



July 19, 2010

New York State Department of Environmental Conservation
Division of Environmental Remediation
Remedial Bureau B
625 Broadway, Albany, NY 12233-7016

Attn: Sadique Ahmed, Environmental Engineer 1

**Re: Site Management Plan
Cornerstone Site B-1
3100 Third Avenue
Bronx, New York
BCP Site #C203044**

Dear Mr. Ahmed:

On behalf of CS Melrose Site B LLC (the Volunteer), CA Rich Consultants, Inc. is pleased to provide you with this Site Management Plan for the above-referenced project. This Report was prepared for the use by the New York State Department of Environmental Conservation (NYSDEC) under the Brownfield Cleanup Program. This document includes revisions in response to comments submitted by the NYSDEC and the New York State Department of Health in their letter dated June 21, 2010.

If you have any questions, please do not hesitate to call our Office.

Respectfully,

CA RICH CONSULTANTS, INC.

A handwritten signature in black ink, appearing to read "D. Shapiro".

Deborah Shapiro
Project Manager

A handwritten signature in black ink, appearing to read "Stephen J. Osmundsen".

Stephen J. Osmundsen
Senior Engineer

cc: Chris Doroski, NYSDOH
Debbie Kenyon, CS Melrose Site B LLC
Repository



Cornerstone Site B-1

**3100 Third Avenue
BRONX, NEW YORK**

Site Management Plan

NYSDEC Site Number: C203044

Prepared for:

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Revisions to Final Approved Site Management Plan:

Revision #	Submitted Date	Summary of Revision	DEC Approval Date

JULY 2010

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LIST OF ACRONYMS

Acronym	Definition
AST	Aboveground Storage Tank
BCA	Brownfield Cleanup Agreement
BCP	Brownfield Cleanup Program
CAMP	Community Air Monitoring Plan
CA RICH	CA RICH Consultants, Inc.
CLP	Contract Laboratory Protocol
COC	Certificate of Completion
DUSR	Data Usability Summary Report
EC	Engineering Controls
ELAP	Environmental Laboratory Accreditation Program
ESA	Environmental Site Assessment
EWP	Excavation Work Plan
HASP	Health and Safety Plan
IC	Institutional Controls
ISCO	In-Situ Chemical Oxidation
LEL	Lower Explosive Limit
NYCRR	New York Codes Rules and Regulations
NYS	New York State
NYSDEC	New York State Department of Environmental Conservation
NYCDEP	New York City Department of Environmental Protection
NYSDOH	New York State Department of Health
PCBs	Polychlorinated Biphenyls
PCE	Tetrachloroethene or perchloroethene
PID	Photoionization Detector
RAWP	Remedial Action Work Plan
RI	Remedial Investigation

Acronym	Definition
ROD	Record of Decision
SCOs	Soil Cleanup Objectives
SMP	Site Management Plan
SVOCs	Semi-volatile Organic Compounds
SSD	Sub Slab Depressurization
SSSALs	Site-Specific Soil Action Levels
SVI	Soil Vapor Intrusion
SWPPP	Storm-Water Pollution Prevention Plan
TAL	Target Analyte List
TOGS	Technical and Operational Guidance Series
VOCs	Volatile Organic Compounds
QAPP	Quality Assurance Project Plan
QEP	Qualified Environmental Professional

SITE MANAGEMENT PLAN

1.0 INTRODUCTION AND DESCRIPTION OF REMEDIAL PROGRAM

1.1 INTRODUCTION

This document is required as an element of the remedial program at Cornerstone Site B-1 (hereinafter referred to as the “Site” as specified in further detail below) under the New York State (NYS) Brownfield Cleanup Program (BCP), administered by New York State Department of Environmental Conservation (NYSDEC). The Site was remediated in accordance with Brownfield Cleanup Agreement (BCA) Index #W2-1126-08-10, Site # C203044, which was executed on December 18, 2008 and BCA Index #W2-1126-09-07 last amended on July 14, 2009.

1.1.1 General

CS Melrose Site B LLC entered into a BCA with the NYSDEC to remediate two lots (Block: 2364; Lots: 45 and 70) totaling 16,028 square feet located in the Borough of the Bronx, New York (the “Site”). The two lots are part of a larger redevelopment that also includes Block: 2364; Lot: 49 and part of Lot 58. This BCA required the Remedial Party, CS Melrose Site B LLC, to investigate and remediate contaminated media at the Site. A figure showing the Site location and boundaries of this 16,028 square foot “Site” is provided in **Figure 1**. The boundaries of the Site are more fully described in the metes and bounds Site description that is part of the Environmental Easement (Appendix K).

After completion of the remedial work described in the Remedial Action Work Plan (RAWP), some contamination was left in the subsurface at this Site, which is hereafter referred to as ‘remaining contamination.’ This Site Management Plan (SMP) was prepared to manage remaining contamination at the Site until the Environmental

Easement is extinguished in accordance with ECL Article 71, Title 36. All reports associated with the Site can be viewed by contacting the NYSDEC or its successor agency managing environmental issues in New York State.

This SMP was prepared by CA RICH Consultants, Inc. (CA RICH), on behalf of CS Melrose Site B LLC, in accordance with the requirements in NYSDEC DER-10 Technical Guidance for Site Investigation and Remediation, dated December 2002, and the guidelines provided by NYSDEC. This SMP addresses the means for implementing the Institutional Controls (ICs) and Engineering Controls (ECs) that are required by the Environmental Easement for the Site.

1.1.2 Purpose

The Site contains contamination left after completion of the remedial action. Engineering Controls have been incorporated into the Site remedy to control exposure to remaining contamination during the use of the Site to ensure protection of public health and the environment. An Environmental Easement granted to the NYSDEC, and recorded with the Bronx County Clerk, will require compliance with this SMP and all ECs and ICs placed on the Site. The ICs place restrictions on Site use, and mandate operation, maintenance, monitoring and reporting measures for all ECs and ICs. This SMP specifies the methods necessary to ensure compliance with all ECs and ICs required by the Environmental Easement for contamination that remains at the Site. This plan has been approved by the NYSDEC, and compliance with this plan is required by the grantor of the Environmental Easement and the grantor's successors and assigns. This SMP may only be revised with the approval of the NYSDEC.

This SMP provides a detailed description of all procedures required to manage remaining contamination at the Site after completion of the Remedial Action, including: (1) implementation and management of all Engineering and Institutional Controls; (2) media monitoring; (3) operation and maintenance of all treatment, collection, containment, or recovery systems; (4) performance of periodic inspections, certification of results, and

submittal of Periodic Review Reports; and (5) defining criteria for termination of treatment system operations.

To address these needs, this SMP includes three plans: (1) an Engineering and Institutional Control Plan for implementation and management of EC/ICs; (2) a Monitoring Plan for implementation of Site Monitoring; (3) an Operation and Maintenance Plan for implementation of remedial collection, containment, treatment, and recovery systems (including, where appropriate, preparation of an Operation and Maintenance Manual for complex systems).

This plan also includes a description of Periodic Review Reports for the periodic submittal of data, information, recommendations, and certifications to NYSDEC.

It is important to note that:

- This SMP details the Site-specific implementation procedures that are required by the Environmental Easement. Failure to properly implement the SMP is a violation of the environmental easement, which is grounds for revocation of the Certificate of Completion (COC);
- Failure to comply with this SMP is also a violation of Environmental Conservation Law, 6 NYCRR Part 375 and the BCA (Index # W2-1126-09-07, Site # C203044) for the Site, and thereby subject to applicable penalties.

1.1.3 Revisions

Revisions to this plan will be proposed in writing to the NYSDEC's project manager. In accordance with the Environmental Easement for the Site, the NYSDEC will provide a notice of any approved changes to the SMP, and append these notices to the SMP that is retained in its files.

1.2 SITE BACKGROUND

1.2.1 Site Location and Description

The Site is located in the Borough of the Bronx, County of the Bronx, New York and is identified as Block: 2364; Lots: 45 and 70 on the Borough of the Bronx Tax Map. The two lots of the BCP Site are part of a larger redevelopment that also includes Block: 2364; Lot: 49 and part of Lot 58. The BCP Site is an approximately 16,028 square feet area bounded by a vacant lot to the north, East 158th Street to the south, a small wedged vacant lot (air rights over p/o Lot 58) and Brook Avenue to the east, and Third Avenue to the west (see **Figure 1**). The boundaries of the Site are more fully described in **Appendix A – Metes and Bounds**.

1.2.2 Site History

1.2.2.1 Past Uses and Ownership

Historical records indicate that Block: 2364; Lot: 45 was originally developed circa 1951 with a single story building with a basement. According to the Phase I Environmental Site Assessment (ESA) dated March 5, 2004 prepared by Pressly and Associates, Inc. (Ref. 1), the building was utilized as a store, upholstery business and an undertaker. Circa 1969, the building was also developed as a dry cleaner. In 1989, the building operated as a medical center and a dry cleaner. Lot 70 was historically used as the backyard of the dry cleaner and a community garden. The Phase I ESA concluded the following:

- A dry cleaner operated on the Site in and around the period between 1969 and 1989. The dry cleaner was not identified in the Resource Conservation and Recovery Act (RCRA) database or spill files and probably pre-dated those databases. However, due to past experience with the poor housekeeping operations of these facilities, it was recommended

that a groundwater investigation be conducted to evaluate the potential presence of dry cleaning solvents in the subsurface on the southern side of the building.

- All reported spills within 1/8 mile of the Site were of small volume and on land, therefore, not likely to impact the Site.
- Although medium radon levels were reported for Bronx County basements, the basement area is currently not occupied.

Based on the findings of the Phase I ESA, a Remedial Investigation (RI) (Ref. 2) was conducted for the Site.

1.2.2.2 Sanborn Maps

All Sanborn Maps available for this Site were reviewed and included as an Appendix to the RAWP (Ref. 3). In addition, Sanborn Maps were reviewed and analyzed in Section 5.0 of the Phase I ESA dated March 5, 2004 (Ref. 1) prior to preparation of the RAWP. The following is the text from Section 5.0 of the Phase I ESA.

Property maps and descriptions were obtained from Sanborn Insurance maps for the target [S]ite. The Site was depicted on a total of [six] maps from the period between 1909 and 1989. In 1909, the entire Site consisted of vacant land.

In 1951[,]. Lot 45 was improved by a single story building divided into sections with a basement with addresses 3100 and 3104 Third Ave, and 481, 501, and 503 158th Street. The building included descriptions of a store, upholstery business, and an undertaker.

Between 1969 and 1979, the former upholstery space in the building on the [Site] was described as a [d]ry [c]leaners. The dry cleaner space could be under the addresses of 481 and 501 158th Street or 3100 Third Ave. In 1989, the building on the [Site] includes a [m]edical [c]enter and a [d]ry [c]leaners.

The former building was demolished in preparation for redevelopment activities.

1.2.3 Geologic Conditions

According to pre-construction survey measurements, the Site is approximately 27 to 30 feet above mean sea level based on the Borough of the Bronx Datum. The pre-construction on-site topography sloped gently towards the northwest.

The Site is located in the New England Upland Physiographic Region. Based on field observations and the New York State Museum and Science Service (Ref. 4) the bedrock underlying the Site is comprised of the Inwood Marble, a member of the Ordovician-Cambrian Wappinger and Stockbridge Groups. Surficial geologic materials are characterized as ground moraine and/or urban fill consisting of sand, silt, clay and gravel. Groundwater in this area of the Bronx is not used for potable supply purposes.

Based upon Site-specific groundwater elevation data collected on January 13, 2010, the Site-specific direction of groundwater flow is toward the southwest and the flow of overburden water or interstitial flow is towards the northeast. The regional direction of groundwater flow is believed to be to the south and towards the confluence of the Harlem and East Rivers. A groundwater well location, water table elevation, and flow map is provided as **Figure 2**. Geologic cross-sections are shown on **Figures 3, 3A, and 3B**.

1.3 SUMMARY OF REMEDIAL INVESTIGATION FINDINGS

An RI was performed to characterize the nature and extent of contamination at the Site. As the applicant entered into the BCP as a Volunteer, they are only responsible for investigating on-site issues. However, as the planned redevelopment for this Site includes the adjacent Lot 49, the RI was conducted at the Site (Lots 45 and 70) as well as at its adjacent lot (Lot 49). It is noted that the redevelopment area also includes an air rights parcel as part of Lot 58; but, as this parcel is an air rights parcel it was not included in the RI. All three lots (45, 49, and 70) are referred to in the RI as the “Study Area”. The investigation was conducted between June and October 2007, and in April 2009. In addition, a pre-design investigation was conducted in May and June 2009 (Ref. 5). The

results of the RI and pre-design investigation are described in detail in the following reports:

<u>Document</u>	<u>Date</u>
Remedial Investigation Report, CA RICH	April 2009
Groundwater Investigation and Design Report, CA RICH	September 2009; Revised November 2009

Generally, the RI and pre-design investigation determined that there has been a release of tetrachloroethene (PCE) to the subsurface soils at the Site. The data indicated that PCE is present below all portions of the former building foundation that were tested, but is most concentrated below the southern portion of the former building, which was formerly used as a dry cleaning facility. Elevated levels of several Semi-Volatile Organic Compounds (SVOCs) commonly referred to as Polynuclear Aromatic Hydrocarbons or “PAHs” and select metals were detected in the soil throughout the Site and in the adjacent Lot 49 at varying depths. There were also four pesticide detections above Part 375 Unrestricted Use Soil Cleanup Objectives (SCOs) (Ref. 6). One polychlorinated biphenyl (PCB) Aroclor (1242) also exceeded the Part 375 Unrestricted Use SCOs. In addition, elevated levels of PCE, acetone, methyl ethyl ketone, toluene and xylene were measured in the soil vapor throughout the Site. The levels of acetone and toluene may have been related to a portion of the Site once being occupied by an undertaker.

As rainwater infiltrates into the soils at the Site, some of the PCE has migrated into the groundwater. PCE was detected above NYSDEC Technical and Operational Guidance Series (TOGS) (Ref. 7) in the overburden and fractured bedrock at on-site monitoring wells MW-7, MW-8, MW-1 and off-site wells MW-2A, MW-5, and MW-6.

Below is a summary of Site conditions when the RI was performed in 2007 and 2009:

Soil

VOCs – Several Volatile Organic Compounds (VOCs) were detected in the soils within the Study Area. PCE was detected in soil samples collected below the basement floor of the former building at concentrations ranging from 3.6 to 49 ug/kg. Detections of methyl ethyl ketone (a.k.a. 2-butanone and MEK) and acetone were also recorded. None of these detections, however, exceeded the Part 375 Unrestricted Use SCOs (Ref. 6).

SVOCs – Numerous SVOCs were detected in the soils within the Study Area. The compounds that exceeded the Part 375 Unrestricted Use SCOs were benzo(a)anthracene, chrysene, benzo(b)fluoranthene, benzo(k)fluoranthene, benzo(a)pyrene, indeno(1,2,3-cd)pyrene, and dibenzo(a,h)anthracene.

Metals – Several metals were detected in the subsurface soils within the Study Area. Of these occurrences, the detections of barium, cadmium, calcium, copper, magnesium, lead, mercury, silver, and zinc in the soils within the Study Area exceeded the Part 375 Unrestricted Use SCOs.

Pesticides – Several pesticides were detected in the soils within the Study Area. These included dieldrin, endrin, endosulfan sulfate, DDE, DDD, and DDT. Of these, dieldrin exceeded the Part 375 Unrestricted Use SCOs in the shallow, zero to one foot deep samples only. The pesticides dieldrin, 4,4'-DDE, 4,4'-DDD, and 4,4'-DDT exceeded Part 375 Unrestricted Use SCOs throughout the Study Area.

PCBs – There were two detections of polychlorinated biphenyls (PCBs), Aroclors 1242 and 1254, within the Study Area. The detection of Aroclor 1242 exceeded the Part 375 Unrestricted Use SCOs.

Below is a summary of Site conditions when the pre-design investigation was performed in 2009:

Soil

VOCs – Ethyl benzene, isopropylbenzene, naphthalene, PCE, toluene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, m,p-Xylene, and o-Xylene were detected in the soil/fill materials. PCE detections ranged from 0.85 to 55.4 ug/kg. These detections were significantly below Part 375 Unrestricted Use SCOs.

SVOCs – Phenol, acenaphthene, acenaphthylene, anthracene, benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(g,h,i)perylene, benzo(k)fluoranthene, 1,1'-Biphenyl, carbazole, chrysene, dibenzo(a,h)anthracene, dimethyl phthalate, bis(2-Ethylhexyl)phthalate, fluoranthene, fluorene, indeno(1,2,3-cd)pyrene, 2-Methylnaphthalene, naphthalene, phenanthrene, and pyrene were detected in the soil/fill materials. These detections were significantly below Part 375 Unrestricted Use SCOs.

Pesticides – Alpha-Chlordane, gamma-Chlordane, 4,4'-DDD, 4,4'-DDE, and 4,4'-DDT were detected in the soil/fill materials. The detections of 4,4'-DDT and 4,4'-DDD in sample MW-6A (8 feet) and 4,4'-DDT in sample MW-9 (17 feet) exceeded the Part 375 Unrestricted Use SCOs.

PCBs – Aroclor 1260 was detected in sample MW-2A. This detection was significantly below Part 375 Unrestricted Use SCOs.

Metals – Aluminum, arsenic, barium, calcium, chromium, cobalt, copper, iron, lead, magnesium, manganese, mercury, nickel, potassium, vanadium, and zinc were detected in the soil/fill materials. The detections of chromium in samples MW-2A, MW-6A (8 feet), MW-7 (5 feet), MW-8 (16 feet), MW-9 (17 feet), and MW-10 (5 feet); lead in samples MW-7 (5 feet) and MW-9 (17 feet); mercury in

sample MW-7 (5 feet); and, zinc in sample MW-8 (16 feet) exceeded the Part 375 Unrestricted Use SCOs.

The soil data from the RI Report dated April 2009 (Ref. 2) as well as the Groundwater Investigation and Design Report dated September 2009; Revised November 2009 (Ref. 5) are summarized on **Figure 4**.

Site-Related Groundwater

Below is a summary of Site conditions when the RI was performed in 2007 and 2009:

VOCs – Two VOCs, PCE and chloroform, were detected above NYSDEC TOGS Class GA groundwater standards (Ref. 7) in the monitoring wells installed and sampled in the Study Area. PCE detections ranged from 4 to 7,900 ug/L.

Metals – There were six metals that exceeded NYSDEC TOGS groundwater standards in the Study Area; iron, magnesium, manganese, selenium, sodium, and thallium.

Below is a summary of Site conditions when the pre-design investigation was performed in 2009:

VOCs – Acetone, bromodichloromethane, 2-Butanone (MEK), chloroform, cis-1,2-dichloroethene, methylene chloride, PCE, and trichloroethene were detected in the groundwater. PCE detections ranged from 0.50 to 17,700 ug/L. The detections of PCE in samples MW-2A (and its associated duplicate), MW-6 (and its associated duplicate), MW-7, MW-8, and OB-MW-8; acetone in sample MW-8; chloroform in samples MW-8 and OB-MW-8; and, trichloroethene in sample MW-2A exceeded NYSDEC TOGS groundwater standards.

SVOCs – Acetophenone, benzaldehyde, bis(2-Ethylhexyl)phthalate, naphthalene, and n-Nitrosodiphenylamine were detected in the groundwater. These detections were significantly below NYSDEC TOGS.

Metals – Aluminum, barium, calcium, chromium, iron, lead, magnesium, manganese, nickel, potassium, selenium, sodium, and zinc were detected in the groundwater. The detections of magnesium in samples MW-2A (and its associated duplicate), MW-6 (and its associated duplicate), MW-7, OB-MW-9, MW-3, and MW-4; aluminum in sample MW-10; chromium and selenium in sample MW-8; and, sodium in samples MW-2A (and its associated duplicate), MW-6 (and its associated duplicate), MW-7, MW-8, OB-MW-8, OB-MW-9, MW-10, MW-3, and MW-4 exceeded NYSDEC TOGS groundwater standards.

The groundwater data from the RI Report dated April 2009 (Ref. 2) as well as the Groundwater Investigation and Design Report dated September 2009; Revised November 2009 (Ref. 5) are summarized on **Figure 5**.

Site-Related Soil Vapor Intrusion

The results of the RI showed that the soil vapor within the Study Area had been impacted with VOCs. PCE was detected in all seven of the sub-slab soil vapor points below the former building at concentrations exceeding 1.3 ug/m^3 , New York State Department of Health's (NYSDOH) mean value of VOCs in air of fuel oil heated homes (Ref. 8). Numerous other VOCs including acetone, MEK, trichloroethylene, toluene and xylene were detected at concentrations in excess of the NYSDOH's mean values for indoor air.

Box plot maps indicating the sample locations and summarizing the soil vapor data prior to the remedy is shown on **Figures 6 and 7**.

Storage Tanks

During the RI, three 275-gallon aboveground storage tanks (ASTs) were observed within the basement of the existing building. At that time, it appeared that one of the ASTs contained liquid, one was empty, and the third was filled with sand. In addition, a fill port and vent pipe probably associated with the ASTs were observed on Third Avenue next to the Site building.

1.4 SUMMARY OF REMEDIAL ACTIONS

The Site was remediated in accordance with the NYSDEC-approved RAWP dated June 2009 (Ref. 3), RAWP Addendum dated July 2009 (Ref. 9), and the Groundwater Investigation and Design Report dated September 2009; Revised November 2009 (Ref. 5). In addition, all remedial activities were summarized on daily and monthly reports to NYSDEC and NYSDOH and are included in the Final Engineering Report.

The following is a summary of the Remedial Actions performed at the Site:

1. Collection of additional soil waste characterization samples to profile the soil/fill for disposal purposes. A waste disposal facility was selected based on the data collected to date. Based on the requirements of the selected facility, additional soil/fill samples were collected and analyzed to obtain soil disposal facility approval.
2. Excavation of soil/fill to 14.8, 15.8, or 22.67 feet below grade or bedrock as needed Site-wide to facilitate construction of the foundation of the proposed new structure. The excavation for the proposed new building's foundation removed all soil/fill exceeding the Track 4 Site Specific Soil Action Levels (SSSALs) established for this Site and soil vapor source areas at the Site.

3. Screening for indications of contamination (by visual means, odor, and monitoring with a photoionization detector (PID)) of all excavated soil during any intrusive Site work.
4. Collection and analysis of end-point samples to evaluate the performance of the remedy with respect to attainment of the Track 4 SSSALs developed for this Site.
5. Appropriate off-site disposal of all material removed from the Site in accordance with all Federal, State and local rules and regulations for handling, transport, and disposal;
6. Removal of three 275-gallon ASTs in accordance with applicable regulations;
7. A pre-design groundwater investigation that included 1) the installation of soil borings; 2) the installation of wells MW-2A, MW-6, MW-7, OB-MW-7, MW-8, and OB-MW-8; and, 3) a pump test on wells MW-2A, MW-6, MW-7, and MW-8. A Pre-Design Investigation Work Plan (Ref. 10) was submitted to NYSDEC in a separate document and was approved on June 16, 2009. The results of the pre-design investigation were included in the Groundwater Investigation and Design Report (Ref. 5).
8. Injection of Regenox™ (in-situ chemical oxidation (“ISCO”) treatment) into the overburden and overburden/groundwater interface in select portions of the Site. The selected areas contained elevated levels of PCE either in the overburden soil/fill, water flowing within the overburden, or both. The injections were proposed as part of the Groundwater Investigation and Design Report (Ref. 5).

9. Based on the results of the pump test, a pump and treat system was installed to collect and treat the halogenated VOC-impacted groundwater (PCE and its degradation products) within shallow bedrock fractures in the locations of MW-2A, MW-6, MW-7, and MW-8. In addition, overburden well MW-11 was added to the monitoring well network. The system design and well installation was included in the Groundwater Investigation and Design Report (Ref. 5).
10. MW-2 was abandoned per NYSDEC guidance using imported sand and bentonite. In addition, during abandonment, two to three well volumes of water from the respective monitoring well were removed.
11. Construction and maintenance of an engineered composite cover system consisting of concrete-covered sidewalks, foundation walls, a ventilated parking garage, and concrete building slabs to prevent human exposure to residual contaminated soil/fill remaining under the Site. In addition, a vapor barrier was installed underneath the entire building foundation for additional protection. This cover encompasses the entire footprint of the Site. No exposed soils remain.
12. Recording of an Environmental Easement, including ICs, to prevent future exposure to any residual contamination remaining at the Site.
13. A Sub-slab Depressurization (SSD) system was incorporated below the foundation of the building for additional protection. The SSD system consists of horizontal trenches containing perforated pipe and gravel. The horizontal pipes were connected to vertical risers that extend above the roof of the building. Any pipe penetrations through the vapor barrier were sealed in accordance with the manufacturer's recommendations. An SSD fan was mounted to the riser above the roof.

14. Collection and analysis of post-remedial groundwater samples from wells MW-1, MW-2A, MW-3, MW-4, MW-5, MW-6, MW-7, MW-8, MW-10, and MW-11 to evaluate performance of the remedy.
15. Development and implementation of a SMP for long term management of remaining contamination as required by the Environmental Easement, which includes plans for: (1) IC/ECs (2) monitoring, (3) operation and maintenance, and (4) reporting.

Remedial activities were completed at the Site in February 2010.

1.4.1 Removal of Contaminated Materials from the Site

The removal of materials from the Site included: 1) the demolition of the existing structure and associated building materials such as brick and concrete; 2) the excavation and removal of subsurface soils, bedrock, and construction and demolition debris; and, 3) removal of three 275-gallon ASTs and associated tank liquid and sludge.

1.4.1.1 Soil Cleanup Objectives

The remedy selected for this Site included a Track 4 cleanup with SSSALs and implementation of certain IC/ECs. The SSSALs were developed based upon 6 NYCRR Part 375 and data from the RI report. All excavation end-point soil samples met or exceeded the Track 4 SSSALs. A list of the Track 4 SSSALs and applicable land use for this Site is provided in **Table 1**.

1.4.1.2 Removal Quantities

During the remedial action, a total of 3,530.46 tons of soil/fill were removed from the Site. A total of 436 tons of soil/fill were disposed of at the Clean Earth of Carteret waste disposal facility in Carteret, New Jersey and a total of 3,094.46 tons of soil/fill were

disposed of at the Bellmawr Waterfront Development Site disposal facility in New Jersey. The volume of construction and demolition debris removed from the Site during demolition was 162.48 tons and from the excavation was 3,300 cubic yards. The construction and demolition debris from the demolition was disposed of at Apex Environmental, LLC of Amsterdam, Ohio. The construction and demolition debris removed during excavation was disposed of at Almar Supplies of Maspeth, New York. In addition, 537-gallons of petroleum product/water mixture and one 55-gallon drum of tank sludge was removed from the three 275-gallon ASTs. The liquid petroleum product/water mixture was disposed of at New York Oil and Recovery of Brooklyn, New York. The 55-gallon drum of sludge was disposed of at Soil Safe of Gloucester County, New Jersey. The three 275-gallon ASTs (3,640 pounds) were disposed of at Gershow Recycling of Lindenhurst, New York. A summary of soil disposal, construction and demolition debris, liquid petroleum product/water shipments, and the scrap metal receipt is enclosed as **Table 2**. In addition, the manifests for the disposal of the petroleum product/water mixture and tank sludge are included in the Tank Closure Report (Ref. 11).

