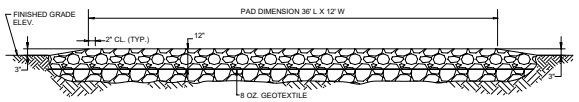
ENVIRONMENTAL METHODS, INC.

DRAWING NUMBER C-2

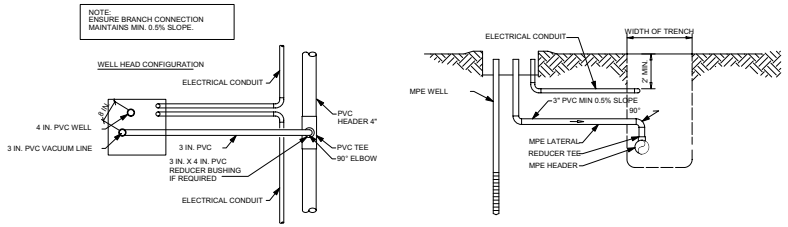
SCALE: 1" = 10' | DATE: 07/07 | SHEET 3 OF 8



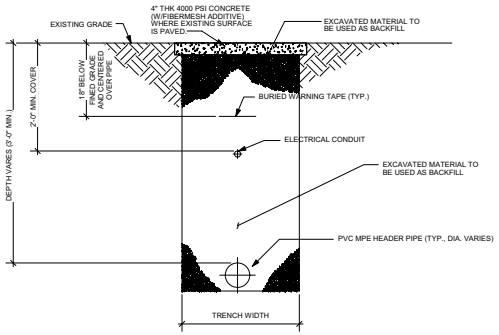
1 C-3 TYPICAL MPE WELL HEAD DETAILS
NOT TO SCALE



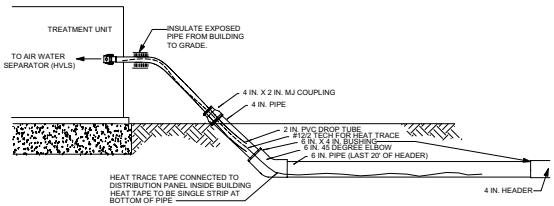
2 C-3 STONE PAD
NOT TO SCALE



3 C-3 TYPICAL MPE LATERAL CONNECTION
NOT TO SCALE



4 C-3 MPE PIPE TRENCH
NOT TO SCALE



5 C-3 MAIN HEADER DETAIL INTO MPE TREATMENT UNIT
NOT TO SCALE

6 C-3 TYPICAL MPE WELL DETAIL
NOT TO SCALE

Concrete Testing:

Concrete Mix: Measure and combine cement, aggregates, water and admixtures in accordance with ASTM C94.

1. Minimum Cement Content: 5-3/4-bags/cu yd.
2. Minimum Strength: 4,000 psi. @28 days
3. Air Content: 6%+/-1%.
4. Maximum Slump: 4 in.
5. The Contractor shall submit a certified mix for approval prior to concrete order / delivery.

Pressure Testing of Pipe:

Pressure testing of pipe shall be in accordance with manufacturer's recommendations.

Vault Construction Notes:

All Well Vaults shall be Model 104 (24" x 24" x 24") as manufactured by:

Atlantic Screen and Manufacturing, Inc.
24575 Milton-Ellendale Hwy.
Milton, DE 19968
Phone: (302) 684-3197
Fax: (302) 684-0643

VAULT CONSTRUCTION

The bottom of the vault shall be set and leveled on 4" of tamped crushed stone approximately 23" below grade, leaving the top of the vault 1" above surrounding grade. The contractor shall insulate the vault skirt with Extruded Polystyrene Insulation per ASTM C 578 Type IV. The insulation shall have a minimum thickness of 2", an R value of 10 and minimum compressive strength of 10 psi. The insulation can be held in place with backfill. The insulation shall be STYROFOAM Square Edge Insulation (standard board size is 24" x 96") as manufactured by:

Dow Building Materials
P.O. Box 1206
Midland, MI 48641-1206
Phone: (866) 583-2583
Fax: (989) 832-1465

The contractor shall backfill around the outside of the vault to 4" below grade. The contractor shall use 2"x4" lumber to construct a form for a a concrete "collar" to be installed around the vault. Ready mix concrete (3,000 psi w/ fibermesh additive) shall be placed around the vault to form a 12" wide collar around the perimeter of the vault. The concrete collar shall be sloped from the top of the vault to the top of the form (placed at grade). The goal is to prevent the vaults from being installed at low points in the topography and collecting water during precipitation events.

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REMEDIAL SYSTEM CONSTRUCTION
AAFES STATION – BUILDING 200, U.S. ARMY GARRISON
FORT HAMILTON – BROOKLYN, NEW YORK

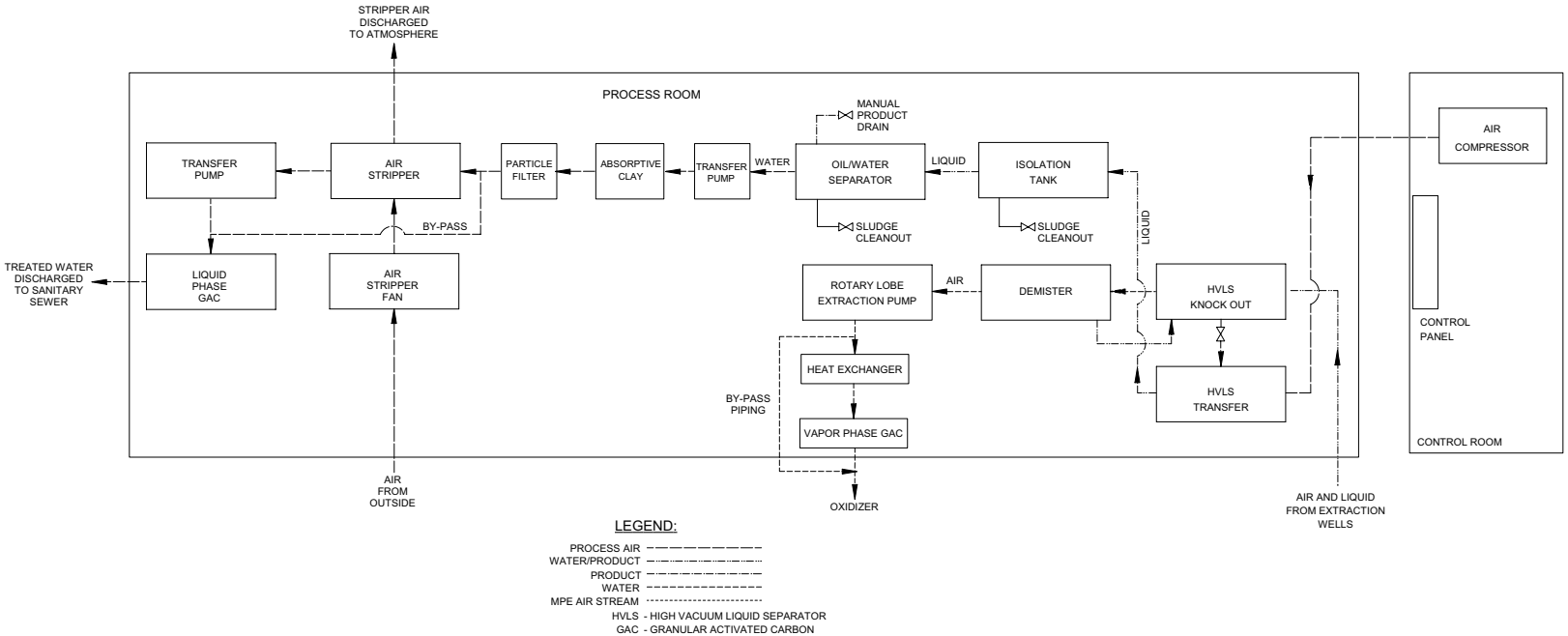
CONSTRUCTION DETAILS

ENVIRONMENTAL METHODS, INC.

DRAWING NUMBER C-3

SCALE: AS NOTED | DATE: 07/07 | SHEET 4 OF 8

MULTI PHASE VACUUM EXTRACTION UNIT
Process Flow Diagram



LEGEND:

PROCESS AIR
WATER/PRODUCT
PRODUCT
WATER
MPE AIR STREAM

HVLS - HIGH VACUUM LIQUID SEPARATOR
GAC - GRANULAR ACTIVATED CARBON

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TYPICAL SYSTEM PROCESS FLOW DIAGRAM

ENVIRONMENTAL METHODS, INC.

DRAWING NUMBER M-1

SCALE: AS NOTED | DATE: 07/07 | SHEET 5 OF 8

Vacuum Blower

1 Manufacturer: M-D Pneumatics
2 Model: 5507
3 Pump Speed (% of Max): 1,900 RPM (57.6%)
4 Motor Rating: Class 1 Division II, 460 volt 3 phase
5 Motor Manufacturer: Teco Westinghouse
6 Motor Horsepower: 20
7 Motor Speed: 1750 rpm
8 Rated Flow rate (14"Hg max): 256 ACFM @ 13 Hg
9 Safety & Control: Vacuum Relief Valve, Vacuum switch, Pressure Switch, Temp switch set below flash point of Gasoline, Thermal overload on motor. (LEL Sensor)
10 Temperature Switch Manufacturer: Burling
11 Temperature Switch Model: B-IC-53-CSA
12 Inlet Particulate filter Solberg
13 Electrical Classification of Temperature Switch cl 1 div 2
14 Vacuum gauges Before and after throttle valve, filter and demister
15 Pressure Gauges after pump
16 Inlet plumbing Air dilution c/w muffler, throttle valve, and check valve
17 Heat Exchanger. SCG model AA33250.

High Vacuum Liquid Separator (HVLS) - Air Water Separator

1 Type of Separator: HVLS-500
2 Manufacturer: SCG Industries Limited
3 Flow rate: 300scfm, 10 gpm
4 Material of Construction: Vessel(s) Steel
5 Reservoir Volume: 30 Gallons (Lower Tank)
6 Type of Level Switch(es): Side-Mounted Level Switch H/H (upper tank), Top Mounted Level Switch (Bottom Tank)
7 Level Switch(es) Manufacturer: Gems
8 Level Switch(es) Model: A-12
9 Characteristics: No emulsion, no motors, no scaling. Liquid and sediment transferability. Air over water transfer without the use of any moving parts.
10 Water Demisting Percentage: Recovery 99.9
11 Sight Glass (Both Tanks)
12 Control System: PLC driven cycling controller c/w electric solenoids

Oil Water Separator

1 Model: B-15
2 Flow rate: 15 gpm
3 Material of Construction: Vessel(s) Steel Epoxy lined internal
4 Dimension: 6.5 long, 3 wide, 5.5 high
5 Type of Level Switch(es): Side-Mounted Level Switch H/H water, H/H Product
6 Level Switch(es) Manufacturer: Gems
7 Level Switch(es) Model: A-12
8 Characteristics: Coalescing, sediment settling, Oil Pumping option
9 Oil Sight Glass

Air Compressor

1 Type: 60 gal Vertical Compressor
2 Manufacturer: Ingersoll-Rand
3 Model: 2340
4 Flow Rate: 17 FM @ 100 psi
5 Hydraulic Flow Rate (HVLS): 25 Gallons/Minute
6 Motor Rating: general purpose, within electrical room
7 Motor Manufacturer: Teco Westinghouse
8 Motor Horsepower: 5
9 PLC controlled continuous operation Alarm program (1 hr)
10 Voltage: 460 volt, 3 phase

Flow Stabilization Tank (Isolation Tank)

1 Type: HDPE
2 Size: 175 gal
3 Features: Bottom clean out, High /High Float, Discharge flow valve.

Air Stripper

1 Model: 1311
2 Flow rate: 10 gpm
3 Material of Construction: Vessel(s) poly
4 Dimension: 30"
5 Type of Level Switch(es): Side-Mounted Level Switch H/H water
6 Level Switch(es) Manufacturer: Gems
7 Level Switch(es) Model: A-12

Effluent Transfer Pumps

1 Type: Centrifugal
2 Manufacturer: Jacuzzi
3 Model: .5 hp 5DA1B 230 volt 3 ph
4 Flow Rate: 20 gpm @ 25 psi
5 Electrical Classification: Class 1 Division II
6 Control: PLC Programmable
7 Flow Meter: 1" T-10
8 Material of Construction: Vessel Steel

Enclosure

1 Type: SCG two room enclosed Trailer
2 Dimensions: 26'L x 8.5'W x 8.5'H
3 Entrance(s): Rear Double Doors, Electrical Man door
4 Noise Emissions: 75 dba
5 Thermal Rating: Walls and ceiling R-6 styrofoam, Floor R-8 Poly Urethane Spray foam.
6 Heater Electrical rating: Cl. 1, Div. 1
7 Heater Manufacturer: Ruff neck, Caloritech
8 Heater Model: XL5000
9 Heater Output: 5000 watts
10 Cooling Provision: 1/3 hp Exhaust Fan Cl. 1/ div. 1, div. 2
11 Fan Manufacturer: Leader Fan Industries
12 Fan Model: X-12
13 Thermostat Manufacturer: Roughneck
14 Thermostat Electrical Classification: cl 1 div 2
15 Material of Construction, Skid: Aluminum (checker plate floor)
16 Material of Construction, Walls: 24 Gauge Anodized Aluminum interior and exterior
17 Sump with Level Switch: No
18 Wall thickness: 1.5"
19 Material: Non Combustible
20 Weather proof
21 Exterior color: White
22 Interior color: White
23 Low Temp Alarm Switch
24 Equipment location Positioned for ease of repair
25 Fire extinguishers: 1 in each room adjacent to man doors
26 Lighting: 4 incandescent Process room, 1 Fluorescent in electrical room
27 Roof Construction: 24 gauge Aluminum interior and exterior
28 Suspension: 3 only 5200 lbs axles for added stability and reduced tongue weight
29 Structural: Reinforced structure at manufacture
30 Manufacturers: Warranty 3 years structural 2 years corrosion

Two Way Telemetry

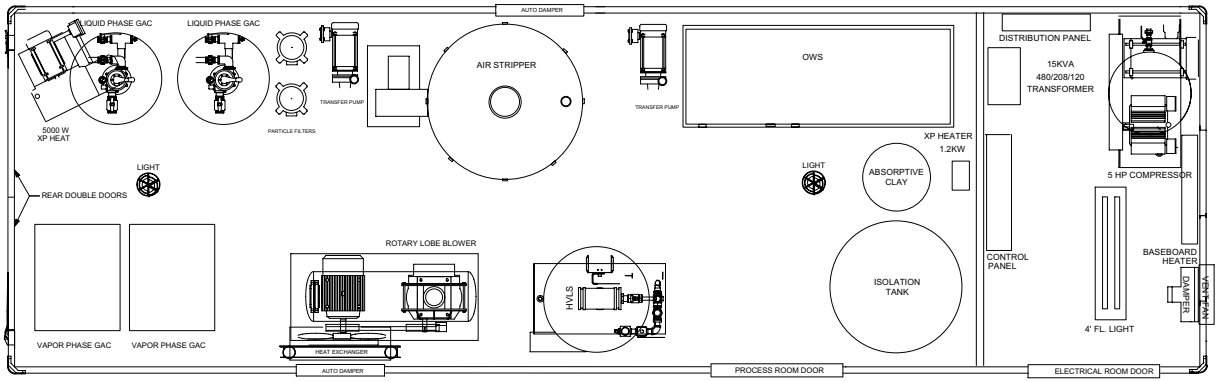
1 Control capable of modification of all I/O functions remotely
2 Connection: 56 K modem at Electrical control room
3 Logging: Capable of storage and retrieve of data
4 Alarm Auto Dialer 2 channel

System Controls

1 PLC Type: Micro
2 PLC Manufacturer: Toshiba
3 PLC Model: T1S
4 Shop-Programmed
5 Emergency Shut-Down
6 Spare Inputs/outputs
7 Status Lights (on PLC)
8 Control Panel Mounting: Interior Electrical Room
9 Transformer: Control and receptacle
10 Main Fused Disconnect: 120 amps, 460 volt Time Delay fuses
11 Distribution: Block
12 Protection: Time delay fuses for all motors and transformers
13 Outputs Fused, labeled, and c/w Terminal blocks
14 Inputs Labeled and c/w terminal blocks
15 115 volt receptacle duplex GFI
16 Motor starters c/w thermal overloads and aux. contacts for all motors
17 Switches and sensor supply power Non -Incendiary

Electrical

1 Classification of Controls Built to Standards (as per NEC)
2 System Electrical Requirements 460 Volt/120 Amp/3 Phase



1 / M-2 EQUIPMENT LAYOUT
NOT TO SCALE

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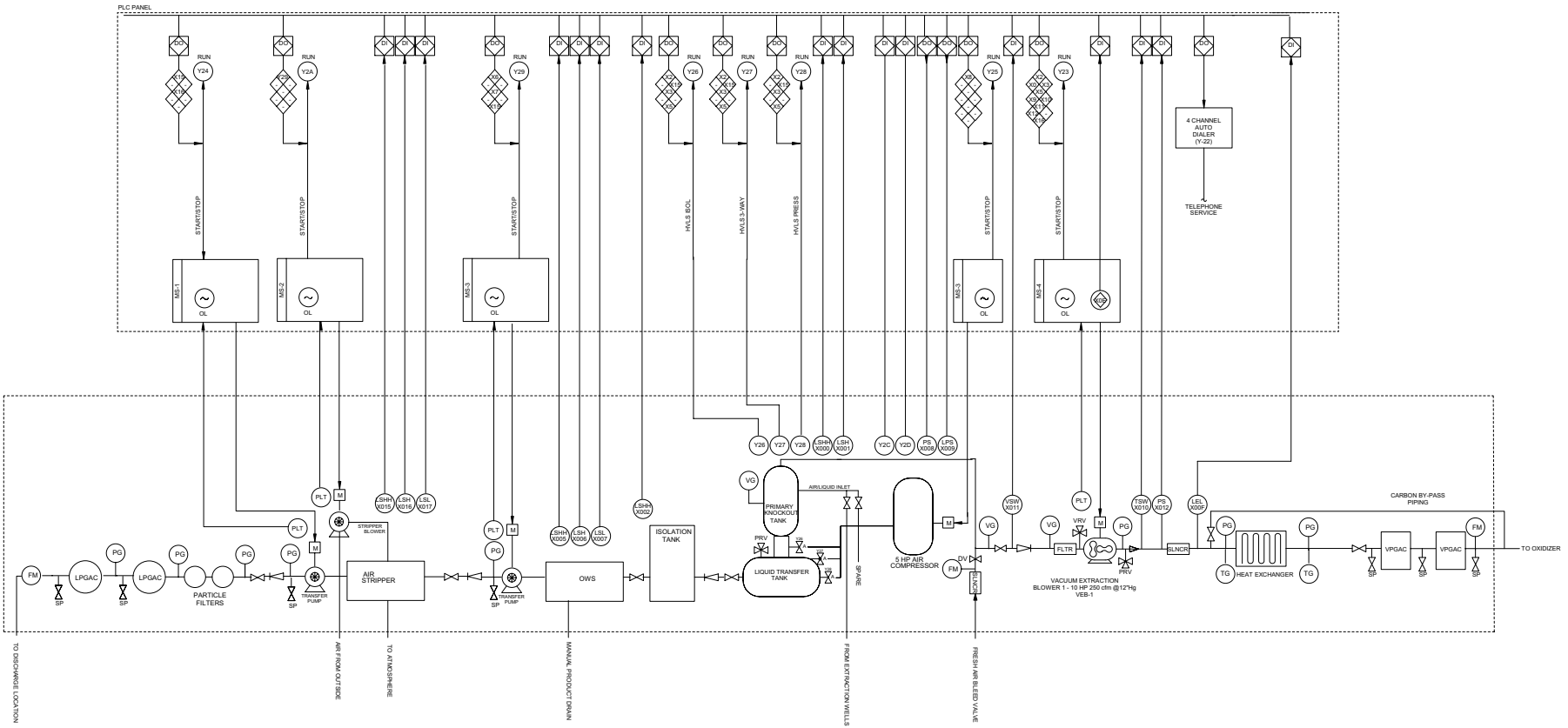
AAFES STATION – BUILDING 200, U.S. ARMY GARRISON
FORT HAMILTON – BROOKLYN, NEW YORK

EQUIPMENT LAYOUT AND SCHEDULE

ENVIRONMENTAL METHODS, INC.

DRAWING NUMBER M-2

SCALE: NO SCALE | DATE: 07/07 | SHEET 6 OF 8



LEGEND

DI	-	DISCRETE INPUT
DO	-	DISCRETE OUTPUT
OL	-	OVERLOAD
MS	-	MOTOR STARTER
M	-	MOTOR
PLT	-	PILOT SWITCH
LSH	-	LEVEL SWITCH HIGH
LSHH	-	LEVEL SWITCH HIGH-HIGH
LSL	-	LEVEL SWITCH LOW
TSW	-	TEMPERATURE SWITCH
VSW	-	VACUUM SWITCH
LEL	-	LOWER EXPLOSIVE LIMIT SENSOR
LPS	-	LOW PRESSURE SWITCH
PG	-	PRESSURE GAGE
VG	-	VACUUM GAGE
TG	-	TEMPERATURE GAGE
FM	-	FLOW METER
PRV	-	PRESSURE RELIEF VALVE
VRV	-	VACUUM RELIEF VALVE
FLTR	-	FILTER
HVLS	-	HIGH VACUUM LIQUID SEPARATOR
OWS	-	OIL WATER SEPARATOR
LPGAC	-	LIQUID PHASE GRANULAR ACTIVATED CARBON
VPGAC	-	VAPOR PHASE GRANULAR ACTIVATED CARBON
SP	-	SAMPLE PORT
DV	-	DILUTION VALVE
SLNCR	-	SILENCER
LEL	-	LOWER EXPOLSIVE LIMIT SENSOR

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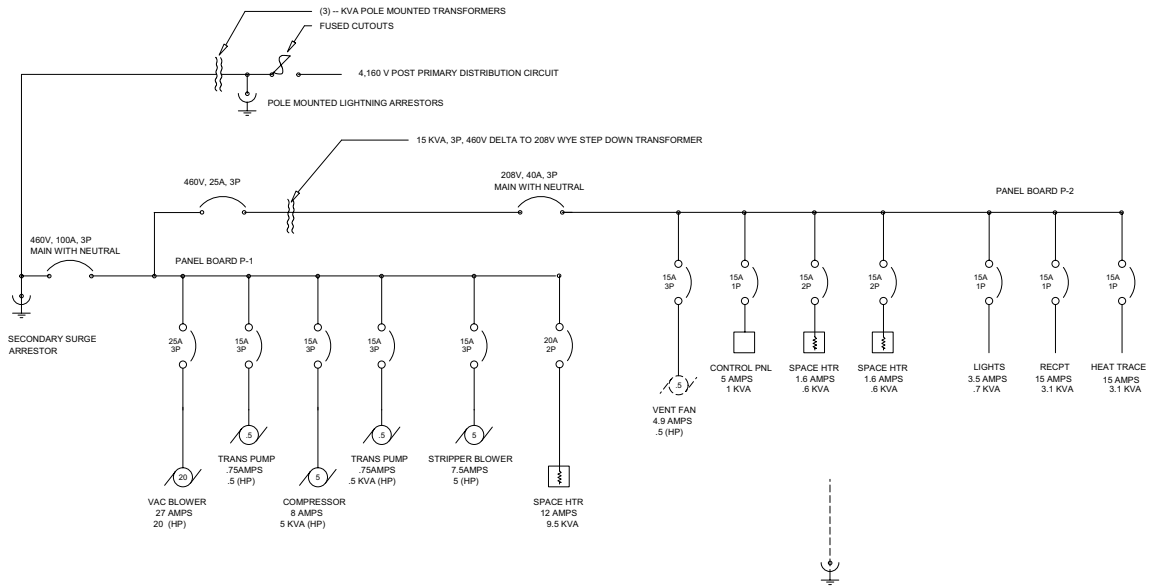
PIPING AND INSTRUMENTATION DIAGRAM

ENVIRONMENTAL METHODS, INC.