1.4.1.3 Location of Materials Removed

A vacant building was present on the western portion of the Site (Lot 45). Three 275-gallon ASTs were located within the vacant building. In addition, a fill port and vent pipe associated with the ASTs was located in the Third Avenue sidewalk. The three ASTs, associated tank liquid and sludge, and associated fill port and vent pipe were removed during demolition of the building in July 2009. The location of the former ASTs and vacant building are illustrated on **Figure 8**. The Tank Closure Report summarized the removal activities (Ref. 11).

To comply with the Track 4 SSSALs, the excavation of soil/fill Site-wide to bedrock, 14.8, 15.8, or 22.67 feet below grade was required. No soil was imported into the BCP Site for backfill; instead, clean gravel was used, when necessary, as backfill. A figure showing areas where excavation was performed as well as the final excavation depths is shown in **Figure 9**.

1.4.2 Site-Related Treatment Systems

1.4.2.1 In-Situ Chemical Oxidation (ISCO)

Injection of Regenox™ was conducted in select areas of the Site on October 19-23, 26, 28, and 29, 2009 to treat the residual VOCs in the overburden and overburden/groundwater interface. Regenox™ is an ISCO process using a solid oxidant complex (sodium percarbonate/catalytic formulation) and an activator complex (a composition of ferrous salt embedded in a micro-scale catalyst gel). The chemical oxidation injection locations were selected (see attached **Figure 10**) based on the geology and results of the pre-design and remedial investigations. The selected areas contained elevated levels of PCE either in the overburden soil/fill, water flowing within the overburden, or both.

In the event the initial chemical oxidation injection does not reduce the PCE concentrations in the overburden water in the on-site wells to or close to the NYSDEC TOGS groundwater standard of 5 ug/L, after one year, a second and final chemical oxidation injection event will occur. As any residual PCE levels in the overburden in Lot 45 will eventually be captured by the pump and treat system, a vapor barrier was installed beneath the foundation, and volatile organic vapor will be prevented from entering the new building via the ventilated parking garage and SSD system, the only area that may require additional treatment is the area around MW-5, which is off-site. Per the NYSDEC-approved Groundwater Investigation and Design Report (Ref. 5), as bedrock slopes to the east, Regenox™ will be injected at the bedrock peak as well as around MW-5, to capture any residual PCE in the overburden that may migrate towards MW-5. The proposed chemical oxidation injection locations for a potential second and final round are illustrated on **Figure 11**.

1.4.2.2 Sub-Slab Depressurization (SSD) System

To prevent off-gassing of residual VOCs dissolved in underlying uppermost groundwater and/or in the soil/fill from entering the new building's interior, installation of an active SSD system in addition to the ventilated parking garage was included in the construction of the new buildings' foundation as additional protection. The SSD system maintains a negative pressure underneath the slab while allowing the vapors below the concrete slab to vent outdoors without intruding into the building. The SSD system consists of horizontal trenches filled with perforated pipe. The horizontal pipes are connected to vertical risers that are connected to one six-inch header that extends above the roof of the building. An SSD fan was mounted on the riser above the roof. All pipe penetrations through the vapor barrier were sealed in accordance with the manufacturer's recommendations. The SSD layout is illustrated on **Figure 12**. The vent and roof detail is illustrated on **Figure 13**.

1.4.2.3 Groundwater Pump and Treat System

A pump and treat system was installed to collect and treat the halogenated VOC-impacted groundwater (PCE and its degradation products) within shallow bedrock fractures in the locations of MW-2A, MW-6, MW-7, and MW-8. The treated discharge is disposed of via the building's sewer system under a New York City Department of Environmental Protection (NYCDEP) sewer discharge permit. The pump and treat system layout is illustrated on **Figure 14**.

1.4.3 Remaining Contamination

After completion of soil excavation activities, a land survey was performed by a NYS-licensed surveyor. The survey defined the final excavation depths needed for construction purposes (see **Figure 9**). After the final excavation depth survey, on-site soils were reused to backfill the deeper excavation areas. A second survey was then performed. This survey defined the top elevation of residual contaminated soils, which

was 14.8 feet below grade Site-wide. The top of the residual contaminated zone was covered with clean gravel followed by a physical demarcation barrier/layer. The physical demarcation layer consists of a Stego™ 15-mil vapor barrier. This demarcation layer constitutes the top of the ‘Residuals Management Zone’, the zone that requires adherence to special conditions for disturbance of contaminated residual soils defined in this SMP. Included within this zone are the utilities for the new building as well as the piping for both the SSD and groundwater pump and treat system. Exposure to residual contaminated soils will be prevented by the composite cover system, which includes the vapor barrier. This composite cover system is comprised of concrete-covered sidewalks, foundation walls, concrete building slabs, a vapor barrier, and a ventilated parking garage.

Soil excavation endpoint samples were collected from the final excavation depths (or higher if bedrock was encountered). The analytical results from the samples illustrated that the remaining contamination consists of the polycyclic aromatic hydrocarbons benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene, the pesticides 4,4'-DDE, 4,4'-DDT, Dieldrin, and 4,4'-DDD, the PCB Aroclor-1254, and the metals chromium, copper, lead, mercury, and zinc in limited areas throughout the Site. **Tables 3-7** and **Figures 15-16** summarize the results of all soil samples remaining at the Site after completion of Remedial Action that exceed the Track 1 (unrestricted) SCOs.

2.0 ENGINEERING AND INSTITUTIONAL CONTROL PLAN

2.1 INTRODUCTION

2.1.1 General

Since remaining contaminated soil, groundwater, and soil vapor exist beneath the Site, EC/ICs are required to protect human health and the environment. This EC/IC Plan describes the procedures for the implementation and management of all EC/ICs at the Site. The EC/IC Plan is one component of the SMP and is subject to revision by NYSDEC.

2.1.2 Purpose

This plan provides:

- A description of all EC/ICs on the Site;
- The basic implementation and intended role of each EC/IC;
- A description of the key components of the ICs set forth in the Environmental Easement;
- A description of the features to be evaluated during each required inspection and periodic review;
- A description of plans and procedures to be followed for implementation of EC/ICs, such as the implementation of the Excavation Work Plan for the proper handling of remaining contamination that may be disturbed during maintenance or redevelopment work on the Site; and,
- Any other provisions necessary to identify or establish methods for implementing the EC/ICs required by the Site remedy, as determined by the NYSDEC.

2.2 ENGINEERING CONTROLS

2.2.1 Engineering Control Systems

2.2.1.1 Composite Cover System

Exposure to remaining contamination in soil/fill at the Site is prevented by a composite cover system placed over the Site. This cover system is comprised of concrete-covered sidewalks, foundation walls, ventilated parking garage, and concrete building slabs. In addition, a vapor barrier was installed underneath the entire building foundation as additional protection. The Excavation Work Plan that appears in **Appendix B** outlines the procedures required to be implemented in the event the cover system is breached, penetrated or temporarily removed, and any underlying remaining contamination is disturbed. Procedures for the inspection and maintenance of this cover are provided in the Monitoring Plan included in Section 4 of this SMP.

2.2.1.2 Sub-Slab Depressurization (SSD) System

An active SSD system was installed at the Site, in addition to the ventilated parking garage, for additional protection in preventing the off-gassing of residual VOCs dissolved in the soil and groundwater. The SSD system maintains a negative pressure underneath the slab while allowing the vapors below the concrete slab to vent outdoors without intruding into the building. The SSD system consists of horizontal trenches with perforated pipe, a filter sock, and gravel. The horizontal pipes are connected to vertical risers that connect to one six-inch header, which extends above the roof of the building. Any pipe penetrations through the vapor barrier were sealed in accordance with the manufacturer's recommendations. An SSD fan was mounted to the riser above the roof. The SSD layout is illustrated on **Figure 12**. The Vent and Roof Detail is illustrated on **Figure 13**.

Procedures for operating and maintaining the SSD system are documented in the Operation and Maintenance Plan (Section 4 of this SMP). Procedures for monitoring the system are included in the Monitoring Plan (Section 3 of this SMP). The Monitoring Plan also addresses severe condition inspections in the event that a severe condition, which may affect controls at the Site, occurs.

2.2.1.3 Groundwater Pump and Treat System

A pump and treat system was installed to collect and treat the halogenated VOC-impacted groundwater (PCE and its degradation products) within shallow bedrock fractures in the locations of MW-2A, MW-6, MW-7, and MW-8. A NYCDEP Sewer Discharge Permit was obtained prior to discharging any treated effluent.

The QED AP2B Bottom Inlet, Short AutoPump® was placed one foot from the bottom of each pumping well, MW-2A, MW-6, MW-7, and MW-8. The pump is held in place by a support harness and cable. The AP2B Bottom Inlet, Short AutoPump® is 1.75 inches in diameter, 33 inches long, and can handle a maximum flow of 2.0 gallons per minute (gpm). The AutoPump® is an air-powered positive displacement pump that is activated by an internal float in response to the natural well recharge. Since the AutoPump® fills by gravity and discharges by air displacement, no emulsification is created during its operation.

A brand new two-horsepower air compressor with a 30 gallon receiver is being used to deliver the required air. The compressor was also fitted with coalescing and particulate filtration and a dryer to prevent moisture buildup inside of the compressor. The two-horsepower air compressor provides 5.7 cfm @135 psi.

A QED® filter regulator followed by a QED® cycle counter was attached to each pump. The filter regulator economizes on system air consumption, allows control of the pump flow rate so that each well can be controlled individually, and filters air system debris. In addition, the filter regulators contain a pressure gauge and are coated on the inside to

prevent corrosion from condensed moisture. The cycle counter detects and displays each pump cycle via the pulse of air that occurs in the supply line thus enabling the total liquid delivered and the flow rate at each well to be calculated and monitored.

The cycle counter was connected to the AP2B Bottom Inlet, Short AutoPump® by 3/8-inch outer-diameter nylon hose that runs through the well cap. The nylon hose carries compressed air from the compressor through the filter regulator, through the cycle counter, and then to the pump. The contaminated groundwater (i.e. fluid) is discharged from the pump through 5/8-inch outer-diameter nylon hose. The nylon hose is connected to a flow meter, which then connects to two 55-gallon drums of virgin, high activity granulated carbon. The treated effluent is then discharged directly into the building's sanitary sewer system. A sample port was installed on the effluent discharge pipe, so that samples of the effluent can be obtained as needed.

The nylon hoses were placed inside either two or four-inch PVC conduit and two-inch PVC conduit with heat tracing to prevent freezing during the winter where the pipe runs underneath the sidewalk. The conduit extends from MW-6 to MW-2A and then drops down to below cellar grade to connect to MW-7 and MW-8. After connecting to MW-8, the conduit runs to the maintenance storage room, located in the northwestern corner of the cellar, where the pipe was brought up to grade to connect to the air compressor and carbon drums. The air compressor and carbon drums were placed inside the mechanical storage room along with the filter regulators, cycle counters, flow meter (to determine total flow), and sample ports to facilitate the collection of groundwater samples as well as effluent samples to comply with NYCDEP discharge permit stipulations. The pump and treat system design, and typical well vault and pump details are illustrated on **Figure 14**.

Procedures for operating and maintaining the Pump and Treat system are documented in the Operation and Maintenance Plan (Section 4 of this SMP). Procedures for monitoring the system are included in the Monitoring Plan (Section 3 of this SMP). The Monitoring Plan also addresses severe condition inspections in the event that a severe condition, which may affect controls at the Site, occurs.

2.2.2 Criteria for Completion of Remediation/Termination of Remedial Systems

Generally, remedial processes are considered completed when effectiveness monitoring indicates that the remedy has achieved the remedial action objectives identified by the decision document. The framework for determining when remedial processes are complete is provided in Section 6.6 of NYSDEC DER-10.

2.2.2.1 Composite Cover System

The composite cover system covers the entire Site, and is a permanent control. The quality and integrity of this system will be inspected at defined, regular intervals in accordance with Section 3.2 and 4.3.1 of this SMP until the Environmental Easement is extinguished.

2.2.2.2 Sub-Slab Depressurization (SSD) System

An SSD system was installed in addition to the composite cover system, specifically the ventilated parking garage, for further protection. The active SSD system or ventilated parking garage will not be discontinued unless prior written approval is granted by the NYSDEC. In the event that monitoring data indicates that the ventilated parking garage or SSD system is no longer required, a proposal to discontinue the SSD system and/or ventilated parking garage will be submitted by the property owner to the NYSDEC and NYSDOH.

2.2.2.3 Groundwater Pump and Treat System

The Pump and Treat system will not be discontinued unless prior written approval is granted by the NYSDEC. In the event that monitoring data indicates that the Pump and Treat system is no longer required, a proposal to discontinue the system will be submitted by the property owner. Conditions that warrant discontinuing the Pump and Treat system

include contaminant concentrations in groundwater that: (1) reach levels that are consistently below ambient water quality standards, (2) have become asymptotic to a low level over an extended period of time as accepted by the NYSDEC, (3) all monitoring wells on-site are dry, or (4) NYSDEC has determined that the Pump and Treat system has reached the limit of its effectiveness. This assessment will be based in part on post-remediation contaminant levels in groundwater collected from monitoring wells located throughout the Site. Systems will remain in place and operational until permission to discontinue their use is granted in writing by the NYSDEC.

2.2.2.4 Monitored Natural Attenuation

Groundwater monitoring activities to assess natural attenuation will continue, as determined by the NYSDEC, until residual groundwater concentrations are found to be consistently below NYSDEC standards, all monitoring wells on-site are dry, or residual groundwater concentrations have become asymptotic at an acceptable level over an extended period. Monitoring will continue until permission to discontinue is granted in writing by the NYSDEC. If groundwater contaminant levels become asymptotic at a level that is not acceptable to the NYSDEC, additional control measures will be evaluated.

2.3 INSTITUTIONAL CONTROLS (ICS)

A series of ICs is required by the RAWP to: (1) implement, maintain and monitor EC systems; (2) prevent future exposure to remaining contamination by controlling disturbances of the subsurface contamination; and, (3) limit the use and development of the Site to restricted residential or commercial uses only. Adherence to these ICs on the Site is required by the Environmental Easement and will be implemented under this SMP.

These ICs are:

- Compliance with the Environmental Easement and this SMP by the Grantor and the Grantor's successors and assigns;
- All ECs must be operated and maintained as specified in this SMP;
- All ECs on the Controlled Property must be inspected at a frequency and in a manner defined in the SMP;
- Groundwater, indoor air, and other environmental or public health monitoring must be performed as defined in this SMP; and,
- Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in this SMP.

ICs identified in the Environmental Easement may not be discontinued without an amendment to or extinguishment of the Environmental Easement.

The Site has a series of ICs in the form of Site restrictions. Adherence to these ICs is required by the Environmental Easement. Site restrictions that apply to the Controlled Property are:

- The property may only be used for restricted residential or commercial use provided that the long-term EC/ICs included in this SMP are employed or eliminated pursuant to this SMP;
- The property may not be used for a higher level of use, such as unrestricted residential use without additional remediation and amendment of the Environmental Easement, as approved by the NYSDEC;
- All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with this SMP;
- The use of the groundwater underlying the property is prohibited without treatment rendering it safe for intended use;
- Subsurface vegetable gardens and farming on the property are prohibited;

- The Site owner or remedial party will submit to NYSDEC a written statement that certifies, under penalty of perjury, that: (1) controls employed at the Controlled Property are unchanged from the previous certification or that any changes to the controls were approved by the NYSDEC; and, (2) nothing has occurred that impairs the ability of the controls to protect public health and environment or that constitute a violation or failure to comply with the SMP while the Environmental Easement is in effect. NYSDEC retains the right to access such Controlled Property at any time in order to evaluate the continued maintenance of any and all controls. This certification shall be submitted annually, or an alternate period of time that NYSDEC may allow and will be made by an expert that the NYSDEC finds acceptable while the Environmental Easement is in effect.

2.3.1 Excavation Work Plan

The Site has been remediated for restricted residential and commercial use. Any future intrusive work that will penetrate the soil cover or cap, or encounter or disturb the remaining contamination, including any modifications or repairs to the existing cover system will be performed in compliance with the Excavation Work Plan (EWP) that is attached as **Appendix B** to this SMP. Any work conducted pursuant to the EWP must also be conducted in accordance with the procedures defined in a Health and Safety Plan (HASP) and Community Air Monitoring Plan (CAMP) prepared for the Site. A sample HASP is attached as **Appendix C** to this SMP that is in current compliance with DER-10, and 29 CFR 1910, 29 CFR 1926, and all other applicable Federal, State and local regulations. Based on future changes to State and Federal health and safety requirements, and specific methods employed by future contractors, the HASP and CAMP will be updated and re-submitted with the notification provided in Section A-1 of the EWP. Any intrusive construction work will be performed in compliance with the EWP, HASP and CAMP, and will be included in the periodic inspection and certification reports submitted under the Site Management Reporting Plan (See Section 5).

The Site owner and associated parties preparing the remedial documents submitted to the State, and parties performing this work, are completely responsible for the safe performance of all intrusive work, the structural integrity of excavations, proper disposal of excavation de-water, control of runoff from open excavations into remaining contamination, and for structures that may be affected by excavations (such as building foundations and bridge footings). The Site owner will ensure that Site development activities will not interfere with, or otherwise impair or compromise, the engineering controls described in this SMP.

2.3.2 Soil Vapor Intrusion Evaluation

If the active SSD system, ventilated parking garage, and vapor barrier are removed from the Site in the future, prior to the construction of any enclosed structures located over the Site, an SVI evaluation will be performed to determine whether any mitigation measures are necessary to eliminate potential exposure to vapors in the proposed structure. Alternatively, an SVI mitigation system may be installed as an element of the building foundation without first conducting an investigation. This mitigation system will include a vapor barrier and passive SSD system that is capable of being converted to an active system.

Prior to conducting an SVI investigation or installing a mitigation system, a work plan will be developed and submitted to the NYSDEC and NYSDOH for approval. This work plan will be developed in accordance with the most recent NYSDOH “Guidance for Evaluating Vapor Intrusion in the State of New York”. Measures to be employed to mitigate potential vapor intrusion will be evaluated, selected, designed, installed, and maintained based on the SVI evaluation, the NYSDOH guidance, and construction details of the proposed structure.

Preliminary (unvalidated) SVI sampling data will be forwarded to the NYSDEC and NYSDOH for initial review and interpretation. Upon validation, the final data will be transmitted to the agencies, along with a recommendation for follow-up action, such as

mitigation. If the property is transferred to a third party, validated SVI data will be transmitted to the new property owner within 30 days of validation. If any indoor air test results exceed NYSDOH guidelines, relevant NYSDOH fact sheets will be provided to all tenants and occupants of the property within 15 days of receipt of validated data.

SVI sampling results, evaluations, and follow-up actions will also be summarized in the next Periodic Review Report.

2.4 INSPECTIONS AND NOTIFICATIONS

2.4.1 Inspections

Inspections of all remedial components installed at the Site will be conducted at the frequency specified in the SMP Monitoring Plan schedule. A comprehensive Site-wide inspection will be conducted annually in accordance with the SMP, regardless of the frequency of the Periodic Review Report. The inspections will determine and document the following:

- Whether ECs continue to perform as designed;
- If these controls continue to be protective of human health and the environment;
- Compliance with requirements of this SMP and the Environmental Easement;
- Achievement of remedial performance criteria;
- Sampling and analysis of appropriate media during monitoring events;
- If Site records are complete and up to date; and,
- Changes, or needed changes, to the remedial or monitoring system.

Inspections will be conducted in accordance with the procedures set forth in the Monitoring Plan of this SMP (Section 3). The reporting requirements are outlined in the Periodic Review Reporting section of this plan (Section 5).

If an emergency, such as a natural disaster or an unforeseen failure of any of the ECs occurs, an inspection of the Site will be conducted within five days of the event or once Site conditions are safe to verify the effectiveness of the EC/ICs implemented at the Site by a qualified environmental professional (QEP) as determined by NYSDEC.

2.4.2 Notifications

Notifications will be submitted by the property owner to the NYSDEC as needed for the following reasons:

- Sixty-day advance notice of any proposed changes in Site use that are required under the terms of the BCA, 6 NYCRR Part 375, and/or Environmental Conservation Law.
- Fifteen-day advance notice of any proposed ground-intrusive activities pursuant to the EWP.
- Notice within 48-hours of any damage or defect to the foundations structures that reduces or has the potential to reduce the effectiveness of other Engineering Controls and likewise any action to be taken to mitigate the damage or defect.
- Notice within 48-hours of any emergency, such as a fire, flood, or earthquake that reduces or has the potential to reduce the effectiveness of ECs in place at the Site, including a summary of actions taken, or to be taken, and the potential impact to the environment and the public.
- Follow-up status reports on actions taken to respond to any emergency event requiring ongoing responsive action shall be submitted to the NYSDEC within 45 days and shall describe and document actions taken to restore the effectiveness of the ECs.

Any change in the ownership of the Site or the responsibility for implementing this SMP will include the following notifications:

- At least 60 days prior to the change, NYSDEC will be notified in writing of the proposed change. This will include a certification that the prospective purchaser has been provided with a copy of the BCA and all approved work plans and reports, including this SMP.
- Within 15 days after the transfer of all or part of the Site, the new owner's name, contact representative, and contact information will be confirmed in writing.

2.5 CONTINGENCY PLAN

Emergencies may include injury to personnel, fire or explosion, environmental release, breach to composite cover system, or serious weather conditions.

2.5.1 Emergency Telephone Numbers

In the event of any environmentally related situation or unplanned occurrence requiring assistance the owner or owner's representative(s) should contact the appropriate party from the contact list below. For emergencies, appropriate emergency response personnel should be contacted. Prompt contact should also be made to CA RICH. These emergency contact lists must be maintained in an easily accessible location at the Site.

Table 8: Emergency Contact Numbers

Medical, Fire, and Police:	911
One Call Center:	(800) 272-4480 (3 day notice required for utility mark-out)
Poison Control Center:	(800) 222-1222
Pollution Toxic Chemical Oil Spills:	(800) 424-8802
NYSDEC Spills Hotline	(800) 457-7362

Table 9: Contact Numbers

CA RICH	516-576-8844
CS Melrose Site B LLC	914-833-3000

* Note: Contact numbers subject to change and should be updated as necessary

2.5.2 Map and Directions to Nearest Health Facility

Site Location: 3100 Third Avenue, Bronx, NY

Nearest Hospital Name: Lincoln Hospital

Hospital Location: 234 E 149th St., Bronx, NY 10451-5504

Hospital Telephone: (718) 585-7920

Directions to the Hospital:

1. Head southwest on 3rd Ave toward E 158th St, - 0.5 mi
2. Turn right at E 149th St/Willis Ave – 0.4 mi
3. Continue to follow E 149th St - Destination will be on the left

Total Distance: 0.8 miles

Total Estimated Time: 2 minutes

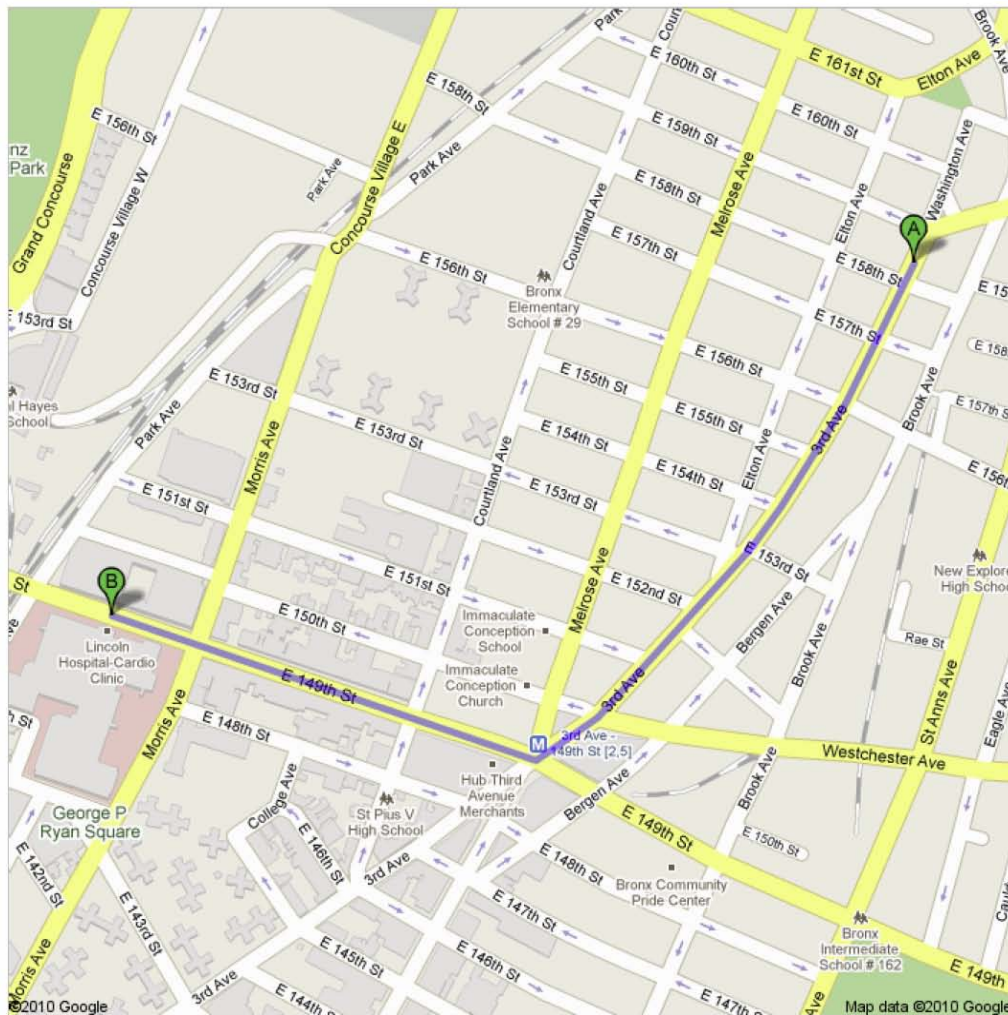
Map Showing Route from the Site to the Hospital:

3rd Ave to 234 E 149th St, Bronx, NY 10451 - Google Maps

http://maps.google.com/maps?f=d&source=s_d&saddr=3rd+Ave&daddr...



Directions to 234 E 149th St, Bronx, NY 10451
0.8 mi – about 2 mins



2.5.3 Response Procedures

As appropriate, the fire department and other emergency response groups will be notified immediately by telephone in case of the emergency. The emergency telephone number list is found at the beginning of this Contingency Plan (**Table 8**). The list will also be posted prominently at the Site and made readily available to all personnel at all times.

2.5.3.1 Procedures for spills

If visual inspection and/or soil screening identify evidence of a petroleum release, either from equipment inside the new building or petroleum encountered during future excavation/construction activities, the owner and QEP will be contacted, and all work activities will be halted until further instructions are received from the QEP. If the petroleum spill is more than five gallons, as required by law, the fuel spill will be reported to the NYSDEC Spill Hotline (1-800-457-7362).