DRAWING NUMBER M-3

SCALE: NO SCALE | DATE: 07/07 | SHEET 7 OF 8



ELECTRICAL ONE-LINE DIAGRAM

PANEL BOARD SCHEDULE P-1

SYSTEM: 460 VOLTS, 3 PH, 3WIRE, 60 HZ — MAIN BREAKER: 100 AMPS 3 POLE; BUS-100A

LOCATION: INDOOR NEMA 12 ENCLOSURE — TOTAL PANEL: CONNECTED LOAD 120 KVA 3PH

NO.	DESCRIPTION	LOAD (KVA) A	LOAD (KVA) B	LOAD (KVA) C	BKR AMPS	COND'S & CONDUIT	FT	PHASE			FT	COND'S & CONDUIT	BKR AMPS	LOAD (KVA) A	LOAD (KVA) B	LOAD (KVA) C	DESCRIPTION	NO.
1	20 Hp	20			50	(3) #8 + #6G IN 1"C		A				(3) #8 + #8G IN 1"C	25	15			208V STEP DOWN XFMR	2
3	PD BLOWER		20						B						15			4
5	(MPE)			20						C						15		6
7	.5 Hp	.5			15			A					15	5			5 Hp STRIPPER FAN	8
9	TRANSFER		.5						B						5			10
11	PUMP			.5						C						5		12
13	PROCESS	5			15			A					15	.5			.5 Hp TRANSFER PUMP	14
15	ROOM HEAT		.5						B						.5			16
17				5						C						.5		18
19	5 Hp	5			15			A										20
21	COMPRESSOR		5						B									22
23				5						C								24
		20.5	20.5	20.5	CONNECTED LOAD			CONNECTED LOAD						20.5	20.5	20.5		

PANEL BOARD SCHEDULE P-2

SYSTEM: 208 VOLTS, 3 PH, 4WIRE, 60 HZ — MAIN BREAKER: 100 AMPS 3 POLE; BUS-200A

LOCATION: INDOOR NEMA 12 ENCLOSURE — TOTAL PANEL: 25 KVA 3PH

NO.	DESCRIPTION	LOAD (KVA) A	LOAD (KVA) B	LOAD (KVA) C	BKR AMPS	COND'S & CONDUIT	FT	PHASE			FT	COND'S & CONDUIT	BKR AMPS	LOAD (KVA) A	LOAD (KVA) B	LOAD (KVA) C	DESCRIPTION	NO.
1		.5						A					20			1	PLC CONTRL PNL	2
3	VENT FAN		.5		15				B				15		1.3		750 WATT HEATER	4
5				.5						C						1.3		6
7	RECEPT'S	3.1			15			A					15	5.4			1200 WATT HEATER	8
9	400 WATT LIGHT		0.7		15				B						5.4			10
11	HEAT TRACE			5	20					C			20	1		1	SPARE	12
13								A										14
15									B									16
17										C								18
19								A										20
21									B									22
23										C								24
		3.6	1.2	5.5	CONNECTED LOAD			CONNECTED LOAD						5.4	5.7	3.3		

NOTE:
SHEET E-1 IS BASED ON PROVISION OF 3-PHASE POWER TO THE EQUIPMENT. CONTRACTOR SHALL EVALUATE COST BENEFIT OF UTILIZATING SINGLE PHASE WITH VFD TO OPERATE PD BLOWER.

GENERAL ELECTRICAL NOTE

1. ELECTRICAL INSTALLATIONS SHALL CONFORM TO THE LATEST EDITION OF THE NATIONAL ELECTRICAL CODE: NFPA-70, AND ALL CODES AND REQUIREMENTS OF THE LOCAL AUTHORITY HAVING JURISDICTION. ALL MATERIALS AND EQUIPMENT SHALL BE LISTED BY UNDERWRITERS LABORATORIES OR OTHERWISE BE INDEPENDENTLY CERTIFIED TO BE SAFE FOR THEIR INTENDED USE.
2. INTERIOR PANEL BOARD, MOTOR CONTROLLERS AND CONTROL PANEL SHALL BE NEMA 12 RATED IN NON CLASSIFIED AREAS.
3. PROVIDE #4 BARE COPPER DIRECT-BURIED GROUNDING RING AROUND BUILDING SITE. BOND TO (2) SUBSURFACE 10 FT GROUNDING RODS OR EMBEDDED CONCRETE REBAR. MAX FALL-OF-POTENTIAL GROUND RESISTANCE 5 OHMS. PROVIDE EMBEDDED #4 COPPER GROUNDING CONDUCTORS FROM GROUNDING RING TO ALL METALLIC MECHANICAL EQUIPMENT, FENCING, BUILDING STEEL, ETC. ALL FITTINGS TO BE CAD WELD OR OTHERWISE LISTED FOR THE PURPOSE.
4. REFER TO FIGURE M-3 FOR PROCESS & INSTRUMENTATION DIAGRAMS. CONTRACTOR TO PROVIDE POWER AND SIGNAL WIRING IN 0.75 IN. GALVANIZED RIGID OR IMC CONDUIT (0.75 IN. MIN) AS REQUIRED BY MANUFACTURERS INSTRUCTIONS.
5. ONLY LIGHTING, RECEPTACLES, AND BUILDING HVAC EQUIPMENT & CONDUIT TO BE SUPPORTED BY THE BUILDING STRUCTURE. CONTRACTOR TO SUPPORT POWER, CONTROL & INSTRUMENTATION INDEPENDENTLY. (SUPPORTED FROM THE FLOOR OR EMBEDDED IN CONCRETE).
6. ALL ELECTRICAL CABLE & CONDUIT SHALL BE COORDINATED WITH MECHANICAL EQUIPMENT AND PIPING TO ELIMINATE INTERFERENCE & PROVIDE FOR SERVICING.
7. ALL INTERIOR PORTIONS OF THE PROCESS ROOM & UNDERGROUND SOIL AREAS ARE CLASS 1, DIVISION 2, GROUP D HAZARDOUS (CLASSIFIED) AREAS AS DEFINED IN NFPA-70. ALL REQUIRED EXPLOSION-PROOF ENCLOSURES, SEALS, AND REQUIREMENTS SHALL BE MET.
8. PROVIDE HAND-OFF-AUTOMATIC SWITCHES ON ALL MOTOR CONTROLLERS, AND 3 PHASE UNDER VOLTAGE AND PHASE LOSS PROTECTION.
9. CONSTRUCTION NOTE: ALL WIRING SHALL USE 75 DEGREE CELSIUS RATED THWN CONDUCTORS OR EQUIVALENT IN RIGID GALVANIZED CONDUIT OR IMC (0.75 IN. MIN) EXCEPT AS OTHERWISE INDICATED.

ISSUE NO.	DESCRIPTION	DATE
1	DRAFT - FOR APPROVAL	12/05/06
2	DRAFT - FINAL	04/04/07
3	FINAL	07/11/07

U.S. Army Corps of Engineers

U.S. ARMY ENGINEER DISTRICT, BALTIMORE
CORPS OF ENGINEERS
BALTIMORE, MARYLAND

REMEDIAL SYSTEM CONSTRUCTION
AAFES STATION – BUILDING 200, U.S. ARMY GARRISON
FORT HAMILTON – BROOKLYN, NEW YORK

ELECTRICAL PLAN

ENVIRONMENTAL METHODS, INC.

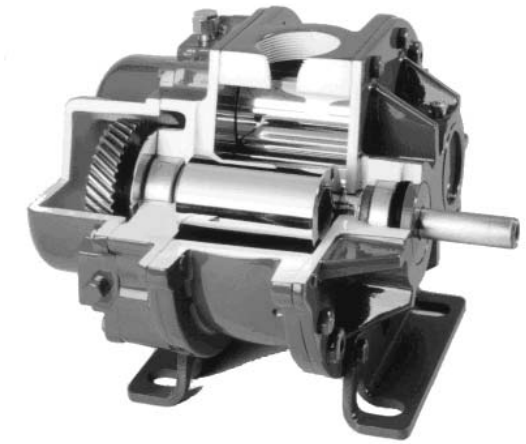
DRAWING NUMBER E-1

SCALE: NO SCALE | DATE: 07/07 | SHEET 8 OF 8

APPENDIX - B
Manufactures Product Sheets

LIST OF PRODUCT SHEETS

MPE BLOWER – MD PNEUMATICS
HIGH VACUUM LIQUID SEPARATOR – SCG INDUSTRIES
AIR STRIPPER – SHALLOW TRAY
VAPOR PHASE CARBON - SCG INDUSTRIES
THERMAL/CATALYTIC OXIDIZER – BISCO ENVIRONMENTAL



M-D Pneumatics™

COMPETITOR PLUS™

Rotary Positive Blowers

COMPETITOR PLUS rotary blowers are designed to be interchangeable with equivalent sizes of Roots Universal RAI®, and many Sutorbilt® California Series B and F, and Legend™ Series L and P blowers. COMPETITOR PLUS models are rated up to 15 PSIG discharge pressure or 16" Hg dry vacuum.

In addition to interchangeability, Tuthill Vacuum & Blower Systems has improved on existing designs with the following superior features ordinarily found only on premium blowers:

Helical Gearing

COMPETITOR PLUS blowers are timed with hardened, precision helical gears, keyed to the rotor shafts, not taper fit spur gears as offered by other manufacturers, which have greater backlash, and can slip and lose timing. Helical gears are also quieter, reducing mechanical noise.

Stronger Bearings

All COMPETITOR PLUS blowers include double row ball bearings at the gear end, stronger than single row ball bearings offered by other manufacturers. Drive shaft bearing is cylindrical roller type for additional strength against side loading from V-belt drives. As a result of this superior design, COMPETITOR PLUS blowers offer design bearing life as much as 50% greater than models offered by other manufacturers.

Rotors with Integral Shafts

COMPETITOR PLUS blowers include precision machined ductile iron rotors with large, integrally cast shafts, not press fit and/or pinned shafts offered by other manufacturers, which can loosen over time and cause rotor clash. All rotors are dynamically balanced for vibration-free rotation.

Positive End Clearances

End clearances are positively established at the blower gear end, eliminating the risk of shifting end clearances when installing or removing drive components. This also eliminates the need for those special fork and saddle tools required by other brands to reset end clearances.

Polished Sealing Surfaces

All shaft surfaces in contact with sealing members are polished to reduce seal wear and risk of leakage.

Individually Tested

Every COMPETITOR PLUS blower is factory tested to assure you of the highest quality. While some manufacturers perform only sample testing, We go the distance to insure that your blower meets our rigid ISO 9001 registered quality standards.

ISO 9001 Registration

COMPETITOR PLUS blowers are manufactured under the Tuthill Vacuum & Blower Systems ISO 9001 registered quality assurance program, the first American manufacturer of rotary blowers to gain such international recognition.

Warranty

Every COMPETITOR PLUS blower is backed by the Tuthill Vacuum & Blower Systemslimited warranty for a period of 18 months after installation or 2 years after original blower shipment, whichever occurs first.

Metric Availability

All COMPETITOR PLUS blowers are available with metric drive shaft and process connections.

Worldwide Sales and Service

With sales offices and service facilities located on six continents, you can be assured of availability and service for your COMPETITOR PLUS blowers.

Material Specifications:

Housing: Cast iron
End Plates: Cast iron
End Cover: Cast iron
Rotors: Ductile iron
Shafts: Ductile iron, cast integrally with rotors
Bearings: Gear end - Double row ball, both rotors
Drive end - Cylindrical roller on drive rotor
Single row ball on driven rotor
Drive Shaft: Ductile iron, cast integrally with drive rotor
Gears: Heat treated alloy steel, helical cut
Seals: Lip seals on rotor shafts and drive shaft
Lubrication: Oil splash on gear end, grease on drive end

Model Size	Max. Press. PSI	Max. Vac. (in. Hg)	Maximum RPM	Displacement CFR
2002	12	16	5275	.016
2004	7	16	5275	.032
3002	15	16	3600	.0467
3003	12	15	3600	.0616
3006	7	15	3600	.102
4002	15	16	3600	.061
4005	12	16	3600	.121
4007	7	15	3600	.160
5003	15	16	2850	.132
5006	13	16	2850	.221
5009	7	15	2850	.323
6005	15	16	2350	.246
6008	14	16	2350	.395
6015	7	14	2350	.740
7006	15	16	2050	.402
7011	10	16	2050	.738
7018	6	12	2050	1.200

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TUTHILL
Vacuum & Blower Systems

ISO 9001

4840 West Kearney Street
Springfield, Missouri USA 65803-8702
Tel 417 865-8715 800 825-6937 Fax 417 865-2950

http://pneumatics.tuthill.com

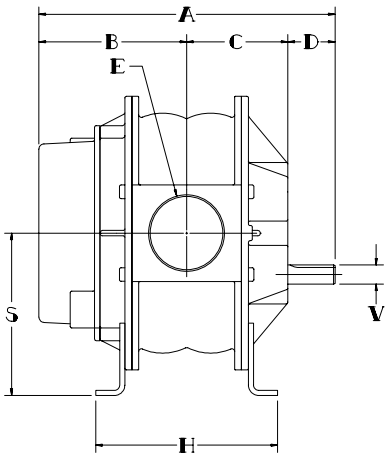
Performance

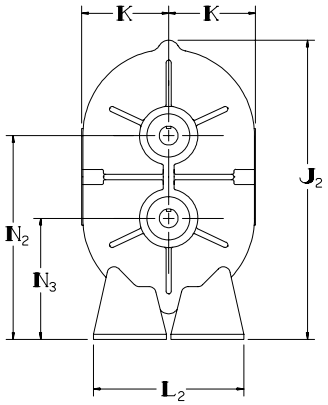
Pressure performance is based on inlet conditions of 14.70 PSIA and 70° F.

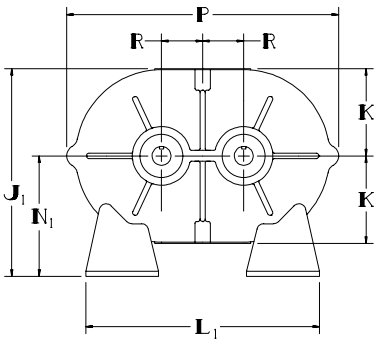
Vacuum performance is based on inlet temperature of 70° F and discharge pressure of 14.70 PSIA.

In conjunction with our program of continuous testing and upgrading, all specifications are subject to change without notice.

All data are approximate. Request a quotation for your specific application.







Blower Model	SPEED (RPM)	6 PSIG		7 PSIG		10 PSIG		12 PSIG		13 PSIG		14 PSIG		15 PSIG		Max. Vacuum		
		CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	"Hg	CFM	BHP
2002	1750	8	0.9	6	1.0											9	7	0.7
	3600	38	1.8	36	2.1	32	2.8	29	3.3							14	28	2.1
	5275	64	2.7	63	3.1	59	4.2	56	4.9							16	51	3.4
2004	1750	24	1.6	21	1.9											10	20	1.4
	3600	83	3.3	80	3.8											14	68	3.8
	5275	137	4.9	134	5.6											16	115	6.3
3002	1170	23	1.6	20	1.9											10	19	1.4
	2700	94	3.8	92	4.3	85	6.0	81	7.1	79	7.6	77	8.2	75	8.7	15	76	4.5
	3600	136	5.0	134	5.7	127	7.9	123	9.4	121	10	119	11	118	12	16	114	6.4
3003	1170	31	2.1	28	2.4											10	27	1.7
	2700	126	4.8	122	5.5	114	7.7	109	9.2							14	107	5.4
	3600	181	6.4	178	7.4	169	10	164	12							15	158	7.7
3006	1170	62	3.3	57	3.8											11	51	3.0
	2700	218	7.7	213	8.9											15	185	9.3
	3600	310	10	305	12											15	277	12
4002	880	20	1.6	17	1.8											10	16	1.3
	1760	74	3.2	71	3.6	64	5.0	60	6.0	58	6.4	56	6.9			14	58	3.6
	3600	186	6.5	183	7.4	176	10	172	12	170	13	168	14	166	15	16	163	8.3
4005	880	44	3.0	39	3.4											9	42	2.2
	1760	150	5.9	145	6.9	132	9.6	124	11							14	121	6.7
	3600	373	12	368	14	354	20	347	24							16	330	16
4007	880	58	3.9	52	4.5											9	56	2.9
	1760	199	7.7	193	9.0											13	169	8.2
	3600	494	16	487	18											15	447	19
5003	710	42	2.7	38	3.1											10	36	2.2
	1760	181	6.6	176	7.6	166	11	159	13	156	14	153	15			16	146	8.5
	2850	324	11	320	12	309	17	303	21	300	22	297	24	294	25	16	289	14
5006	710	70	4.3	63	5.0											10	61	3.6
	1760	302	11	295	12	277	17	266	21	261	23					14	262	12
	2850	543	17	536	20	518	28	507	34	502	37					16	485	22
5009	710	133	6.2	125	7.2											11	114	5.6
	1760	472	15	464	18											14	427	18
	2850	824	25	816	29											15	769	30
6005	710	93	4.9	87	5.6	70	7.9									12	70	4.8
	1760	352	12	345	14	328	20	318	23	313	25	309	27	304	29	16	296	16
	2350	497	16	490	19	473	26	463	31	458	34	454	36	449	39	16	442	21
6008	710	150	7.6	139	8.9	112	13									12	113	7.5
	1760	565	19	554	22	527	31	510	37	503	40	496	43			15	490	23
	2350	798	25	787	29	760	41	744	50	736	54	729	58			16	709	33
6015	710	281	14	261	16											10	254	12
	1760	1058	35	1038	40											14	943	40
	2350	1494	46	1475	54											14	1380	53
7006	710	195	7.8	188	9.1	168	13	157	15	152	17					13	161	8.3
	1760	617	19	610	22	591	32	579	38	574	41	569	44	564	47	16	556	25
	2050	734	23	726	26	707	37	696	44	691	48	686	51	681	55	16	672	29
7011	710	367	14	354	16	321	23									13	308	15
	1760	1142	35	1129	41	1096	58									16	1035	45
	2050	1356	41	1343	47	1310	67									16	1249	53
7018	710	632	23													10	608	19
	1760	1892	56													12	1830	55
	2050	2240	65													12	2178	64

Dimensions

Model Size	A	B	C	D	E	H	J1	J2	K	L1	L2	N1	N2	N3	P	R	S	V
2002	10.00	4.88	2.63	2.50	1" NPT	5.00	6.88	9.69	3.13	5.13	5.13	3.75	6.25	3.75	9.38	1.25	5.00	.625
2004	12.00	5.88	3.63		2" NPT	7.00												
3002	11.56	5.69	3.38	2.50	1¼" NPT	6.75	8.94	12.81	3.94	7.25	7.25	5.00	8.50	5.00	12.19	1.75	6.75	.875*
3003	12.44	6.19	3.75		2" NPT	7.63												
3006	14.81	7.38	4.94		2½" NPT	10.00												
4002	12.94	6.25	3.69	3.00	1½" NPT	7.25	10.63	15.13	4.38	8.00	8.00	6.25	10.25	6.25	13.69	2.00	8.25	.875
4005	15.69	7.63	5.06		2½" NPT	10.00												
4007	17.44	8.50	5.94		3" NPT	11.75												
5003	15.25	7.38	4.50	3.38	2½" NPT	8.38	12.13	17.38	5.38	10.50	10.50	6.75	11.25	6.25	17.19	2.50	8.75	1.125
5006	17.88	8.69	5.81		4" NPT	11.00												
5009	20.88	10.19	7.31		4" NPT	14.00												
6005	18.75	9.44	5.63	3.69	3" NPT	10.13	15.06	21.69	6.25	17.00	11.00	8.75	14.75	8.75	19.81	3.00	11.75	1.375
6008	21.75	10.94	7.13		5" NPT	13.13	15.06		6.25									
6015	28.75	14.44	10.63		6" FLG	20.13	16.44		7.50									
7006	20.31	10.31	5.94	4.06	4" NPT	11.75	20.63	26.13	9.63	21.00	14.00	11.00	18.00	11.00	23.25	3.50	14.50	1.562
7011	25.31	12.69	8.44		6" FLG	16.75	19.50		8.50									
7018	32.31	16.31	11.94		8" FLG	23.75	19.50		8.50									

Values shown are approximate and should not be used for construction.
Certified drawings are available through your local Tuthill Vacuum & Blower Systems Sales Professional.

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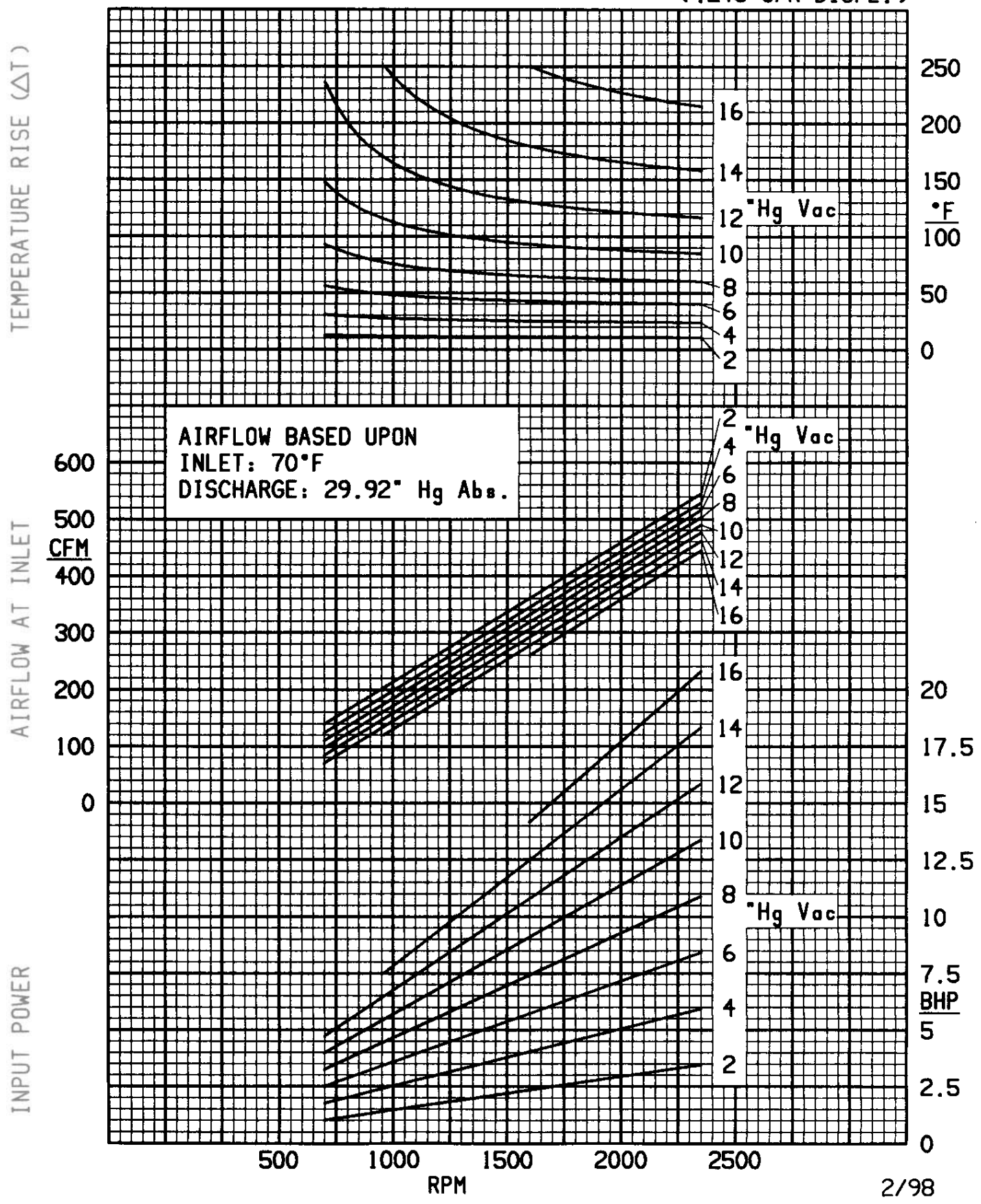
C-1451

6005 COMPETITOR PLUS™ VACUUM CURVE

(.246 CFR DISPL.)



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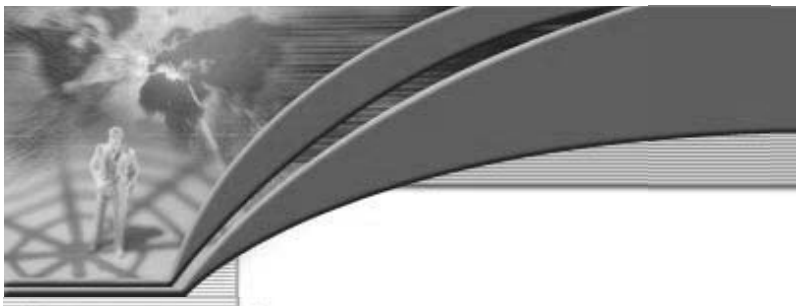

SCG Industries

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HVLS (High Vacuum Liquid Separator)

Project Background:

In 1995, a new groundwater treatment technology was developed by the US Navy. This is referred to as multi-phase vapour extraction. In this system a series of wells are put down in the area of contaminated groundwater. The wells are then connected to a vacuum pump which removes both liquid and vapour through the wells for delivery to a treatment system for subsequent discharge. SCG sought to become involved in this technology but perceived “shortcomings” in the existing system(s). It seemed that there was no way to separate the air and the water without significant emulsion. Further, sediment in the water would be detrimental to the vacuum pumps and/or liquid transfer pumps.

SCG sought to develop a system to rectify this problem by separating air and liquid streams, prior to the pump. Once this is working satisfactorily, our next challenge is the reduction of liquid carry-over (mist elimination).

Project Objectives:

To develop an effective means of separating liquid from air in a continuous vacuum extraction process without the use of an extraction pump (HVLS separator).

Even though the old design was commercially successful, SCG found limitations. In short, we need to increase liquid flow up to 30 GPM and increase airflow up to 1000 CFM.

And finally, there is the need to better appreciate the mist transfer characteristics for each of the sizes (i.e. functional limitations).

Technical Uncertainties:

- The multi-phase vapour extraction process, by its nature, has widely varying proportions of air and liquid that is contained in a system under vacuum. Due to the fluctuations in the liquid volume, the use of a pump was not practical. An alternative solution must be found. Also, the action of the pump could emulsify contaminants, thus making them difficult to separate. It was also uncertain how sediment is dealt with.
- Any systems would have to deal with great fluctuations in liquid

volume (start-up as well as seasonally).
- Because these systems handle petroleum-contaminated groundwater, any design would have to be explosion-proof.
- The configuration of control systems needed to be determined.
- Once design concepts were developed, performance limitations needed to be determined.
- Once designed concepts were developed, performance limitations needed to be determined.
- During development, the flow characteristics of the system needed to be examined in order to refine the design.
- The long-term reliability of the system had to be determined.
- The system(s) requires improved access to the maintenance components (i.e. bolt down lid).
- Maximum flow of liquid, and air, needs to be defined within practical manageability (cost, space, etc.) limits.

Technical Advancement:

- A workable, two-chamber vacuum air-liquid separator has been developed and proven in the field for flow rates up to 1000 CFM.
- Performance constraints have been defined.
- A commercial design has been developed.
- The flow characteristics of the multi-phase vacuum systems have been studied and understood.
- There is now a reduced mist discharge
- Redesigned removable lid allows the maintenance characteristics that we need

Current Project Status:

Complete as of June 2003; however, future design refinements have been planned.

E-mail us at remedi8@scgindustries.com for further information.

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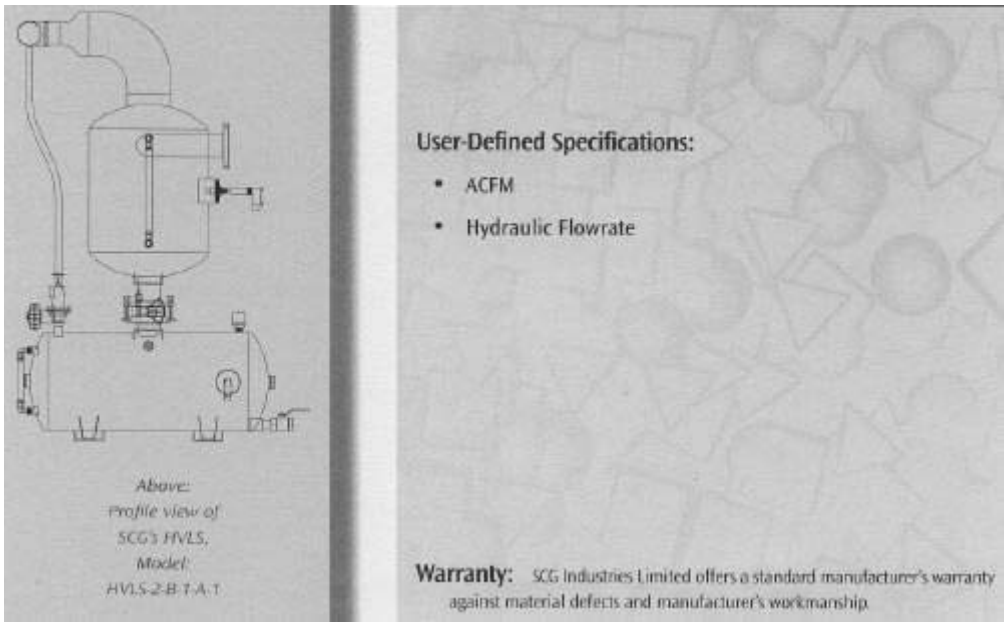
HVLS - High Vacuum Liquid Separator

The SCG patented HVLS is a unique design used for the continuous separation of liquid and vapor phases during high vacuum extraction (i.e., bioslurping). The HVLS provides upstream separation of all process liquids before the process vapor enters the vacuum driving system (i.e., liquid ring pump). Once separated, process water is allowed to pass downstream for subsequent treatment while constant liquid separation from the vapor stream is achieved.

The two-tank design provides phase separation with reduced emulsification that sets apart SCG's approach to vacuum extraction from its competitors. The HVLS construction includes two vacuum tanks, pneumatic valves, hazardous location floats, sight glasses and carbon steel inlet and outlet lines.



Above:
Profile view of SCG's HVLS, Model: HVLS-2-B-T-A-T

User-Defined Specifications:

- ACFM
- Hydraulic Flowrate

Warranty: SCG Industries Limited offers a standard manufacturer's warranty against material defects and manufacturer's workmanship.

Serving Consultants Groundwater Concerns Since 1993

LPCC - Liquid Phase Carbon Canister

The SCG assembled LPCC is employed as a tertiary water treatment vessel for the removal of dissolved VOCs from contaminated water streams. All systems are designed to meet specific site requirements.

User-Defined Specifications:

- Hydraulic Flowrate
- Contaminant Type
- Removal Efficiency
  - Influent Concentration
  - Effluent Concentration

Listed Options:

- Filter Media
  - Carbon
  - Clay
- Piping Manifold
  - Reversible
  - Bypass
- Multiple Filter Configuration
  - Parallel
  - Series
- Chain Restraint Assembly

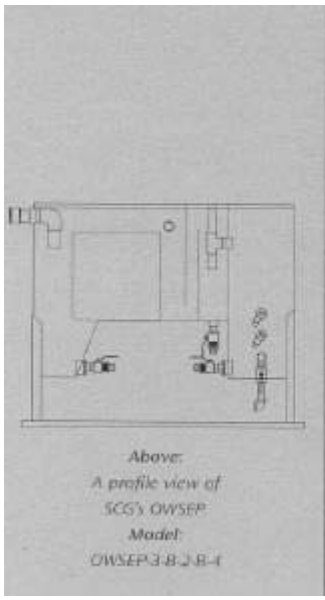
Warranty: SCG Industries Limited offers a standard manufacturer's warranty against material defects and manufacturer's workmanship.

Serving Consultants Groundwater Concerns Since 1993

OWS - Oil/Water Separator

The SCG manufactured OWS is used as a secondary water treatment vessel which is employed to coalesce and remove free phase oils and petroleum hydrocarbons from contaminated water streams. As the OWS operates most effectively with a laminar influent flow of up to 50 gpm it is typically located downstream of an ISOL.

The OWS is an epoxy-lined carbon steel tank equipped with weirs to regulate liquid flow to prevent breakthrough of separated product, an adjustable skimmer, oleophilic coalescing pack, sludge clean-outs, vapor-tight lid and vent assembly, and a hazardous location float for overflow protection.



Above:
A profile view of SCG's OWSEP Model: OWSEP3-B-J-B-4

User-Defined Specifications:

- Hydraulic Flowrate
- Contaminant Type
- Removal Efficiency
  - Influent Concentration

Listed Options:

- Cleanout chambers
  - Influent Concentration
  - Effluent Concentration
- Additional Floats

Warranty: SCG Industries Limited offers a standard manufacturer's warranty against material defects and manufacturer's workmanship.

Serving Consultants Groundwater Concerns Since 1993

ShallowTray®
low profile air strippers

1300-P Series

Model Pictured: 1331-P

Basic system includes the following components: Sump tank, cover, and trays, Polyethylene; TEFC air blower sized to number of trays; Blower inlet screen and damper; Mist eliminator, stainless steel; Water inlet spray nozzle; Water level sight tube; Gaskets; Latches; Internal piping, Schedule 80 PVC.

Options chosen for model pictured:
(None)

- ❑ Air pressure gauge
- ❑ Gravity discharge
- ❑ Steel frame
- ❑ EXP blower motors
- ❑ Discharge and/or feed pump, TEFC or EXP
- ❑ Blower start/stop panel only
- ❑ Main disconnect switch
- ❑ Standard NEMA 3R system control panel with alarm interlocks, motor starter, relays, alarm light, UL listed
- ❑ NEMA 3R control panel with level controls for pumps, alarm interlocks, motor starters, relays, alarm light, UL listed
- ❑ PurgePanel™: NEMA 4X enclosure, small blower, pressure switch, and a small explosion-proof enclosure (NEMA 7)
- ❑ Control panel IS components for remote mounted NEMA 3R panel, UL listed
- ❑ NEMA 7 and/or custom control panel
- ❑ Strobe alarm light
- ❑ Alarm horn
- ❑ Low air pressure alarm switch
- ❑ High water level alarm switch
- ❑ Discharge pump level switch
- ❑ Water pressure gauges
- ❑ Digital water flow indicator and totalizer
- ❑ Air flow meter
- ❑ Temperature gauges
- ❑ Line sampling ports
- ❑ Air blower silencer
- ❑ Auto dialer
- ❑ Automatic operation components for multiple wells
- ❑ Other custom requirements (Please call)

The full range of options are available to meet your project's specifications.

Models	flow rate	# trays	width	length	height	cfm
1311-P	0.5-15gpm	1	4'6"	2'6"	3'4"	150
	0.1-3.4m³/hr		1.4m	0.75m	1m	255m³/hr
1321-P	0.5-15gpm	2	4'6"	2'6"	4'4"	150
	0.1-3.4m³/hr		1.4m	0.75m	1.3m	255m³/hr
1331-P	0.5-15gpm	3	4'6"	2'6"	5'4"	150
	0.1-3.4m³/hr		1.4m	0.75m	1.6m	255m³/hr
1341-P	0.5-15gpm	4	4'6"	2'6"	6'4"	150
	0.1-3.4m³/hr		1.4m	0.75m	2m	255m³/hr

ShallowTray®
low profile air strippers

System Performance Estimate

Client and Proposal Information:

AAFES Station / Building 200
200 General Lee Avenue
Ft. Hamilton, Brooklyn, NY

Series chosen:	1300-P	
Water Flow Rate:	6.25 gpm	1.4 m3/hr
Air Flow Rate:	150 scfm	260 m3/hr
Water Temp:	50 °F	10 °C
Air Temp:	60 °F	16 °C
A/W Ratio:	186 :1	
Safety Factor:	15%	

Contaminant	Untreated Influent / Effluent Target	SELECTED MODEL Model P 1311 Effluent lbs/hr / ppmv / %removal	Model P 1321 Effluent lbs/hr / ppmv / %removal	Model P 1331 Effluent lbs/hr / ppmv / %removal	Model P 1341 Effluent lbs/hr / ppmv / %removal	Model P 1351 Effluent lbs/hr / ppmv / %removal
BTEX (as Benzene) Solubility 1,780 ppm Mwt 78.12	20 ppm ppm	<1 ppm 0.06 32.29 95.47%	<1 ppm 0.06 33.75 99.79%	<1 ppm 0.06 33.82 99.99%	<1 ppm 0.06 33.82 100.00%	<1 ppm 0.06 33.82 100.00%
Total ppm	20 ppm	1 ppm	0 ppm	0 ppm	0 ppm	0 ppm
Total VOC lbs/hr - ppmv		0.06 32.29	0.06 33.75	0.06 33.82	0.06 33.82	0.06 33.82
Total		95.47%	99.79%	99.99%	100.00%	100.00%

3 trays

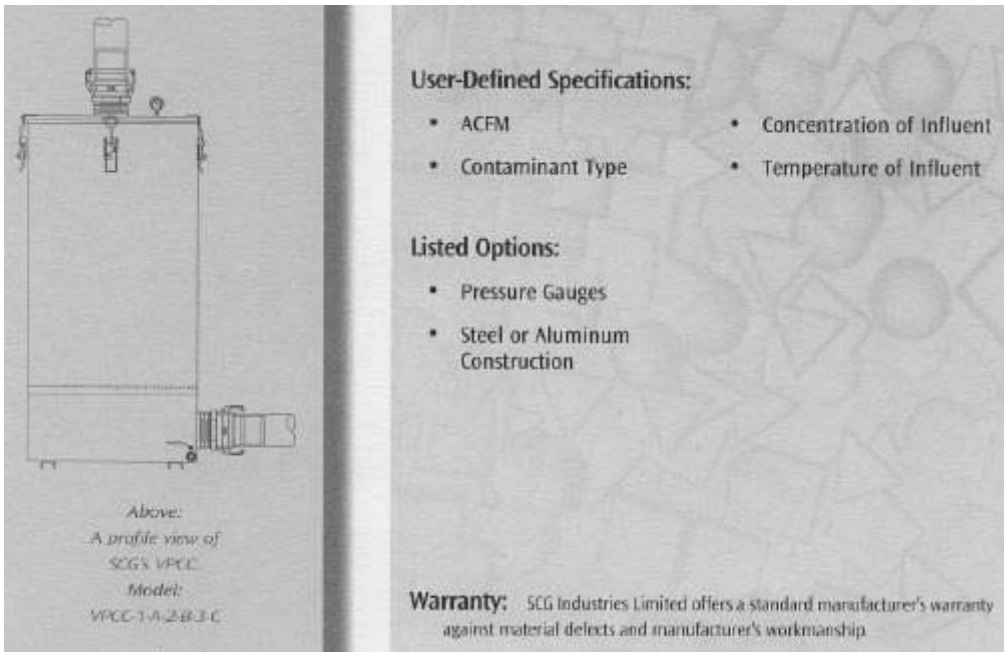
This report has been generated by ShallowTray Modeler software version 6.12e. This software is designed to assist a skilled operator in predicting the performance of a ShallowTray air stripping system. North East Environmental Products, Inc. (NEEP Systems) is not responsible for incidental or consequential damages resulting from the improper operation of either the software or the air stripping equipment. This software is

Report Generated: 9/18/2007

Modeler V6.12e 5/24/2001

VPCC - Vapor Phase Carbon Canister

The SCG manufactured VPCC is employed as a primary vapor treatment vessel for the removal of entrained VOCs from contaminated vapor streams. The bottom-loaded VPCC has a unique square construction to allow easy access for maintenance and is equipped with a sump to allow for moisture accumulation which safeguards filter media efficiency. The VPCC is suited for a non-pressurized flow and flow rates up to 1,000 cfm.



E-mail us at remedi8@scgindustries.com for further information.