2.5.3.2 Evacuation plans

- In case of a fire, employees/contractors/residents should activate the nearest fire alarm box and/or make a telephone call to the local Fire Department via 911. The locations of the fire alarm boxes are noted on the evacuation floor plans in the new building.
- It may be necessary to activate additional fire alarm boxes, or shout the alarm, if people are still in the building and the alarm has stopped sounding, or if the alarm does not sound. This can be done while exiting.
- Persons discovering a fire, smoky condition, or explosion should pull the fire alarm box. Any pertinent fire or rescue information should be conveyed to the Fire Department. All emergency telephone numbers are listed in Section 2.5.1.
- When the fire alarm sounds, all personnel should ensure that nearby personnel are aware of the emergency, quickly shutdown operating equipment, close doors and exit the building using stairwells.

- All occupants should exit the building.
- All occupants and workers should know where primary and alternate exits are located, and be familiar with the various evacuation routes available. Floor plans with escape routes, alternate escape routes, and exit locations should be posted in the building.
- Building occupants must NOT use elevators as an escape route in the event of a fire.
- To report all other emergencies and injuries, a call should be placed to 911. State your name, your location, and the nature of the call. Speak slowly and clearly. Wait for the dispatcher to hang up first. On occasion the dispatcher may need additional information or may provide you with additional instructions.
- Small fires can be extinguished only if you are trained to use a fire extinguisher. However, an immediate readiness to evacuate is essential.
- All fires, even those that have been extinguished, must be reported to the property owner immediately.
- Do not enter a room that is smoke filled.
- Do not enter a room if the door is warm to touch.

2.5.3.3 Procedures for Breach of Composite Cover System

The following procedures will be required if breaching of the composite cover system is needed or occurs or is discovered during a monitoring/inspection event in accordance with Sections 3.2 and 4.3.1:

- The NYSDEC and NYSDOH will be notified of the request, and approval will need to be granted prior to the planned breach. If an unplanned breach occurs, the above agencies will be notified within 24 hours of the discovery of the occurrence.
- A written plan detailing the proposed repair or replacement activities will be submitted for review. A Site Plan indicating the area of the breach will be included in the plan.

- Once approval is received, the NYSDEC and NYSDOH will be notified at least 5 days prior to plan implementation to afford the ability to be on-site during the repair/replacement activities.
- If a breach should occur, grout injection will be performed, where applicable, to eliminate water infiltration, fill voids, and repair any cracks of the vapor barrier. The basic steps for this type of crack repair are:
 - Clean the area to be injected; remove any delaminated concrete, dust, dirt, etc. in and around the crack;
 - Drill holes for injection packers at an angle to intersect the crack; the spacing for the holes is determined by a NYS-licensed P.E. based on the size and severity of the crack(s);
 - Install and tighten packers;
 - Flush crack with water; in the event that there is water seeping through the crack, this step shall not be necessary;
 - Inject the chemical grout beginning at the bottom; continue along the crack from one end to the other; and,
 - Remove the injection packers, patch the holes, remove any excess surface grout and clean the equipment.
- If a breach of an area greater than 12 inches in diameter is requested, the concrete foundation in the area will be saw cut, removed, and disposed of properly as construction and demolition debris. The concrete area to be saw cut will be greater than the area of vapor barrier that is proposed to be breached. Upon completion of the subsurface activities, the vapor barrier will be installed according to the manufacturer's product specifications with the vapor barrier overlapping the original barrier appropriately. The ends of the barrier will be sealed as per the manufacturer's product specifications to ensure a vapor proof seal.

- As all soil was removed above the level of the vapor barrier, there will not be any soil to be removed or managed due to a breach. All soil remaining below the vapor barrier was within acceptable guidelines and limits.

3.0 SITE MONITORING PLAN

3.1 INTRODUCTION

3.1.1 General

The Monitoring Plan describes the measures for evaluating the performance and effectiveness of the remedy to reduce or mitigate contamination at the Site, the soil cover system, and all affected Site media identified below. Monitoring of other ECs is described in Chapter 4, Operation, Monitoring and Maintenance Plan. This Monitoring Plan may only be revised with the approval of NYSDEC.

3.1.2 Purpose and Schedule

This Monitoring Plan describes the methods to be used for:

- Sampling and analysis of all appropriate media (e.g. groundwater, indoor air, soil vapor, soils);
- Assessing compliance with applicable NYSDEC standards, criteria and guidance, particularly ambient groundwater standards and Part 375 SCOs for soil;
- Assessing achievement of the remedial performance criteria.
- Evaluating Site information periodically to confirm that the remedy continues to be effective in protecting public health and the environment; and,
- Preparing the necessary reports for the various monitoring activities.

To adequately address these issues, this Monitoring Plan provides information on:

- Sampling locations, protocol, and frequency;
- Information on all designed monitoring systems (e.g., well logs);
- Analytical sampling program requirements;
- Reporting requirements;
- Quality Assurance/Quality Control (QA/QC) requirements;
- Inspection and maintenance requirements for monitoring wells;
- Monitoring well decommissioning procedures; and,
- Annual inspection and periodic certification.

Quarterly monitoring of the performance of the remedy and overall reduction in contamination on-site will be conducted for the first year. The frequency thereafter will be specified in the first Periodic Review Report for approval by NYSDEC. Trends in contaminant levels in air, soil, and/or groundwater in the affected areas will be evaluated to determine if the remedy continues to be effective in achieving remedial goals. Monitoring programs are summarized in **Table 10** and outlined in detail in Sections 3.2 and 3.3 below.

Table 10: Monitoring/Inspection Schedule

Monitoring Program	Frequency*	Event	Matrix	Analysis	Termination Criteria
Groundwater Monitoring and Sampling	Quarterly for first year. Frequency after first year will be specified in first Periodic Review Report	Monitoring and Sampling	Groundwater	VOCs via EPA Method 8260	See Section 2.2.2.4
Composite Cover System	Annual. First inspection to begin 18 months after COC	Inspection	Soil/Soil Vapor	None	See Section 2.2.2.1
SSD Operations and Maintenance	Monthly for the first quarter, quarterly for the first year, and annually for subsequent years	Operations and Maintenance	Soil Vapor/Indoor Air/Ambient Air	None	See Section 2.2.2.2
Soil Vapor/Indoor Air/Ambient Air Monitoring and Sampling	After SSD system start-up and prior to system shut down only	Monitoring and Sampling	Soil Vapor/Indoor Air/Ambient Air	VOCs via EPA Method TO-15	See Section 2.2.2.2 and 2.3.2
Groundwater Pump and Treat System Operations and Maintenance	Weekly for the first month, monthly for the first quarter, and quarterly for subsequent years	Operations and Maintenance	Groundwater	None	See Section 2.2.2.3
Groundwater Pump and Treat System Effluent Sampling	Quarterly while system is operating	Effluent Sampling	Groundwater	NYCDEP B+ parameters	See Section 2.2.2.3

* The frequency of events will be conducted as specified until otherwise approved by NYSDEC and NYSDOH

3.2 COMPOSITE COVER SYSTEM MONITORING

On an annual basis as long as the Environmental Easement is in effect, a licensed professional engineer or his/her designee shall evaluate the apparent structural integrity of the concrete floor, support columns into the floor and the wall joints. If any cracks or openings are identified, they shall be screened for organic vapors with a field photo-ionization detector (PID) and any readings shall be noted. In addition, any cracks or openings in the floor shall then be sealed. The results of the inspection will be included in the Periodic Review Report.

3.3 MEDIA MONITORING PROGRAM

3.3.1 Groundwater Monitoring

Groundwater monitoring will be performed on a periodic basis to assess the performance of the remedy. The network of monitoring wells has been installed to monitor both up-gradient and down-gradient groundwater conditions at the Site. The network of on-site and off-site wells has been designed based on the results of the RI and pre-design investigations.

MW-1, MW-2A, MW-3, MW-4, MW-5, MW-6, MW-7, MW-8, MW-10, and MW-11 served as the groundwater monitoring wells for the initial round of post-remedial groundwater monitoring that was conducted in December 2009 (see **Figure 2** for well locations). Monitoring well construction logs are included in **Appendix D**. Groundwater samples were collected from the wells, submitted to an Environmental Laboratory Approval Program (ELAP) and Contract Laboratory Protocol (CLP) Certified Laboratory, and analyzed for VOCs via EPA Method 8260 and total and dissolved TAL metals with NYSDEC ASP Category B deliverables. The analytical results are summarized on **Figures 17** through **19**.

After the initial round of sampling, MW-1, MW-2A, MW-3, MW-4, MW-5, MW-6, MW-7, MW-8, MW-10, and MW-11 will be sampled on a quarterly basis, after start-up of the groundwater pump and treat system, for one year. MW-3, MW-4, MW-10, and any other wells whose results meet NYSDEC TOGS groundwater standards for four consecutive quarters will be eliminated from the monitoring well network. Groundwater samples collected from the subsequent groundwater monitoring events will be analyzed for VOCs via EPA Method 8260 only with NYSDEC ASP Category B deliverables. In addition, a sample of the treated effluent prior to its discharge will be obtained on a quarterly basis to comply with the NYCDEP discharge permit. The sample will be analyzed for NYCDEP B+ parameters.

The monitoring will continue, as determined by NYSDOH and NYSDEC, until residual groundwater concentrations are found to be below NYSDEC standards or have become asymptotic over an extended period or have become dry. The monitoring frequency after the first year will be specified in the Periodic Review Report for approval by NYSDEC.

QA/QC samples will be collected and analyzed in connection with the testing as set forth in the Quality Assurance Project Plan (QAPP) (**Appendix G**) and will include one trip blank, one field blank per day of field work, one duplicate, one matrix spike, and one matrix spike duplicate. In addition, the data will be validated by a qualified third-party and a Data Usability Summary Report (DUSR) will be prepared. The sampling frequency may be modified with the approval of NYSDEC. The SMP will be modified to reflect changes in sampling plans approved by NYSDEC.

Deliverables for the groundwater monitoring program are specified below.

3.3.1.1 Sampling Protocol

All monitoring well sampling activities will be recorded in a field book and a sample groundwater-sampling log is presented in **Appendix E**. Other observations (e.g., well

integrity, etc.) will be noted on the well sampling log. The well sampling log will serve as the inspection form for the groundwater monitoring well network.

First, depth-to-water and depth-to-bottom measurements will be collected from the monitoring wells. Prior to sampling, at least three times the volume of water will be removed from each well using new polyethylene tubing and a submersible pump. Purging will continue until the readings of pH, temperature, conductivity, oxygen/reduction potential, and dissolved oxygen have stabilized and are recorded. Purge water will be contained in 55-gallon drums and disposed of in accordance with applicable regulations.

After purging is complete, a sample of the groundwater will be collected directly from the pump discharge into laboratory-issued containers by a QEP. The samples will be placed in a cooler on ice and sent to Accutest Laboratories of Dayton, New Jersey or equivalent (an ELAP and CLP certified laboratory) via overnight delivery for analysis of VOCs using EPA Method 8260 and NYSDEC ASP Category B deliverables. The following samples will also be collected for QA/QC purposes: trip blank, field blank, duplicate sample, matrix spike, and matrix spike duplicate.

A qualified third-party Data Validator will review the groundwater laboratory data and prepare a DUSR.

3.3.1.1.1 Sampling QA/QC

All on-site sampling equipment will be decontaminated between each use in the following manner: laboratory grade detergent and fresh water wash using scrub brush, followed by two fresh water rinses and final air dry. The submersible pump used for groundwater sample collection will be decontaminated between sample collection by passing the detergent and water mixture through the pump, followed by two fresh water rinses. Gloves worn for sample handling will be discarded between sample collections.

Dedicated, new polyethylene tubing will be used at each well location for purging and sampling. Samples will be packaged in 40-mil vials supplied by the laboratory by QEPs and stored on ice pending same day or overnight shipment to a NYS-certified laboratory. The vials will be filled completely and checked to ensure no air bubbles are present. Additional field and laboratory QA/QC protocol is included in the associated QAPP.

3.3.1.2 Monitoring Well Repairs, Replacement And Decommissioning

If biofouling or silt accumulation occurs in the on-site and/or off-site monitoring wells, the wells will be physically agitated/surged and redeveloped. Additionally, monitoring wells will be properly decommissioned and replaced (as per the Monitoring Plan), if an event renders the wells unusable.

Repairs and/or replacement of wells in the monitoring well network will be performed based on assessments of structural integrity and overall performance.

The NYSDEC will be notified prior to any repair or decommissioning of monitoring wells for the purpose of replacement, and the repair or decommissioning and replacement process will be documented in the subsequent periodic report. Well decommissioning without replacement will be done only with the prior approval of NYSDEC. Well abandonment will be performed in accordance with NYSDEC's "Groundwater Monitoring Well Decommissioning Procedures." Monitoring wells that are decommissioned because they have been rendered unusable will be reinstalled in the nearest available location, unless otherwise approved by the NYSDEC.

3.3.2 Soil Vapor/Indoor Air Monitoring

One round of soil vapor, indoor air, and ambient (outdoor) air samples will be collected when the building is completed in 2011 to confirm that engineering controls in effect are sufficient and prior to system shut down. Soil vapor samples will be collected from sample ports located on each of the three risers of the SSD system. Three indoor air

samples will be collected from inside the parking garage. One ambient (outdoor) air sample will be collected from the courtyard and one ambient air sample will be collected from outside the building on East 158th Street. Sample locations are illustrated on **Figure 20**.

Samples will be conducted via the utilization of Summa Canisters calibrated to collect air for a 24-hour period. The samples will be analyzed by a NYS-certified laboratory and will be analyzed for VOCs using EPA Method TO-15 or the most current method available at that time. The results will be compared to the most current matrixes listed in NYSDOH guidance (Ref. 8). The sample results will be included in the Periodic Review Report.

In addition, soil vapor, indoor and ambient (outdoor) air samples will be obtained when the SSD system is proposed to be turned off or in the unlikely event the composite cover system is compromised. Air samples taken in conjunction with a breach will be taken in the specific area of the breach and outward from the breach in all four compass directions. Samples will be tested for VOCs by EPA Method TO-15 or the most current method available at that time. The results will be compared to the most current matrixes listed in NYSDOH guidance (Ref. 8) at that time. The results for any such sampling will be included in the following Period Review Report for that particular year.

3.3.2.1 Sampling Protocol

The sampling will be performed in accordance with NYSDOH's Guidance for Evaluating Soil Vapor Intrusion (Ref. 8). Prior to the collection of any samples, each soil vapor sampling point will be purged with a low flow vacuum pump to withdraw at least three volumes of the sampling tube. The tubing will then be connected to a pre-cleaned and pre-evacuated sample canister (i.e., six-litre Summa canister) equipped with a "T" connection. A helium tracer gas will be introduced into a closed environment above the vapor point. A helium meter will be connected to one end of the "T" connection to confirm that the ambient air and the soil vapor below are sealed apart.

Once the seal is verified, the sample canister and regulator numbers and starting gauge pressure will be recorded for each location and the flow controller will be opened to collect the soil vapor sample. After a sample collection period of approximately two-hours elapses, the final gauge pressure will be recorded, the flow control valve will be closed, the regulator/gauge assembly will be removed, and the labeled sample will be shipped back to a NYS-certified laboratory for chemical analysis. Chemical analysis will include volatile organic compounds by EPA Method TO-15.

The indoor air and ambient (outdoor) sample collection procedures are similar to those described for the soil vapor samples except the helium tracer gas step is not necessary since all samples will be collected within the breathing zone (4-6 feet high). One other difference is that the Summa canisters will be equipped with flow controllers set to collect samples over a 24-hour period. All indoor air and soil vapor samples will be analyzed by a NYS-certified laboratory for volatile organic compounds via EPA Method TO-15.

3.4 SITE-WIDE INSPECTION

Site-wide inspections will be performed on a regular schedule at a minimum of once a year. Site-wide inspections will also be performed after all severe weather conditions that may affect ECs or monitoring devices. During these inspections, an inspection form will be completed (**Appendix F**). The form will compile sufficient information to assess the following:

- Compliance with all ICs, including Site usage;
- An evaluation of the condition and continued effectiveness of ECs;
- General Site conditions at the time of the inspection;
- The Site management activities being conducted including, where appropriate, confirmation sampling and a health and safety inspection;

- Compliance with permits and schedules included in the Operation and Maintenance Plan; and,
- Confirm that Site records are up to date.

3.5 MONITORING QUALITY ASSURANCE/QUALITY CONTROL

All sampling and analyses will be performed in accordance with the requirements of the QAPP prepared for the Site (**Appendix G**). Main Components of the QAPP include:

- QA/QC Objectives for Data Measurement;
- Sampling Program:
 - Sample containers will be properly washed, decontaminated, and appropriate preservative will be added (if applicable) prior to their use by the analytical laboratory. Containers with preservative will be tagged as such.
 - Sample holding times will be in accordance with the NYSDEC ASP requirements.
 - Field QC samples (e.g., trip blanks, coded field duplicates, and matrix spike/matrix spike duplicates) will be collected as necessary.
- Sample Tracking and Custody;
- Calibration Procedures:
 - All field analytical equipment will be calibrated immediately prior to each day's use. Calibration procedures will conform to manufacturer's standard instructions.
 - The laboratory will follow all calibration procedures and schedules as specified in USEPA SW-846 and subsequent updates that apply to the instruments used for the analytical methods.
- Analytical Procedures;
- Preparation of a DUSR, which will present the results of data validation, including a summary assessment of laboratory data packages, sample preservation and chain of custody procedures, and a summary assessment of precision,

accuracy, representativeness, comparability, and completeness for each analytical method.

- Internal QC and Checks;
- QA Performance and System Audits;
- Preventative Maintenance Procedures and Schedules;
- Corrective Action Measures.

3.6 MONITORING REPORTING REQUIREMENTS

Forms and any other information generated during regular monitoring events and inspections will be kept on file at the Site, management office, or with the sponsor. All forms, and other relevant reporting formats used during the monitoring/inspection events, will be (1) subject to approval by NYSDEC, and (2) submitted at the time of the Periodic Review Report, as specified in the Reporting Plan of this SMP.

All monitoring results will be reported to NYSDEC on a periodic basis in the Periodic Review Report in accordance with Section 5.3 of this SMP. A letter report will also be prepared, subsequent to each sampling event. The report (or letter) will include, at a minimum:

- Date of event;
- Personnel conducting sampling;
- Description of the activities performed;
- Type of samples collected (e.g., sub-slab vapor, indoor air, outdoor air, etc);
- Copies of all field forms completed (e.g., well sampling logs, chain-of-custody documentation, etc.);
- Sampling results in comparison to appropriate standards/criteria;
- A figure illustrating sample type and sampling locations;
- Copies of all laboratory data sheets and the required laboratory data deliverables for all points sampled (to be submitted electronically in the NYSDEC-identified format);

- Any observations, conclusions, or recommendations; and
- A determination as to whether groundwater conditions have changed since the last reporting event.

Data will be reported in hard copy or digital format as determined by NYSDEC. A summary of the monitoring program deliverables are summarized in **Table 11** below.

Table 11: Schedule of Monitoring/Inspection Reports

Task	Reporting Frequency*
Groundwater Monitoring Report	Quarterly for the first four quarters. Frequency after first four quarters will be specified in the first Periodic Review Report.
Periodic Review Report	Annually beginning 18 months after receipt of COC until termination of Environmental Easement or termination of requirement by NYSDEC

* The frequency of events will be conducted as specified until otherwise approved by NYSDEC

4.0 OPERATION AND MAINTENANCE PLAN

4.1 INTRODUCTION

This Operation and Maintenance Plan describes the measures necessary to operate, monitor and maintain the mechanical components of the remedy selected for the Site. This Operation and Maintenance Plan:

- Includes the steps necessary to allow individuals unfamiliar with the Site to operate and maintain the pump and treat and SSD systems;
- Includes an operation and maintenance contingency plan; and,
- Will be updated periodically to reflect changes in Site conditions or the manner in which the pump and treat and SSD systems are operated and maintained.

Information on non-mechanical ECs (i.e. composite cover system) is provided in Section 3 - Engineering and Institutional Control Plan. A copy of this Operation and Maintenance Plan, along with the complete SMP, will be kept at the Site and will be located in the on-site maintenance room and/or the building management's office. This Operation and Maintenance Plan is not to be used as a stand-alone document, but as a component document of the SMP.

4.2 ENGINEERING CONTROL SYSTEM OPERATION AND MAINTENANCE

4.2.1 Composite Cover System

4.2.1.1 Scope

Exposure to residual contaminated soils is being prevented by an engineered, composite cover system that was built on the Site. This composite cover system consists of concrete sidewalks, concrete building slabs/foundations, foundation walls, vapor barrier, and a ventilated parking garage. The ventilated parking garage and the vapor barrier are shown on **Figure 12**. The vapor barrier specifications are enclosed as **Appendix H**.

The composite cover system will remain intact 24-hours a day, seven days a week, for 365 days a year. Breaching of the concrete sidewalks, foundation walls and slabs, and ventilated parking garage or vapor barrier is prohibited by the Environmental Easement. In the unlikely event of an unanticipated accidental or requested breach, the procedure for response to breach of the composite cover system is outlined in Section 2.5.

4.2.1.2 System Start-Up and Testing

As the composite cover system is not a mechanical system, no start-up testing was required.

4.2.1.3 System Operation: Routine Operation Procedures

As the composite cover system is not a mechanical system, there are no routine operating procedure requirements.

4.2.1.4 System Operation: Routine Equipment Maintenance

As there are no mechanical components of the composite cover system – periodic maintenance is not warranted. However, the composite cover system will be inspected by a NYS-licensed P.E. or his/her designee annually while the environmental easement is in effect to ensure the system's integrity.

4.2.1.5 System Operation: Non-Routine Equipment Maintenance

As the composite cover system is not a mechanical system, there are no equipment maintenance requirements.

4.2.2 Groundwater Pump and Treat System

4.2.2.1 Scope

The purpose of the pump and treat system is to collect and treat the residual halogenated VOC-impacted groundwater (PCE and its degradation products) within shallow bedrock fractures in the locations of MW-2A, MW-6, MW-7, and MW-8. The piping and vaults for the pump and treat system were installed in December 2009 and February 2010. The mechanical system components were installed in March 2010. The system was started up on April 22, 2010.

In March 2010, the QED AP2B Bottom Inlet, Short AutoPump® was placed in each pumping well, MW-2A, MW-6, MW-7, and MW-8. The bottom of the pump was placed at 50 feet in MW-2A, at 43 feet in MW-6, at 47 feet in MW-7, and 34 feet in MW-8. The AP2B Bottom Inlet, Short AutoPump® is 1.75 inches in diameter, 33 inches long, and can handle a maximum flow of 2.0 gpm. The pump is held in place by a support harness and cable.

Based on the operating requirements of the AutoPump®, a brand new two-horsepower air compressor with a 30 gallon receiver is being used to deliver the required air. The compressor was also fitted with coalescing and particulate filtration, an automatic drain, and an air dryer to prevent moisture buildup inside of the compressor. The two-horsepower air compressor will provide 5.7 cfm @135 psi.

A QED® filter regulator followed by a QED® cycle counter was attached to each pump. The filter regulator economizes on system air consumption, allows control of the pump flow rate so that each well can be controlled individually, and filters air system debris. In addition, the filter regulators contain a pressure gauge and are coated on the inside to prevent corrosion from condensed moisture. The cycle counter detects and displays each pump cycle via the pulse of air that occurs in the supply line thus enabling the total liquid delivered and the flow rate at each well to be calculated.

The cycle counter was connected to the AP2B Bottom Inlet, Short AutoPump® by 3/8-inch outer-diameter nylon hose that runs through the well cap. The nylon hose carries compressed air from the compressor through the filter regulator, through the cycle counter, and then to the pump. The contaminated groundwater (i.e. fluid) is discharged from the pump through 5/8-inch outer-diameter nylon hose. The nylon hose is connected to a flow meter, which then connects to a series of two 55-gallon drums of virgin, high activity granulated carbon. The treated effluent is then discharged directly into the building's sanitary sewer system. As required, a NYCDEP Sewer Discharge Permit and any other required permits were obtained prior to discharging any treated effluent. Sample ports were also included on the effluent discharge pipe and in between carbon drums, so that periodic review of samples of the effluent can be obtained for carbon breakthrough analysis and to satisfy the NYC DEP discharge requirement.

The nylon hoses were placed inside of a four-inch PVC conduit where the pipe runs underneath the slab and inside of the building and a two-inch PVC conduit with heat tracing to prevent freezing during the winter where the pipe runs underneath the sidewalk. The conduit extends from MW-6 to MW-2A and drops down to below cellar

grade to connect to MW-7 and MW-8. After connecting to MW-8, the conduit runs to the maintenance storage room, located in the northwestern corner of the cellar, where the pipe was brought up to grade so that one nylon hose can be connected to the air compressor and another to the carbon drums. The selected air compressor and carbon drums were placed inside the mechanical storage room along with the filter regulator, cycle counter, flow meter (to determine total flow), and a sample port to facilitate the collection of effluent samples to comply with the anticipated NYCDEP discharge permit stipulations. The maintenance storage room is sealed off via a locking door to prevent vandalism. The pump and treat system design, and typical well vault and pump details are illustrated on **Figure 14**.

The pump and treat system operates 24 hours per day, except during maintenance activities, until the termination criteria have been met. The termination criteria are outlined in Section 2.2.2.3.

4.2.2.2 System Start-Up and Testing

A start-up test/system shakedown was conducted on March 29, 2010 under NYSDEC oversight. Water levels were obtained from accessible wells before, during, and after the test. While the system operated, significant leaking was observed in one of the discharge hoses, water levels could not be obtained from the pumping wells while the system was operating, and not all of the gauges were operating properly. Therefore, maintenance was performed on the system on April 13, 2010 and second start-up test was conducted. All hoses, pumps, gauges, and ports were inspected during the April 13, 2010 start-up test and were found to be working correctly. No leaks were observed. The following table illustrates the water levels before, during, and after the system was started up. It is noted that the recharge water levels were obtained 30 minutes after the system was shut down.

<u>Well</u>	<u>Static Water Level</u>	<u>Water Level during Pumping</u>	<u>Recharge Water Level</u>
MW-1	NA	NA	NA
MW-2A	25.50 ft.	49.57 ft.	27.30 ft.
MW-3	11.47 ft.	11.51 ft.	11.52 ft.
MW-4	14.46 ft.	14.50 ft.	14.50 ft.
MW-5	NA	NA	NA
MW-6	25.28 ft.	41.36 ft.	27.0 ft.
MW-7	4.75 ft.	46.15 ft.	45.70 ft.
MW-8	11.02 ft.	33.10 ft.	27.0 ft.
MW-10	25.88 ft.	25.90 ft.	25.90 ft.
MW-11	12.11 ft.	12.12 ft.	12.13 ft.

Note:

NA – Well Not Accessible

The system testing described above will be conducted if, in the course of the pump and treat system's lifetime, significant changes are made to the system, and the system must be restarted.

4.2.2.3 System Operation: Routine Operation Procedures

The pump and treat system operates 24 hours per day until the termination criteria have been met. The only regularly scheduled maintenance activity that will require shutting off the system is the quarterly oil and filter change of the compressor.