Serving Consultants Groundwater Concerns Since 1993

BISCO Environmental

Model 250G Thermal / Catalytic Oxidizer - LRP Integrated

- **Dual Mode Thermal Oxidizer (catalytic or thermal)**
- **7 gauge rolled steel reactor**
- **Refractory - 2200 °F ceramic insulation media**
- **Gas train suitable for CSA and FM approval**
- **400 cell density, metal substrate, precious metal monolith catalyst**
- **Automatic purge / dilution control**
- **Allen Bradley PLC and Honeywell burner controls**
- **Yokagowa paperless chart recorder**

Specifications:

Design Air Flow - 250 SCFM

Max Air Flow - 300 SCFM

Min Air Flow - 50 SCFM

Max Heater Input - 750,000 BTUH

Min Thermal Temp. - 1400 °F

Max Thermal Temp. - 1600 °F

Catalyst Operating Temp - 600 °F

Max Catalyst Temp - 1200 °F

Catalyst Volume - 0.458 ft³

Destruction Efficiency - > 99%

Max LEL - 25% w/o sensor

Time to Reach Temp - 10 minutes

Combustion Fan HP - 2

Noise Level - 80 dBa @ 10'

BISCO Environmental

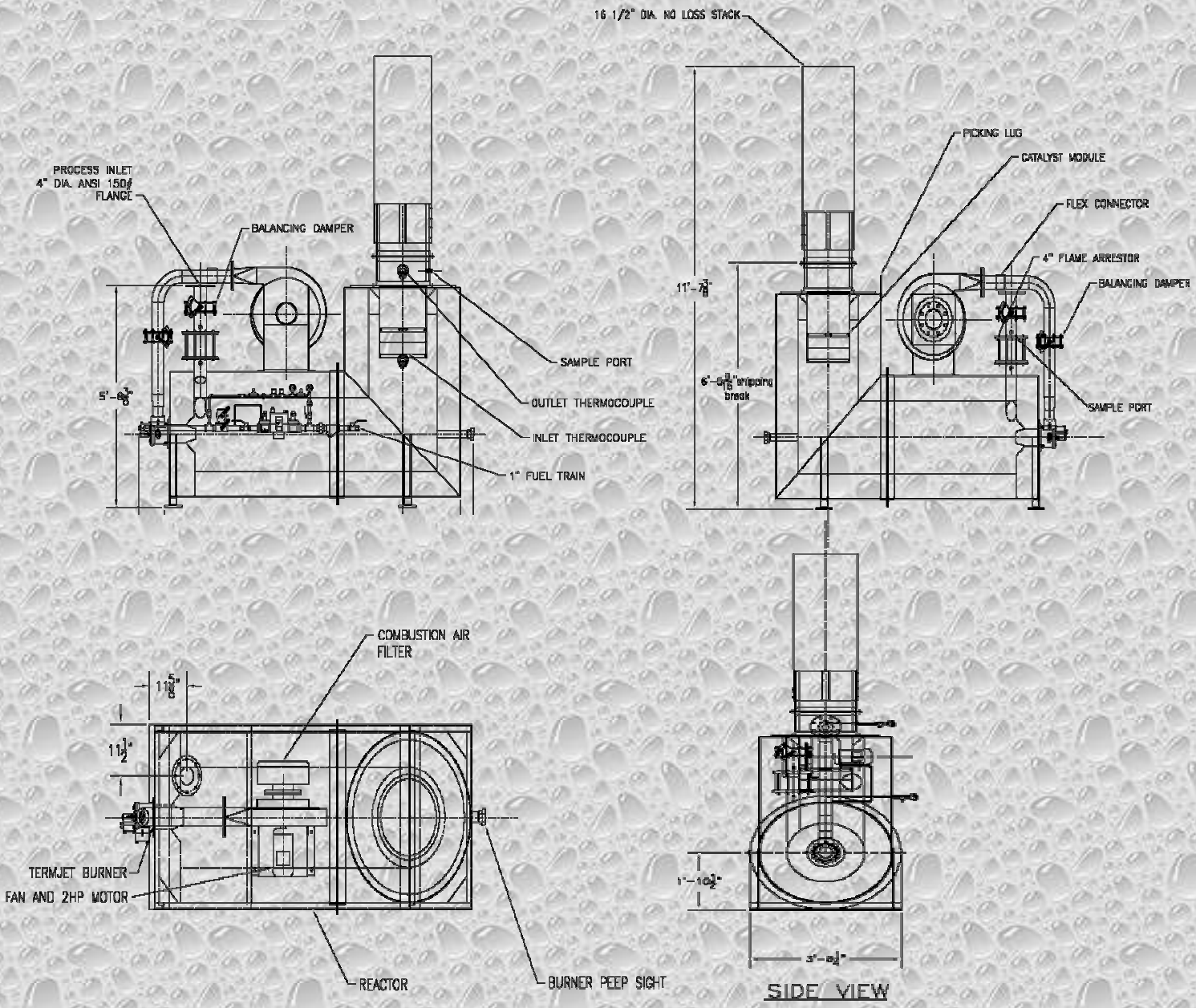
91 Pacella Park Drive
Randolph, MA 02368

1735 East Wilshire
Suite 805
Santa Ana, CA 92705
www.biscoenv.com

714-442-9183
Fax: 714-242-1419

Soil & Groundwater Remediation Equipment

91 Pacella Park Drive
Randolph, MA 02368
781-963-0090
Fax: 781-986-1540



Satellite Office Locations

7825 Crest Hammock Way
Sarasota, FL 34249
941-342-6585
bbaize@biscoenv.com

1735 East Wilshire Avenue
Suite 805
Santa Ana, CA 92705
714-442-9183
tierneyef@biscoenv.com

Mid Atlantic Environmental Equipment
15 Carroll Drive
Blufton, SC 29910
843-836-1804
sevans@mae2.com

APPENDIX - C
Specifications

LIST OF SPECIFICATIONS

Section #	Description
01037	**Subcontractor Heath and Safety**
01300	**Submittals**
01312A	**Quality Control System**
01396	**Subcontractor Construction Operations Plan**
01740	**Warranties**

SECTION 01037

SUBCONTRACTOR HEALTH AND SAFETY

PART 1 GENERAL

1.01 Summary

A. Site activities in conjunction with this project may pose unique safety and chemical and physical exposure hazards that require specialized expertise to effectively address and eliminate. The Subcontractor shall be responsible for preparing and implementing a detailed, effective Site-Specific Health & Safety Plan (HASP). At a minimum this plan shall meet the requirements, procedures and protocols set forth in this section. The Subcontractor shall amend this plan as necessary to reflect proposed operations and activities associated with the proposed scope of work. The HASP will be subject to the review and acceptance of USACE, and any review comments must be addressed to the satisfaction of USACE prior to the initiation of any on-site activities. To facilitate the timely and proper preparation of the HASP, an initial conference call will be arranged between USACE and the HASP author from the selected firm.

Due to the nature of this work and safety hazards associated with this type of operation, a thorough evaluation of the site and implementation of safety procedures is necessary to reduce the potential for accidents and to minimize risks to workers.

All health and safety procedures, precautions, and personal protective equipment to be employed during construction shall be specified in detail in the Subcontractor's HASP. The HASP must contain adequate details to address the potential health and safety concerns that may be encountered **for each site task and operation**, as required by OSHA standards 29 CFR 1910.120 and 1926.65. These OSHA standards will be the primary reference tool in reviewing the selected contractors HASP, and careful attention must be paid in the preparation of this document to ensure that all requirements of these regulations pertaining to HASPs are adequately addressed. No field work shall begin until the HASP and Exhibits 1-3 have been submitted to and accepted in writing by USACE. Additionally, the Subcontractor shall ensure that safety and health provisions are followed by all their employees and any lower tiered subcontractors, suppliers and support personnel.

1.02 References

The publications listed below form a part of this specification to the extent referenced. The publications are referred to in the text by basic designation only.

A. CODE OF FEDERAL REGULATIONS

29 CFR 1910 Occupational Safety and Health Standards (all applicable sections, with emphasis on – but not limited to – the following:

29 CFR 1910.120 Hazardous Waste Operations and Emergency Response

29 CFR 1910.95 Occupational Noise Exposure

29 CFR 1910.134 Respiratory Protection

29 CFR 1910.1200 Hazard Communication

29 CFR 1926 Safety and Health Regulations for Construction (all applicable sections, with emphasis on – but not limited to – the following:

29 CFR 1926 Subpart P - Excavations

29 CFR 1926.65 Hazardous Waste Operations and Emergency Response

29 CFR 1926.52 Occupational Noise Exposure

29 CFR 1926.103 Respiratory Protection

29 CFR 1926.59 Hazard Communication

40 CFR 260-270 Environmental Protection Agency (USEPA) Hazardous Waste Requirements

B. AMERICAN NATIONAL STANDARDS INSTITUTE (ANSI) PUBLICATIONS

Z88-1 American National Standard Practices for Respiratory Protection

C. U.S. ENVIRONMENTAL PROTECTION AGENCY (USEPA) PUBLICATIONS

600/4-84/075 Characterization of Hazardous Waste Sites - A Methods Manual, Volume I - Site Investigations

D. OWSER Directive

9234.1-02 CERCLA Compliance with other Laws Manual

EPA 1988 Standard Operating Safety Guidelines (SOSG)

450/1-89-001 Air/Superfund National Technical Guidance Study Series Volume I - Application of Air Pathway Analyses for Superfund Activities

E. UNITED STATES ARMY CORPS OF ENGINEERS (USACE)

EM 385-1-1 Safety and Health Requirements

F. U. S. ARMY

REG 385-100 DARCOM Safety and Health Requirements

G. NATIONAL INSTITUTE OF OCCUPATIONAL SAFETY AND HEALTH NIOSH)

DHHS (NIOSH) NIOSH/EPA/USCG/ EPA Occupational Safety and Pub. # 85-115 Health Guidance manual for Hazardous Site Activities

DHHS (NIOSH) NIOSH Guide to Industrial Respiratory Protection Pub. # 85-116

DHHS (NIOSH) NIOSH Certified Equipment Pub. # 90-102

1.03 Submittals

The following shall be submitted in accordance with Section 01300 SUBMITTALS:

A. Site-Specific Health and Safety Plan (HASP)

1. Health and Safety Certificates (ref. EXHIBIT 1 - 3)

a. 1, OSHA Compliance and Training Letter

b. 2, Subcontractor Medical Approval Form

c. 3, Medical Surveillance Letter

1.04 Requirements

A. Site-specific safety and health procedures are required due to the hazardous conditions potentially present onsite during construction activities. The Subcontractor shall develop and maintain onsite at all times during performance of the work, a Health and Safety Plan (HASP) detailing the safety and health procedures at this site and shall obtain acceptance of the plan by USACE prior to the initiation of construction activities. Subcontractor shall implement, maintain, and enforce these procedures prior to and during all phases of the project. Should any unforeseen or site-specific safety factors, health hazards, or conditions become evident during the performance of the work, notify USACE verbally and in writing as soon as possible for resolution. Subcontractor shall take prudent action to establish and maintain safe working conditions and to safeguard employees, the surrounding community, and the environment.

B. The HASP shall comply with all federal, state, and local health and safety requirements.

1.05 Protection of Existing Work to Remain

A. The Subcontractor shall collect, stage, remove, and handle contaminated soil and associated waste materials or perform other work as specified without damage or contamination to adjacent properties. Where such properties are damaged or contaminated as verified by USACE using visual inspection or sample analysis, the Subcontractor shall restore them to original conditions or completely decontaminate

them as deemed appropriate by USACE. This includes inadvertent spills of wastes, dirt, dust, or debris in which levels of contamination are found to exceed regulatory limits. When spills occur, the Subcontractor shall stop work immediately and clean up the spill. When USACE is satisfied that decontamination levels have been achieved either by visual inspection or sampling results, USACE shall then permit the Subcontractor to proceed with work operations. Subcontractor shall be liable for all costs associated with the cleanup, restoration, verification of cleanup of a spill, and disposal of all wastes generated during spill cleanup activities.

1.06 Medical Surveillance Requirements

A. All Subcontractor personnel entering contaminated areas of the site must have completed a medical examination by a licensed, board-certified physician specializing in occupational medicine complying with the requirements of 29 CFR 1910.120 and 1926.65 within 12 months prior to entering the site. Written certification, signed by the physician, of fitness for work and ability to wear required respiratory protection shall be provided to USACE prior to assigning personnel onsite.

B. Non-scheduled medical examinations shall be conducted under one or more of the following circumstances:

1. After acute exposure to any toxic or hazardous material

2. At the discretion of USACE, and the occupational physician when an employee has been exposed to dangerous levels of toxic or hazardous materials

3. At the discretion of USACE and the occupational physician, and at the request of an employee with demonstrated symptoms of overexposure to toxic or hazardous materials

C. Medical Records (29 CFR 1910.120)

1. The Subcontractor shall maintain complete and accurate records of employee's medical examinations and exposure data for at lease 30 years (or longer, if required by Federal, State, or local requirements) after termination of employment, and shall make records of the required medical examination and exposure data available for inspection and copying to appropriate local, state, and/or federal regulatory agencies, or authorized representative of them, and an employee's physician upon the request of the employee or former employee. Medical records are not to be submitted to USACE.

1.07 Training Requirements

A. Qualified personnel shall certify that all Subcontractor personnel (including visitors) entering the Exclusion or Contamination Reduction Zones have received appropriate health and safety training in accordance with 29 CFR 1910.120 and 29 CFR 1926.65. Initial training shall consist of a minimum of 40 hours offsite and 3

days of actual field experience under the direct supervision of a trained experienced supervisor. This training will be updated annually with minimum of 8 hours of training offsite. In addition, Subcontractor's supervisory personnel shall have a minimum of 8 hours of additional specialized training on managing health and safety concerns in hazardous waste operations. This supervisory training also carries an annual refresher training requirement that must be satisfied. The Subcontractor may petition USACE to reduce the initial training requirement to 24 hours upon documentation that workers who are selected for the 24-hour training are in compliance with 1910.120 and 1926.65 paragraphs (e)(3)(ii.) or (iii.). Documentation of all such training must be submitted to USACE before any employees are allowed in the Contamination Reduction or Exclusion Zones.

B. In addition to the above training, prior to entering contaminated areas, all personnel (including visitors) shall be provided site-specific training and shall read the Health and Safety Plan (HASP) and be familiar with the use of safety, respiratory, and protective equipment, and with the health, safety, and security procedures. The Subcontractor shall maintain documentation of site-specific training on site, and must make all training and medical surveillance documentation available to USACE upon request. The site-specific briefing shall also include a review of the hazard communication program in accordance with 29 CFR 1910.1200.

C. The Subcontractor shall provide at least one certified First Aid Technician on site during all site activities, who must be certified by the American Red Cross or other approved agency in First Aid and CPR. The Subcontractor shall submit the names(s) of all first aid/CPR technician(s) and copies of the current first aid and CPR certification(s) to USACE prior to setup of work operations.

1.08 Responsibilities

A. Certified Industrial Hygienist

1. The Subcontractor shall utilize a Certified Industrial Hygienist (CIH) certified by the American Board of Industrial Hygiene to develop and approve the HASP and to provide the continued support for all health and safety activities as needed, including the upgrading and downgrading of personal protective equipment (PPE) levels. The qualifications of the CIH shall include at least 3 years of experience working in the hazardous waste industry, as well as demonstrable expertise in the development of air monitoring and PPE programs for work in potentially toxic atmospheres. The CIH must have formal training in occupational safety and health and have a working knowledge of applicable Federal and State health and safety regulations.

B. Safety and Health Compliance

1. In addition to the requirements detailed in this specification, the Subcontractor shall comply with the laws, ordinances, criteria, rules, and regulations of federal, state, regional, and local authorities regarding handling, sampling, and storing of hazardous wastes. The Subcontractor shall submit matters of interpretation of standards to the appropriate administrative agency for resolution before initiating work operations and, if necessary, during operations. Where the requirements of applicable laws,

rules, criteria, ordinances, regulations, and referenced documents vary, the most stringent requirement as defined by USACE shall apply. Any disregard for the provision of these Specifications shall be deemed just and sufficient cause of termination of Contract or any Subcontract without compromise or prejudice to the rights of USACE. The subcontractor shall also provide morning safety briefings to discuss elements of that day's planned activities and items that may be the focus of near miss or actual incidents.

C. Safe Work Permits

1. Safe Work Permits may be required (or some reasonable alternative that the subcontractors health and safety plan specifies) to guide personnel in daily operations on a task by task basis. An example permit is provided in Exhibit 4. USACE may require the subcontractor to prepare and issue safe Work Permits for each planned task. These permits must be made available to USACE upon request. The Safe Work Permits are to based on the elements of the subcontractor's Site-Specific Health and Safety Plan, and should provide more detailed guidance for specific operations.

   Generally, the requirement for these permits will be limited to either complex tasks (such as permit-required confined space entry operations) or when multiple tasks are performed at the same time at different areas of a site. In situations where a Safe Work Permit is prepared and the requirements specified in it are more conservative than those specified in the subcontractor's HASP, the Safe Work Permit will take precedence.

D. Respirator Program

1. The Subcontractor shall establish and implement a personnel respirator program as required by ANSI Z 88.2, 29 CFR 1910.134, and 29 CFR 1926.103.

E. Hazard Communication Program

1. The Subcontractor and each lower tier subcontractor shall establish a Hazard Communication Program as required by 29 CFR 1910.1200 and 29 CFR 1926.59. This must address all aspects of a minimum-required program specific to the work site.

F. Site Equipment

1. The Subcontractor and each lower tier subcontractor shall provide well-maintained equipment suitable to carry out the work. All equipment brought on-site will be subjected to an equipment inspection prior to commencement of on-site activities. USACE will oversee the equipment inspections. All repairs to be made will be completed prior to the commencement of work. Should the required repairs cause a delay the subcontractor will be fully responsible for any impact on schedule and associated costs.

G. Permits

1. The Subcontractor and each lower tier subcontractor shall secure all necessary permits such as excavation/dig permits and utilities identification/demarcation prior to all subsurface operations. USACE will assist the subcontractor in these efforts.

H. Requirements and Restrictions for Heavy Equipment

1. Any heavy equipment (e.g., bulldozers, cherry pickers, forklift trucks, front-end loaders, etc.) brought to the site must be in proper safe working order, and have all manufacturer's provided guarding devices securely in place. All mobile vehicles must be equipped with operable back-up motion alarms. Also, functional emergency kill switches (if applicable) must be in place and properly marked. These devices must be inspected and tested as part of the initial equipment inspection process upon arrival on site, and tested periodically throughout the performance of site work. **Any equipment found to be deficient in these areas must not be permitted to be operated on site**.

   All vehicle operators must be properly trained and licensed, and must be able to provide proof of such training to USACE prior to being permitted to operate the machinery.

   Subcontractor personnel will be prohibited from performing unsafe practices such as climbing the bucket arm. If any maintenance is required on elevated surfaces, appropriate fall protection devices (fall arrest devices such as belts, lanyards, fall protection slide rail, or ladders that meet the requirements of applicable OSHA and ANSI standards) must be provided by the subcontractor, and properly used.

   Only equipment approved by the equipment manufacturer may be used in conjunction with heavy equipment. Additional requirements and restrictions may be specified in the general HASP, the subcontractor's Site-Specific Health and Safety Plan, or other site documents.

PART 2 PRODUCTS

Not Applicable.

PART 3 EXECUTION

3.01 Site-Specific Health and Safety Plan

In addition to the direction on HASP preparation specified in section 1.01 of this solicitation package, the following additional direction is also relevant for this document.

A. The Subcontractor shall prepare a site specific Health and Safety Plan (HASP) that will govern all activities under this project. The following standards are a partial listing of requirements that must be considered and addressed (as applicable) to

the planned Scope of Work shall be considered in preparing the HASP. The subcontractor is responsible for identifying any other requirements that may apply to the planned scope of work and addressing them in their HASP:

- Subpart C - General Safety and Health Provisions

- Subpart D - Occupational Health and Environmental Controls

  ⇒ 1926.50 - Medical services and first aid
  ⇒ 1926.52 - Occupational noise exposure
  ⇒ 1926.55 - Gases, vapors, fumes, dusts, and mists
  ⇒ 1926.59 - Hazard communication
  ⇒ 1926.64 - Process safety management of highly hazardous chemicals

- Subpart E - Personal Protective Equipment and Life Saving Equipment(1926.95- .103)

  ⇒ 1926.95 - Criteria for personal protective equipment
  ⇒ 1926.96 - Occupational foot protection
  ⇒ 1926.100 - Head protection
  ⇒ 1926.101 - Hearing protection
  ⇒ 1926.102 - Eye and face protection
  ⇒ 1926.103 - Respiratory protection

- Subpart F - Fire Protection and Prevention

  ⇒ 1926.150 - Fire protection
  ⇒ 1926.151 - Fire prevention
  ⇒ 1926.152 - Flammable and combustible liquids

- Subpart H - Materials Handling, Storage, Use, and Disposal

  ⇒ 1926.251 - Rigging equipment for material handling

- Subpart I - Tools - Hand and Power

  ⇒ 1926.300 - General requirements
  ⇒ 1926.301 - Hand tools
  ⇒ 1926.302 - Power operated hand tools

- Subpart J - Welding and Cutting

- Subpart K - Electrical

  ⇒ 1926.417 - Locking and tagging of circuits

- Subpart O - Motor Vehicles, Mechanized Equipment, and Marine Operations

⇒ 1926.600 - Equipment
⇒ 1926.601 - Motor vehicles

- Subpart P - Excavations

- Subpart Q - Concrete and Masonry Construction

⇒ 1926.700 - Scope, application, and definitions applicable to this subpart
⇒ 1926.701 - General requirements
⇒ 1926.702 - Requirements for equipment and tools
⇒ 1926.703 - Requirements for cast-in-place concrete

B. The HASP must include the following minimum-required elements:

1. Site overview and site control measures, including a site map showing the exclusion zone, decontamination zone, and support zone.

2. Names of key personnel and alternates responsible for site safety and health, including a Site Safety and Health Officer (SSHO) and Certified Industrial Hygienist (CIH). Telephone numbers, addresses, and organizations of these individuals shall be listed in the plan and posted in a conspicuous place at the site.

3. A safety and health (chemical and physical) risk or hazard analysis for each site task and work operation.

4. An Accident Prevention Plan including methods of reducing hazards.

5. Employee training requirements.

6. Frequency and types of air monitoring, personnel monitoring, and environmental sampling techniques and instrumentation to be used, including methods of maintenance and calibration of monitoring and sampling equipment to by used.

7. Personnel and equipment decontamination procedures, including a diagram of the facilities.

8. Emergency Response Plan and contingency procedures, including onsite first aid and emergency equipment.

9. Confined Space Entry Plan (if confined space activities are planned)

10. Spill containment program.

11. Site Postings, Logs, reports, and record keeping.

C. The HASP shall also address how and where the inventory of hazardous chemical substances supplied by the Subcontractor and lower tier subcontractor(s) will be prepared and maintained, and also shall address the collection and maintenance of

MSDSs at the work site. Include in the HASP provisions related to initial site preparation prior to implementation of the remedial activities described in the Contract. It shall be the responsibility of the Subcontractor to conduct whatever testing and monitoring is necessary to assure safe operations during the initial site preparation work.

D. Should the Subcontractor seek relief from, or substitution for, any portion or provision of the HASP, Subcontractor shall submit such requests to USACE in writing. If approved, authorization will be provided in writing by USACE.

E. Establish Procedures for Weather-Related Problems

1. Weather conditions can affect site work and impact on personnel safety. Work practices shall be written to account for extremes in weather conditions and the potential impact of these conditions on work safety onsite and public safety offsite. Procedures shall be specified to suspend or halt remediation activities under given environmental conditions.

F. Unforeseen Conditions

1. Should any unforeseen potentially hazardous condition become evident during the performance of work at the site, it shall be the Subcontractor's responsibility to bring such to the attention of USACE for resolution both verbally within one work shift and in writing within 48 hours. In the interim, the Subcontractor shall implement all necessary prudent action to establish and maintain safe working conditions and to safeguard employees, the public, and the environment.

G. Temporary Facilities

1. Any temporary facilities or special construction procedure required to construct Support and Contamination Reduction Zones shall be the responsibility of the Subcontractor and shall be delineated in the HASP.

3.02 Site Control

Work performed at the site will be required to be segregated into a three-zone approach. These zones must be addressed in the HASP, and they must include the following.

A. Exclusion Zone

1. The Exclusion Zone includes all areas within the designated work area, and all potentially contaminated areas. All such areas will be posted with warning signs for the duration of remedial activities. Only personnel involved with the work operations and necessary equipment will be allowed in this zone. The initial minimum level of PPE required in this zone shall be in accordance with these Specifications and with determinations made by the CIH and the SSHO after monitoring and onsite evaluation.

B. Decontamination Zone

1. The Decontamination Zone is located directly adjacent to the exclusion Zone. This zone shall provide for the transfer of equipment and materials to and from the Support Zone and will include decontamination equipment for both personnel and equipment.

C. Support Zone

1. The Support Zone shall be established adjacent to the Decontamination Zone in an area where active or passive contamination from the work site cannot be transported. Support facilities as well as clean safety and work equipment are stored in this zone.

D. Daily Activities Log

1. The subcontractor and the prime contractor representative will control and document expenditures of resources, equipment, and manpower, such as through the completion of a Daily Activities Log. The format used will be mutually agreeable to both parties. The daily activities logs will be utilized to show expenditures and activities conducted. This document and either the field logbook entries or the Safe Work Permits will be used to document health and safety measures instituted during the daily execution of specific tasks.

E. Inspections

1. Inspections of work performed, materials employed, equipment, and ongoing operations will be conducted by the site owner or their designated representative and USACE.

F. Site Ownership Inspections

1. Site owner inspections may be conducted periodically to ensure the acceptability of all work, materials, and equipment in support of elements as defined within these specifications.

G. USACE

1. USACE, or its' representative, will also conduct inspections for the same reasons as identified above. The inspections will focus on determining compliance with the elements specified in the HASP, or other site guidance documents as applicable (e.g., Safe Work Permits). The control and inspection system will form a fundamental basis for measurement and payment at the completion of the contract.

3.03 Emergency Equipment and First Aid Requirement

A. Eyewash and Fire Extinguishers in the Decontamination Zone

1. Provide an approved emergency eye wash station (as per ANSI Z358.1) with minimum rating of 2-1 and one (1) B:C type dry chemical fire

extinguishers. Adequate supplies of potable water must be available at all times during active work for routine and emergency decontamination. The location of the fist aid kit, eyewash stations, and fire extinguishers shall be appropriately marked.

3.04 Emergency Response and Contingency Procedures

A. Emergency Response and Contingency Plan

1. The Subcontractor shall develop site-specific emergency response and contingency plans as required by 29 CFR 1910.120 for chemical exposures, personal injury, potential or actual fire or explosion, and environmental accidents, as part of the HASP.

2. These plans shall include line of authority, evacuation procedures and routes to places of refuge or safe distances from the danger area. Instructions for possible mobilization/evacuation of the surrounding community shall also be included.

B. In Case of Emergency

1. The Subcontractor shall take diligent action to remove or reduce the cause of the emergency, to alert USACE, and institute measures necessary to prevent any repetition of the conditions or actions leading to, or resulting in, the emergency. Subcontractor shall provide written notification of emergencies to USACE within 24 hours.

C. Emergency Medical Care

1. Subcontractor shall pre-arrange for emergency medical care services at a nearby medical facility and establish emergency routes. Additionally, the Subcontractor shall make arrangements with or notify attending medical staff of the potential requirement to make contact with contaminated skin and/or clothing.

3.05 Personnel Protective Equipment (PPE) Requirements

A. Personnel Protective Equipment Procedures

1. The appropriate level of PPE and procedures to be followed shall be initially determined by the Subcontractor CIH and periodically evaluated by the SSHO based on a review of existing data, personal observation, and an air monitoring program.

B. Personnel Protective Equipment

1. Subcontractor shall provide all onsite personnel with appropriate PPE, and ensure that all safety equipment and protective clothing is kept clean and well maintained. The Subcontractor shall establish "action levels" for

airborne contaminants in the HASP. These levels shall be used in conjunction with air monitoring results and direct contact potential to determine upgrading or downgrading of PPE levels to be worn. Any changes to the entry level of the PPE shall be approved by USACE.

3.06 Personal Hygiene and Decontamination

A. Personal Hygiene

1. Subcontractor shall specify personal hygiene concerns and requirements for this site in the HASP. Subcontractor shall provide and require that personnel use appropriate storage containers for used disposable clothing.

B. Decontamination Procedures

1. Subcontractor shall specify required decontamination procedures for both personnel and equipment, including procedures for removing contaminated clothing, cleaning personnel and equipment, disposing of disposable clothing, and laundering of re-useable clothing.

C. Vehicle Decontamination

1. Personnel engaged in vehicle decontamination shall wear PPE including disposable clothing and respiratory protection consistent with the requirements of this Specification and the HASP.

D. Eye Protection

1. When the use of a full-face respirator is not required, the Subcontractor shall provide safety glasses, goggles, or face shields to, and mandate their use by personnel engaged in remediation operations.

E. Caution Signs and Labels

1. The Subcontractor shall post caution signs at all approaches to the Exclusion Zone and the Contamination Reduction Zone. The Subcontractor shall locate signs at such a distance that personnel may read the sign and take the necessary protective steps required before entering the area. The Subcontractor shall provide labels to all contaminated materials, scrap, waste, debris, and other products.

F. Disposal of PPE and Decontamination Fluids

1. The Subcontractor will package used PPE and decon fluids in appropriate containers and properly dispose of the materials in accordance with Federal, State, and Local regulations at no additional cost to USACE.

3.07 Onsite Medical Monitoring

A. Subcontractor shall include procedures for monitoring personnel for physical conditions (e.g., heart rate, body temperature, and body water loss) in the HASP. When necessary, monitoring shall be performed by a person with a current first aid/CPR certification who is trained to recognize the symptoms of various physical conditions and shall comply with the NIOSH/OSHA/USCG/EPA Occupational Safety and Health Guidance Manual for Hazardous Waste Site Activities.

3.08 Accident Prevention Plan

A. Accident Prevention

1. Subcontractor shall include an Accident Prevention Plan in the HASP. The plan shall address the safety hazards expected, personnel responsibilities, task-specific safety procedures, subcontractor supervision, safety meetings, fire prevention and protection, site housekeeping, mechanical equipment inspection, first aid and medical concerns, sanitation, accident reporting, and daily safety inspections conducted by Subcontractor personnel.

B. Daily Safety Log

1. Subcontractor shall use daily safety logs to document the inspection, noting safety deficiencies and corrective actions taken.

3.09 Work Procedure

A. The Subcontractor shall perform the scope of work in accordance with all pertinent local, state and federal regulatory guidance specified herein. Personnel shall wear and utilize all protective clothing, dosimeters, and equipment as specified in the approved HASP. Eating, smoking, or drinking shall not be permitted in the Exclusion Zone or the Decontamination Zone. Personnel of other trades not engaged in the supervision, handling, construction, sampling, or disposal of contaminated materials shall not be exposed at any time to concentrations of contaminants in excess of regulatory limits unless all personnel protection provisions of this specification are complied with by the trade personnel. If contamination escapes to areas outside of the Exclusion or Decontamination Zones, the Subcontractor shall stop work immediately and correct the condition to the satisfaction of USACE prior to resumption of work.

B. Contaminated Materials Handling Procedures

1. All contaminated materials, waste, debris, clothing, and water shall be properly handled in accordance with the regulations stipulated in 40 CFR 761 and 40 CFR parts 262-264.

C. Site Inspection

1. While performing this work the Subcontractor shall be subject to onsite inspection by USACE who may be assisted by or represented by safety personnel. If the work is found to be in violation of these Specifications,

USACE or his representative will issue a stop work order to be in effect immediately and until the violation is resolved. Stand by time required during resolution of the violation shall be at the Subcontractor's expense.

EXHIBIT 1

TRAINING - OSHA COMPLIANCE LETTER

The following statements must be typed on company letterhead and signed by an officer of the company to accompany certificates or other acceptable means of certification attesting to the following:

LOGO
XYZ CORPORATION
555 E. 5th Street
Nowheresville, Kansas 55555

Month, day, year

USACE
_____
_____
_____

Subject: Health and Safety Training - OSHA Compliance

Dear _____:

As an officer of XYZ Corporation, I hereby state that I am aware of the potential hazardous nature of the subject project. I also understand that it is our responsibility to comply with all applicable occupational safety and health regulations, including those stipulated in Title 29 of the Code of Federal Regulations (CFR) Parts 1926 (OSHA Construction Industry standards) and 1904 (injury and illness recordkeeping and reporting requirements).

I also understand that many of the applicable regulations require an appropriate level of training for certain employees engaged in those operations. In this regard, I hereby state that all XYZ company employees who will be assigned to work on this project will have satisfied appropriate health and safety training for the planned site activities. Copies of training certificates for these employees will be provided to USACE.

Sincerely,

(Name of Company Officer)

Enclosed - Copies of Training Certificates

EXHIBIT 2

TRAINING/MEDICAL SURVEILLANCE DOCUMENTATION

My signature below indicates that I am aware of the potentially hazardous nature of performing remediation activities at the __ site, and that I have received site-specific training which included the elements presented below:

- Names of personnel and alternates responsible for site safety and health
- Safety, health and other hazards present on site
- Use of personal protective equipment
- Work practices to minimize risks from hazards
- Safe use of engineering controls and equipment
- The contents of the Site-Specific Health and Safety Plan, and other applicable site guidance documents
- Use of the Safe Work Permit System (when used as stipulated in the Health and Safety Plan)
- Emergency action procedures (evacuation and assembly points)
- Spill response procedures
- Review the contents of relevant Material Safety Data Sheets
- Associated hazards and restrictions within the facility
- Other topics:_____
  _____
  _____
  _____
  _____

I further state that I have been given the opportunity to ask questions and that all of my questions have been answered to my satisfaction.

Name	Signature	Training Date

EXHIBIT 3
MEDICAL DATA SHEET

This form must be completed by all on-site personnel prior to the commencement of on-site activities. The original shall be maintained at the site command post during on-site activities. This information must be delivered to any attending physician when medical assistance is needed.

Project _____

Name _____ Home Telephone _____

Address _____

Age _____ Height _____ Weight _____

Name of Next Kin _____

Drug or other Allergies _____

Particular Sensitivities _____

Do You Wear Contacts? _____

Provide a Checklist of Previous Illnesses or Exposure to Hazardous Chemicals__

_____

_____

What medications are you presently using?_____

_____

_____

Do you have any medical restrictions?_____

_____

_____

Name, Address, and Phone Number of personal physician:_____

_____

_____

I am the individual described above. I have read and understand the Health and Safety Plan, Site-Specific Safety and Health Program, and other applicable site guidance documents.

_____ _____

Signature Date

EXHIBIT 4
SAFE WORK PERMIT

Permit No. _____ Date: _____ Time: From _____ to _____

SECTION I: General Job Scope (To be filled in by person performing work)

I. Work limited to the following (description, area, equipment used): _____

II. Names: _____

III. On-site Inspection conducted □ Yes □ No Initials of Inspector _____ _____
USACE representative

SECTION II: General Safety Requirements (To be filled in by permit issuer)

IV. Protective equipment required

Level D □ Level B □
Level C □ Level A □
Detailed on Reverse

Respiratory equipment required

Full face APR	□	Escape Pack	□
Half face APR	□	SCBA	□
SKA-PAC SAR	□	Bottle Trailer	□
Skid Rig	□	None	□

Modifications/Exceptions: _____

V. Chemicals of Concern | Action Level(s) | Response Measures

_____ _____ _____
_____ _____ _____

VI. Additional Safety Equipment/Procedures

Hard-hat	□ Yes □ No	Hearing Protection (Plugs/Muffs)	□ Yes □ No
Safety Glasses	□ Yes □ No	Safety belt/harness	□ Yes □ No
Chemical/splash goggles	□ Yes □ No	Radio	□ Yes □ No
Splash Shield	□ Yes □ No	Barricades	□ Yes □ No
Splash suite/coveralls	□ Yes □ No	Gloves (Type)	□ Yes □ No
Steel toe/shank Workboots	□ Yes □ No	Work/rest regimen	□ Yes □ No

Modifications/Exceptions: _____

VII. Procedure review with permit acceptors

	Yes	NA		Yes	NA
Safety shower/eyewash (Location & Use)	□	□	Emergency alarms	□	□
Procedure for safe job completion	□	□	Evacuation routes	□	□
Contractor tools/equipment inspected	□	□	Assembly points	□	□

VII. Equipment Preparation

	Yes	NA
Equipment drained/depressurized	□	□
Equipment purged/cleaned	□	□
Isolation checklist completed	□	□
Electrical lockout required/field switch tested	□	□
Blinds/misalignments/blocks & bleeds in place	□	□
Hazardous materials on walls/behind liners considered	□	□

VIII. Additional Permits required (Hot work, Permit-Required Confined Space, excavation etc.). .. □ Yes □ No
If yes, fill out appropriate section(s) on safety work permit addendum

IX. Special instructions, precautions: _____

Permit Issued by: _____ Permit Accepted by: _____
Job Completed by: _____ Date: _____

ATTACHMENT 1

CONTRACTOR HEALTH AND SAFETY QUESTIONNAIRE

CONTRACTOR HEALTH AND SAFETY QUESTIONNAIRE

Date:_____ Telephone Number:_____
Fax Number: _____

Name of Company: _____

Address: _____

_____

Submitted By: _____ Title: _____

Type of Services Performed: _____

_____

Your firm's primary Standard Industry Classification (SIC) Code: _____

Safety Performance Data

1. Has your company performed work as a subcontractor to USACE previously?
   ☐ Yes ☐ No

   If yes, explain the nature of the work, project location, and project dates (if your company has worked for USACE on multiple contracts, include this information only for the most recent job):

   _____
   _____
   _____

2. List your company's Workers' Compensation Experience Modification Rate (EMR) for the last 3 full years below. Put the most recent year first. Please attach documentation from your insurance carrier stating the current EMR. If you have different rates for interstate and intrastate, complete both of the following sections:

   INTRASTATE EMRs

   Year 1: 20_ EMR_____ Carrier_____ Policy Number _____

   Year 2: 20_ EMR_____ Carrier_____ Policy Number _____

   Year 3: 20_ EMR_____ Carrier_____ Policy Number _____

INTERSTATE EMRs

Year 1: 20__ EMR_____ Carrier_____ Policy Number _____

Year 2: 20__ EMR_____ Carrier_____ Policy Number _____

Year 3: 20__ EMR_____ Carrier_____Policy Number _____

3. If you do not have any EMR information to provide, please explain: _____

_____

_____

4. How long have you been covered by your current provider of worker's compensation insurance? _____ years

5. Has there been a change in ownership in your company within the last 3 years?

☐ Yes ☐ No

6. Does your company employ more than 10 full time employees?

☐ Yes ☐ No

If yes, what is the average number of employees on your payroll for the last 3 years?

Year 20__ _____ Year 20__ _____ Year 20__ _____

7. Using data from your OSHA 200 Log for the last 3 full years, complete the table below. Put the most recent data first. **Please attach a copy of each OSHA 200 Log used to fill in the table.**

	Year 20____	Year 20____	Year 20____
A. Number of Fatalities (Totals from columns 1 and 8 of OSHA 200 Log)			
B. Number of cases that involved either lost workdays or restricted duty (Totals from columns 2 and 9, OSHA 200 Log)			
C. Number of cases involving recordable injuries without lost workdays (Totals from columns 6 and 13, OSHA 200 Log)			
D. Total Cases (sum of items A, B, & C above for a given year)			
E. Total Man-hours worked			
F. OSHA Total Cases Incidence Rate*			
G. OSHA Lost Workday Cases Incidence Rate*			

* See Question 8 below for instructions on calculating the OSHA Incidence Rates.

8. Use the information recorded in the table above (items A-E) to calculate your company's OSHA Incidence Rates for the last 3 full years. Multiply the Total Cases (or Lost Workday Cases) for each year by 200,000 and divide by the total number of man-hours worked by all employees of your company in that year. Record the results in the table above under item F for the Total Cases Incidence Rate and item G for the

Lost Workday Cases Incidence Rate. The equations below demonstrate how to do the calculations.

$$\frac{\text{Total Cases (item D) X 200,000}}{\text{Total Man-hours Worked (item E)}} = \text{OSHA Total Cases Incidence Rate (item F)}$$

$$\frac{\text{Lost Workday Cases (item B) X 200,000}}{\text{Total Man-hours Worked (item E)}} = \text{OSHA Lost Workday Cases Incidence Rate (item G)}$$

Note: Only man-hours actually worked by direct employees of your company are to be used in calculating your OSHA Incidence Rates. Do not include any non-work hours even if these hours were paid (vacation, sick-time, etc.).

9. Do you have a written Safety and Health Program?
☐ Yes ☐ No

10. If yes, who is responsible for administering the program? _____

11. Does the program include work practices and procedures such as:

	Yes	No
Equipment lockout and tagout (LOTO)		
Confined space entry		
Injury and illness reporting		
Fall protection		
Personal protective equipment		
Portable electrical/power tools		
Welding/cutting		
Vehicle/heavy equipment safety		
Compressed gas cylinders		
Masonry/Stonework		
Housekeeping		
Unsafe condition reporting		
Emergency preparedness		
Other (please describe briefly) _____		

12. Please attach copies of any citations your company has received in the last 3 years from any government agencies, such as OSHA or EPA. Please include information as to the disposition of the citation. If your firm has not had any citations in the last 3 years, indicate so in the space provided.

☐ No citations received in the last 3 years.

13. Has your company experienced any occupational fatalities in the past 5 years?
☐ Yes ☐ No

If yes, provide an explanation below. List location, causes, and corrective actions (use additional sheets of paper as necessary)

14. Have your activities resulted in property damage claims in excess of $1,000 within the last 3 years?

☐ Yes ☐ No

If yes, provide an explanation on the back of this page (use additional sheets of paper as necessary)

15. Do you conduct jobsite health and safety inspections to determine compliance with applicable regulations/procedures for the following:

Federal Laws/Regulations	☐ Yes	☐ No
State Laws/Regulations	☐ Yes	☐ No
Client/Owner Standards	☐ Yes	☐ No
Your Own Company Procedures/Policies	☐ Yes	☐ No

If yes, explain who conducts the inspections (name and title) and how often they are conducted _____

16. Explain how health and safety requirements are implemented and enforced on your jobsites? _____

17. List the employees in your organization who are responsible for developing/implementing your corporate H&S program:

Name: _____ Title: _____

Name: _____ Title: _____

Name: _____ Title: _____

18. Do you have a new employee training program?

☐ Yes ☐ No

19. Indicate subject matter in which your employees have received training:

	Yes	No		Yes	No
Company safety policy/rules			Fire protection/hot work		
Heavy equipment operation			Confined space entry		
Chemical and physical hazard recognition			Hazard communication/toxic substances		
Trenching/excavation			Electrical safety/lockout-tagout		
Emergency response procedures			First aid/CPR		
Injury reporting			Substance abuse		
Non-injury accident reporting (near-miss)			Fall Protection (such as safety belts and lifelines)		
Personal protective equipment			Hearing conservation		
Welding/cutting safety			Process Safety Management		
Housekeeping			Rigging procedures/equipment		

20. Do your employees read, write, and understand English such that they can perform their job tasks safely without an interpreter?

☐ Yes ☐ No

If no, provide a description of your plan to assure that they can safely perform their jobs.

21. Craft Training

a. Have employees been trained in appropriate job skills?

☐ Yes ☐ No

b. Are employees' job skills certified where required by regulatory or industry consensus standards?

☐ Yes ☐ No

c. List crafts which have been certified?

_____

_____

_____

22. Do you have safety and health and crafts training records for your employees?

☐ Yes ☐ No

23. Do you have a specific safety and health training program for supervisors?

☐ Yes ☐ No

24. Do you conduct field safety inspection of work in progress? ☐ Yes ☐ No

a) If yes, who conducts inspection?_____

b) How often?_____

25. Do you conduct routine equipment inspection/maintenance on your equipment, vehicles, etc.?

☐ Yes ☐ No

26. Does your company conduct injury, incident and near-miss investigations? ☐ Yes ☐ No

27. Are records kept of the investigation findings?

☐ Yes ☐ No

28. If unsafe acts or conditions are identified, do you track these items to completion to guard against future occurrences?

☐ Yes ☐ No

29. Do you notify all employees of accidents and precautions related to accidents and near-misses?

☐ Yes ☐ No

How is this notification accomplished:

a) Safety meeting? ☐ Yes ☐ No

If yes, how soon after event? _____

b) Written notification? ☐ Yes ☐ No

If yes, is this notification posted near the site where the incident occurred?

☐ Yes ☐ No

c) Are accident reports distributed to management?

☐ Yes ☐ No

To whom? _____

How often? _____

30. Do you conduct medical examinations designed to determine fitness for duty?

☐ Yes ☐ No

31. Do you conduct medical examinations for:

Pre-employment	☐ Yes	☐ No
Pre-placement job capability	☐ Yes	☐ No
Respiratory	☐ Yes	☐ No

USACE may request documentation of physical examinations for employees who are working on our premises.

33. Have your employees been trained in the use of respiratory protection?

☐ Yes ☐ No

If yes, have your employees been fit tested for the respirators they wear?

☐ Yes ☐ No

What fit testing methods do you use?_____

_____

Please have an officer of the company sign below certifying that the information provided in this document is current and correct.

Officer Name _____
(Printed)

Title _____

Signature _____

Date _____

MISREPRESENTATION OF DATA REQUESTED IS GROUNDS FOR IMMEDIATE TERMINATION OF CURRENT SUBCONTRACTS AND DISQUALIFICATION FROM FUTURE CONSIDERATION.

-- End of Section--

SECTION 01300

SUBMITTALS

PART 1 GENERAL

1.01 Description

The Subcontractor shall provide the submittals required by this Section for review and approval by the USACE Project Manager.

1.02 Summary of Submittals

A. The submittals that the Subcontractor is required to provide include, but are not limited to, those summarized in Table 01300-1. Table 01300-1 is provided as a quick reference. The Subcontractor's attention is directed to the "Submittals" section of each specification, typically found under Part 1, for the required submittals for each section.

B. No portion of the work requiring a shop drawing, calculations, product data, or sample shall be commenced nor shall any material be fabricated or installed prior to review of the Subcontractor design drawings, shop drawings, product data, or sample by the USACE Project Manager or designee, and the submittal returned to the Subcontractor marked "APPROVED" or "APPROVED AS NOTED-RESUBMITTAL NOT NECESSARY". USACE shall not be responsible for any expense or delay due to Subcontractor's corrections or remedies required to accomplish conformity.

1.03 Shop Drawings and Product Data

A. Shop Drawings

1. Engineering data pertaining to all equipment and fabricated materials that will become a permanent part of the work under this Subcontract shall be submitted for review. Shop drawings as specified in individual work sections include, but are not limited to, custom prepared data such as fabrication and erection/installation drawings, setting diagrams, actual shop-work manufacturing instructions, custom templates, special wiring diagrams, and coordination drawings.