During scheduled operations and maintenance, the following information will be checked and/or recorded on log sheets that will be kept in the locked maintenance room:

1. Compressor pressure
2. Total from flow meter
3. Pressure from filter regulator for each well

4. Reading from cycle counter
5. Conversion of each cycle counter reading into flow from each well (gpm)
6. Loose connections and leaks in vaults and in maintenance room
7. Temperature dial for heat tape is set to proper temperature
8. Collection of effluent sample to comply with NYCDEP Discharge Permit

In the event the system is not operating, the following Troubleshooting Table may be used for guidance.

Table 12. Pump and Treat Troubleshooting Guide

Possible Causes	Symptoms		
Detailed Instructions are found in Operation Manuals, which are enclosed as Appendix I	Pump not cycling	Pump cycles, but volume is reduced or there is no discharge	Air in fluid discharge
1. Air supply	X		X
2. Fluid level	X		
3. Air exhaust restricted	X		X
4. Fluid inlet clogged	X		
5. Debris, scale or very viscous fluid	X	X	X
6. Float pins	X		X
7. Debris in air inlet valve	X		
8. Fluid check valve		X	
9. Valve timing	X		

4.2.2.4 System Operation: Routine Equipment Maintenance

The following outlines the equipment maintenance procedures for the pump and treat system while the system is operating. It is noted that all maintenance procedures should be performed in accordance with the operation's manual of the equipment, which are enclosed as **Appendix I**.

Air Compressor

Quarterly

- Check lubricant level. Fill as needed.
- Replace filters.
- Check and tighten all bolts, nuts, etc.
- Make sure automatic drain is working properly.
- Check for unusual noise and vibration.
- Ensure covers are securely in place.
- Inspect for air leaks. Spray soapy water around joints during compressor operation and watch for air bubbles.
- Clean exterior.

Dryer

Quarterly

- Clean the Condenser using a dust collector and an air gun.

Annually

- Wash the automatic drain

Flow MeterQuarterly

- Visual check to see if working properly

Carbon UnitsQuarterly

- A sample of the effluent should be obtained and analyzed as stipulated in the discharge permit. If the analytical results indicate that there has been breakthrough of the carbon, the carbon unit should be properly disposed of and replaced with virgin carbon.
- There are no periodic maintenance procedures recommended by the manufacturer.

AP-2 AutoPump® and HosesEvery Operations and Maintenance Event

- Check pump cycle counter.
- Inspect all hoses and connections for damage including cracks, and listen for leaks in the system.
- Check air filters and filter bowl drains on the filters/regulator for saturation and operation.
- Check volume pumped per cycle
- Perform air quality check.
- Drain the air filters on the air hose to the pumps of collected particles, water and oil. Draining prevents the filter from clogging up or being otherwise damaged. Check the regulator to ensure the pressure setting has not drifted appreciably.
- Check pumps to see if they require service including exterior cleaning.

Pressure Regulator

Every Operations and Maintenance Event

- Visual check to see if pressure regulator is properly working.

Cycle Counter

Every Operations and Maintenance Event

- Visual check to see if cycle counter is properly working.

Heat Trace

Quarterly

- Check that temperature dial for heat tape is set to proper temperature.

4.2.2.4 System Operation: Non-Routine Equipment Maintenance

Any non-routine equipment maintenance should be performed in accordance with the equipment's owner's manual.

4.2.3 Sub-Slab Depressurization System

4.2.3.1 Scope

As an additional measure to prevent off-gassing of residual VOCs dissolved in underlying uppermost groundwater and/or in the soil/fill from entering the new building's interior, installation of an active SSD system, in addition to the ventilated parking garage, was included in the construction of the new buildings' foundation. The sub-slab piping for the SSD system was installed in December 2009 and January 2010.

The SSD system maintains a negative pressure underneath the slab while allowing the vapors below the concrete slab to vent without intruding into the building. The SSD system consists of horizontal trenches with four-inch perforated PVC pipe, a filter sock, and gravel. The horizontal pipes are connected to three vertical risers that combine into one six-inch header that extends above the roof of the building. A magnehelic gauge was retrofitted to each of the three riser pipes above the slab to facilitate collection of vacuum readings. These magnehelics also serve as warning devices or indicators to ensure that this active system is working properly. Sample ports were also installed in each of the riser pipes to allow for the collection of soil gas samples, if needed. In addition, labels were affixed to each riser immediately below the sample ports indicating the following:

SUB-SLAB DEPRESSURIZATION SYSTEM

This is a component of a Sub-Slab Depressurization System

DO NOT ALTER OR DISCONNECT

For Service call: CA RICH Consultants, Inc. 516-576-8844

The SSD fan is a Fantech Model number HP-220 fan that was mounted above the roof. The SSD layout is illustrated on **Figure 12**. The Typical Vent and Roof Detail is illustrated on **Figure 13**.

The SSD system will be operated 24 hours per day except during maintenance until the termination criteria have been satisfied. The termination criteria are outlined in Section 2.2.2.2.

4.2.3.2 System Start-Up and Testing

A pilot test of the system was conducted on January 26, 2010. The results of the pilot test are illustrated on **Figures 21 to 26**.

Once the new building construction is completed, the SSD system will be turned on and a start-up test will be conducted to confirm that the SSD system is working. Once the system is balanced, a vacuum range of 0.5 to 1.5 inches is anticipated. First, real time instrumentation readings of total VOCs in incoming sub-slab soil vapor (influent gas) will be obtained using a MiniRae PID and a Lower Explosive Limit (LEL) meter from each of the three risers. In addition, real time instrumentation readings of total VOCs in the exhaust (effluent gas) will be obtained.

Next, vacuum readings will be obtained from the magnehelic gauges attached to the risers. These readings will be reported in the first Periodic Review Report.

In addition, soil vapor, indoor air, and ambient (outdoor) air samples will be collected. Three soil vapor samples will be collected, one from each riser. Three indoor air samples will be collected from inside the parking garage. In addition, one ambient (outdoor) air sample will be collected from the courtyard and one ambient air sample will be collected from the exterior of the building along the East 158th Street sidewalk. Sampling will be conducted via the utilization of Summa Canisters calibrated to collect air for a 24-hour period. The samples will be analyzed by a NYS-certified laboratory and will be analyzed for VOCs using EPA Method TO-15. The indoor air results will be compared to the outdoor air and the matrixes included in the NYSDOH guidance (Ref. 8). The analytical results will be included in the Periodic Review Report.

The system testing described above will be conducted if, in the course of the SSD system lifetime, significant changes are made to the system, and the system must be restarted.

4.2.3.3 System Operation: Routine Operation Procedures

The SSD system will be monitored on an annual basis by a QEP or Professional Engineer. Monitoring of the SSD system will consist of a visual inspection of the complete system including checking to confirm that the SSD fan is operating properly, observing all magnehilics to confirm there is vacuum, identification and repair of leaks (if any), and obtaining a PID reading of the blower discharge effluent. In addition, the building floor will be inspected for wear-related cracks or pitting and repaired as needed.

The SSD system will not be discontinued without written approval by NYSDEC and NYSDOH. A proposal to discontinue the active SSD system will be submitted by the property owner based on confirmatory data that justifies such request. Systems will remain in place and operational until permission to discontinue use is granted in writing by NYSDEC and NYSDOH.

4.2.3.4 System Operation: Routine Equipment Maintenance

Operations and maintenance procedures that apply to the Fantech® Model Number HP220 fan includes a physical inspection of the fan to confirm that air is being discharged and that the fan is operating. No other maintenance is recommended by the manufacturer. Operations and maintenance procedures that apply to the Dwyer Magnehelic Differential Pressure Gauges include keeping the case exterior and cover clean and occasionally disconnecting the pressure lines to vent both sides of the gauge to atmosphere and re-zero. No other maintenance is recommended for any of the other parts of the SSD system at this time. The Fantech® Model Number HP220 fan and Dwyer® Magnehelic Differential Pressure Gauges owner's manuals are enclosed as **Appendix I**.

4.2.3.4 System Operation: Non-Routine Equipment Maintenance

Any non-routine equipment maintenance should be performed in accordance with the equipment's owner's manual.

4.3 ENGINEERING CONTROL SYSTEM PERFORMANCE MONITORING

4.3.1 Composite Cover System Monitoring

Exposure to residual contaminated soils is being prevented by an engineered, composite cover system that was built on the Site. This composite cover system consists of concrete sidewalks, concrete building slabs/foundations, foundation walls, vapor barrier, and a ventilated parking garage. The composite cover system will remain intact 24-hours a day, seven days a week, 365 days a year. Breaching of the cover system is prohibited by the Environmental Easement. In the unlikely event of an unanticipated accidental or requested breach, the procedure for response to breach of the composite cover system is outlined in Section 2.5.

As the composite cover system is not a mechanical system, there are no monitoring systems. However, the composite cover system will be inspected by a NYS-licensed P.E. or his/her designee annually while the Environmental Easement is in effect to ensure the system's integrity.

4.3.2 Groundwater Pump and Treat System Monitoring

The pump and treat system collects and treats the residual halogenated VOC-impacted groundwater (PCE and its degradation products) within shallow bedrock fractures in the locations of MW-2A, MW-6, MW-7, and MW-8. The piping and vaults for the pump and treat system were installed in December 2009 and February 2010. The mechanical system components were installed in March 2010.

4.3.2.1 Monitoring Schedule

The operations and maintenance schedule for the pump and treat system has been established and is included in **Table 10** on page 40.

Groundwater monitoring and sampling will also be conducted on a periodic basis to assess the performance of the pump and treat system. Baseline groundwater samples were collected from the monitoring well network during the RI and pre-design investigations. In addition, a baseline groundwater sample was collected from MW-11 on November 12, 2009. The monitoring frequency is described in detail in Section 3.3.1.

Inspection frequency is subject to change with the approval of the NYSDEC. Unscheduled inspections and/or sampling may take place when a suspected failure of the groundwater pump and treat system has been reported or an emergency occurs that is deemed likely to affect the operation of the system. Monitoring deliverables for the groundwater pump and treat system are specified later in this Plan.

4.3.2.2 General Equipment Monitoring

A visual inspection of the complete system will be conducted during each monitoring event. The pump and treat system components to be monitored include, but are not limited to, the following: air compressor, flow meter, pressure regulators, cycle counters, and carbon units.

A complete list of components to be checked is provided in the Inspection Checklist, presented in **Appendix J**. If any equipment readings are not within their typical range, any equipment is observed to be malfunctioning, or the system is not performing within specifications, maintenance and repair as per the Operation and Maintenance Plan are required immediately, and the pump and treat system restarted.

4.3.2.3 Sampling Event Protocol

All monitoring well sampling activities will be recorded in a field book and a sample groundwater-sampling log is presented in **Appendix E**. Other observations (e.g., well

integrity, etc.) will be noted on the well sampling log. The well sampling log will serve as the inspection form for the groundwater monitoring well network.

First, depth-to-water and depth-to-bottom measurements will be collected from the monitoring wells. Prior to sampling, at least three times the volume of water will be removed from each well using new polyethylene tubing and a submersible pump. Purging will continue until the readings of pH, temperature, conductivity, oxygen/reduction potential, and dissolved oxygen have stabilized and are recorded. Purge water will be contained in 55-gallon drums and disposed of in accordance with applicable regulations.

After purging is complete, a sample of the groundwater will be collected directly from the pump discharge into laboratory-issued containers by a QEP. The samples will be placed in a cooler on ice and sent to Accutest Laboratories of Dayton, New Jersey or equivalent (an ELAP and CLP certified laboratory) via overnight delivery for analysis of VOCs using USEPA Method 8260 and NYSDEC ASP Category B deliverables. The following samples will also be collected for QA/QC purposes: trip blank, field blank, duplicate sample, matrix spike, and matrix spike duplicate. A qualified third-party Data Validator will review the groundwater laboratory data and prepare a DUSR.

All on-site sampling equipment will be decontaminated between each use in the following manner: laboratory grade detergent and fresh water wash using scrub brush, followed by two fresh water rinses and final air dry. The submersible pump used for groundwater sample collection will be decontaminated between sample collection by passing the detergent and water mixture through the pump, followed by two fresh water rinses. Gloves worn for sample handling will be discarded between sample collections.

Dedicated, new polyethylene tubing will be used at each well location for purging and sampling. Samples will be packaged in 40-mil vials supplied by the laboratory by QEPs and stored on ice pending same day or overnight shipment to a NYS-certified laboratory.

The vials will be filled completely and checked to ensure no air bubbles are present. Additional field and laboratory QA/QC protocol is included in the associated QAPP.

4.3.3 SSD System Monitoring

As an additional measure to prevent off-gassing of residual VOCs dissolved in underlying uppermost groundwater and/or in the soil/fill from entering the new building's interior, installation of an active SSD system, in addition to the ventilated parking garage, was included in the construction of the new buildings' foundation. The sub-slab piping for the SSD system was installed in December 2009 and January 2010.

4.3.3.1 Monitoring Schedule

The operations and maintenance schedule for the SSD system has been established and is included in **Table 10** on page 40.

The inspection frequency is subject to change with the approval of the NYSDEC. Unscheduled inspections and/or sampling may take place when a suspected failure of the SSD system has been reported or an emergency occurs that is deemed likely to affect the operation of the system. Monitoring deliverables for the SSD system are specified later in this Plan.

4.3.3.2 General Equipment Monitoring

A visual inspection of the complete system will be conducted during the monitoring event. SSD system components to be monitored include, but are not limited to, the following: Fantech fan, magnehelic gauges, and general system piping.

A complete list of components to be checked is provided in the Inspection Checklist, presented in **Appendix J**. If any equipment readings are not within their typical range, any equipment is observed to be malfunctioning, or the system is not performing within

specifications, maintenance and repair as per the Operation and Maintenance Plan are required immediately, and the SSD system restarted.

4.3.3.3 Sampling Event Protocol

One round of soil vapor, indoor air, and ambient (outdoor) air samples will be collected when the building is completed in 2011 to confirm that engineering controls in effect are sufficient and prior to system shut down. Soil vapor samples will be collected from the sample ports located on each of the three risers of the SSD system. Three indoor air samples will be collected from inside the parking garage. One ambient (outdoor) air sample will be collected from the courtyard and one ambient (outdoor) air sample will be collected from outside the building on East 158th Street. Sample locations are illustrated on **Figure 20**.

Samples will be conducted via the utilization of Summa Canisters calibrated to collect air for a 24-hour period. The samples will be submitted to a NYS Certified laboratory and will be analyzed for VOCs using EPA Method TO-15. The results will be compared to the most current matrixes listed in NYSDOH guidance (Ref. 8). The sample results will be included in the Periodic Review Report.

In addition, soil vapor, indoor and ambient (outdoor) air samples will be obtained in the unlikely event the composite cover system is compromised or the SSD system is proposed to be turned off. Air samples taken in conjunction with a breach will be taken in the specific area of the breach and outward from the breach in all four compass directions. Samples will be tested for VOCs by EPA Method TO-15 or the most current method available at that time. The results will be compared to the most current matrixes listed in NYSDOH guidance (Ref. 8) at that time. The results for any such sampling will be included in the following Period Review Report for that particular year.

The sampling will be performed in accordance with NYSDOH's Guidance for Evaluating Soil Vapor Intrusion (Ref. 8). Prior to the collection of any samples, each soil vapor sampling point will be purged with a low flow vacuum pump to withdraw at least three volumes of the sampling tube. The tubing will then be connected to a pre-cleaned and pre-evacuated sample canister (i.e., six-litre Summa canister) equipped with a "T" connection. A helium tracer gas will be introduced into a closed environment above the vapor point. A helium meter will be connected to one end of the "T" connection to confirm that the ambient (outdoor) air and the soil vapor below are sealed apart.

Once the seal is verified, the sample canister and regulator numbers and starting gauge pressure will be recorded for each location and the flow controller will be opened to collect the soil vapor sample. After a sample collection period of approximately two-hours elapses, the final gauge pressure will be recorded, the flow control valve will be closed, the regulator/gauge assembly will be removed, and the labeled sample will be shipped back to a NYS-certified laboratory for chemical analysis. Chemical analysis will include volatile organic compounds by EPA Method T0-15.

The indoor air and ambient (outdoor) sample collection procedures are similar to those described for the soil vapor samples except the helium tracer gas step is not necessary since all samples will be collected within the breathing zone (4-6 feet high). One other difference is that the Summa canisters will be equipped with flow controllers set to collect samples over a 24-hour period. All indoor air and soil vapor samples will be analyzed by a NYS-certified laboratory for volatile organic compounds via EPA Method TO-15.

4.4 MAINTENANCE AND PERFORMANCE MONITORING REPORTING REQUIREMENTS

Maintenance reports, and any other information generated during regular operations at the Site, will be kept on-file in the on-site maintenance room and/or the building management office (C&C Affordable Management LLC, 1735 Park Avenue, Suite 300, New York, NY 10035). All reports, forms, and other relevant information generated will be available upon request to the NYSDEC and submitted as part of the Periodic Review Report, as specified in the Section 5 of this SMP.

4.4.1 Routine Maintenance Reports

Checklists or forms (see Appendices F and J) will be completed during each routine maintenance event. Checklists/forms will include, but not be limited to the following information:

- Date;
- Name, company, and position of person(s) conducting maintenance activities;
- Maintenance activities conducted;
- Any modifications to the system;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents noted (included either on the checklist/form or on an attached sheet); and,
- Other documentation such as copies of invoices for maintenance work, receipts for replacement equipment, etc., (attached to the checklist/form).

4.4.2 Non-Routine Maintenance Reports

During each non-routine maintenance event, a form will be completed which will include, but not be limited to, the following information:

- Date;
- Name, company, and position of person(s) conducting non-routine maintenance/repair activities;
- Presence of leaks;
- Date of leak repair;
- Other repairs or adjustments made to the system;
- Where appropriate, color photographs or sketches showing the approximate location of any problems or incidents (included either on the form or on an attached sheet); and,
- Other documentation such as copies of invoices for repair work, receipts for replacement equipment, etc. (attached to the checklist/form).

5.0 INSPECTIONS, REPORTING AND CERTIFICATIONS

5.1 SITE INSPECTIONS

5.1.1 Inspection Frequency

All inspections will be conducted at the frequency specified in the schedules provided in Section 3 Monitoring Plan and Section 4 Operation and Maintenance Plan of this SMP. At a minimum, a Site-wide inspection will be conducted annually. Inspections of remedial components will also be conducted when a breakdown of any treatment system component has occurred or whenever a severe condition has taken place, such as an erosion or flooding event that may affect the ECs.

5.1.2 Inspection Forms, Sampling Data, and Maintenance Reports

All inspections and monitoring events will be recorded on the appropriate forms for their respective system which are contained in Appendices J (SSD system and/or ventilated parking garage, and groundwater pump and treat system). Additionally, a general Site-wide inspection form will be completed during the Site-wide inspection (see **Appendix F**). These forms are subject to NYSDEC revision.

All applicable inspection forms and other records, including all media sampling data and system maintenance reports, generated for the Site during the reporting period will be provided in electronic format in the Periodic Review Report.

5.1.3 Evaluation of Records and Reporting

The results of the inspection and Site monitoring data will be evaluated as part of the EC/IC certification to confirm that the:

- EC/ICs are in place, are performing properly, and remain effective;
- The Monitoring Plan is being implemented;
- Operation and maintenance activities are being conducted properly; and, based on the above items,
- The Site remedy continues to be protective of public health and the environment and is performing as designed in the RAWP and FER.

5.2 CERTIFICATION OF ENGINEERING AND INSTITUTIONAL CONTROLS

After the last inspection of the reporting period, a Professional Engineer licensed to practice in NYS will prepare the following certification:

- For each institutional or engineering control identified for the Site, I certify that all of the following statements are true:
 - The inspection of the Site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under my direction;
 - The IC and/or EC employed at this Site is unchanged from the date the control was put in place, or last approved by the Department;
 - Nothing has occurred that would impair the ability of the control to protect the public health and environment;
 - Nothing has occurred that would constitute a violation or failure to comply with any SMP for this control;
 - Access to the Site will continue to be provided to the Department to evaluate the remedy, including access to evaluate the continued maintenance of this control;
 - If a financial assurance mechanism is required under the oversight document for the Site, the mechanism remains valid and sufficient for the intended purpose under the document;
 - Use of the Site is compliant with the Environmental Easement;
 - The EC systems are performing as designed and are effective;
 - To the best of my knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the Site remedial program and generally accepted engineering practices; and
 - The information presented in this report is accurate and complete.
 - I certify that all information and statements in this certification form are true. I understand that a false statement made herein is punishable as a Class “A” misdemeanor, pursuant to Section 210.45 of the Penal Law. I, [name], of [business address], am certifying as [Owner or Owner’s Designated Site Representative] for the Site.

The signed certification will be included in the Periodic Review Report described below.

5.3 PERIODIC REVIEW REPORT

A Periodic Review Report will be submitted to the Department every year, beginning 18 months after the COC is issued. In the event that the Site is subdivided into separate parcels with different ownership, a single Periodic Review Report will be prepared that addresses the Site described in **Appendix A** (Metes and Bounds). The report will be prepared in accordance with NYSDEC DER-10 and submitted within 45 days of the end of each certification period. Media sampling results will also be incorporated into the Periodic Review Report. The report will include:

- Identification, assessment and certification of all ECs/ICs required by the remedy for the Site;
- Results of the required annual Site inspections and severe condition inspections, if applicable;
- All applicable inspection forms and other records generated for the Site during the reporting period in electronic format;
- A summary of any discharge monitoring data and/or information generated during the reporting period with comments and conclusions;
- Data summary tables and graphical representations of contaminants of concern by media (groundwater, soil vapor, etc.), which include a listing of all compounds analyzed, along with the applicable standards, with all exceedances highlighted. These will include a presentation of past data as part of an evaluation of contaminant concentration trends;
- Results of all analyses, copies of all laboratory data sheets, and the required laboratory data deliverables for all samples collected during the reporting period will be submitted electronically in a NYSDEC-approved format;
- A Site evaluation, which includes the following:
 - The compliance of the remedy with the requirements of the Site-specific RAWP, Record of Decision (ROD) or Decision Document;

- The operation and the effectiveness of all treatment units, etc., including identification of any needed repairs or modifications;
 - Any new conclusions or observations regarding Site contamination based on inspections or data generated by the Monitoring Plan for the media being monitored;
 - Recommendations regarding any necessary changes to the remedy and/or Monitoring Plan; and
 - The overall performance and effectiveness of the remedy.
- A performance summary for all treatment systems at the Site during the calendar year, including information such as:
 - The number of days the system was run for the reporting period;
 - The average flows per day;
 - The contaminant mass removed;
 - A description of breakdowns and/or repairs along with an explanation for any significant downtime;
 - A description of the resolution of performance problems;
 - A summary of the performance, effluent and/or effectiveness monitoring; and
 - Comments, conclusions, and recommendations based on data evaluation.

The Periodic Review Report will be submitted, in hard-copy and electronic format, to the NYSDEC Central Office, the NYSDOH Bureau of Environmental Exposure Investigation, and the document repository.

5.4 CORRECTIVE MEASURES PLAN

If any component of the remedy is found to have failed, or if the periodic certification cannot be provided due to the failure of an institutional or engineering control, a corrective measures plan will be submitted to the NYSDEC for approval. This plan will explain the failure and provide the details and schedule for performing work necessary to correct the failure. Unless an emergency condition exists, no work will be performed pursuant to the corrective measures plan until it is approved by the NYSDEC.

References

1. Pressly & Associates, Inc. Phase I Environmental Site Assessment For Site B, Block 2364; Lots 45, 49, 55, 56, 58, Third Avenue/E.160th Street/Brook Avenue, Bronx, NY. (also includes Lot 70). New York: Author, March 2004.
2. CA RICH Consultants, Inc. Remedial Investigation Report, Cornerstone Site B-1, 3100 Third Avenue, Bronx, N.Y. New York: Author, November 2007; Revised April 2009.
3. CA RICH Consultants, Inc. Remedial Action Work Plan, Cornerstone Site B-1, 3100 Third Avenue, Bronx, N.Y. New York: Author, December 2007; Revised May 2009; 2nd Revision June 2009.
4. New York State Museum and Science Service. Geologic Map of New York, Lower Hudson Sheet, Map and Chart Series Number 15. New York: Author, 1995.
5. CA RICH Consultants, Inc. Groundwater Investigation and Design Report, Cornerstone Site B-1, 3100 Third Avenue, Bronx, N.Y. New York: Author, September 2009; Revised November 2009.
6. NYSDEC. 6 NYCRR Part 375 Environmental Remediation Programs, Subparts 375-1 to 375-4 & 375-6. New York: Author, December 2006.
7. NYSDEC. Technical and Operational Guidance Series (1.1.1) Ambient Water Quality Standards and Guidance Values and Groundwater Effluent Limitations. New York: Author, June 1998.
8. NYSDOH. Final Guidance for Evaluating Soil Vapor Intrusion in the State of New York. New York: Author, October 2006.

9. CA RICH Consultants, Inc. Remedial Action Work Plan Addendum. New York: Author, July 2009.
10. CA RICH Consultants, Inc. Pre-Design Investigation Work Plan. New York: Author, May 2009.
11. CA RICH Consultants, Inc. Tank Closure Report. New York: Author, February 2010.