2. The Subcontractor shall check all his lower tier subcontractors' shop drawings regarding measurements, size of members, materials, and details to satisfy himself that they conform to the intent of the Contract Drawings and Technical Specifications. Drawings found to be inaccurate or otherwise in error shall be returned to the Subcontractor's lower tier subcontractors for correction before submission to the USACE Project Manager.

3. Each final submittal shall have affixed to it the following Certification Statement, signed by the Subcontractor: "Certification Statement: by this submittal, I hereby represent that I have determined and verified all field measurements, field construction criteria, materials, dimensions, catalog numbers, and similar data and I have checked and coordinated each item with other applicable reviewed shop drawings and all Subcontract requirements."

4. All deviations from the Contract Drawings or Technical Specifications shall be identified on each submittal and shall be tabulated in the Sub-contractor's letter of transmittal. Such submittal shall, as pertinent to the deviations, indicate essential details for all changes proposed by the Subcontractor (including modifications to other facilities that may be a result of the deviation) and all required piping and wiring diagrams.

5. Each submittal shall indicate the intended use of the item in the work. When catalog pages are submitted, applicable items shall be clearly identified. The current revision, issue number, and date shall be indicated on all drawings and other descriptive data.

6. Submittals shall be sequentially numbered, with resubmittals of the same or supplementary information numbered with the original submittal number and an "-A" for the second submittal, "-B" for the third submittal, etc.

B. Product Data

1. Product data, as specified in individual sections, include, but are not limited to, standard prepared data for manufactured products (sometimes referred to as catalog data), such as the Manufacturer's product specification and installation instructions, availability of colors and patterns, Manufacturer's printed statements of compliances and applicability, roughing in diagrams and templates, catalog cuts, product photographs, standard wiring diagrams, production or quality control inspection and test reports and certifications, mill reports, product operating and maintenance instructions and recommended spare-parts listing, printed product warranties, schedule information, individual system or equipment inspection and test reports including performance curves and certifications, manufacturer's certificates, as applicable to the work.

   Product data for materials used by the Subcontractor shall be submitted to the USACE Project Manager to verify that the requirements for materials have been met. This information shall be required for, at a minimum, the concrete mix, crushed stone, well vaults, piping, tubing, and fence material.

2. Product data shall also include, if requested by the USACE Project Manager, items of disposable clothing, safety equipment, breathing apparatus, communication devices, items of equipment to be used on the site, and any other items that are required for the safety and health of all personnel on the site.

C. Submission Requirements

1. Coordination of Submittal Items

Each submittal will be prepared and transmitted within the time specified in the individual work sections of the Specifications, so that the installation will not be delayed by processing times including revision and resubmittal (if required), coordination with other submittals, testing, purchasing, fabrication, delivery, and similar sequenced activities. No extension of time will be authorized because of the Subcontractor's failure to transmit submittals sufficiently in advance of the work.

2. Number of Submittals Required

a. Shop drawings: Submit six copies.
b. Product Data: Submit six copies.
c. All other submittals: Submit three copies unless stated elsewhere in the Technical Specification or as directed by the USACE Project Manager.

3. All submittals, regardless of origin, shall have the following identification data, as applicable, contained thereon or permanently adhered thereto:

a. Date of submission and dates of any previous submissions.
b. Project Name and Subcontract Number.
c. Subcontractor's name and address.
d. Supplier's name and address.
e. Manufacturer's name and address.
f. Submittal or resubmittal number.
g. Title or identification of submittal.
h. References to applicable Section and part of the Technical Specification paragraphs or to applicable Contract Drawings.
i. Subcontractor's Certification Statement.
j. Deviations from Subcontract Documents.

D. Resubmission Requirements

1. Make any corrections or changes in the submittals required by USACE Project Manager and resubmit until approved.

E. Review of Subcontractor Submittals, Shop Drawings and Product Data

1. After review by the USACE Project Manager or designee, submittals, shop drawings, and product data will be returned to the Subcontractor stamped with the following classifications:

a. Approved.
b. Approved except as noted. Resubmittal not necessary.
c. Approved except as noted. Resubmittal necessary.

d. Disapproved. Resubmittal necessary.
e. Receipt acknowledged.
f. Submittal not required.

2. The Subcontractor will subsequently indicate any changes that have been made in addition to those requested by the USACE Project Manager.

3. No portion of the work requiring a shop drawing, product data, or sample shall be commenced nor shall any material be fabricated or installed prior to review of the Subcontractor design drawings, shop drawing, product data, or sample by the USACE Project Manager or designee and the submittal returned to the Subcontractor marked "APPROVED" or "APPROVED AS NOTED-RESUBMITTAL NOT NECESSARY." USACE shall not be responsible for any expense or delay due to Subcontractor's corrections or remedies required to accomplish conformity.

4. Any need for more than one resubmission, or other delay in obtaining USACE review of submittals, will not entitle Subcontractor to a schedule extension.

5. Reviews required by this Section will be accomplished by the USACE Project Manager and returned to the Subcontractor within five (5) days after its receipt by USACE.

F. Distribution

1. Distribute reproduction of Subcontractor submittals, shop drawings, product data, and samples returned to the Subcontractor marked "APPROVED" or "APPROVED AS NOTED-RESUBMITTAL NOT REQUIRED," where required, to the job site file and elsewhere as directed by the USACE Project Manager.

PART 2 PRODUCTS

Not Applicable

PART 3 EXECUTION

Not Applicable

---End of Section---

TABLE 01300-1
SUMMARY OF SUBMITTAL REQUIREMENTS
PAGE 1 of 1

SECTION	SUBMITTAL	SUBMISSION DATE
01037	•Subcontractor Health and Safety Plan (HASP) •Health and Safety Exhibits 1,2,3	•5 days prior to Pre-Construction Conference •With HASP
Contract Drawings	•As built survey	•30 days after Work Acceptance
01396	•Subcontractor Construction Operations Plan (SCOP) • Notification of Proposed Changes	•5 days prior to Pre-Construction Conference • As soon as possible during construction
01312	•Subcontractor Weekly QC reports •Subcontractor QC Summary Report • SQCP	•Weekly during construction •30 days after Final Inspection • 5 days prior to Pre-construction Conference
01396	•Schedule	• 5 days prior to Pre-construction Conference
Contract Drawings	•Shop drawings of proposed equipment treatment train components •Pre-engineered treatment building shop drawings •Pre-engineered treatment building specifications	•10 days after Approval of Final Design
Contract Drawings	•Product Data •Ready-mix concrete •Crushed stone •Well Vaults •Pipe and tubing •Fence Material (if incorporated in project)	•10 days after Approval of Final Design

SECTION 01312A

QUALITY CONTROL SYSTEM

PART 1 GENERAL

1.1 DESCRIPTION

The Government will use the Resident Management System for Windows (RMS) to assist in its monitoring and administration of this contract. The Contractor shall use the Government-furnished Construction Contractor Module of RMS, referred to as QCS, to record, maintain, and submit various information throughout the contract period. The Contractor module, user manuals, updates, and training information can be downloaded from the USACE web site. This joint Government-Contractor use of RMS and QCS will facilitate electronic exchange of information and overall management of the contract. QCS provides the means for the Contractor to input, track, and electronically share information with the Government in the following areas:

- Administration,
- Finances,
- Quality Control,
- Submittal Monitoring,
- Scheduling,
- Import/Export of Data,
- Correspondence and Electronic Communications

For ease and speed of communications, both Government and Contractor will, to the maximum extent feasible, exchange correspondence and other documents in electronic format. Correspondence, pay requests and other documents comprising the official contract record shall also be provided in paper format, with signatures and dates where necessary. Paper documents will govern, in the event of discrepancy with the electronic version.

Also, there is no separate payment for establishing and maintaining the QCS database; all costs associated therewith shall be included in the contract pricing for the work.

1.2 QCS SOFTWARE

QCS is a Windows-based program that can be run on a stand-alone personal computer or on a network. The Government will make available the QCS software to the Contractor after award of the construction contract. Prior to the Pre-Construction Conference, the Contractor shall be responsible to download, install and use the latest version of the QCS software from the Government's RMS Internet Website. Upon specific justification and request by the Contractor, the Government can provide QCS on CD-ROM. Any program updates of QCS will be made available to the Contractor via the Government RMS Website as they become available.

1.3 SYSTEM REQUIREMENTS

The following is the minimum system configuration that the Contractor shall have to run QCS:

Hardware

- IBM-compatible PC with 1000 MHz Pentium or higher processor
- 256+ MB RAM for workstation / 512+ MB RAM for server
- 1 GB hard drive disk space for sole use by the QCS system
- Compact Disk (CD) Reader 8x speed or higher
- SVGA or higher resolution monitor (1024x768, 256 colors
- Mouse or other pointing device
- Windows compatible printer. (Laser printer must have 4 MB+ of RAM)
- Connection to the Internet, minimum 56k BPS

Software

- MS Windows 2000 or higher
- QAS-Word Processing software: MS Word 2000 or newer
- Latest version of: Netscape Navigator, Microsoft Internet Explorer, or other browser that supports HTML 4.0 or higher
- Electronic mail (E-mail) MAPI compatible
- Virus protection software that is regularly upgraded with all issued manufacturer's updates

1.4 RELATED INFORMATION

1.4.1 QCS User Guide

After contract award, the Contractor shall download instructions for the installation and use of QCS from the Government RMS Internet Website; the Contractor can obtain the current address from the Government. In case of justifiable difficulties, the Government will provide the Contractor with a CD-ROM containing these instructions.

1.4.2 Contractor Quality Control (CQC) Training

The use of QCS will be discussed with the Contractor's QC System Manager during the mandatory CQC Training class

1.5 CONTRACT DATABASE

Prior to the pre-construction conference, the Government shall provide the Contractor with basic contract award data to use for QCS. The Government will provide data updates to the Contractor as needed, generally by files attached to E-mail. These updates will generally consist of submittal reviews, correspondence status, QA comments, and other administrative and QA data.

1.6 DATABASE MAINTENANCE

The Contractor shall establish, maintain, and update data for the contract in the QCS database throughout the duration of the contract. The Contractor shall establish and maintain the QCS database at the Contractor's site office. Data updates to the Government shall be submitted by E-mail with file attachments, e.g., daily reports, schedule updates, payment requests. If permitted by

the Contracting Officer, a CD may be used instead of E-mail (see Paragraph DATA SUBMISSION VIA CD-ROM). The QCS database typically shall include current data on the following items:

1.6.1 Administration

1.6.1.1 Contractor Information

The database shall contain the Contractor's name, address, telephone numbers, management staff, and other required items. Within 14 calendar days of receipt of QCS software from the Government, the Contractor shall deliver Contractor administrative data in electronic format via E-mail.

1.6.1.2 Subcontractor Information

The database shall contain the name, trade, address, phone numbers, and other required information for all subcontractors. A subcontractor must be listed separately for each trade to be performed. Each subcontractor/trade shall be assigned a unique Responsibility Code, provided in QCS. Within 14 calendar days of receipt of QCS software from the Government, the Contractor shall deliver subcontractor administrative data in electronic format via E-mail.

1.6.1.3 Correspondence

All Contractor correspondence to the Government shall be identified with a serial number. Correspondence initiated by the Contractor's site office shall be prefixed with "S". Letters initiated by the Contractor's home (main) office shall be prefixed with "H". Letters shall be numbered starting from 0001. (e.g., H-0001 or S-0001). The Government's letters to the Contractor will be prefixed with "C".

1.6.1.4 Equipment

The Contractor's QCS database shall contain a current list of equipment planned for use or being used on the jobsite, including the most recent and planned equipment inspection dates.

1.6.1.5 Management Reporting

QCS includes a number of reports that Contractor management can use to track the status of the project. The value of these reports is reflective of the quality of the data input, and is maintained in the various sections of QCS. Among these reports are: Progress Payment Request worksheet, QA/QC comments, Submittal Register Status, Three-Phase Inspection checklists.

1.6.2 Finances

1.6.2.1 Pay Activity Data

The QCS database shall include a list of pay activities that the Contractor shall develop in conjunction with the construction schedule. The sum of all pay activities shall be equal to the total contract amount, including modifications. Pay activities shall be grouped by Contract Line Item Number (CLIN), and the sum of the activities shall equal the amount of each CLIN. The total of all CLINs equals the Contract Amount.

1.6.2.2 Payment Requests

All progress payment requests shall be prepared using QCS. The Contractor shall complete the payment request worksheet and include it with the payment request. The work completed under the contract, measured as percent or as specific quantities, shall be updated at least monthly. After the update, the Contractor shall generate a payment request report using QCS. The Contractor shall submit the payment requests with supporting data by E-mail with file attachment(s). If permitted by the Contracting Officer, a CD may be used instead of E-mail. A signed paper copy of the approved payment request is also required, which shall govern in the event of discrepancy with the electronic version.

1.6.3 Quality Control (QC)

QCS provides a means to track implementation of the 3-phase QC Control System, prepare daily reports, identify and track deficiencies, document progress of work, and support other contractor QC requirements. The Contractor shall maintain this data on a daily basis. Entered data will automatically output to the QCS generated daily report. The Contractor shall provide the Government a Contractor Quality Control (CQC) Plan within the time required. Within seven calendar days of Government acceptance, the Contractor shall submit a CD reflecting the information contained in the accepted CQC Plan: schedule, pay activities, features of work, submittal register, QC requirements, and equipment list.

1.6.3.1 Daily Contractor Quality Control (CQC) Reports

QCS includes the means to produce the Daily CQC Report. The Contractor may use other formats to record basic QC data. However, the Daily CQC Report generated by QCS shall be the Contractor's official report. Data from any supplemental reports by the Contractor shall be summarized and consolidated onto the QCS-generated Daily CQC Report. Daily CQC Reports shall be submitted as required. Reports shall be submitted electronically to the Government using E-mail or CD within 24 hours after the date covered by the report. Use of either mode of submittal shall be coordinated with the Government representative. The Contractor shall also provide the Government a signed, printed copy of the daily CQC report.

1.6.3.2 Deficiency Tracking

The Contractor shall use QCS to track deficiencies. Deficiencies identified by the Contractor will be numerically tracked using QC punch list items. The Contractor shall maintain a current log of its QC punch list items in the QCS database. The Government will log the deficiencies it has identified using its QA punch list items. The Government's QA punch list items will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of both QC and QA punch list items.

1.6.3.3 Three-Phase Control Meetings

The Contractor shall maintain scheduled and actual dates and times of preparatory and initial control meetings in QCS.

1.6.3.4 Accident/Safety Tracking

The Government will issue safety comments, directions, or guidance whenever safety deficiencies are observed. The Government's safety comments will be included in its export file to the Contractor. The Contractor shall regularly update the correction status of the safety comments. In addition, the Contractor shall utilize QCS to advise the Government of any accidents occurring on the jobsite. This brief supplemental entry is not to be considered as a substitute for completion of mandatory reports, e.g., ENG Form 3394 and OSHA Form 300.

1.6.3.5 Features of Work

The Contractor shall include a complete list of the features of work in the QCS database. A feature of work may be associated with multiple pay activities. However, each pay activity (see subparagraph "Pay Activity Data" of paragraph "Finances") will only be linked to a single feature of work.

1.6.3.6 QC Requirements

The Contractor shall develop and maintain a complete list of QC testing, transferred and installed property, and user training requirements in QCS. The Contractor shall update all data on these QC requirements as work progresses, and shall promptly provide this information to the Government via QCS.

1.6.4 Submittal Management

The Government will provide the initial submittal register in electronic format. Thereafter, the Contractor shall maintain a complete list of all submittals, including completion of all data columns. Dates on which submittals are received and returned by the Government will be included in its export file to the Contractor. The Contractor shall use QCS to track and transmit all submittals. ENG Form 4025, submittal transmittal form, and the submittal register update shall be produced

using QCS. RMS will be used to update, store and exchange submittal registers and transmittals, but will not be used for storage of actual submittals.

1.6.5 Schedule

The Contractor shall develop a construction schedule consisting of pay activities, in accordance with Contract Clause "Schedules for Construction Contracts", as applicable. This schedule shall be input and maintained in the QCS database either manually or by using the Standard Data Exchange Format (SDEF). The updated schedule data shall be included with each pay request submitted by the Contractor.

1.6.6 Import/Export of Data

QCS includes the ability to export Contractor data to the Government and to import submittal register and other Government-provided data, and schedule data using SDEF.

1.7 IMPLEMENTATION

Contractor use of QCS as described in the preceding paragraphs is mandatory. The Contractor shall ensure that sufficient resources are available to maintain its QCS database, and to provide the Government with regular database updates. QCS shall be an integral part of the Contractor's management of quality control.

1.8 DATA SUBMISSION VIA COMPACT DISK (CD)

The Government-preferred method for Contractor's submission of updates, payment requests, correspondence and other data is by E-mail with file attachment(s). For locations where this is not feasible, the Contracting Officer may permit use CDs for data transfer. Data on the CDs shall be exported using the QCS built-in export function. If used, CDs will be submitted in accordance with the following:

1.8.1 File Medium

The Contractor shall submit required data on compact disks capable of running under Microsoft Windows 95 or newer. They shall conform to industry standards used in the United States. All data shall be provided in English.

1.8.2 Compact Disk Labels

The Contractor shall affix a permanent exterior label to each CD submitted. The label shall indicate in English, the QCS file name, full contract number, contract name, project location, data date, name, and telephone number of person responsible for the data.

1.8.3 File Names

The Government will provide the file names to be used by the Contractor with the QCS software.

1.9 MONTHLY COORDINATION MEETING

The Contractor shall update the QCS database each workday. At least monthly, the Contractor shall generate and submit an export file to the Government with schedule update and progress payment request. As required in Contract Clause "Payments", at least one week prior to submittal, the Contractor shall meet with the Government representative to review the planned progress payment data submission for errors and omissions.

The Contractor shall make all required corrections prior to Government acceptance of the export file and progress payment request. Payment requests accompanied by incomplete or incorrect data submittals will be returned. The Government will not process progress payments until an acceptable QCS export file is received.

1.10 NOTIFICATION OF NONCOMPLIANCE

The Contracting Officer will notify the Contractor of any detected noncompliance with the requirements of this specification. The Contractor shall take immediate corrective action after receipt of such notice. Such notice, when delivered to the Contractor at the work site, shall be deemed sufficient for the purpose of notification.

-- End of Section --

SECTION 01396

SUBCONTRACTOR CONSTRUCTION OPERATIONS PLAN

PART 1 GENERAL

1.01 Description

A. The Subcontractor shall provide a Subcontractor's Construction Operations Plan (SCOP) seven (7) days after the initial coordination meeting with USACE and other parties who will be working at the site. The SCOP shall identify personnel, equipment, and construction procedures to be used in carrying out the requirements of this project. The SCOP shall accommodate and incorporate the agreements made at the initial coordination meeting.

1.02 Contents of the SCOP

A. The Subcontractor Construction Operations Plan shall outline the overall construction sequencing and procedures to be followed during the site work activities. The plan shall contain a thorough and concise summary of how the work will be accomplished and shall include at a minimum:

1. Subcontractor's technical approach including work sequence, proposed schedules, major milestones, health and safety, and general work procedures, including methods and procedures that address Section 01396 of these specifications.

2. Construction Operations Organization Chart showing lines of authority and responsibility. Number of personnel to be utilized on the job should be indicated in appropriate organizational elements. All lower tier subcontractors should be indicated. If significant changes in the organization are expected to occur during the project or phases of construction, these should be discussed.

3. Names, qualifications, training certifications, and work experience of all Subcontractor supervisors, health and safety personnel, and employees with Quality Control responsibilities. If the personnel identified in the SCOP are not available at the start of the project, the Subcontractor shall submit, prior to mobilization, the names and qualifications of substitute personnel, with equal or more extensive experience, to the USACE Site Representative for approval.

4. Equipment to be utilized for the site activities.

5. Discussion of regulatory requirements applicable to the project and how compliance will be assured. Personnel training requirements should be listed and compliance demonstrated.

6. Names, qualifications and work experience of all lower tier subcontractors. Discussion of all activities that will be performed by any lower tier subcontractor.

7. Project schedule in CPM format indicating tasks, task durations, and task relationships (i.e. predecessor, successor). At minimum, this schedule will be updated weekly indicating progress to date for each task and projected completion dates. Two copies of the revised schedule will be submitted weekly.

1.03 Notification of Change

A. After submittal of the SCOP, the Subcontractor shall notify the USACE Project Manager, in writing, of any proposed change prior to implementing changes.

1.04 Submittals

A. Submittals shall be to the USACE Project Manager in accordance with Section 01300.

B. Submit the Subcontractor Construction Operations Plan (SCOP) 7 days after the Pre-Construction Conference/Initial Coordination Meeting.

PART 2 EXECUTION

2.01 General

A. The Subcontractor shall perform all work-related activities in compliance with the SCOP.

---End of Section---

SECTION 01740

WARRANTIES

PART 1 GENERAL

1.01 Project Maintenance And Warranty

A. Maintain and keep in good repair the Work covered by the final Construction Drawings and Specifications until acceptance by USACE.

B. The Subcontractor shall warrant for a period of one year from the date of USACE's written acceptance of the Work and/or USACE's written final acceptance of the Project, as defined in the Contract Documents, that the completed Work is free from all defects due to faulty products or workmanship and the Subcontractor shall promptly make such corrections as may be necessary by reason of such defects. USACE will give notice of observed defects with reasonable promptness. In the event that the Subcontractor should fail to make such repairs, adjustments or other work that may be made necessary by such defects, USACE may do so and charge the Subcontractor the cost thereby incurred.

C. The Subcontractor shall not be obligated to make replacements which become necessary because of ordinary wear and tear, or as a result of improper operation or maintenance, or as a result of improper work or damage by another Subcontractor, or USACE, or to perform any work which is normally performed by a maintenance crew during operation.

D. In the event of multiple failures of major consequences prior to the expiration of the one-year warranty described above, the affected unit shall be disassembled, inspected and modified or replaced as necessary to prevent further occurrences.

All related components that may have been damaged or rendered non-serviceable as a consequence of the failure shall be replaced. A new 12-month warranty against defective or deficient design, workmanship, and materials shall commence on the day that the item is reassembled and placed back into operation. As used herein, multiple failures shall be interpreted to mean two or more successive failures of the same kind in the same item or failures of the same kind in two or more items. Major failures may include, but are not limited to, cracked or broken housings, piping, or vessels, excessive deflections, bent or broken shafts, broken or chipped gear teeth, premature bearing failure, excessive wear or excessive leakage around seals. Failures which are directly and clearly traceable to operator abuse, such as operations in conflict with published operating procedures or improper maintenance, such as substitution of unauthorized replacement parts, use of incorrect lubricants or chemicals, flagrant over- or under-lubrication and using maintenance procedures not conforming with published maintenance instructions, shall be exempted from the scope of the one year warranty. Should multiple failures occur in a given item, all products of the same size and type shall be disassembled, inspected, modified or replaced as necessary and rewarranted for one year.

E. The Subcontractor shall, at Subcontractor's own expense, furnish all labor, materials, tools and equipment required and shall make such repairs and removals and shall perform such work or reconstruction as may be made necessary by any structural or functional defect or failure resulting from neglect, faulty workmanship or faulty materials, in any part of the Work performed by the Subcontractor. Such repair shall also include refilling of trenches, excavations or embankments which show settlement or erosion after backfilling or placement.

F. Except as noted on the Drawings or as specified, all structures such as embankments and fences shall be returned to their original condition prior to the completion of the Contract. Any and all damage to any facility not designated for removal, resulting from the Subcontractor's operations, shall be promptly repaired by the Subcontractor at no cost to USACE.

G. The Subcontractor shall be responsible for all road and entrance reconstruction and repairs and maintenance of same for a period of one year from the date of final acceptance. In the event the repairs and maintenance are not made immediately and it becomes necessary for the owner of the road to make such repairs, the Subcontractor shall reimburse the owner of the road for the cost of such repairs.

H. The USACE Representative shall have access to the Work at all times and Subcontractor shall provide such access for inspection or observation of the Work. Examination or reexamination of covered Work may be ordered by USACE; and, if so ordered, such Work must be uncovered by the Subcontractor. If such Work is found to be in accordance with the Contract Documents, USACE shall pay Subcontractor the cost of uncovering and replacement, such cost shall be determined by the change provisions of the Contract. If such Work is found to be defective or faulty, Subcontractor shall pay all costs to correct that Work and all costs for the uncovering and replacement.

I. In the event the Subcontractor fails to proceed to remedy the defects upon notification within 15 days of the date of such notice, USACE reserves the right to cause the required materials to be procured and the work to be done, as described in the Drawings and Specifications, and to hold the Subcontractor liable for the cost and expense thereof.

J. Notice to Subcontractor for repairs and reconstruction will be made in the form of a registered letter per the notice provisions of the contracts.

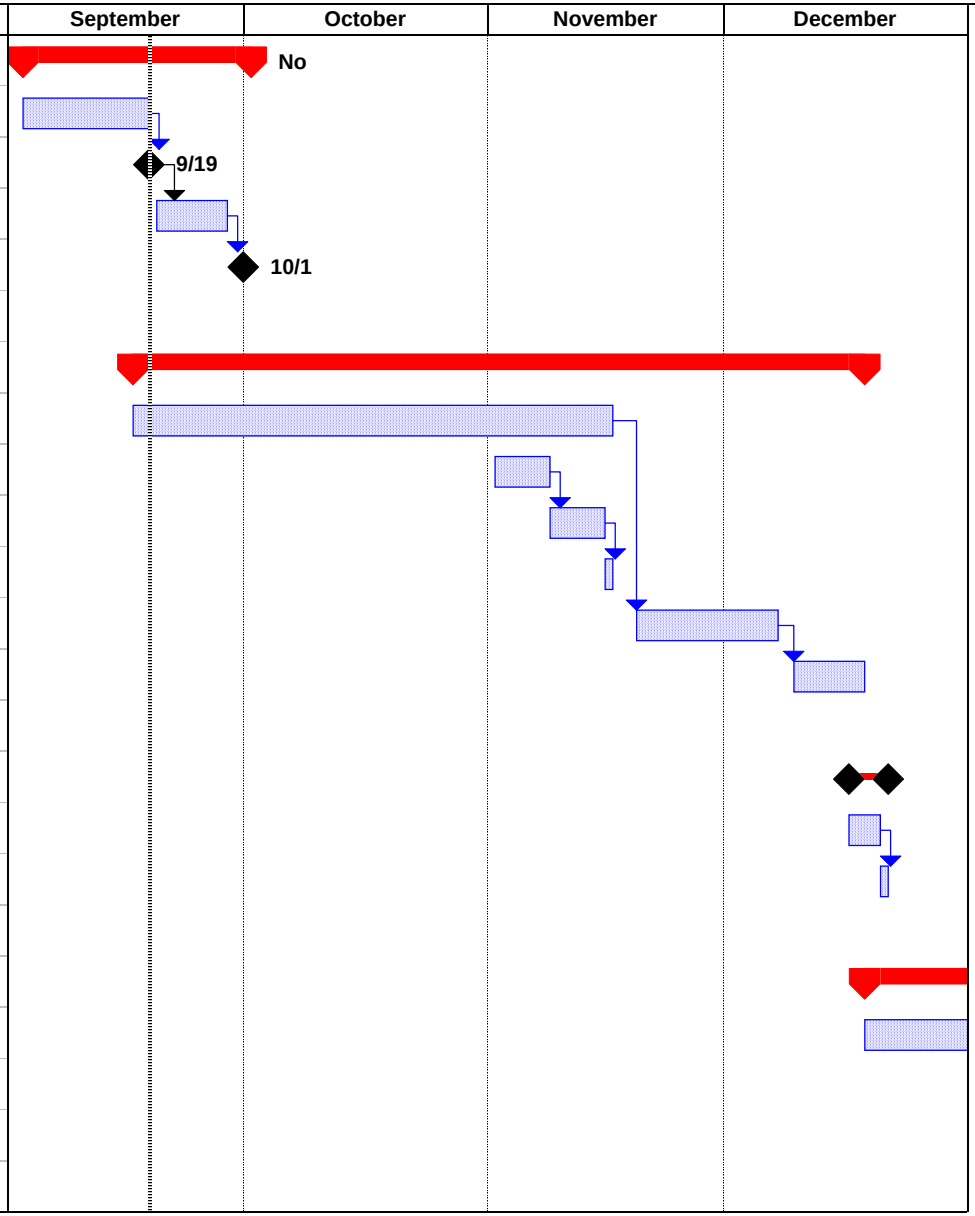
K. Neither the foregoing paragraphs nor any provision in the Contract Documents, nor any special guarantee time limit implies any limitation of the Subcontractor's liability within the law of the place of construction.

---End of Section---

APPENDIX D
CONSTRUCTION SCHEDULE

Fort Hamilton Project Schedule

ID	Act ID	Task Name	Duration	Start	Finish
1		**Work plans**	**21d**	**Mon 9/3/07**	**Mon 10/1/07**
2	1220	Develop Final RAWP	12d	Mon 9/3/07	Tue 9/18/07
3	1220	Submit Final RAWP	0d	Wed 9/19/07	Wed 9/19/07
4	1270	USACE/NYSDEC Review Final RAWP	7d	Thu 9/20/07	Fri 9/28/07
5	1270	USACE/NYSDEC Approve Final RAWF	0d	Mon 10/1/07	Mon 10/1/07
6					
7		**Field Work/Equipment Installation**	**67d**	**Mon 9/17/07**	**Tue 12/18/07**
8	1610	Procure Treatment System	45d	Mon 9/17/07	Fri 11/16/07
9	1000	Mobilization/Sitepreparation	5d	Fri 11/2/07	Thu 11/8/07
10	1570	MPE Well Installation	5d	Fri 11/9/07	Thu 11/15/07
11	1310	MPE Well Development	1d	Fri 11/16/07	Fri 11/16/07
12	1400	Treatment System Installation	14d	Tue 11/20/07	Fri 12/7/07
13	1510	Treatment System Start up/Proveout	7d	Mon 12/10/07	Tue 12/18/07
14					
15		**Site Restoration/Demobilization**	**5d**	**Mon 12/17/07**	**Fri 12/21/07**
16	1530	Site Restoration	4d	Mon 12/17/07	Thu 12/20/07
17	1520	Demobilization	1d	Fri 12/21/07	Fri 12/21/07
18					
19		**Operation and Maintenance**	**180d**	**Wed 12/19/07**	**Tue 8/26/08**
20	1540	Treatment System O&M	180d	Wed 12/19/07	Tue 8/26/08
21					
22		**Project Closeout**	3d	Wed 8/27/08	Fri 8/29/08
23	1590	Project Closeout	3d	Wed 8/27/08	Fri 8/29/08



Project: Fort Hamilton.MPP
Date: Wed 9/19/07

Task Milestone Summary

Fort Hamilton Project Schedule

Project: Fort Hamilton.MPP
Date: Wed 9/19/07

Task Milestone Summary

APPENDIX – E
CALCULATIONS / TECHNICAL DESIGN MEMO

Final

BASIS OF DESIGN MEMORANDUM
AAFES STATION – BUILDING 200
REMEDIAL DESIGN/REMEDIAL ACTION
U.S. ARMY GARRISON, FORT HAMILTON
BROOKLYN, NY

Basis of Design – Wells

Historical product and water table elevations were evaluated to determine the vertical location of the (MPE) well screen interval. The highest product/water table elevations were recorded approximately 16 feet below grade. In order to maintain enough available well screen during high water table conditions to operate the MPE system, the top of screen will be set at 10 feet below grade. The lowest product/water table elevations were recorded approximately 26 feet below grade. The vertical extent of contamination is approximately 30 feet below grade. Therefore, the bottom of the MPE well will be designed to extend to 30 feet below grade.

Typically, MPE wells will be completed with filter pack extending 2 ft above the screen, a minimum of 2 ft of bentonite seal, and portland/bentonite grout to within 4 ft of the ground surface to allow space for the lateral piping to enter the vault.

Basis of Design – Multi-phase Extraction System

1. Air Flow Rate - MPE

During the MPE pilot test performed at the AAFES Station (EA, 2005), the maximum MPE flow rate was recorded to be 25 cfm per well using a 4-in. diameter extraction well. This maximum flow rate of 25 cfm also induced the highest vacuum influence in the vadose zone. The wellhead vacuum necessary to achieve this flow rate was 90 in. of water. The radius of influence (ROI) estimated from the test data ranged from 28 to 41 ft.

A conservative radius of influence of 25 ft was used during the design of the AAFES Station well field. The conservative number was utilized: (1) to account for some expected short-circuiting due to a permeable gravel seam at approximately 15 – 20 feet below grade, and (2) the relatively small size of the site / plume allowed the use of a conservative ROI while still maintaining a moderately sized system.

<u>Design flow rate</u>: A safety factor of 25% was applied to the maximum rate tested during the pilot test to size the vacuum blower.
25 cfm X 25% = 32 cfm

The capacity of the vacuum pump will be based primarily on the number of wells, the amount of air flow/vacuum desired at the wells, and the amount of headloss associated with process piping, fittings, and anticipated system components (i.e., air/moisture separator, filters, silencers, etc.). Based on the 25 foot R-O-I, seven MPE wells are sufficient to provide coverage of the impacted area. Due to the presence of LNAPL in MW-5, system piping will be extended to this well to facilitate LNAPL recovery.

8* MPE wells x 32 cfm/well = 256 cfm

*Includes 7 new MPE wells and MW-5

Therefore, the MPE blower will be capable of a minimum of 256 cfm at the design vacuum.

2. Pore Volume Extraction Rate

Remediation of vadose zone soil is dependent on the flow of air through the subsurface. The goal is to have 1,000 – 1,500 pore volume exchanges to remediate an area (USACE 2002). The pore volume exchange rate (PVER) for the AAFES station design was calculated to confirm the selected flow rate and R-O-I will provide an acceptable rate. An approach presented in the USACE Engineer Manual (EM 1110-1-4001) was used to estimate the PVER for an R-O-I of 25 feet and a flow rate of 32 cfm (conservative rate). These design parameters provide for approximately 1,500 pore volume exchanges over a 1 year period (**Worksheet No. 1**). This rate is acceptable for the AAFES Station design.

3. Extraction Vacuum – MPE

Design Wellhead Vacuum = 90 in. of water (EA, 2005)

Vacuum Required to Overcome Friction Losses in Pipe/Valves (using vendor information and standard friction loss table for piping):

Total Loss = 63 in. of water (**Worksheet No. 2**)

Operating Vacuum Required at Blower:

90 in. of water + 63 in. of water = 153 in. of water **= 11.1 in. of Hg + 15% SF**
= 12.8 in. of Hg

Therefore, the MPE blower will be capable of 256cfm @ 12.8 in. of Hg. (Worksheet No. 3)

The proposed MPE equipment trailer will also include an air/liquid separator, which will be rated for 300 cfm.

4. Vapor Treatment - MPE

Off gas from the AAFES Station MPE system will initially be treated using an oxidizer and will move to granular activated carbon once concentrations allow. During the MPE pilot test performed at the AAFES Station (EA, 2005), an air sample was collected and analyzed via EPA test method TO-3. The analytical data was forwarded to an equipment vendor for carbon usage calculations (see Attachments). Calculations estimated carbon consumption rates between 14.3 and 28.1 lbs/hr making treatment via carbon impractical at start-up. An oxidizer will be utilized initially (monthly rental) until vapor concentrations reach a level where carbon treatment is viable.

5. Liquid Treatment - MPE

Water (i.e., condensate, groundwater) generated by the MPE system will be treated using an air stripper system combined with liquid-phase activated carbon polishing. During the MPE pilot test performed at the AAFES Station (EA, 2005), the maximum groundwater recovery rate recorded was 0.86 gpm.

Design flow rate: A safety factor of 25% was applied to the maximum rate tested during the pilot test (MW-5) to size the water treatment system.
0.86 gpm X 25% = 1 gpm

The capacity of the water treatment train will be based primarily on the number of wells and the amount of groundwater expected to be generated from the wells.

8 MPE wells x 1 gpm/well = 8 gpm

To account for unanticipated water generation, the water treatment system components will be selected with a capacity of 15 gpm.

The proposed water treatment system will include an air/liquid separator, flow equalization tank, oil/water separator, air stripper, bag filters, liquid-phase activated carbon, and water transfer pumps. Each of these components will be rated for a minimum of 15 gpm liquid flow. Any product recovered will be manually drained from the oil sump in the OWS. Water treated by the system is planned to be discharged to an adjacent sanitary sewer.

6. Sound Propagation – MPE Equipment

Due to the proximity of base housing north of the AAFES Station, the MPE system design will include provisions to reduce noise during equipment operation. These provisions may include the installation of extra silencers/mufflers in process equipment piping, positioning of intake/discharge lines and louvers away from the housing, and installation of extra soundproofing insulation in the system enclosure.

Noise propagation associated with the MPE system equipment will be estimated assuming a sound pressure level of 75 dB at the source (enclosure). The calculation (**Worksheet No. 4**) is conservative in that it will assume no attenuation of noise between the enclosure and the base housing area. The actual equipment configuration will direct noise in the opposite direction from the base housing area. The following equation was used to estimate sound propagation (source: Noise Control Reference Handbook by Industrial Acoustics Company, Equation C-6):

$$Lp = Lw - 20 \log R + DI - Ab - Ag - Aa + 2.3$$

Where:

L_p = Sound pressure level at receiver (dB)
L_w = Sound pressure level at source (dB)
R = Distance between source and receiver (100 ft)
DI = Directivity index
A_b = Attenuation due to barriers
A_g = Attenuation due to ground absorption
A_a = Attenuation due to atmosphere (wind).

Therefore: The noise level at the base housing area due to the system equipment (without accounting for attenuation) was estimated at 47 dB, which is equivalent to a "quiet restaurant"

7. Estimation of Electrical Service – MPE Equipment

The electrical service will be rated to provide adequate power for the MPE system equipment (i.e., blower, air stripper fan/pump, heaters, lights, controls,) oxidizer and heat tracing for MPE vaults and header piping.

Calculations associated with the AAFES Station MPE system are provided in Calculation **Worksheet No. 5**. The electrical service will be rated for 460 volt/3-phase/150 amps.

ATTACHMENTS

Worksheet No.	Description
1	Pore Volume Exchange Rate
2	Headloss Calculations
3	Vacuum Blower Operation Parameters
4	Sound Propagation Calculation
5	Estimate of Electrical Service

Blower Curve for MD Pneumatics Competitor Plus Model 6005

Rotron Frictionloss Chart

SVES Data Sheet

Air Stripper Data Sheet

CALCULATION WORKSHEET NO. 1

CLIENT: Plexus Scientific — JOB NUMBER: 3104.06-001

SUBJECT: Pore Volume Air Exchange — Page 1 of 1
AAFES Station - Ft. Hamilton, NY

BY: DFC — CHECKED BY: JFK — DATE: 4/2/2007

Objective: Calculate soil pore volume exchanges/soil remediation time frames

Source: Soil Vapor Extraction and Bioventing Engineer Manual, Army Corp of Engineers
EM 1110-1-4001 (ACE 2002)

Note: Goal of 1000 to 1500 pore volume exchanges to remediate area of concern

	1 well			**Remediation area**	
Number of wells				8	wells
Air flow rate	32	cfm		256	cfm
Estimated radius of influence	25	ft	Area of Concern	10,000	ft^2
Depth of treatment area	20	ft		20	
Soil porosity	30%			30%	
Total volume	39,270	ft^3		200,000	
Total air-filled volume	11,781	ft^3		60,000	
Daily air volume removal	46,080	ft^3		368,640	
Daily pore volume exhanges	3.9			6.1	
Goal	1500	pore vol. exchanges		1500	
Time to achieve goal	383.5	days		244.1	
	1.1	years		0.7	

Entire remediation area has over 1,500 pore volumes removed within 1 year.
Design Acceptable.

CALCULATION WORKSHEET NO. 2

CLIENT:	Plexus Scientific	JOB NUMBER:	3104.06-001
SUBJECT:	Breakdown of Longest Path from MPE-2 to System AAFES Station - Ft. Hamilton, NY		Page 1 of 3
BY: DFC	CHECKED BY: JFK	DATE:	4/2/2007

Line No.	Line / Path Description	Length feet	Proposed Pipe Dia. (inches)	Pipe Dia. Used in Calc (inches)
1	MPE-2 to TEE w/ MPE-1	24	4	3
2	TEE to MPE-3	41	4	3
3	MPE-3 to MPE-7	60	4	3
4	MPE-7 to MPE-5	6	4	3
5	MPE-5 to MPE-6	32	4	3
6	MPE-6 to MPE-4	45	6	5
7	MPE-4 to SYSTEM	97	6	5

Note: Pipe schedule is included on Drawing No. C-2
Laterals from well to header line are 3-inch dia.
Header lines are 4-inch and 6-inch dia.
Header line is 6-inch dia. MPE-4 to the system

Smaller ipe diameter used in pneumatic analysis to account for some loss of area due to fluid in lines.

CALCULATION WORKSHEET NO. 2

CLIENT: Plexus Scientific JOB NUMBER: 3104.06-001

SUBJECT: Headloss Calculations
AAFES Station - Ft. Hamilton, NY

BY: DFC CHECKED BY: JFK DATE: 4/2/2007

Objective: Complete pneumatic analysis of SVE system
Source: Soil Vapor Extraction and Bioventing Engineer Manual, Army Corp of Engineers (ACE 2002)
Note: Each line (1-7) is listed with associated physical parameters. Total vacuum applied is added to additional vacuum need to overcome friction losses though pipe, valves, and other physical restrictions.

	Line 1	Line 2	Line 3	Line 4	Line 5	Line 6	Line 7	Comments
Flow (cfm)	32	64	96	128	160	192	256	
Nom. Dia. (in)	3	3	3	3	3	5	5	
Dia (ft)	0.250	0.250	0.250	0.250	0.250	0.417	0.417	
Int. Area (ft3)	0.049	0.049	0.049	0.049	0.049	0.136	0.136	
Velocity (ft/m)	652	1304	1956	2608	3259	1408	1877	
Velocity (ft/s)	11	22	33	43	54	23	31	
Loss/ft	0.010	0.010	0.021	0.035	0.054	0.014	0.014	Rotron table
L (ft)	24	41	60	6	32	45	97	
	0.24	0.41	1.26	0.21	1.73	0.63	1.36	
Equivalent Lengths								
90 deg	7	7	7	7	7	10	10	Gast
Tee (straight thru)	5	5	5	5	5	7	7	Gast
Tee (branched)	16	16	16	16	16	20	20	Gast
Gate valve	2	2	2	2	2	3	3	Gast
Check valve	26	26	26	26	26	34	34	Gast
45 deg	4	4	4	4	4	5	5	Rotron table
Quantities								
90 deg	1	1				1	4	
Tee (straight thru)								
Tee (branched)	1	1	1	1	1	1		
Gate valve	1							
Check valve								
45 deg							1	
Total Equivalent Length	24.5	22.5	15.5	15.5	15.5	30	45	
Pressure head								
Total Loss	0.49	0.64	1.59	0.75	2.57	1.05	1.99	

Total Headloss in Headers: 9.06

CALCULATION WORKSHEET NO. 2

CLIENT: Plexus Scientific JOB NUMBER: 3104.06-001

SUBJECT: System Summary
AAFES Station - Ft. Hamilton, NY

BY: DFC CHECKED BY: JFK DATE: 4/2/2007

	Design Parameter		**Notes:**
1	No. of Extraction Wells	8	7 new MPE wells + MW-5
2	Required vacuum @ Extraction Well	90	At well, NOT slurp-tube
3	*Headloss/Vacuum Summary*	*inches H_2O*	
	Estimated line (friction) loss in 1" slurp tube	8.4	= 0.42" per ft X 20 ft
	Estimated line (friction) Headloss in	9.06	
	Headloss in HVLS Air/Water Separator	10	Source SCG
	Headloss in particle filter	20	
	Headloss thru vapor-phase GAC	15	Source SCG
	Subtotal of headloss>	62.46	
	Total vacuum required of rotary-lobe blower 2 + 3 =	152.46	= 11.1 inches Hg
	Safety Factor (15%)		= 12.8 inches Hg
4	MPE blower operating parameters	256 cfm @	12.8 inches Hg

CALCULATION WORKSHEET NO. 3

CLIENT: Plexus Scientific JOB NUMBER: 3104.06-001

SUBJECT: MPE Blower Analysis / Preliminary Selection Page 1 of 1
AAFES Station - Ft. Hamilton, NY

BY: DFC CHECKED BY: JFK DATE: 4/2/2007

# MPE Wells	Total Req'd Flowrate[1]	Blower Specs		Blower Model	Speed rpm	% of max rpm	Discharge[2]
		flowrate[3] cfm	vacuum " Hg	M-D Pneumatics **Legend**			temp °F
8	256	275	13	Model 5507*	1,900	57.6%	+ 160°

Notes:
1 Total required flowrate = # of MPE wells X 32 cfm/well
2 Discharge parameters are based on 1.0 psi back-pressure from oxidizer / GAC
3 Assumed to be the blower's inlet cfm.
4 20 Hp motor required to achieve design operation parameters

CALCULATION WORKSHEET NO. 4

CLIENT:	Plexus Scientific	JOB NUMBER:	3104.06-001
SUBJECT:	Estimate sound propagation from MPE equipment		Page 1 of 2
BY:	DFC CHECKED BY: JFK	DATE:	12/4/2006

OBJECTIVE: Estimate the sound propagation at a distance away from the source (equipment compound).