Tables

Table 1

**Cornerstone Site B-1
3100 Third Avenue
Bronx, New York
BCP #C203044**

Track 4 Site Specific Soil Action Levels (SSSALs)

<u>Compound/Constituent</u>	<u>Track 4 SSSALs</u>	<u>Units</u>
Tetrachloroethene	1.3	mg/kg

Notes:

mg/kg = milligrams per kilogram

Table 2

**Cornerstone B-1
3100 Third Avenue
Bronx, NY
BCP #C203044**

Summary of Waste Disposal Receipts and Manifests

Soil Disposal from BCP Site Excavation

Item #	Date	Manifest #	Facility Destination	Weight (TN)	Cumm Qty (TN)
1	08/14/09	199547	Clean Earth of Carteret in Carteret, NJ	28.63	28.63
2	08/14/09	199551	Clean Earth of Carteret in Carteret, NJ	31.89	60.52
3	08/14/09	199559	Clean Earth of Carteret in Carteret, NJ	30.37	90.89
4	08/14/09	199557	Clean Earth of Carteret in Carteret, NJ	28.34	119.23
5	08/14/09	199549	Clean Earth of Carteret in Carteret, NJ	31.42	150.65
6	08/14/09	199555	Clean Earth of Carteret in Carteret, NJ	30.00	180.65
7	08/14/09	199561	Clean Earth of Carteret in Carteret, NJ	28.32	208.97
8	08/14/09	199548	Clean Earth of Carteret in Carteret, NJ	30.24	239.21
9	08/14/09	199560	Clean Earth of Carteret in Carteret, NJ	30.50	269.71
10	08/14/09	199558	Clean Earth of Carteret in Carteret, NJ	32.99	302.70
11	08/14/09	199550	Clean Earth of Carteret in Carteret, NJ	34.02	336.72
12	08/14/09	199552	Clean Earth of Carteret in Carteret, NJ	34.99	371.71
13	08/14/09	199562	Clean Earth of Carteret in Carteret, NJ	31.93	403.64
14	08/14/09	199204	Clean Earth of Carteret in Carteret, NJ	32.36	436.00
15	08/26/09	356310	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	33.18	469.18
16	08/26/09	356309	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	30.11	499.29
17	08/26/09	356308	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	30.94	530.23
18	08/26/09	356307	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	30.47	560.70
19	08/26/09	356306	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	31.72	592.42
20	08/26/09	356305	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	29.60	622.02
21	08/26/09	356304	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	32.97	654.99
22	08/26/09	356303	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	33.37	688.36
23	08/26/09	356302	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	32.28	720.64
24	08/26/09	356301	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	32.94	753.58
25	08/26/09	356300	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	31.94	785.52
26	08/26/09	356299	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	32.34	817.86

Table 2

**Cornerstone B-1
3100 Third Avenue
Bronx, NY
BCP #C203044**

Summary of Waste Disposal Receipts and Manifests

Soil Disposal from BCP Site Excavation

Item #	Date	Manifest #	Facility Destination	Weight (TN)	Cumm Qty (TN)
27	09/29/09	360223	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	34.27	852.13
28	09/29/09	360174	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	34.56	886.69
29	09/29/09	360176	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	35.72	922.41
30	09/29/09	360229	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	34.20	956.61
31	09/29/09	360217	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	32.45	989.06
32	09/29/09	360232	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	35.00	1,024.06
33	09/29/09	360171	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	39.17	1,063.23
34	09/29/09	360167	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	29.87	1,093.10
35	09/29/09	360222	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	25.37	1,118.47
36	09/29/09	360225	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	31.56	1,150.03
37	09/29/09	360168	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	32.85	1,182.88
38	09/29/09	360177	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	33.87	1,216.75
39	09/29/09	360228	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	32.43	1,249.18
40	09/29/09	360180	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	36.90	1,286.08
41	09/29/09	360197	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	32.99	1,319.07
42	09/29/09	360221	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	27.38	1,346.45
43	09/29/09	360170	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	28.56	1,375.01
44	09/29/09	360178	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	29.60	1,404.61
45	09/29/09	360227	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	30.52	1,435.13
46	09/29/09	360226	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	28.54	1,463.67
47	09/29/09	360182	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	32.60	1,496.27
48	09/29/09	360179	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	29.44	1,525.71
49	09/29/09	360173	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	33.50	1,559.21
50	09/29/09	360224	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	32.04	1,591.25
51	09/29/09	360230	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	30.02	1,621.27
52	09/29/09	360175	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	32.81	1,654.08
53	09/29/09	360231	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	29.38	1,683.46
54	09/29/09	360218	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	31.12	1,714.58
55	09/29/09	360169	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	31.37	1,745.95

Table 2

**Cornerstone B-1
3100 Third Avenue
Bronx, NY
BCP #C203044**

Summary of Waste Disposal Receipts and Manifests

Soil Disposal from BCP Site Excavation

Item #	Date	Manifest #	Facility Destination	Weight (TN)	Cumm Qty (TN)
56	10/15/09	360400	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	36.85	1,782.80
57	10/15/09	360401	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	36.79	1,819.59
58	10/15/09	360404	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	33.76	1,853.35
59	10/15/09	360395	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	35.15	1,888.50
60	10/15/09	360397	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	33.77	1,922.27
61	10/15/09	360408	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	36.90	1,959.17
62	10/15/09	360410	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	36.42	1,995.59
63	10/15/09	360394	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	32.89	2,028.48
64	10/15/09	360405	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	34.81	2,063.29
65	10/15/09	360399	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	35.90	2,099.19
66	10/15/09	360402	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	35.86	2,135.05
67	10/15/09	360403	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	36.42	2,171.47
68	10/15/09	360398	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	33.51	2,204.98
69	10/15/09	360396	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	34.35	2,239.33
70	10/15/09	360407	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	38.18	2,277.51
71	10/15/09	360409	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	36.48	2,313.99
72	10/15/09	360393	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	36.06	2,350.05
73	10/15/09	199703	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	35.07	2,385.12
74	10/15/09	199704	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	30.42	2,415.54
75	10/15/09	360406	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	33.82	2,449.36

Table 2

Cornerstone B-1
3100 Third Avenue
Bronx, NY
BCP #C203044

Summary of Waste Disposal Receipts and Manifests

Soil Disposal from BCP Site Excavation

Item #	Date	Manifest #	Facility Destination	Weight (TN)	Cumm Qty (TN)
76	11/09/09	355719	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	35.59	2,484.95
77	11/09/09	355718	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	37.57	2,522.52
78	11/09/09	355720	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	35.59	2,558.11
79	11/09/09	355717	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	37.72	2,595.83
80	11/09/09	355721	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	35.95	2,631.78
81	11/09/09	355716	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	36.48	2,668.26
82	11/09/09	355722	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	38.17	2,706.43
83	11/09/09	355723	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	35.84	2,742.27
84	11/09/09	355715	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	37.27	2,779.54
85	11/09/09	355726	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	35.88	2,815.42
86	11/09/09	355713	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	36.75	2,852.17
87	11/09/09	355714	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	36.45	2,888.62
88	11/09/09	355724	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	36.92	2,925.54
89	11/09/09	355725	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	40.00	2,965.54
90	11/09/09	355727	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	36.65	3,002.19
91	11/09/09	355712	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	34.48	3,036.67
92	11/18/09	355995	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	35.58	3,072.25
93	11/18/09	355994	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	34.70	3,106.95
94	11/18/09	236304	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	35.79	3,142.74
95	11/18/09	236302	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	36.20	3,178.94
96	11/18/09	355996	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	34.57	3,213.51
97	11/18/09	355997	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	32.47	3,245.98
98	11/18/09	356000	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	36.19	3,282.17
99	11/18/09	355990	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	34.68	3,316.85
100	11/18/09	355991	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	34.72	3,351.57
101	11/18/09	355992	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	36.64	3,388.21
102	11/18/09	355993	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	34.90	3,423.11
103	11/18/09	355998	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	34.47	3,457.58
104	11/18/09	236303	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	36.44	3,494.02
105	11/18/09	355999	Bellmawr Waterfront Redevelopment Site in Bellmawr, NJ	36.44	3,530.46
Total Soil Disposal from BCP Site:					3,530.46

Table 2

**Cornerstone B-1
3100 Third Avenue
Bronx, NY
BCP #C203044**

Summary of Waste Disposal Receipts and Manifests

Construction and Demolition Debris from Demolition

Item #	Date	Ticket #	Facility Destination	Weight (TN)	Cumm Qty (TN)
1	06/04/09	24991	APEX Environmental, LLC of Amsterdam, Ohio	7.20	7.20
2	06/05/09	24999	APEX Environmental, LLC of Amsterdam, Ohio	6.34	13.54
3	06/05/09	25003	APEX Environmental, LLC of Amsterdam, Ohio	8.29	21.83
4	06/11/09	25065	APEX Environmental, LLC of Amsterdam, Ohio	18.70	40.53
5	06/10/09	25060	APEX Environmental, LLC of Amsterdam, Ohio	11.57	52.10
6	06/10/09	25058	APEX Environmental, LLC of Amsterdam, Ohio	11.05	63.15
7	06/10/09	25054	APEX Environmental, LLC of Amsterdam, Ohio	11.76	74.91
8	06/10/09	25053	APEX Environmental, LLC of Amsterdam, Ohio	8.97	83.88
9	06/10/09	25051	APEX Environmental, LLC of Amsterdam, Ohio	7.82	91.70
10	06/09/09	25048	APEX Environmental, LLC of Amsterdam, Ohio	6.13	97.83
11	06/09/09	25046	APEX Environmental, LLC of Amsterdam, Ohio	6.06	103.89
12	06/09/09	25043	APEX Environmental, LLC of Amsterdam, Ohio	5.59	109.48
13	06/09/09	25040	APEX Environmental, LLC of Amsterdam, Ohio	10.63	120.11
14	06/08/09	25030	APEX Environmental, LLC of Amsterdam, Ohio	12.00	132.11
15	06/08/09	25028	APEX Environmental, LLC of Amsterdam, Ohio	11.78	143.89
16	06/08/09	25020	APEX Environmental, LLC of Amsterdam, Ohio	9.10	152.99
17	06/08/09	25026	APEX Environmental, LLC of Amsterdam, Ohio	9.49	162.48
Total Construction and Demolition Debris from Demolition:					162.48

Table 2

**Cornerstone B-1
3100 Third Avenue
Bronx, NY
BCP #C203044**

Summary of Waste Disposal Receipts and Manifests

Construction and Demolition Debris from Excavation

Item #	Date	Ticket #	Facility Destination	Weight (CY)	Cumm Qty (CY)
1	08/27/09	7321	Almar Supplies of Maspeth, New York	35.00	35.00
2	08/27/09	1406	Almar Supplies of Maspeth, New York	35.00	70.00
3	08/27/09	7478	Almar Supplies of Maspeth, New York	35.00	105.00
4	08/27/09	1405	Almar Supplies of Maspeth, New York	35.00	140.00
5	08/27/09	1404	Almar Supplies of Maspeth, New York	35.00	175.00
6	08/27/09	1403	Almar Supplies of Maspeth, New York	35.00	210.00
7	08/27/09	1408	Almar Supplies of Maspeth, New York	35.00	245.00
8	08/27/09	7320	Almar Supplies of Maspeth, New York	35.00	280.00
9	08/28/09	7479	Almar Supplies of Maspeth, New York	35.00	315.00
10	08/31/09	7325	Almar Supplies of Maspeth, New York	35.00	350.00
11	08/31/09	7483	Almar Supplies of Maspeth, New York	35.00	385.00
12	08/31/09	7322	Almar Supplies of Maspeth, New York	35.00	420.00
13	08/31/09	7323	Almar Supplies of Maspeth, New York	35.00	455.00
14	08/31/09	7481	Almar Supplies of Maspeth, New York	35.00	490.00
15	08/31/09	7480	Almar Supplies of Maspeth, New York	35.00	525.00
16	09/01/09	7276	Almar Supplies of Maspeth, New York	35.00	560.00
17	09/01/09	7277	Almar Supplies of Maspeth, New York	35.00	595.00
18	09/01/09	7484	Almar Supplies of Maspeth, New York	35.00	630.00
19	09/03/09	1415	Almar Supplies of Maspeth, New York	35.00	665.00
20	09/03/09	1414	Almar Supplies of Maspeth, New York	35.00	700.00
21	09/03/09	7488	Almar Supplies of Maspeth, New York	35.00	735.00
22	09/03/09	7487	Almar Supplies of Maspeth, New York	35.00	770.00
23	09/03/09	7489	Almar Supplies of Maspeth, New York	35.00	805.00
24	09/03/09	1416	Almar Supplies of Maspeth, New York	35.00	840.00
25	09/03/09	NA	Almar Supplies of Maspeth, New York	35.00	875.00
26	09/03/09	1417	Almar Supplies of Maspeth, New York	35.00	910.00

Table 2

Cornerstone B-1
3100 Third Avenue
Bronx, NY
BCP #C203044

Summary of Waste Disposal Receipts and Manifests

Construction and Demolition Debris from Excavation

Item #	Date	Ticket #	Facility Destination	Weight (CY)	Cumm Qty (CY)
27	09/09/09	7283	Almar Supplies of Maspeth, New York	35.00	945.00
28	09/09/09	7492	Almar Supplies of Maspeth, New York	35.00	980.00
29	09/09/09	7491	Almar Supplies of Maspeth, New York	35.00	1,015.00
30	09/09/09	7281	Almar Supplies of Maspeth, New York	35.00	1,050.00
31	09/09/09	7280	Almar Supplies of Maspeth, New York	35.00	1,085.00
32	09/09/09	7282	Almar Supplies of Maspeth, New York	35.00	1,120.00
33	09/09/09	7494	Almar Supplies of Maspeth, New York	35.00	1,155.00
34	09/09/09	7493	Almar Supplies of Maspeth, New York	35.00	1,190.00
35	09/11/09	7285	Almar Supplies of Maspeth, New York	35.00	1,225.00
36	09/11/09	7284	Almar Supplies of Maspeth, New York	35.00	1,260.00
37	09/11/09	7286	Almar Supplies of Maspeth, New York	35.00	1,295.00
38	09/15/09	1427	Almar Supplies of Maspeth, New York	35.00	1,330.00
39	09/15/09	1424	Almar Supplies of Maspeth, New York	35.00	1,365.00
40	09/16/09	247280	Almar Supplies of Maspeth, New York	35.00	1,400.00
41	09/16/09	245802	Almar Supplies of Maspeth, New York	35.00	1,435.00
42	09/16/09	247813	Almar Supplies of Maspeth, New York	35.00	1,470.00
43	09/16/09	248240	Almar Supplies of Maspeth, New York	35.00	1,505.00
44	09/16/09	247008	Almar Supplies of Maspeth, New York	35.00	1,540.00
45	09/16/09	7485	Almar Supplies of Maspeth, New York	35.00	1,575.00
46	09/17/09	1431	Almar Supplies of Maspeth, New York	35.00	1,610.00
47	09/17/09	1430	Almar Supplies of Maspeth, New York	35.00	1,645.00
48	09/17/09	1432	Almar Supplies of Maspeth, New York	35.00	1,680.00
49	09/17/09	248236	Almar Supplies of Maspeth, New York	35.00	1,715.00
50	09/17/09	244207	Almar Supplies of Maspeth, New York	35.00	1,750.00
51	09/18/09	1433	Almar Supplies of Maspeth, New York	35.00	1,785.00
52	09/18/09	1434	Almar Supplies of Maspeth, New York	35.00	1,820.00
53	09/19/09	1439	Almar Supplies of Maspeth, New York	35.00	1,855.00
54	09/19/09	1437	Almar Supplies of Maspeth, New York	35.00	1,890.00
55	09/19/09	1440	Almar Supplies of Maspeth, New York	35.00	1,925.00
56	09/19/09	1438	Almar Supplies of Maspeth, New York	35.00	1,960.00
57	09/21/09	1441	Almar Supplies of Maspeth, New York	35.00	1,995.00

Table 2

**Cornerstone B-1
3100 Third Avenue
Bronx, NY
BCP #C203044**

Summary of Waste Disposal Receipts and Manifests

Construction and Demolition Debris from Excavation

Item #	Date	Ticket #	Facility Destination	Weight (CY)	Cumm Qty (CY)
58	09/22/09	1442	Almar Supplies of Maspeth, New York	35.00	2,030.00
59	09/22/09	1444	Almar Supplies of Maspeth, New York	35.00	2,065.00
60	09/22/09	1445	Almar Supplies of Maspeth, New York	35.00	2,100.00
61	09/22/09	1443	Almar Supplies of Maspeth, New York	35.00	2,135.00
62	09/23/09	1450	Almar Supplies of Maspeth, New York	35.00	2,170.00
63	09/23/09	1451	Almar Supplies of Maspeth, New York	35.00	2,205.00
64	09/23/09	1447	Almar Supplies of Maspeth, New York	35.00	2,240.00
65	09/23/09	1446	Almar Supplies of Maspeth, New York	35.00	2,275.00
66	09/23/09	1448	Almar Supplies of Maspeth, New York	35.00	2,310.00
67	09/28/09	1455	Almar Supplies of Maspeth, New York	35.00	2,345.00
68	09/29/09	1464	Almar Supplies of Maspeth, New York	35.00	2,380.00
69	09/29/09	1462	Almar Supplies of Maspeth, New York	35.00	2,415.00
70	09/29/09	1463	Almar Supplies of Maspeth, New York	35.00	2,450.00
71	09/29/09	1461	Almar Supplies of Maspeth, New York	35.00	2,485.00
72	09/29/09	1459	Almar Supplies of Maspeth, New York	35.00	2,520.00
73	09/29/09	1460	Almar Supplies of Maspeth, New York	35.00	2,555.00
74	09/30/09	1466	Almar Supplies of Maspeth, New York	35.00	2,590.00
75	09/30/09	1469	Almar Supplies of Maspeth, New York	35.00	2,625.00
76	09/30/09	1467	Almar Supplies of Maspeth, New York	35.00	2,660.00
77	09/30/09	1465	Almar Supplies of Maspeth, New York	35.00	2,695.00
78	10/01/09	1470	Almar Supplies of Maspeth, New York	35.00	2,730.00
79	10/01/09	1471	Almar Supplies of Maspeth, New York	35.00	2,765.00
80	10/01/09	1472	Almar Supplies of Maspeth, New York	35.00	2,800.00
81	10/01/09	1473	Almar Supplies of Maspeth, New York	35.00	2,835.00
82	10/08/09	1476	Almar Supplies of Maspeth, New York	35.00	2,870.00
83	10/08/09	1474	Almar Supplies of Maspeth, New York	35.00	2,905.00
84	10/08/09	1475	Almar Supplies of Maspeth, New York	35.00	2,940.00
85	10/13/09	1479	Almar Supplies of Maspeth, New York	35.00	2,975.00
86	10/13/09	1478	Almar Supplies of Maspeth, New York	35.00	3,010.00
87	10/13/09	1477	Almar Supplies of Maspeth, New York	35.00	3,045.00

Table 2

**Cornerstone B-1
3100 Third Avenue
Bronx, NY
BCP #C203044**

Summary of Waste Disposal Receipts and Manifests

Construction and Demolition Debris from Excavation

Item #	Date	Ticket #	Facility Destination	Weight (CY)	Cumm Qty (CY)
88	10/14/09	1480	Almar Supplies of Maspeth, New York	35.00	3,080.00
89	10/14/09	1481	Almar Supplies of Maspeth, New York	35.00	3,115.00
90	10/14/09	1482	Almar Supplies of Maspeth, New York	35.00	3,150.00
91	10/15/09	1483	Almar Supplies of Maspeth, New York	30.00	3,180.00
92	10/15/09	1484	Almar Supplies of Maspeth, New York	30.00	3,210.00
93	10/26/09	1300	Almar Supplies of Maspeth, New York	30.00	3,240.00
94	10/26/09	1301	Almar Supplies of Maspeth, New York	30.00	3,270.00
95	10/27/09	1302	Almar Supplies of Maspeth, New York	30.00	3,300.00
Total Construction and Demolition Debris from Excavation:					3,300.00

Table 2

**Cornerstone B-1
3100 Third Avenue
Bronx, NY
BCP #C203044**

Summary of Waste Disposal Receipts and Manifests

Liquid and Tank Sludge Removed from ASTs

Item #	Date	Ticket #	Facility Destination	Weight (g)	Cumm Qty (g)
1	05/21/09	45602	New York Oil and Recovery of Brooklyn, New York	537.00	537.00
2	05/21/09	46760	Soil Safe of Gloucester County, New Jersey	55.00	592.00
Total Liquid and Tank Sludge Removed from ASTs:					592.00

Disposal of Three 275-gallon ASTs

Item #	Date	Ticket #	Facility Destination	Weight (lbs)	Cumm Qty (lbs)
1	06/05/09	2182352	Gershow Recycling of Lindenhurst, New York	3,640.00	3,640.00
Total Disposal of Three 275-gallon ASTs:					3640.00

Table 3
Validated Analytical Results for Volatile Organic Compounds In Soil Excavation Endpoint Samples
Cornerstone Site B-1
3100 Third Avenue, Bronx, NY
BCP # C203044

[illegible]

Notes: µg/kg - micrograms per kilogram or parts per billion ND - Not detected or above laboratory detection limits N/A - No Value Given J - Estimated Value R - The sample results are unreliable/unusable. The presence or absence of the analyte cannot be verified. LUL - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample. Bold and bold indicates exceedance of Track 1 Soil Cleanup Objectives			EP-X is a duplicate of EP-2 EP-JXX is a duplicate of EP-20	*6 NYCR Part 375, Subparts 375-1 to 375-4 & 375-6; Table 375-6 (iv) Unrestricted Use Soil Cleanup Objectives **Track 4 Site Specific Soil Action Levels, Remedial Action Work Plan, June 2009.
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Table 5

Validated Analytical Results for PCBs In Soil Excavation Endpoint Samples

Cornerstone Site B-1

3100 Third Avenue, Bronx, NY

BCP # C203044

[illegible]

Notes:		
<i>ug/Kg</i> - micrograms per kilogram or parts per billion	EP-X is a duplicate of EP-2	*6 NYCRR Part 375, Subparts 375-1 to 375-4 & 375-6;
ND - Not detected at or above laboratory detection limits	EP-XX is a duplicate of EP-20	Table 375-6.8(a)/Unrestricted Use Soil Cleanup Objectives and Table 375-6.8(b)/Restricted Use Soil Cleanup Objectives
NVG - No Value Given		**Track 4 Site Specific Soil Action Levels, Remedial Action Work Plan, June 2009.
J - Estimated Value		
FB - Field Blank		
Boxed and bold indicates exceedance of Track 1 Soil Cleanup Objectives		

Validated Analytical Results for Pesticides In Soil Excavation Endpoint Samples
Cornerstone Site B-1
3100 Third Avenue, Bronx, NY
BCP # C203044

Notes:		
ug/Kg - micrograms per kilogram or parts per billion	EP-X is a duplicate of EP-2	*6 NYCRR Part 375; Subparts 375-1 to 375-4 & 375-6;
ND - Not detected at or above laboratory detection limits	EP-XX is a duplicate of EP-20	Table 375-6.8(a):Unrestricted Use Soil Cleanup Objectives
NVG - No Value Given		**Track 4 Site Specific Soil Action Levels, Remedial Action Work Plan, June 2009.
a - Result is from Run #2		
b - Result is from Run #2		
J - Estimated Value		
Boxed and bold indicates exceedance of Track 1 Soil Cleanup Objectives		