WORKING EQUATION:

$L_p = L_w - 20 \log R + DI - A_b - A_g - A_a + 2.3$

REFERENCE: Noise Control Reference Handbook by Industrial Acoustics Company Equation C-6.

WHERE:

L_p=	Sound pressure level at receiver (dB).	
L_w=	Sound pressure level at source (dB), provided by SCG	**75 dB**
R =	Distance between source and receiver (feet).	**100 feet**
DI=	Directivity Index	
A_b =	Attenuation due to barriers.	
A_g =	Attenuation due to ground absorption.	
A_a =	Attenuation due to atmosphere (wind).	

INPUTS

FIRST: The directivity index (DI) is the difference between the sound pressure level in any given direction in the acoustical far field and the average sound pressure level in that field.

The DI is obtained from a chart on page B-2 of the reference and is based on the noise emanating from the trailer in the direction of the residential area. This is a conservative approach since the actual equipment configuration will direct noise in the opposite direction (180^o) of the residential area.

DI = 10 dB

SECOND: To be conservative, assume the attenuation factors to be zero decibels, i.e. no attenuation.

THIRD: Calculate the sound pressure at the residential area from the equipment:

L_p= 47.3 dB and is equivalent to a quiet restaurant.

dB (SPL)		Source (with distance)
194		Theoretical limit for a sound wave at 1 atmosphere environmental pressure; pressure waves with a greater intensity behave as shock waves.
180		Krakatoa volcano explosion at 1 mile in air [1]
160		M1 Garand being fired at 1 meter (3 ft)
150		Jet engine at 30 m (100 ft)
140		Low Caliber Rifle being fired at 1m (3 ft); the engine of a Formula One car at 1 meter (3 ft)
130		Threshold of pain; civil defense siren at 100 ft (30 m)
120		Train horn at 1 m (3 ft). Perforation of eardrums.
110		Football stadium during kickoff at 50 yard line; chainsaw at 1 m (3 ft)
100		Jackhammer at 2 m (7 ft); inside discothèque
90		Loud factory, heavy truck at 1 m (3 ft)
80		Vacuum cleaner at 1 m (3 ft), curbside of busy street, PLVI of City
70		Busy traffic at 5 m (16 ft)
60		Office or restaurant inside
50		Quiet restaurant inside
40		Residential area at night
30		Theatre, no talking
20		Whispering
10		Human breathing at 3 m (10 ft)
0		Threshold of human hearing (with healthy ears); sound of a mosquito flying 3 m (10 ft) away

CALCULATION WORKSHEET NO. 5

CLIENT: Plexus Scientific — JOB NUMBER: 3104.06-001

SUBJECT: Estimation of Electical Service — Page 1 of 1
AAFES Station - Ft. Hamilton, NY

BY: DFC — CHECKED BY: JFK — DATE: 4/2/2007

Item	Description	Quantity	Hp	Voltage	Phase	Amps[1]	Power[2] kW	Total kW
	SCG Trailer							
1.0	MOTORS:							
1.1	MPE Blower	1	20	460	3	27	12.4	12.4
1.2	Safety Factor 25% of largest motor						3.1	3.1
1.3	Air Compressor	1	5	460	3	7.6	3.5	3.5
1.4	Air Stripper Fan	1	5	460	3	7.6		
1.5	OWS Transfer Pump	1	0.5	460	3	2	0.9	0.9
1.6	Air Stripper Transfer Pump	1	0.5	460	3	2	0.9	0.9
1.7	Control Room Vent Fan	1	0.5	208	1	4.9	1.0	1.0
2.0	HEATERS:							
2.1	Process Room Heater	1	NA		3 & 1		6.5	6.5
2.2	Control Room Baseboard Heater	1	NA				1.3	1.3
3.0	CONTROLS & MISC:							
3.1	Control Panel	1	NA					1.0
3.2	Stepdown Transformer (460 >> 240)							15.0
3.3	Receptacles	2					0.18	0.4
4.0	LIGHTS:							
4.1	Lighting (Exterior)[3]	1					0.4	0.5
4.2	Lighting (Interior)[3]	3					0.1	0.4
5.0	**External**							
5.1	Oxidizer	1	NA		3 & 1		10.0	10.0
5.2	Heat Tracing :	8 vaults X 10' per vault = 80 ft 3 headers (2 water & 1 air) X 20' per header = 60' 140' X 6 watts per foot = 840 watts + 20% SF = 1,008 watts						1.0

Total Connected kW: 57.9

Notes: 1 - Full-Load Current Amperage from NEC, Table 430-150.
2 - Power in kilowatts (kW) = Voltage X Amps / 1,000
3 - Total power consumption for lighting includes 25% safety factor.

Total Connected Watts: 57,915

Required Amperage: 125.9

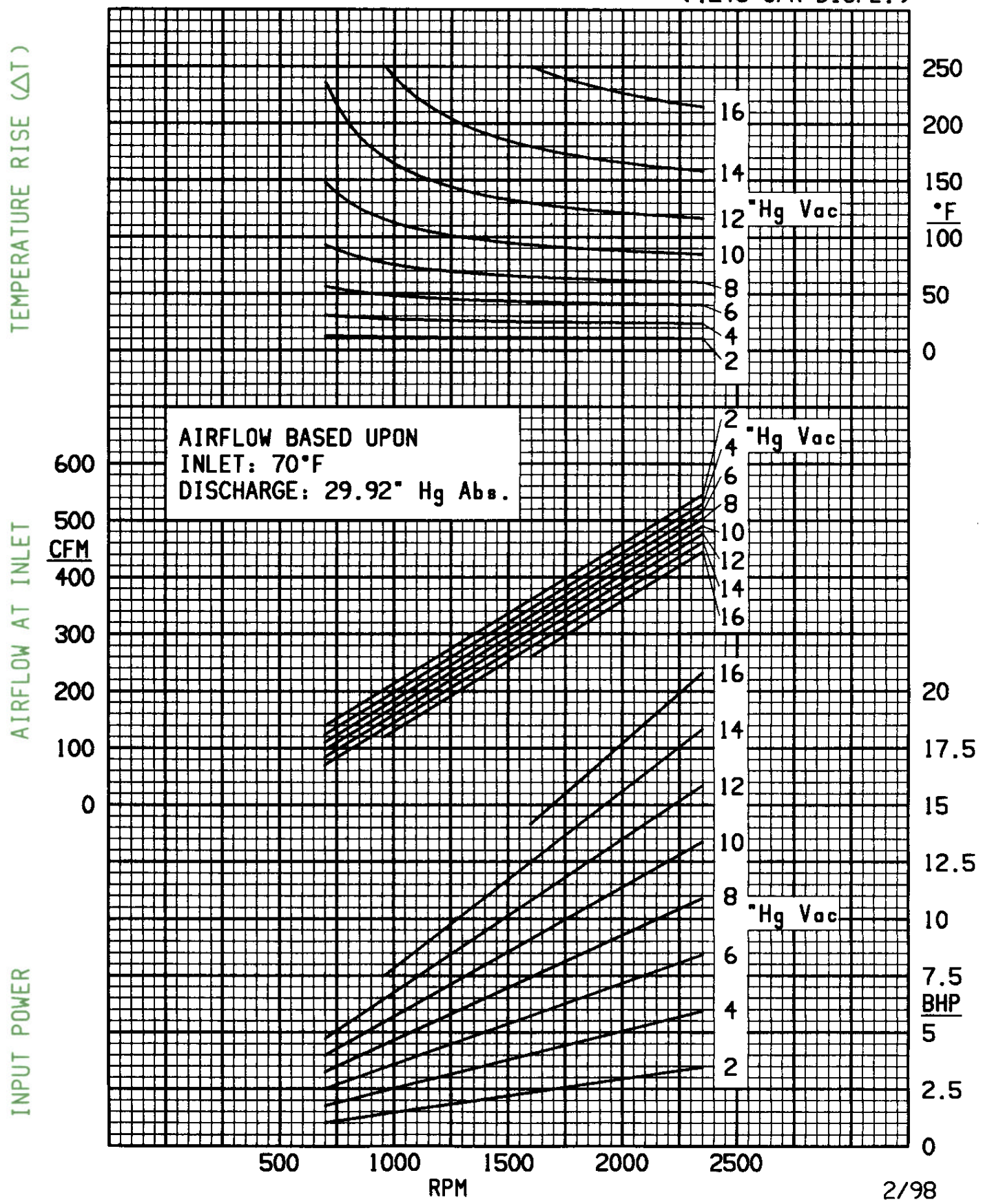
Service = 460 Volt / 3 Phase and should be rated for (amps): 150

TUTHILL
Vacuum & Blower Systems

C-1451

6005 COMPETITOR PLUS™ VACUUM CURVE

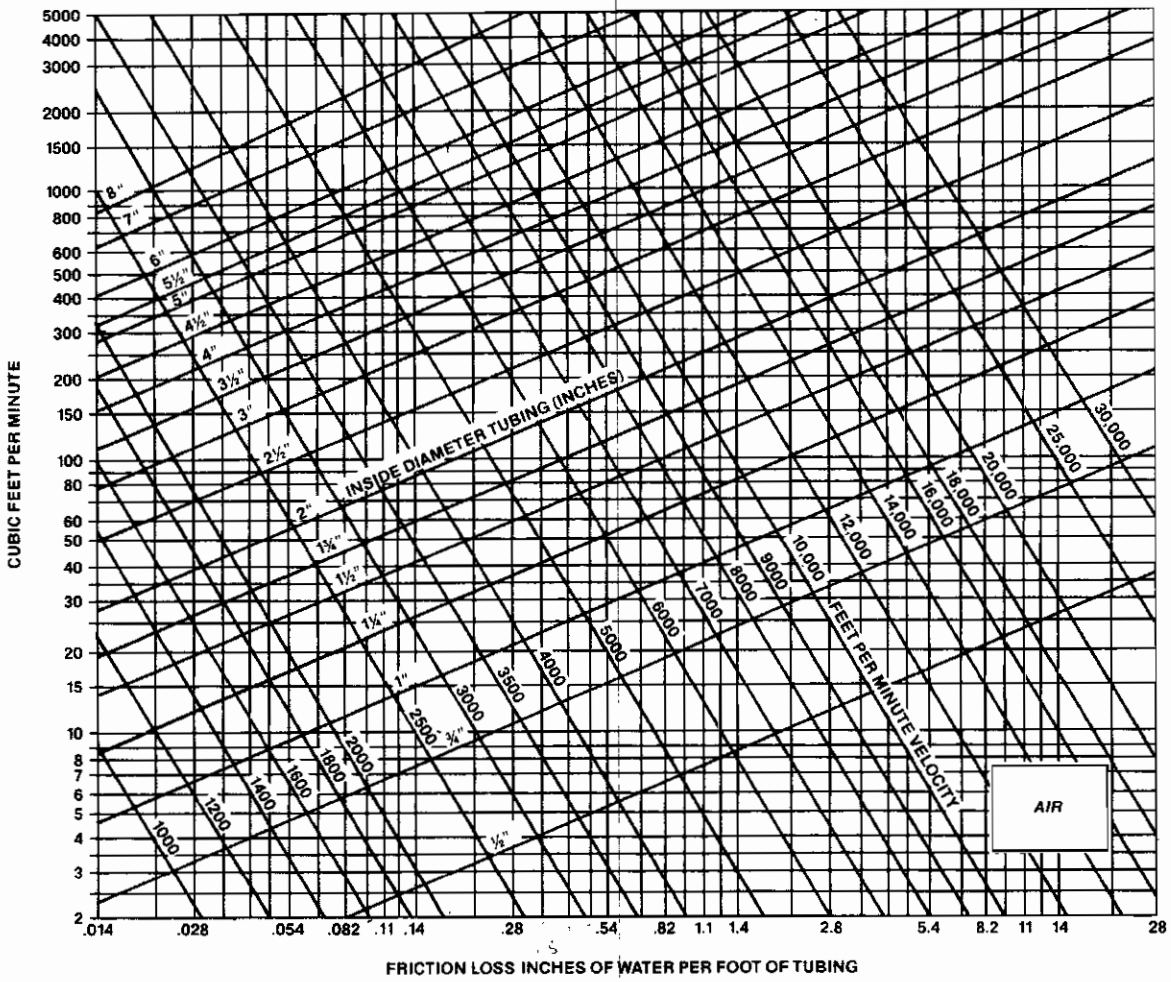
(.246 CFR DISPL.)



2/98

Application Engineering Basics

Friction Loss Per Foot of Tubing



Friction Loss in Fittings

To calculate friction loss in fittings use chart below. This chart will yield equivalent lengths (in feet) of tubing. Use this length with graph above to find friction loss in inches of water column.

NOMINAL PIPE SIZE (INCHES)	EQUIVALENT TUBING LENGTH (FEET)	
	90° EL	45° EL
1 1/4	3	1.5
1 1/2	4	2
2	5	2.5
2 1/2	6	3
3	7	4
4	10	5
5	12	6
6	15	7.5
8	20	10

Rev. 2/01

Air Stripper Data Sheet

TO: (Regional Spill Engineer) or (File)
FROM: (Responsible Party or Contractor) or (Regional Spill Engineer)

1. Reason for Submittal:

   X Notice of Operation
   ___ Notice of Removal of Emission Control Equipment

2. Spill Name: AAFES Station, Building 200
   Spill Location: 200 General Lee Avenue
   Ft. Hamilton / Brooklyn, NY

3. Spiller: US Army Air Force Exchange Service (AAFES)
   Address: 129 Wainwright Drive
   Brooklyn, NY 11252

4. Spill Number: 98 02727 PIN Number: _____

5. Date Air Stripping Operations Began: NA / ___ / TBD

6. Estimated Project Duration: 1 - 2 ~~Months or~~ (Years)

7. Emission Point

   a. Emission I.D. Number: 001 (to be identified on site plan as well)
   b. Ground Elevation Above Sea Level: 38 FT.
   c. Stack Height: 15 FT.
   d. Height Above Nearest Structure: 3 FT.
   e. Stack Inside Dimensions: 0.5 FT.
   f. Air Exit Temperature: 60 °F
   g. Water Flow-rate: 6.25 GPM = 9,000 GPD
   h. Air Flow-rate: 150 CFM
   i. Air Exit Velocity: 12.8 FT/SEC

      = Air Flow-rate in CFM ÷ 60
      Cross Sectional Area of Stack in FT^2

   j. Benzene Concentration in Water Influent: 700 * UG/L * estimated max concentration
   k. Distance From Base of Stack to Nearest On-Site Bldg.: 5 - 15 FT
   l. Distance From Base of Stack to Nearest Off-Site Bldg.: 80 FT

8. Operation Time

   a. (Hours/Day: 24)* TBD (Potential auto shut-down for evening hours)
   b. Days/Year: 365
   c. % Operation by Season: 25% winter 25% summer
      25% spring 25% Fall

9. Process Description

Air stripper to remove volatile compounds from groundwater, and to discharge the compounds to the atmosphere via cross-current air flow. (Include description of air discharge treatment if appropriate.)

10. Emission Controls

__X__ Not Needed Based on Analysis of Design Conditions
_____ Not Needed Based on Analysis of Operating Conditions
_____ Described Below

11. Control Equipment NA

a. I.D. Number: 01 (to be identified on site plan as well)
b. Control Type:

___ none ___ thermal afterburner
___ activated bed adsorber ___ catalytic unit
___ other, explain:

c. Manufacturer's Name: _____
d. Model Number: _____
e. Disposal of Collected Contaminants:

___ landfill off-site ___ recycled on-site
___ recycled in the process ___ public sewer
___ other, explain:

f. Date Emission Control Operations Began: ____/____/____
g. Expected Useful Life: _____ Months or Years

12. Contaminant

a. Name: Benzene
b. CAS Number: 71-43-2
c. Stripper Water Input: 0.00198 LBS/HR
(= 7g. in GPM x 7j. in UG/L x 4.542 x 10^{-7})
d. Stripper Efficiency: 99.99 % * Based on Shallow Tray Model P 1331
e. Stripper Water Output: 1.98×10^{-7} LBS/HR
(= 12c. - (12c. x 12d. ÷ 100))
f. ~~Control Equipment~~ Air Stripper Input: ~~NA~~ 0.00198 LBS/HR
(= 12c. - 12e.)
g. Control Equipment Efficiency: NA %
h. ~~Control Equipment~~ Output: ~~NA~~ LBS/HR 0.00198 LBS/HR
(= 12f.- (12f. x 12g. ÷ 100))
Air Stripper
i. Permissible Water Input Conc.: 1.5 PPM BENZENE ~~UG/L~~ (extrapolated from Stip Guidance Figure 2 "Air Stripper Benzene Emissions" for 6.25 gpm
j. Permissible Air Output Conc.: 0.00494 LBS/HR

13. Fuels for Combustion Vented to the Same Emission Point NA (Equipment to be powered by electric motors)

a. Fuel Used:

___ none ___ oil ___ gas
___ other, explain:

b. Fuel Type:

___ #2 fuel oil ___ natural gas
___ #4 fuel oil ___ LP gas
___ diesel fuel ___ other, explain:

c. Amount: _____ x 10^3 GALS/YR (oil)
_____ x 10^3 FT^3/YR (gas)

d. For Oil Only, Sulfur Content: _____% By Weight
e. For Gas Only, Heating Value: _____ BTU/FT^3

SVES Data Sheet

TO: (Regional Spill Engineer) or (File)
FROM: (Responsible Party or Contractor) or (Regional Spill Engineer)

1. Reason for Submittal:
   _X_ Notice of Operation
   _____ Notice of Removal of Emission Control Equipment

2. Spill Name: AAFES Station, Building 200
   Spill Location: 200 General Lee Avenue
   Ft. Hamilton / Brooklyn, NY

3. Spiller: US Army Air Force Exchange Service (AAFES)
   Address: 129 Wainwright Drive
   Brooklyn, NY 11252

4. Spill Number: 98 02727 PIN Number: _____

5. Start-Up Date: __/__/NA / TBD
   mo day yr

6. Estimated Project Duration: 1 - 2 ~~Months or~~ Years

7. Emission Point:
   a. Emission I.D. Number: 001
   b. Ground Elevation Above Sea Level: 38 FT
   c. Stack Height: 15 FT
   d. Height Above Nearest Structure: 3 FT
   e. Stack Inside Dimensions: 1.3 FT
   f. Air Exit Temperature: _____ F 1,000 – 1,600°F (depending on oxidizer mode catalytic or thermal)
   g. Air Flow-rate: 256 CFM * Design Extraction Flow Rate
   h. Air Exit Velocity: 3.2 FT/SEC
      = Air Flow-rate in CFM
      Cross-sectional Area of Stack in FT^2 X 60
   i. Benzene Concentration in Air Influent: _____ UG/M^3
      _____ LB/HR
      27 PPM-V
   j. Distance From Base of Stack to Nearest On-Site Bldg: 5 - 15 FT
   k. Distance From Base of Stack to Nearest Off-Site Bldg: 80 FT

8. Operation Time
   a. Hours/Day: 24 * TBD (Potential Auto Shut-down for evening hours)
   b. Days/Year: 365
   c. % Operation by Season: 25% Winter 25% Summer
      25% Spring 25% Fall

9. Process Description
   Soil vapor extraction to remove volatile compounds from petroleum-contaminated soil, and to discharge the compounds to the atmosphere.

10. Emission Controls

_____ Not Needed Based on Analysis of Pilot Test Data
_____ Not Needed Based on Analysis of Operating Data
__X__ Described Below

11. Control Equipment

a. I.D. Number: 01 (to be identified on site plan as well)
b. Control Type:
___ none __X__ thermal afterburner } dual-mode oxidizer
___ activated bed adsorber __X__ catalytic unit
___ other, explain:

c. Manufacturer's Name: Bisco Environmental
d. Model Number: Model 250 G
e. Disposal of Collected Contaminants:
___ landfill off-site ___ recycled on-site
___ recycled in the process ___ public sewer
___ other, explain: NA - contaminants destroyed
f. Date Emission Control Operations Began: NA/____/TBD
g. Expected Useful Life: * Months or Years
↳ short-term rental anticipated (4-8 months)

12. Contaminant

a. Name: Benzene
b. CAS Number: 71-43-2
c. Control Equipment Input (= 7i.): 27 ~~LBS/HR (or UG/m³ or~~ PPM-V) benzene
d. Control Equipment Efficiency: >99 %
e. Control Equipment Output (= (1-12d.) x 12c.): <0.27 ~~LBS/HR (or UG/m³ or~~ PPM-V) benzene
f. Permissible Air Output Conc.: 1.6 ~~LBS/HR (or UG/m³~~ or PPM-V) benzene
↑ based on 15' stack & 250 cfm air flow

13. Fuels for Combustion Vented to the Same Emission Point

a. Fuel Used:
___ none ___ oil ___ gas
__X__ other, explain: natural gas

b. Fuel Type:
___ #2 fuel oil __X__ natural gas (for supplemental fuel)
___ #4 fuel oil ___ LP gas
___ diesel fuel ___ other, explain:

c. Amount:_____ x 10^3 GALS/YR (oil)
__*__ x 10^3 FT^3/YR (gas) * dependent on influent concentrations
d. For Oil Only, Sulfur Content:_____% By Weight
e. For Gas Only, Heating Value:_____ BTU/FT^3