TABLE 7																																											
Validated Analytical Results for Metals in Soil Excavation Endpoint Samples																																											
Cornerstone Site B-1																																											
3100 Third Avenue, Bronx, NY																																											
BCP # C203044																																											
Sample ID	EP-1	EP-2	EP-X	EP-3	EP-4	EP-5	EP-6	EP-7	EP-8	EP-9	EP-10	EP-11	EP-12	EP-13	EP-14	EP-15	EP-16	EP-17	EP-18	EP-19	EP-20	EP-XX	EP-21	EP-22	EP-23	EP-24	EP-25	EP-26	EP-27	EP-28	EP-29	EP-30	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Field Blank	Part 375 - Track	Part 375 - Track	Track 4 Site	
Matrix	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Soil	Liquid	Liquid	Liquid	Liquid	Liquid	Liquid	Liquid	Soil Cleanup	Soil Cleanup	Specific Soil		
Date Sampled	8/27/2009	8/27/2009	8/27/2009	9/30/2009	10/8/2009	10/8/2009	9/30/2009	9/30/2009	9/30/2009	9/30/2009	9/30/2009	9/30/2009	9/30/2009	9/30/2009	9/30/2009	9/30/2009	9/30/2009	9/30/2009	10/21/2009	10/21/2009	10/21/2009	10/21/2009	11/5/2009	11/5/2009	11/5/2009	10/21/2009	10/21/2009	11/5/2009	11/18/2009	11/18/2009	11/30/2009	11/30/2009	8/27/2009	9/30/2009	10/8/2009	10/21/2009	11/5/2009	11/18/2009	11/30/2009	Soil Cleanup Objectives*	Soil Cleanup Objectives*	Action Levels**	
Metals	Units	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	mg/kg	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	ug/L	mg/kg	mg/kg	mg/kg	
Aluminum	10,000 J	10,100 J	10,600 J	6,850	5,160	10,200	8,960	5,930	6,900	5,160	4,930	10,600	5,990	8,600	3,460	8,480	11,800	8,350	7,770 J	10,700 J	9,010 J	8,140 J	10,700	13,200	8,760	13,200 J	17,300 J	11,900	10,800 J	12,300 J	12,400	13,900	<200	<200	<200	<200	<200	<200	<200	NVG	NVG	NVG	
Antimony	<2.3 UJ	<2.1 UJ	<2.3 UJ	<2.5 UJ	<2.4 UJ	<2.3 UJ	<2.5 UJ	<2.4 UJ	<2.1 UJ	<2.5 UJ	<2.4 UJ	<2.3 UJ	<2.3 UJ	<2.4 UJ	<2.2 UJ	<2.4 UJ	<2.5 UJ	<2.1 UJ	<2.2 UJ	<2.2 UJ	<2.2 UJ	<2.2 UJ	<2.2 UJ	<2.3 UJ	<2.2 UJ	<2.4 UJ	<2.2 UJ	<2.4 UJ	<2.2 UJ	<2.2 UJ	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	<6.0	NVG	NVG	NVG		
Arsenic	<2.3 UJ	<2.1 UJ	<2.3 UJ	<2.5	<2.4	2.3	<2.5	<2.4	<2.1	<2.5	<2.4	4.9	<2.3	2.8	<2.3	<2.2	<2.4	<2.5	<2.1	3.2	2.8	<2.2	4.1 J	2.4	2.9	2.5	2.7	<2.2	2.4	2.9	2.4	<2.2 UJ	<3.0 UJ	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	13	16	NVG	
Barium	61.0	48.4	59.1	42.9	90.3	79.1	100	41.3	82.6	<25	26.9	111	41.6	85.4	<23	60.6	69.2	55.8	39.6	126	101 J	187 J	235	160	333	54.6	69.1	74.1	66.5	85.5	69.5	65.6	<200	<200	<200	<200	<200	<200	<200	350	400	NVG	
Beryllium	<0.57	<0.53	<0.57	<0.62	<0.59	<0.57	<0.62	<0.60	<0.52	<0.63	<0.60	<0.57	<0.56	<0.61	<0.59	<0.55	<0.59	<0.63	<0.53	<0.55	<0.55	<0.55	<0.54	<0.58	<0.54	<0.59	<0.54	<0.60	<0.57	<0.67	0.79	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	<1.0	7.2	72	NVG		
Cadmium	<0.57	<0.53	<0.57	<0.62 UJ	<0.59 UJ	<0.62 UJ	<0.62 UJ	<0.60 UJ	<0.52 UJ	<0.63 UJ	<0.60 UJ	<0.57 UJ	<0.56 UJ	<0.61 UJ	<0.59 UJ	<0.55 UJ	<0.59 UJ	<0.63 UJ	<0.53	<0.55	<0.55	<0.55	2.4	0.67	0.92	<0.54	<0.59	<0.54	<0.60	<0.57	<0.56	<0.56 UJ	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	<3.0	2.5	4.3	NVG	
Calcium	10,700 J	2,100 J	1,620 J	47,400	74,800	39,400	60,900	22,600	21,500	7,270	12,300	11,400	10,700	9,730	936	21,300	30,300	9,860	17,800 J	23,600 J	18,300 J	13,900 J	16,700	20,100 J	17,200 J	6,080 J	5,950 J	4,680 J	15,200	11,300	4,540 J	2,850	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	NVG	NVG	NVG	
Chromium	23.3	24.0	24.1	14.3	14.8	19.1	16.4	12.8	14.9	16.0	12.3	35.2	11.0	19.9	8.8	19.4	25.8	17.1	16.3 J	24.3 J	19.9 J	16.3 J	26.4	27.4	23.7	24.3 J	34.1 J	29.7	22.1	23.8	24.7	27.4	<10	<10	<10	<10	<10	<10	<10	1	110	NVG	
Cobalt	9.5	7.4	8.1	<6.2	9.8	6.8	15.1	6.4	5.8	<6.3	<6.0	8.4	<5.6	7.0	<5.9	6.7	10.7	<6.3	5.9 J	7.0 J	6.7 J	6.3 J	7.4	11.1 J	8.4 J	7.4 J	8.2 J	10.1 J	7.1	8.2	7.4	8.0	<50	<50	<50	<50	<50	<50	<50	NVG	NVG	NVG	
Copper	25.0	22.4 J	34.5 J	18.7	29.8	23.9	23.7	23.9	25.6	10.2	13.3	63.7	19.4	27.5	11.0	19.8	26.6	20.5	21.9	47.2	26.3	23.3	55.7	40.6	37.0	19.5	25.7	27.2	19.7	27.9	19.3	17.5	<10	<10	<10	<10	<10	<10	<10	50	270	NVG	
Iron	18,100	14,600	16,800	11,400	12,400	15,400	16,700	11,700	12,600	9,180	9,750	18,800	11,300	15,300	7,160	13,600	18,700	13,700	13,300	18,100	15,100	12,700	21,900	21,900 J	26,400 J	17,900	21,300	18,900 J	16,700 J	18,500 J	16,300 J	17,500 J	<100 UJ	<100	<100	<100	<100	<100	<100	<100	NVG	NVG	NVG
Lead	43.5 J	54.1 J	88.7 J	26.0 J	81.6 J	82.4 J	54.7 J	18.7 J	24.3 J	<2.5 UJ	<2.4 UJ	215 J	7.4 J	97.4 J	2.5 J	47.9 J	42.3 J	63.5 J	8.9 J	116 J	107 J	72.0 J	322	127 J	197 J	18.3 J	12.2 J	30.9 J	67.4 J	69.7 J	41.7 J	31.5 J	<3.0 UJ	<3.0 UJ	<3.0 UJ	<3.0 UJ	<3.0	<3.0 UJ	<3.0	63	400	NVG	
Magnesium	10,500 J	4,260 J	4,950 J	27,600	47,300	24,200	34,200	15,300	13,800	6,460	9,410	9,900	8,180	7,630	1,710	13,500	22,300	7,700	11,100 J	11,800 J	11,000 J	8,940 J	8,590	14,500	10,400	6,660 J	9,760 J	6,310	11,100	10,700	5,230	5,900	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	<5,000	NVG	NVG	NVG	
Manganese	363 J	260 J	324 J	205 J	558 J	273 J	911 J	264 J	503 J	156 J	146 J	345 J	193 J	225 J	142 J	231 J	254 J	235 J	222 J	288 J	316 J	233 J	340	371 J	311 J	341 J	342 J	335 J	293 J	320 J	312 J	314 J	<15	<15	<15	<15	<15	<15	<15	1,600	2,000	NVG	
Mercury	0.048	0.19	0.16	0.097	0.18	0.40	0.16	<0.035	0.048	<0.040	<0.037	2.7	<0.035	0.66	<0.033	0.22	0.25	0.12	0.10	0.42	0.34 J	0.23 J	0.46	0.25	0.29	0.086	0.041	0.058	0.27	0.35	0.073	<0.035	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	<0.20	0.18	0.81	NVG	
Nickel	20.5 J	16.0 J	16.6 J	12.9	17.1	14.9	17.1	14.9	15.7	11.0	10.7	17.5	12.5	13.9	7.6	15.4	22.5	13.6	13.5 J	17.2 J	16.1 J	13.4 J	18.6	19.2	16.4	16.9 J	21.5 J	20.5	14.4	17.1	17.1 J	18.9 J	<10	<10	<10	<10	<10	<10	<10	30	310	NVG	
Potassium	2,310 J	1,580 J	1,480 J	1,900	1,770	2,220	3,040	1,710	1,760	<1,300	1,280	2,300	1,790	2,180	<1,200	1,900	3,560	1,530	1,690	2,450	2,270	1,730	2,190	3,580	2,070	1,510	2,890	2,280	2,000	1,960	1,470	1,620	<10,000	<10,000	<10,000	<10,000	<10,000	<10,000	<10,000	NVG	NVG	NVG	
Selenium	<2.3	<2.1	<2.3	<2.5	<2.4	<2.3	<2.5	<2.4	<2.1	<2.5	<2.4	<2.3	<2.3	<2.4	<2.3	<2.2	<2.4	<2.5	<2.1	<2.2	<2.2	<2.2	<2.2	<2.3	<2.2	<2.4	<2.2	<2.4	<2.2	<2.3	<2.2	<2.2	<10	<10	<10	<10	<10	<10	<10	3.9	180	NVG	
Silver	<1.1	<1.1	<1.1	<1.2 UJ	<1.2 UJ	<1.1 UJ	<1.2 UJ	<1.2 UJ	<1.0 UJ	<1.3 UJ	<1.2 UJ	<1.1 UJ	<1.1 UJ	<1.2 UJ	<1.2 UJ	<1.1 UJ	<1.2	<1.3 UJ	<1.1	<1.1	<1.1	<1.1	<1.2	<1.1	<1.1	<1.2	<1.1	<1.1	<1.2	<1.1	<1.1	<1.1	<10	<10	<10	<10	<10	<10	<10	2	180	NVG	
Sodium	<1,100	<1,100	<1,100	<1,200	<1,200	<1,100	<1,200	<1,200	<1,000	<1,300	<1,200	<1,100	<1,100	<1,200	<1,100	<1,100	<1,200	<1,100	<1,100	<1,100	<1,100	<1,100	<1,100	<1,100	<1,100	<1,100	<1,100	<1,100	<1,200	<1,100	<1,100	<1,100	<10,000	<10,000	<10,000	<10,000	<10,000	<10,000	<10,000	NVG	NVG	NVG	
Thallium	<1.1	<1.1	<1.1	<1.2 UJ	<1.2 UJ	<1.1 UJ	<1.2 UJ	<1.2 UJ	<1.0 UJ	<1.3 UJ	<1.2 UJ	<1.1 UJ	<1.1 UJ	<1.2 UJ	<1.2 UJ	<1.1 UJ	<1.3 UJ	<1.1 UJ	<1.1 UJ	<1.1 UJ	<1.1 UJ	<1.1 UJ	<1.1	<1.2	<1.1	<1.1 UJ	<1.2 UJ	<1.1	<1.2	<1.1	<1.1 UJ	<2.0	<2.0 UJ	<2.0	<2.1	<2.0 UJ	<2.0	<2.0	<2.0	NVG	NVG	NVG	
Vanadium	28.2	25.4	28.5	24.3	21.6	28.1	28.0	19.9	23.4	18.0	19.7	33.9	20.5	25.9	11.6	25.0	38.6	23.2	22.0	30.1	25.5	20.5	29.9	35.8	31.5	30.5	37.9	33.2	26.3	32.7	27.3	30.5	<50	<50	<50	<50 UJ	<50	<50	<50	NVG	NVG	NVG	
Zinc	103 J	57.8 J	75.0 J	48.1	70.4	74.7	95.7	90.4	70.7	25.3	20.3	125	35.9	128	15.8	64.0	66.5	59.2	40.2 J	145 J	101 UJ	82.9 J	379	176 J	263 J	44.5 J	55.9 J	65.7 J	59.3	89.6	65.1 J	51.4 J	<20	<20	<20	<20	<20	<20	<20	109	10,000	NVG	
Notes:																																											
mg/kg - milligrams per kilogram or parts per million																																											
ND - Not detected at or above laboratory detection limits																																											
NVG - No Value Given																																											
J - Estimated Value																																											
UJ - The analyte was analyzed for, but was not detected above the reported sample quantitation limits.																																											
UJ - The analyte was not detected above the reported sample quantitation limit. However, the reported quantitation limit is approximate and may or may not represent the actual limit of quantitation necessary to accurately and precisely measure the analyte in the sample.																																											
Boxed and bold indicates exceedance of Track 1 Soil Cleanup Objectives																																											
Boxed, bold, and italicized indicates exceedance of Track 2 Restricted-Residential Soil Cleanup Objectives																																											

**Tables 8 through 12 are included in the text
of the SMP**

Table 13

**Cornerstone Site B-1
3100 Third Avenue
Bronx, NY
BCP # C203044**

Restricted Residential Soil Cleanup Objectives

<u>Contaminant</u>	<u>Soil Cleanup Objective</u>
Metals	
Arsenic	16
Barium	400
Beryllium	47
Cadmium	4.3
Chromium, hexavalent	19
Chromium, trivalent	180
Copper	270
Total Cyanide	27
Lead	400
Manganese	2,000
Total Mercury	0.73
Nickel	130
Selenium	4
Silver	8.3
Zinc	2,480
PCBs/Pesticides	
2,4,5-TP Acid (Silvex)	3.8
4,4'-DDE	8.9
4,4'-DDT	7.9
4,4'-DDD	13
Aldrin	0.097
alpha-BHC	0.02
beta-BHC	0.09
Chlordane (alpha)	2.9
delta-BHC	0.25
Dibenzofuran	59
Dieldrin	0.1
Endosulfan I	24
Endosulfan II	24
Endosulfan sulfate	24
Endrin	0.06
Heptachlor	0.38
Lindane	0.1
Polychlorinated biphenyls	1

Table 13

**Cornerstone Site B-1
3100 Third Avenue
Bronx, NY
BCP # C203044**

Restricted Residential Soil Cleanup Objectives

<u>Contaminant</u>	<u>Soil Cleanup Objective</u>
Semivolatile Organic Compounds	
Acenaphthene	98
Acenaphthylene	100
Anthracene	100
Benzo(a)anthracene	1
Benzo(a)pyrene	1
Benzo(b)fluoranthene	1
Benzo(g,h,i)perylene	100
Benzo(k)fluoranthene	1.7
Chrysene	1
Dibenzo(a,h)anthracene	0.33
Fluoranthene	100
Fluorene	100
Indeno(1,2,3-cd)pyrene	0.5
m-Cresol	0.33
Naphthalene	12
o-Cresol	0.33
p-Cresol	0.33
Pentachlorophenol	0.8
Penanthrene	100
Phenol	0.33
Pyrene	100

Table 13

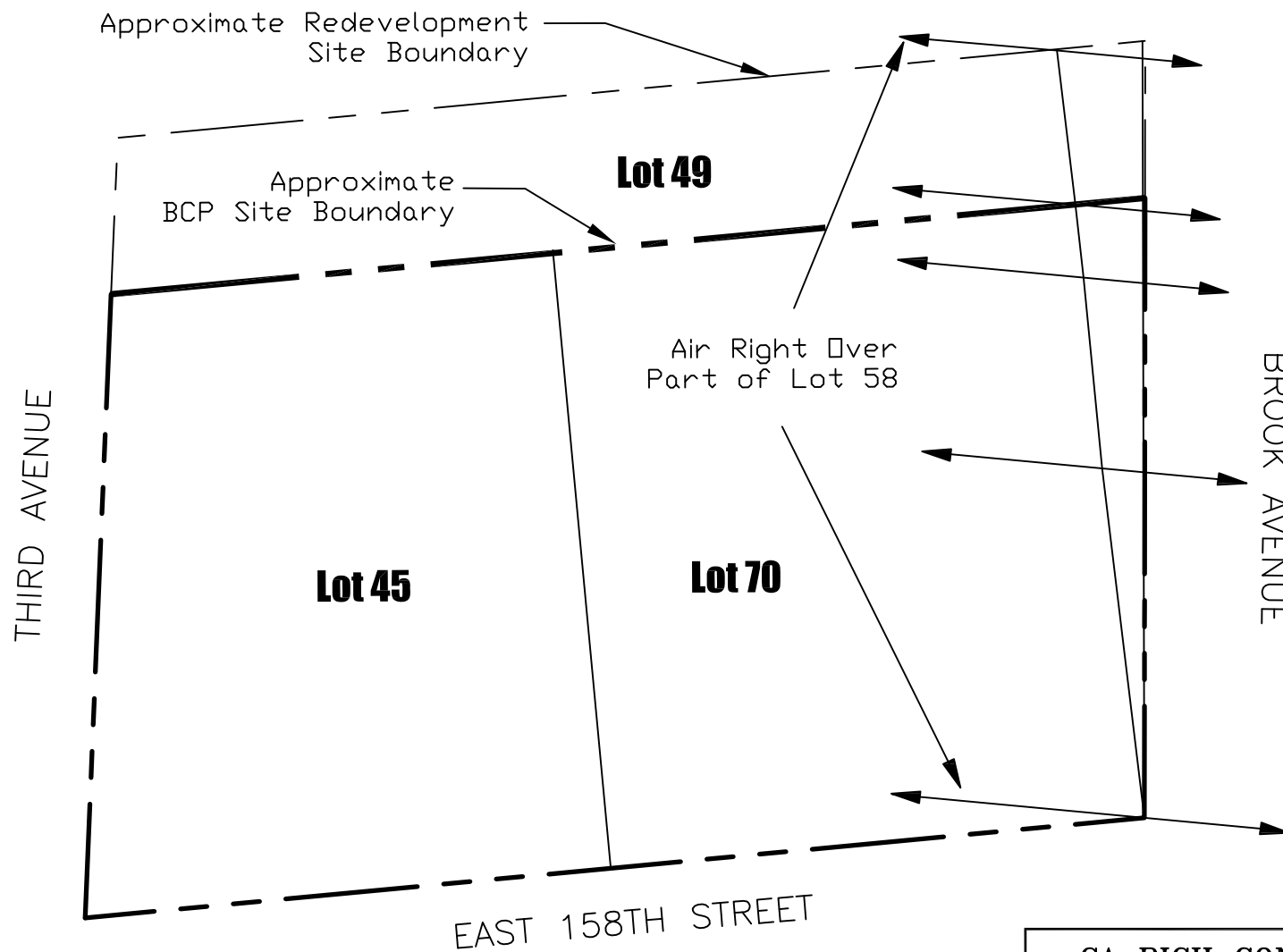
**Cornerstone Site B-1
3100 Third Avenue
Bronx, NY
BCP # C203044**

Restricted Residential Soil Cleanup Objectives

<u>Contaminant</u>	<u>Soil Cleanup Objective</u>
Volatile Organic Compounds	
1,1,1-Trichloroethane	0.68
1,1-Dichloroethane	0.27
1,1-Dichloroethene	0.33
1,2-Dichlorobenzene	1.1
1,2-Dichloroethane	0.02
cis-1,2-Dichloroethene	0.25
trans-1,2-Dichloroethene	0.19
1,3-Dichlorobenzene	2.4
1,4-Dichlorobenzene	1.8
1,4-Dioxane	0.1
Acetone	0.05
Benzene	0.06
Butylbenzene	12
Carbon tetrachloride	0.76
Chlorobenzene	1.1
Chloroform	0.37
Ethylbenzene	1
Hexachlorobenzene	1.2
Methyl ethyl ketone	0.12
Methyl tert-butyl ether	0.93
Methylene chloride	0.05
n-Propylbenzene	3.9
sec-Butylbenzene	11
tert-Butylbenzene	5.9
Tetrachloroethene	1.3
Toluene	0.7
Trichloroethene	0.47
1,2,4-Triethylbenzene	3.6
1,3,5-Trimethylbenzene	8.4
Vinyl Chloride	0.02
Xylene (mixed)	1.6

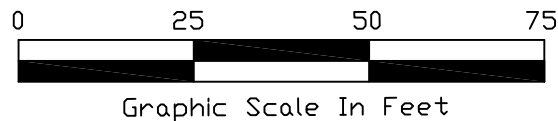
All SCOs are in parts per million (ppm)

Figures

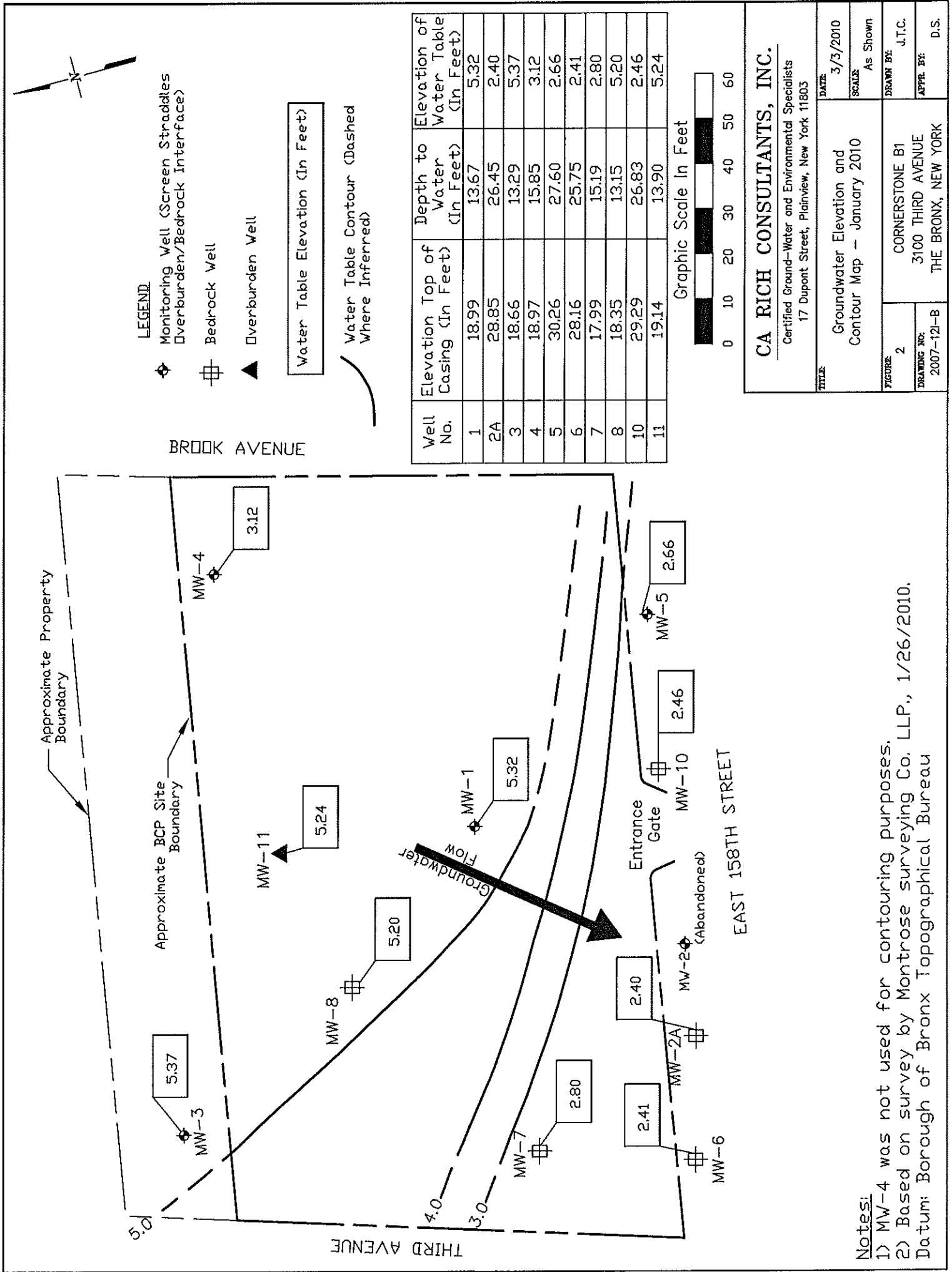


Note:

1) Based on survey by Montrose Surveying CO. LLP., 1/26/2010 and 4/9/2009. Datum: Borough of Bronx Topographical Bureau
 2) Limiting plane elevation shown hereon refers to the Borough of the Bronx Topographical Bureau Datum, which is 2.608 Feet above Mean Sea Level Datum.



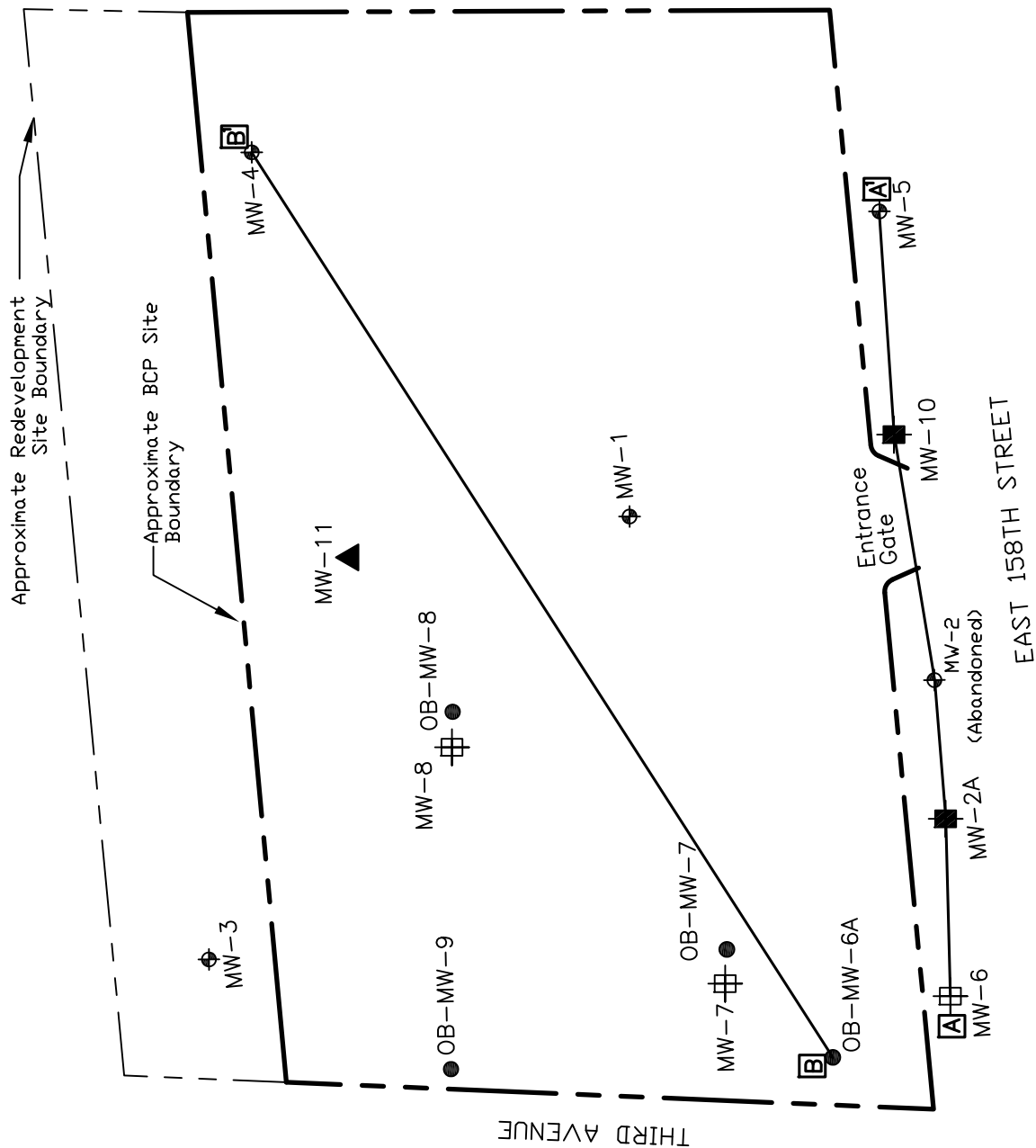
CA RICH CONSULTANTS, INC. Environmental Specialists Since 1982 17 Dupont Street, Plainview, New York 11803		
TITLE: SITE PLAN		DATE: 7/07/2010
FIGURE: 1		SCALE: As Shown
DRAWING NO: 2010-17	CORNERSTONE B1 3100 THIRD AVENUE THE BRONX, NEW YORK	DRAWN BY: J.T.C. APPR. BY: D.S.



Notes:

- MW-4 was not used for contouring purposes.
- Based on survey by Montrose surveying Co. LLP., 1/26/2010.

Datum: Borough of Bronx Topographical Bureau



LEGEND

- Monitoring Well (Screen Straddles Overburden/Bedrock Interface)
- Bedrock Well
- Soil Boring and Temporary Overburden Interface Well
- Soil Boring and Bedrock Well
- Overburden Monitoring Well
- Geologic Cross-Section Location

Graphic Scale In Feet



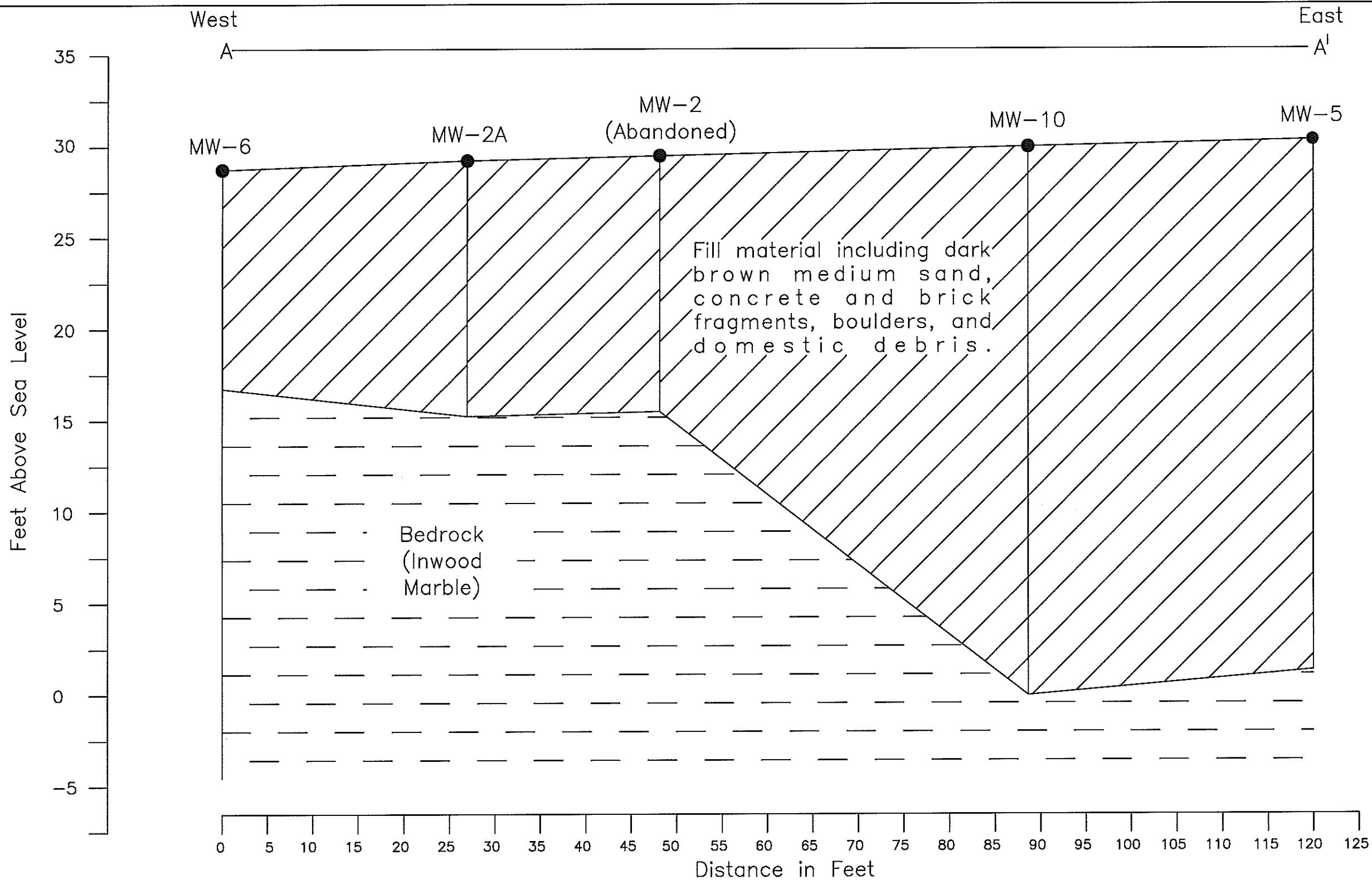
CA RICH CONSULTANTS, INC.

Certified Groundwater and Environmental Specialists
17 Dupont Street, Plainview, New York 11803

TITLE	Geologic Cross-Section For A-A' and B-B'		DATE	2/22/2010
			SCALE	As Shown
FIGURE	3	DRAWN BY: J.T.C.		
DRAWING NO:	2010-2	APPR BY: D.S.		


Notes:

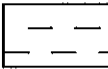
- Based on survey by Montrose Surveying CO. LLP., 1/26/2010.
Datum: Borough of Bronx Topographical Bureau



Notes:

Cross-section drawn with a 2X vertical exaggeration

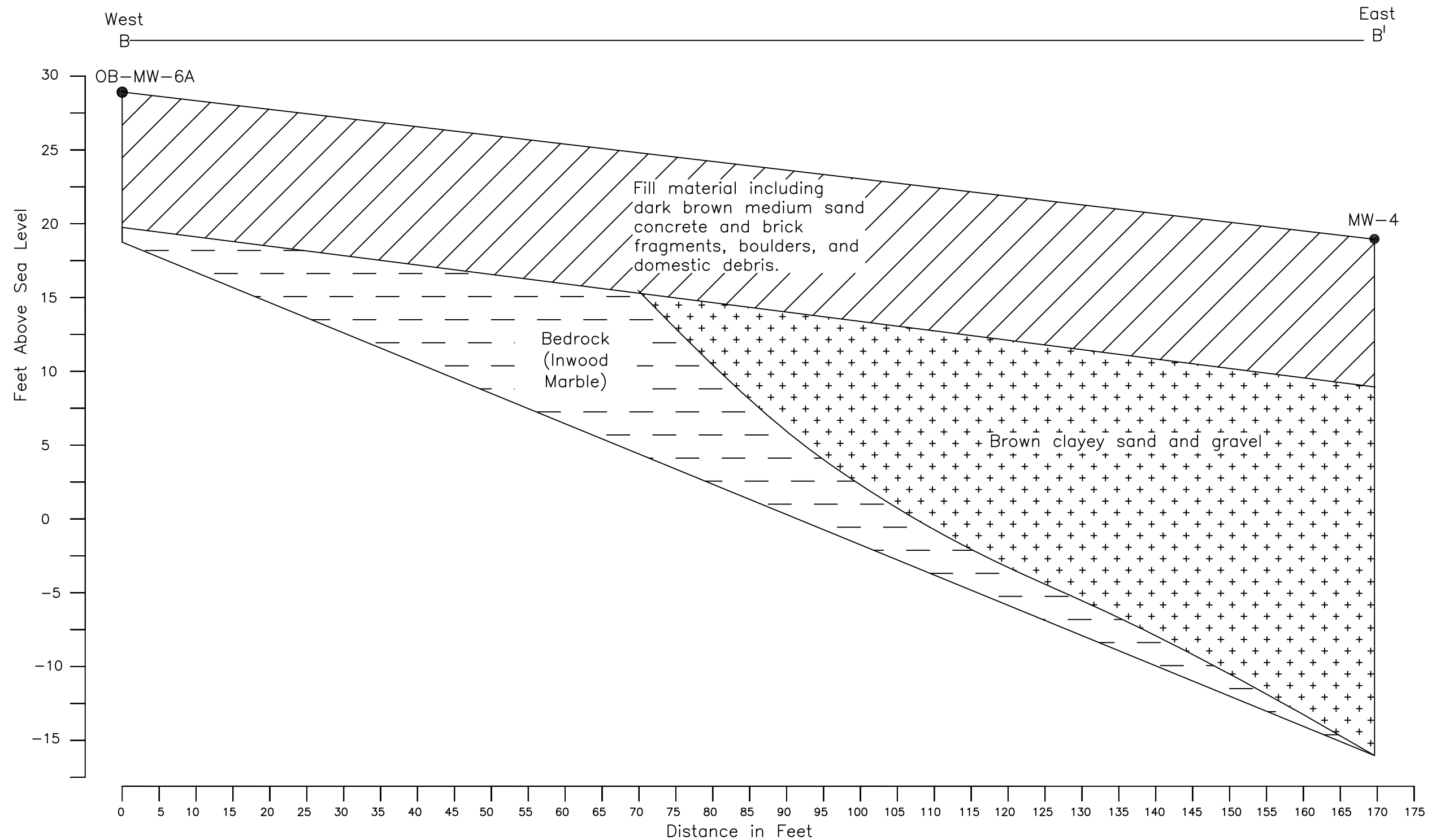
 Fill material including dark brown medium sand, concrete and brick fragments, boulders, and domestic debris

 Bedrock (Inwood Marble)

CA RICH CONSULTANTS, INC.

Certified Groundwater and Environmental Specialists
17 Dupont Street, Plainview, New York 11803

TITLE: OFF-SITE GEOLOGIC CROSS-SECTION		DATE: 3/2/2010
FIGURE: 3A		SCALE: AS SHOWN
DRAWING NO: 2010-3		DRAWN BY: J.T.C.
CORNERSTONE B1 3100 THIRD AVENUE THE BRONX, NEW YORK		APPR. BY: D.S.

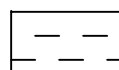


Notes:

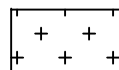
Cross-section drawn with a 2X vertical exaggeration



Fill material including dark brown medium sand, concrete and brick fragments, boulders, and domestic debris



Bedrock (Inwood Marble)

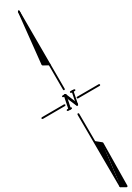


Brown clayey sand and gravel

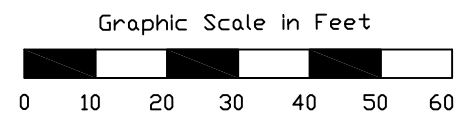
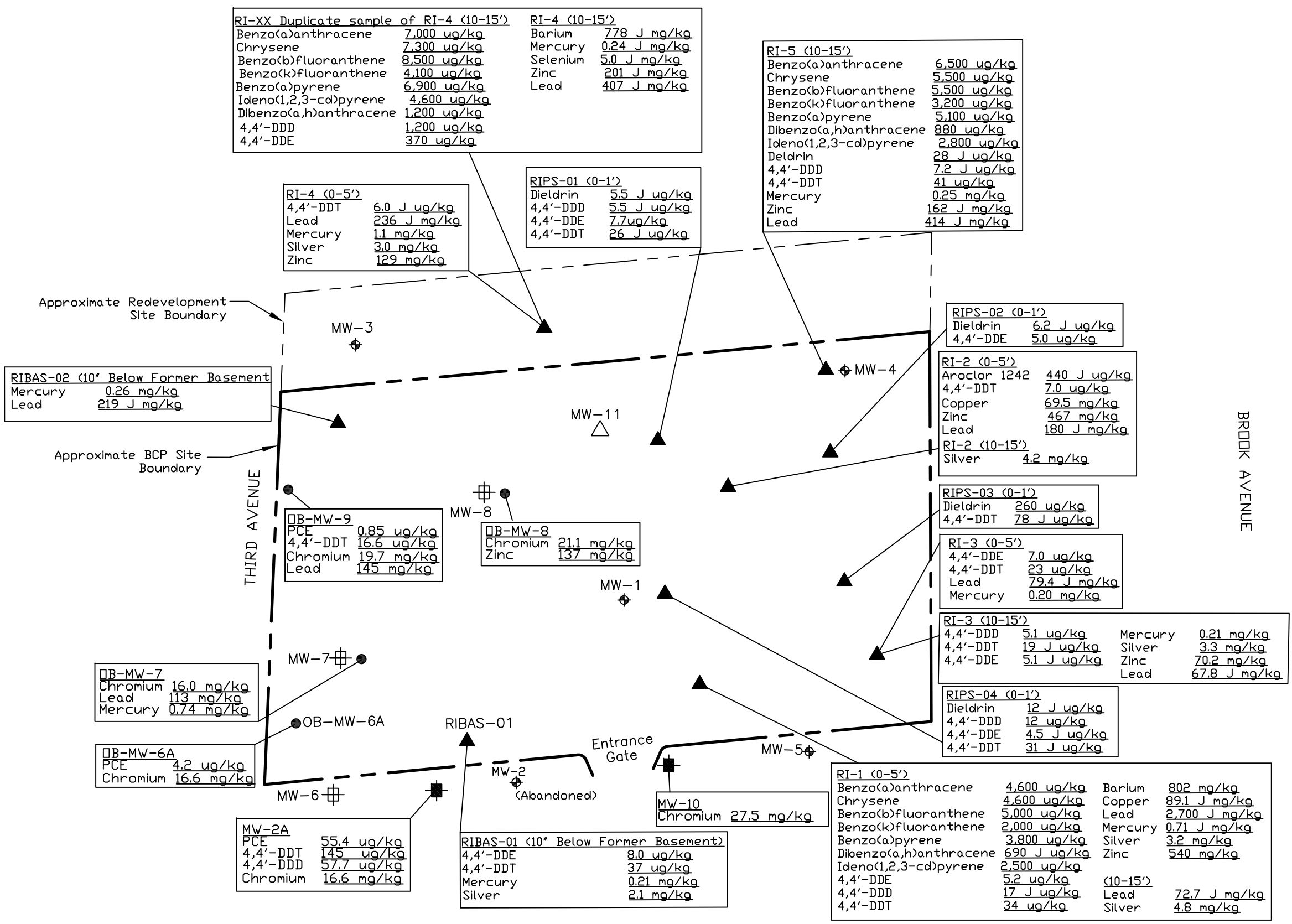
CA RICH CONSULTANTS, INC.

Certified Groundwater and Environmental Specialists
17 Dupont Street, Plainview, New York 11803

TITLE: ON-SITE GEOLOGIC CROSS-SECTION		DATE: 3/5/2010
		SCALE: AS SHOWN
FIGURE: 3B	CORNERSTONE B1 3100 THIRD AVENUE THE BRONX, NEW YORK	DRAWN BY: J.T.C.
DRAWING NO: 2010-7		APPR BY: E.A.W.



- LEGEND**
- Monitoring Well (Screen Straddles Overburden/Bedrock Interface)
 - Bedrock Well
 - Soil Boring and Temporary Overburden Interface Well
 - Soil Boring and Bedrock Well
 - Overburden Well
 - Soil Boring Sample

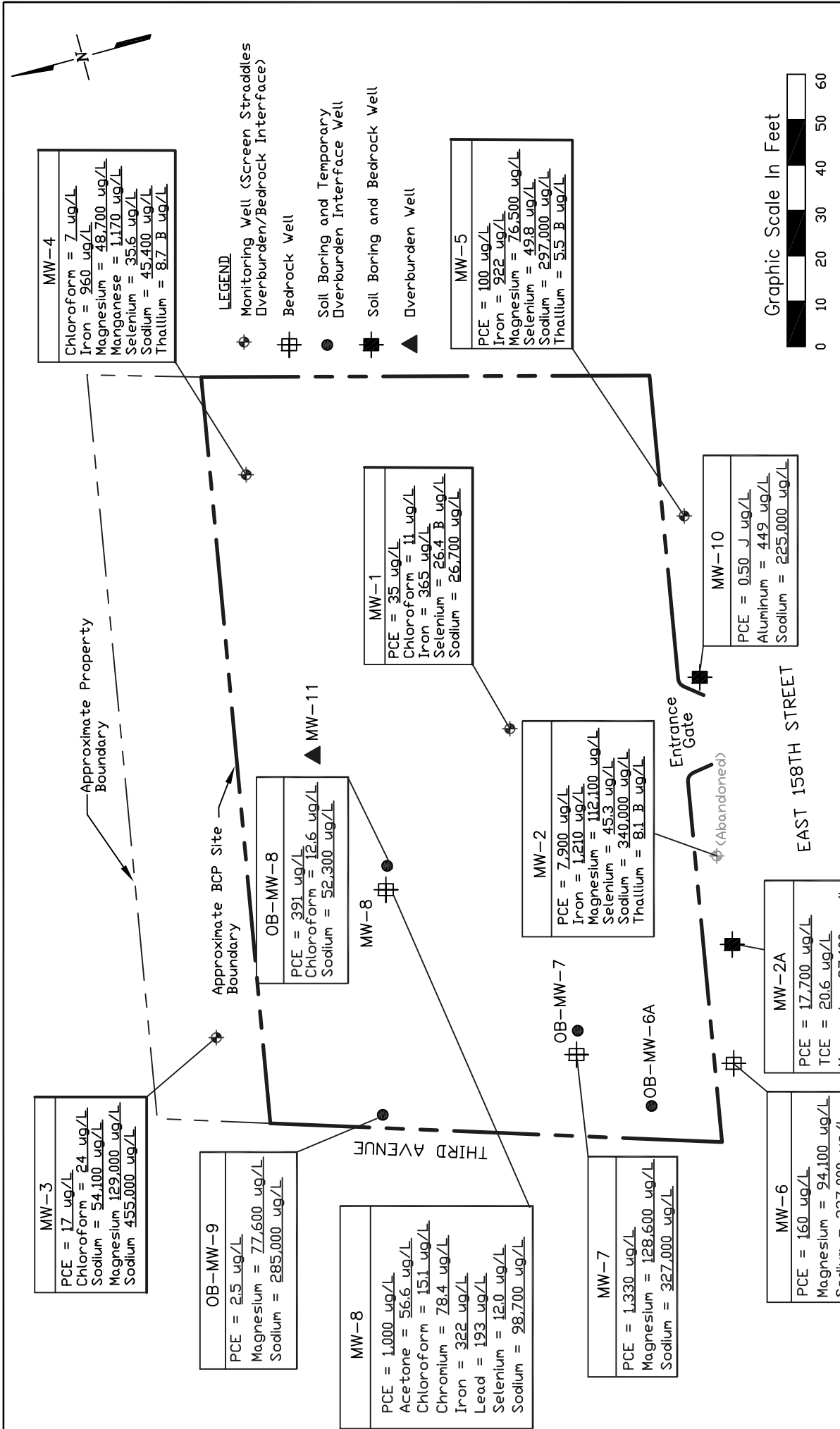


Notes:
1) UUSCOs – Unrestricted Use Soil Cleanup Objectives (6 NYCRR Part 375 Table 375–6.89)
2) Based on survey by Montrose Surveying CO. LLP., 1/26/2010
Datum: Borough of Bronx Topographical Bureau

CA RICH CONSULTANTS, INC.
Certified Groundwater and Environmental Specialists
17 Dupont Street, Plainview, New York 11803

TITLE: Compounds Detected in Soil above Part 375 UUSCOs During RI and/or Pre-Design Investigation	DATE: 3/5/2010
FIGURE: 4	SCALE: AS SHOWN
DRAWING NO: 2007-12E	DRAWN BY: J.T.C.
	APPR. BY: D.S.

EAST 158TH STREET



CA RICH CONSULTANTS, INC.

Certified Groundwater and Environmental Specialists
17 Dupont Street, Plainview, New York 11803

TITLE

Compounds Detected in Groundwater
above NYSEDEC TOGS

DATE

6/24/2010

SCALE

As Shown

FIGURE

5

DRAWN BY:

J.T.C.

APPR. BY:

D.S.

DRAWING NO:

2007-12G

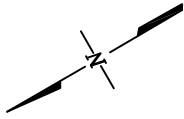
Notes:

1) Samples were collected during the Remedial Investigation on 8/27/07, 10/25/07, 6/4/09, 6/30/09, and 7/14/09. The highest concentration for each analyte was taken from a sample collected on the dates.

2) All concentrations in parts per billion

3) Based on survey by Montrose Surveying CD, LLP., 1/26/2010.

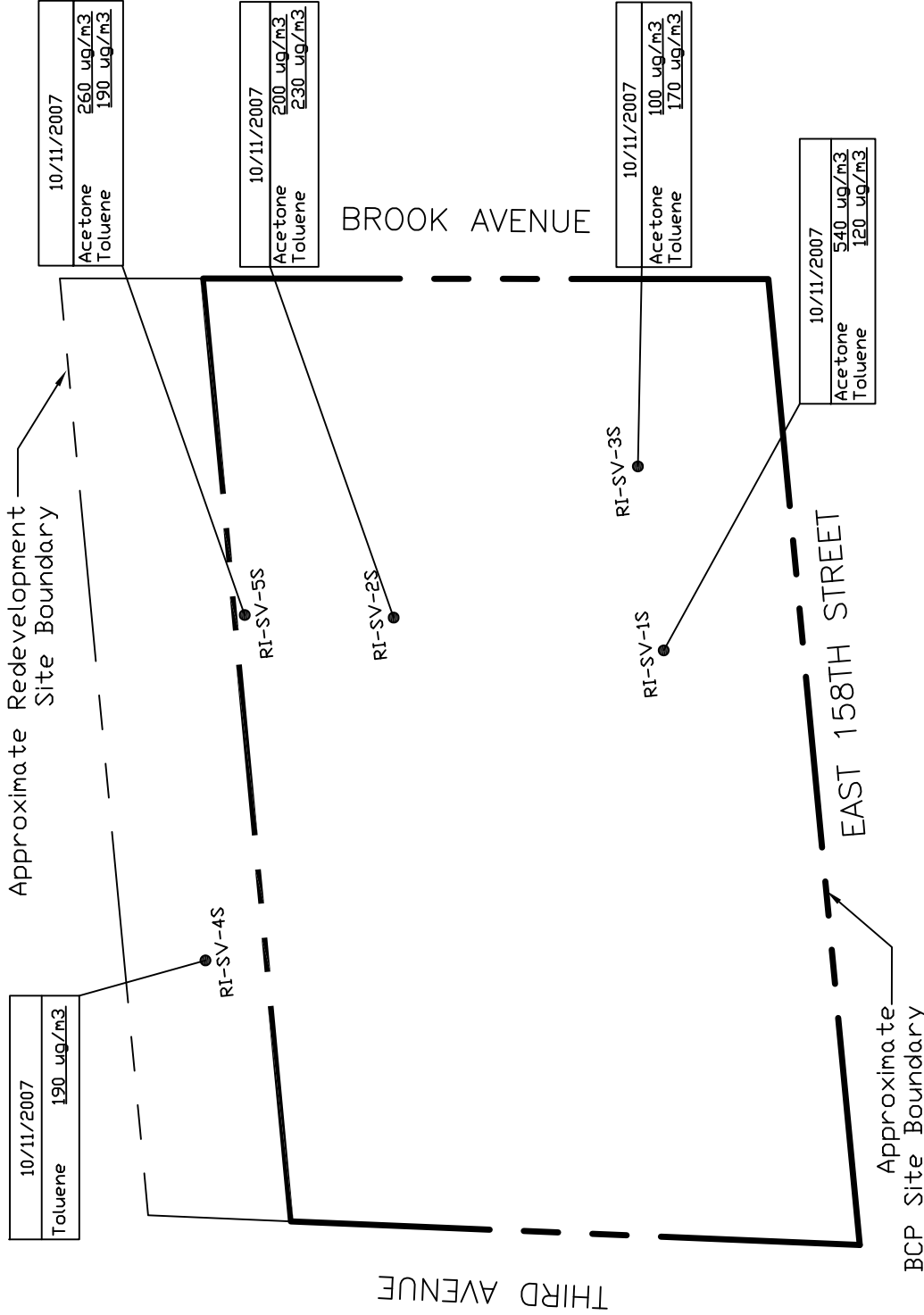
Datum: Borough of Bronx Topographical Bureau



LEGEND

- Soil Vapor Sample

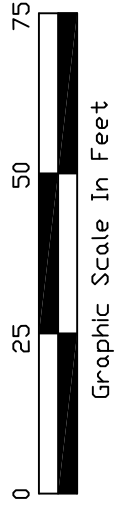
Date
Compound Concentration

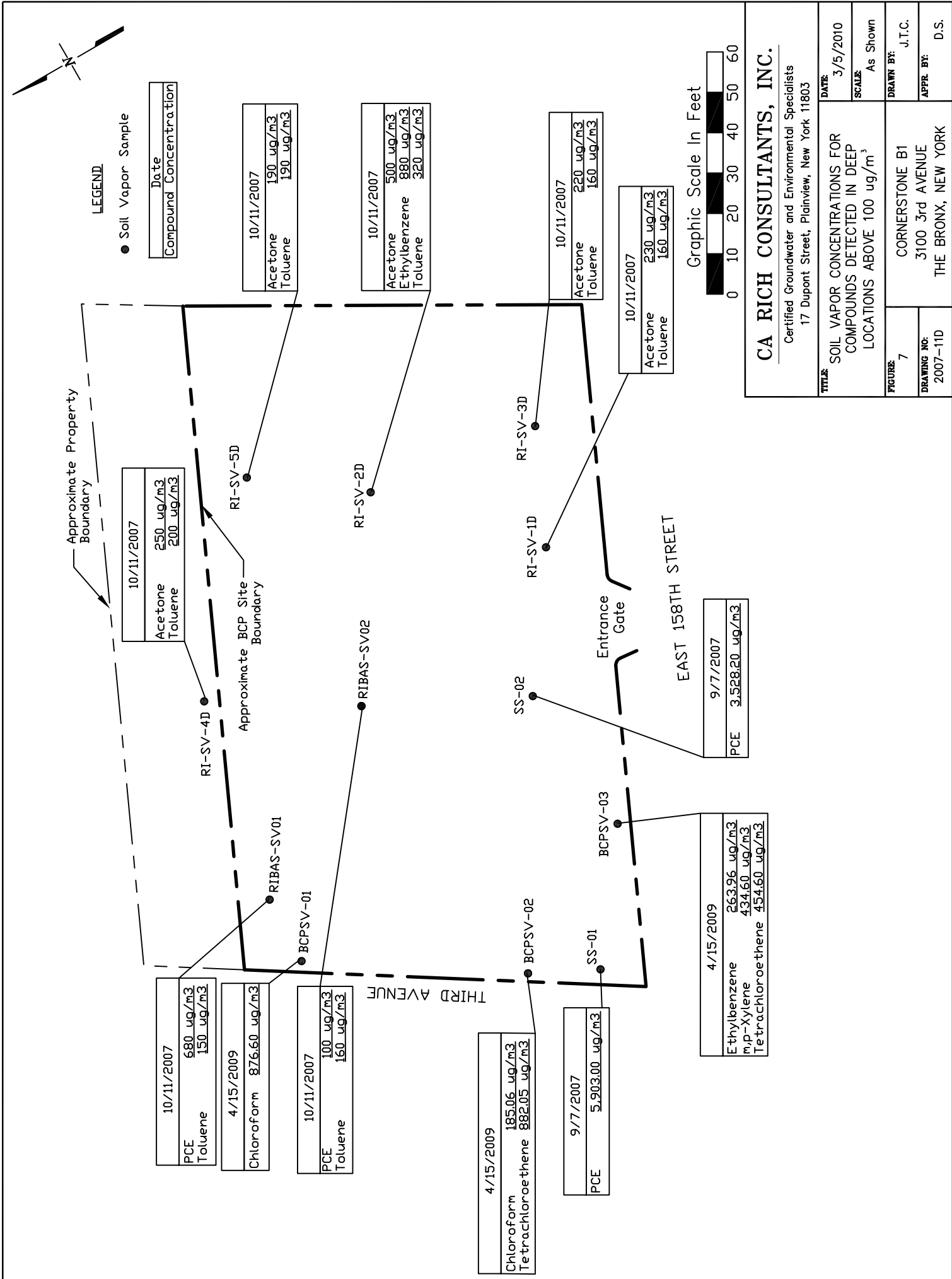


CA RICH CONSULTANTS, INC.

Certified Groundwater and Environmental Specialists
17 Dupont Street, Plainview, New York 11803

TITLE: SOIL VAPOR CONCENTRATIONS FOR COMPOUNDS DETECTED IN SHALLOW LOCATIONS ABOVE 100 ug/m ³	DATE: 2/22/2010
	SCALE: As Shown
FIGURE: 6	DRAWN BY: J.T.C.
DRAWING NO: 2007-11C1	APPR. BY: D.S.





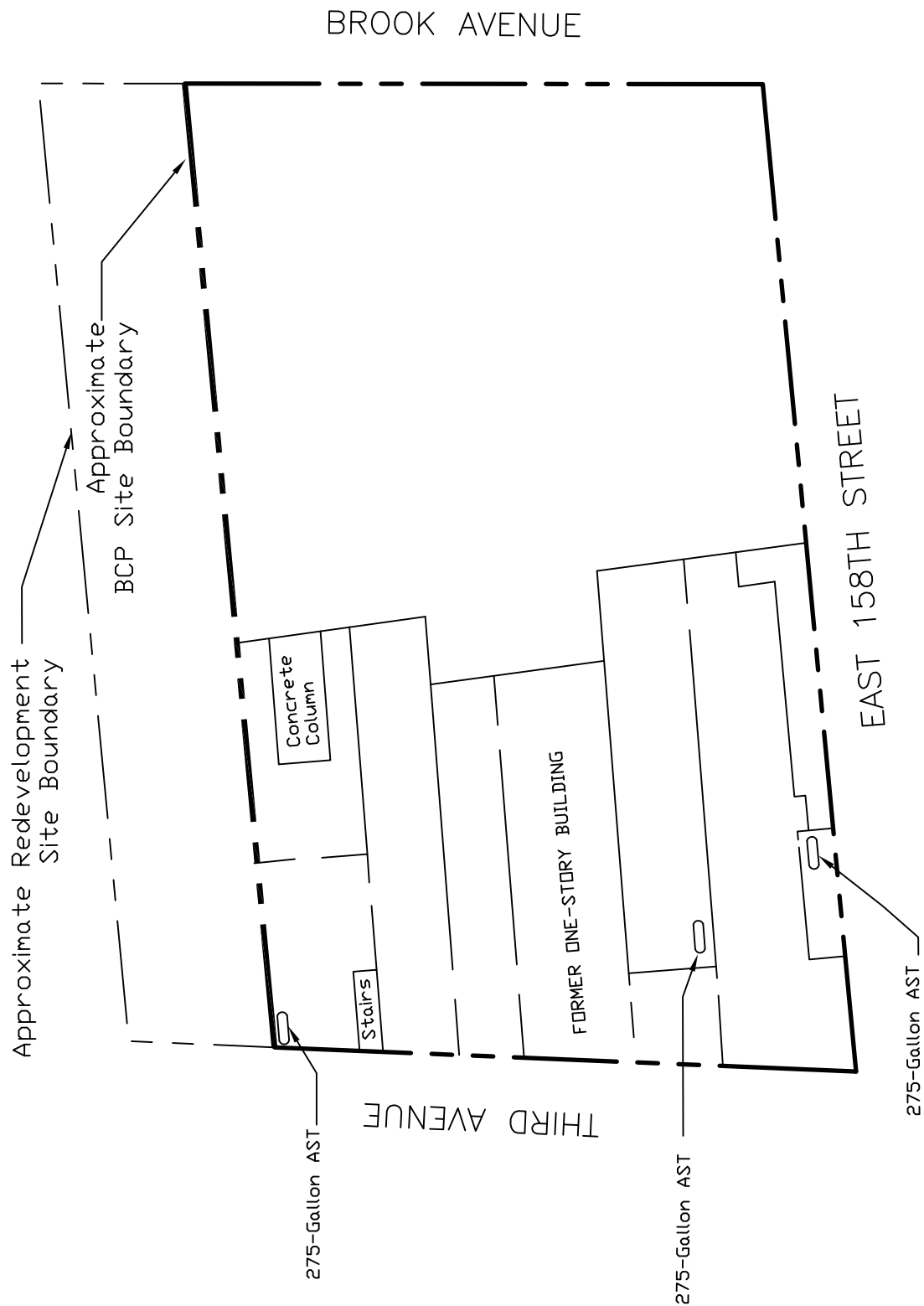
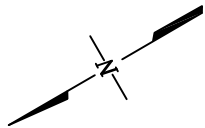
Graphic Scale In Feet



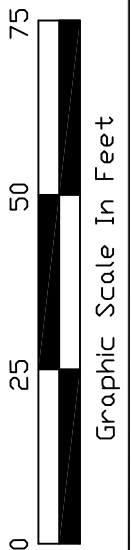
CA RICH CONSULTANTS, INC.

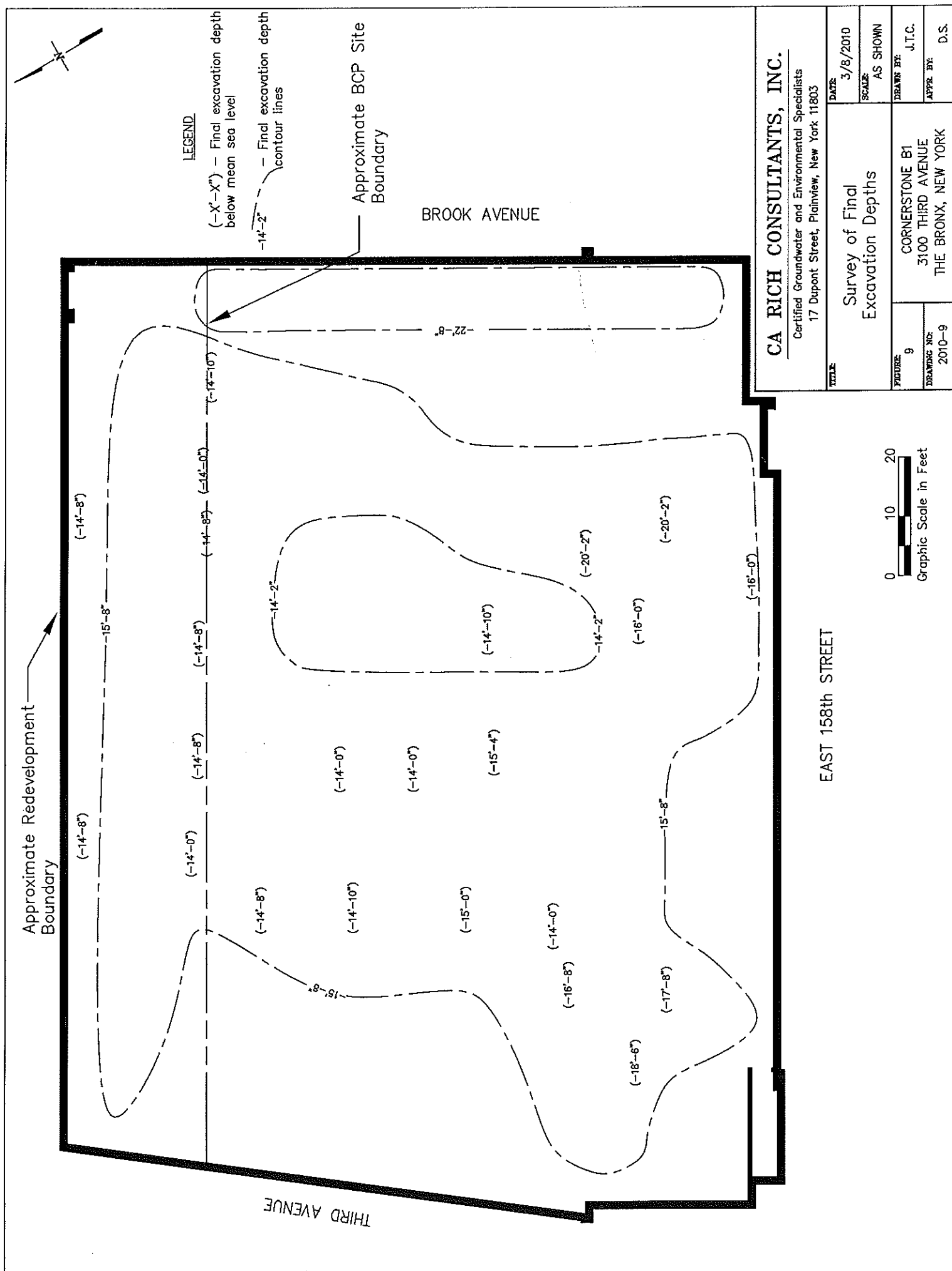
Certified Groundwater and Environmental Specialists
17 Dupont Street, Plainview, New York 11803

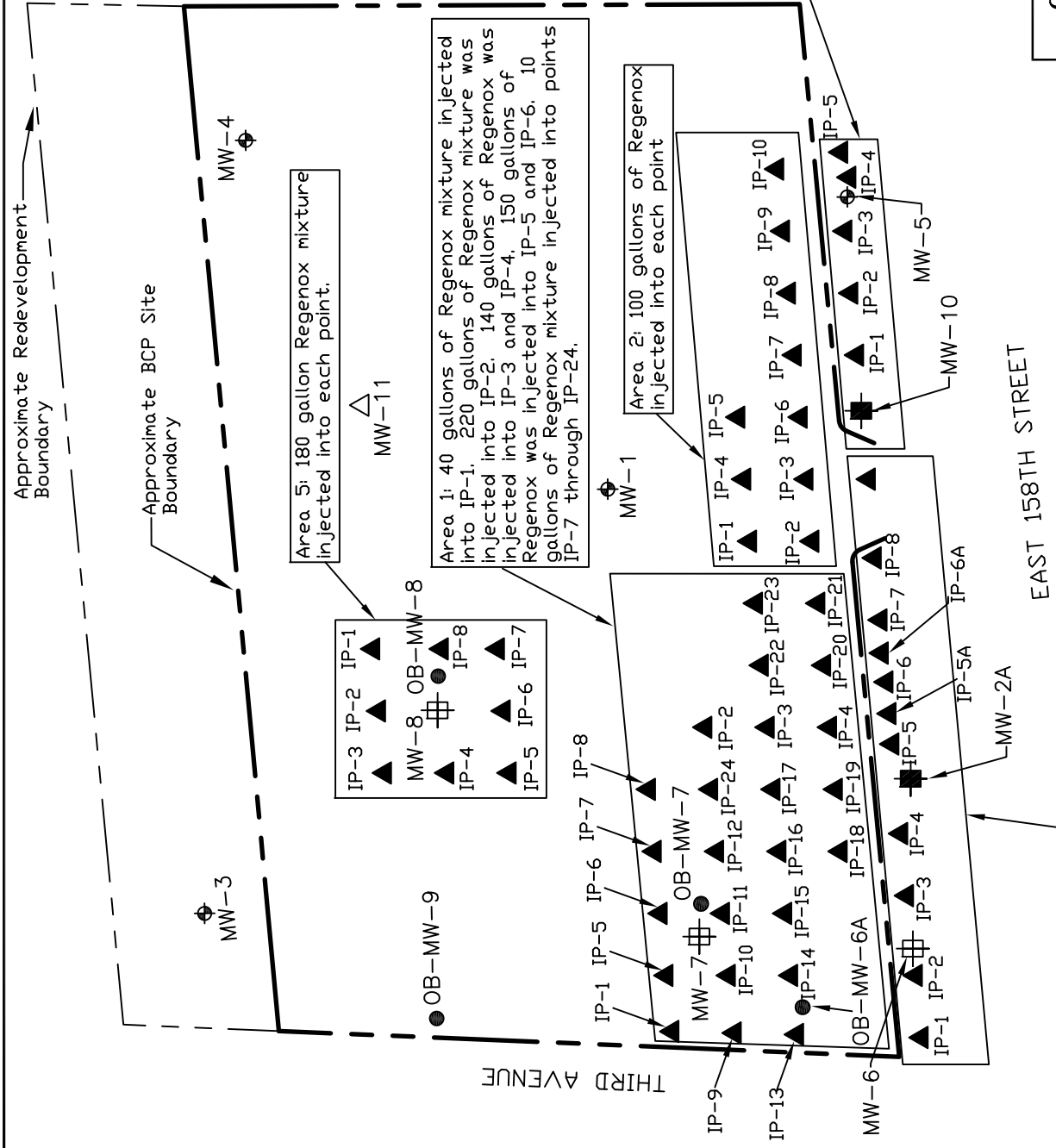
TITLE	SOIL VAPOR CONCENTRATIONS FOR COMPOUNDS DETECTED IN DEEP LOCATIONS ABOVE 100 ug/m ³		DATE	3/5/2010
			SCALE	As Shown
FIGURE	7	DRAWN BY: J.T.C.		
DRAWING NO:	2007-11D	APPR. BY: D.S.		
		CORNERSTONE B1 3100 3rd AVENUE THE BRONX, NEW YORK		



CA RICH CONSULTANTS, INC. Certified Groundwater and Environmental Specialists 17 Dupont Street, Plainview, New York 11803			
TITLE	TANK LOCATION MAP		DATE
	FIGURE 8		2/22/2010
DRAWING NO:	CORNERSTONE B1		SCALE
	3100 3rd AVENUE		As Shown
2007-10B		DRAWN BY:	J.T.C.
		APPR BY:	E.A.W.
		THE BRONX, NEW YORK	



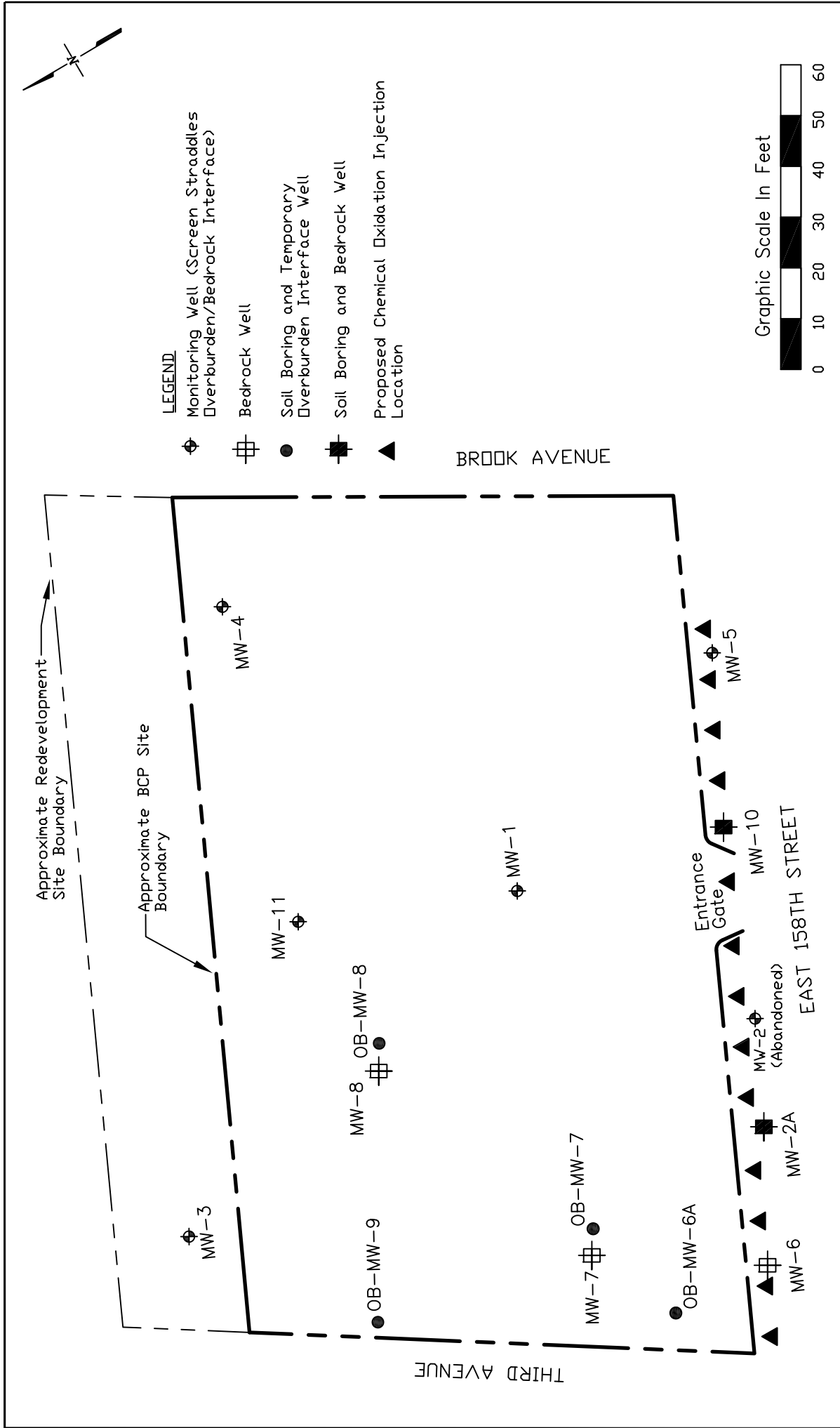




CA RICH CONSULTANTS, INC. Certified Groundwater and Environmental Specialists 17 Dupont Street, Plainview, New York 11803		TITLE: Chemical Oxidation Injection Locations		DATE: 7/15/2010
FIGURE: 10 DRAWING NO: 2010-5		CORNERSTONE B1 3100 THIRD AVENUE THE BRONX, NEW YORK		SCALE: As Shown DRAWN BY: J.T.C. APPR BY: D.S.

Notes:

1) Based on survey by Montrose Surveying CO, LLP, 1/26/2010.
 Datum: Borough of Bronx Topographical Bureau

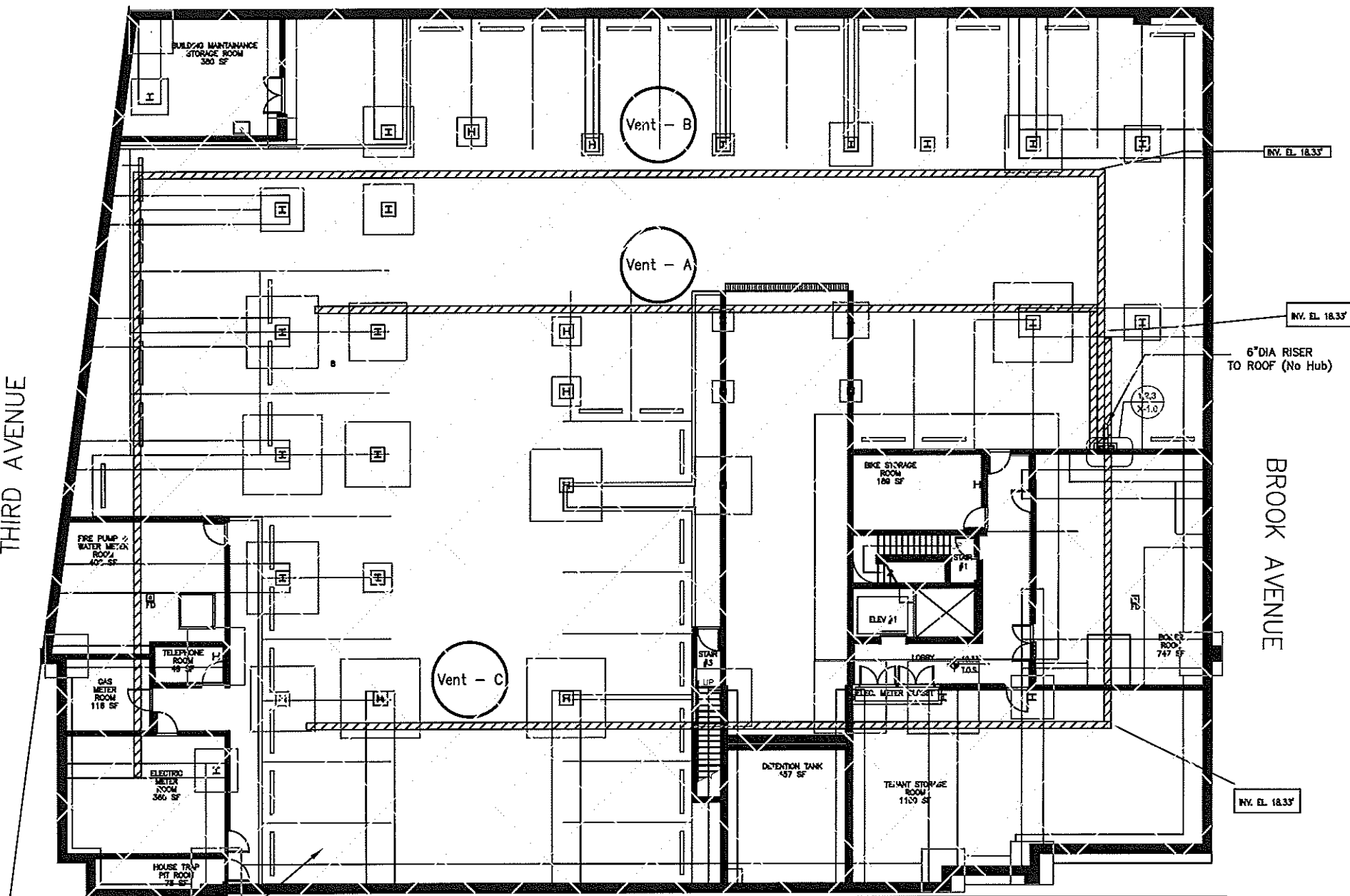


CA RICH CONSULTANTS, INC.	
Certified Groundwater and Environmental Specialists 17 Dupont Street, Plainview, New York 11803	
TITLE:	DATE: 2/22/2010
Chemical Oxidation Injection Locations for Second Injection, If Needed	SCALE: As Shown
FIGURE: 11	DRAWN BY: J.T.C.
DRAWING NO: 2007-12J	APPR. BY: D.S.

Notes:

1) Based on survey by Montrose Surveying CO. LLP., 1/26/2010.
Datum: Borough of Bronx Topographical Bureau

THIRD AVENUE



Stego 15 mil. Vapor Barrier underneath entire building

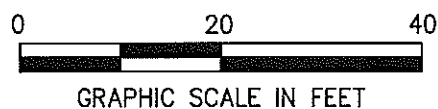
EAST 158TH STREET

BROOK AVENUE

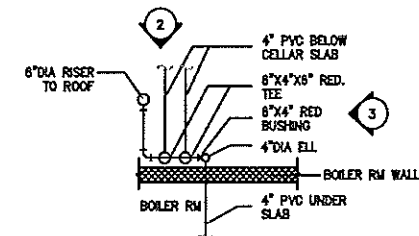
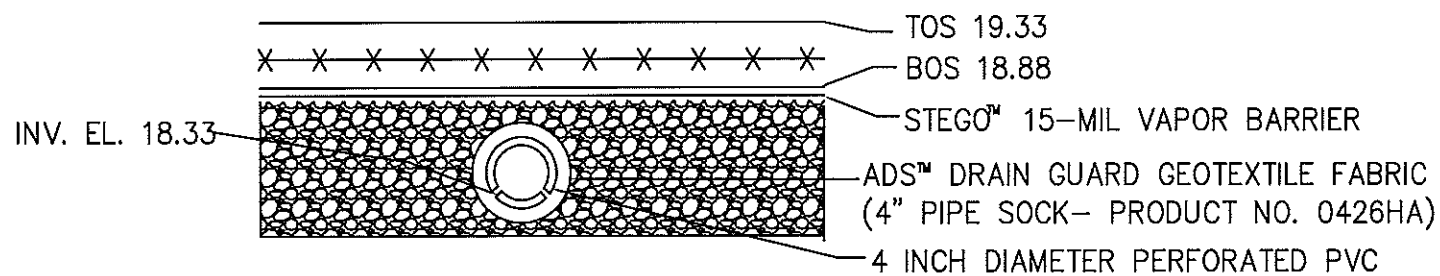
LEGEND

SSD Piping

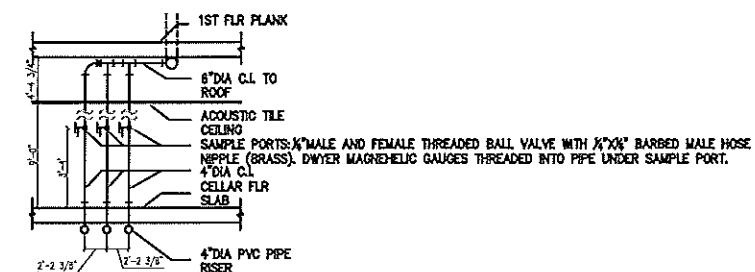
Vapor Barrier



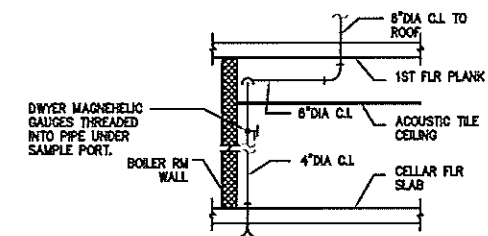
TYPICAL SECTION AT GRADE BEAM



1 SSD PIPE RISER PLAN
NTS



2 ELEVATION: SSD PIPE RISER
NTS



3 ELEVATION: SSD PIPE RISER
NTS

CA RICH CONSULTANTS, INC.

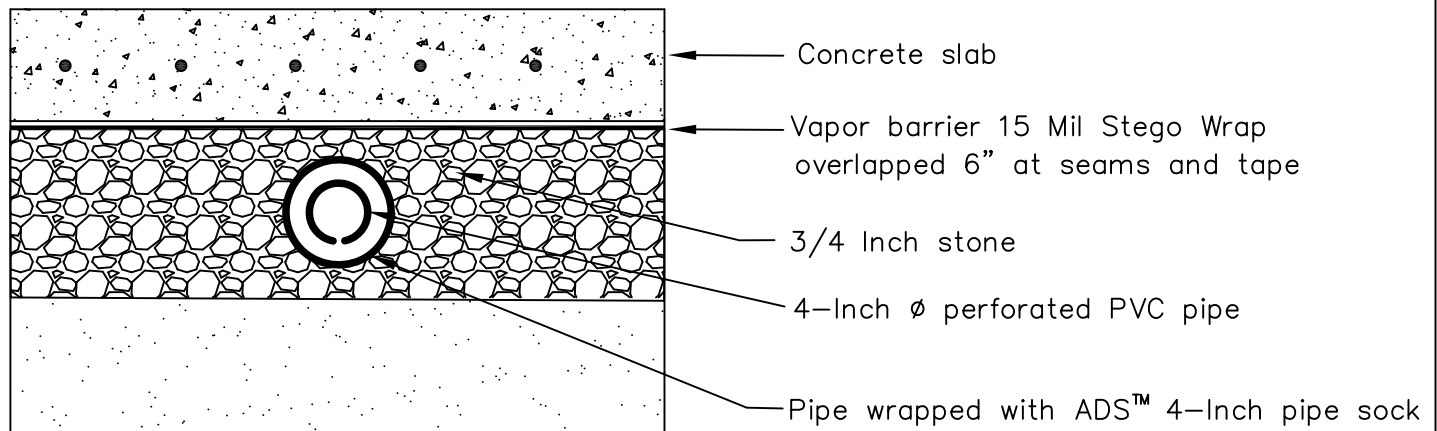
Certified Groundwater and Environmental Specialists
17 Dupont Street, Plainview, New York 11803

Stephen J. Osmundsen, P.E.

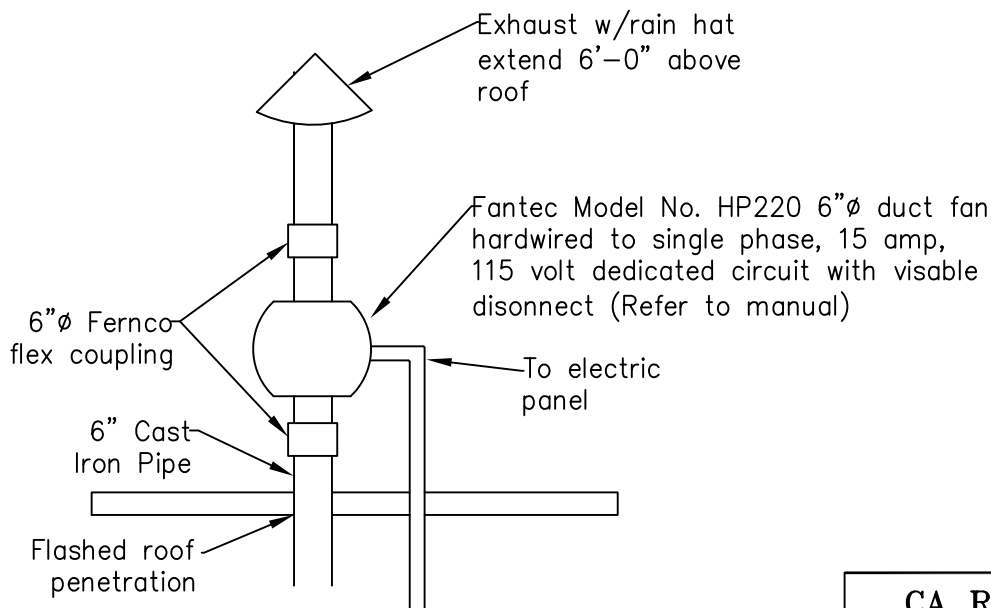
Consulting Engineer
514 Pantigo Road # 16, East Hampton New York 11937

TITLE: SSD Layout and Vapor Barrier	DATE: 3/8/2010
FIGURE: 12 DRAWING NO: 11.30.09 X-1.0	SCALE: AS SHOWN DRAWN BY: J.T.C. APPR BY: D.S.

CORNERSTONE B1
3100 THIRD AVENUE
THE BRONX, NEW YORK



Below ground detail



Above roof detail

CA RICH CONSULTANTS, INC.

Environmental Specialists Since 1982
17 Dupont Street, Plainview, New York 11803

Stephen J. Osmundsen, P.E.

Consulting Engineer
514 Pantigo Road #16, East Hampton, New York 11937

FIGURE:

Vent and Roof
Detail

DATE:

7/07/2010

SCALE:

Not to Scale

FIGURE:

13

DRAWING NO:

2007-44a

CORNERSTONE B1
3100 3rd AVENUE
THE BRONX, NEW YORK

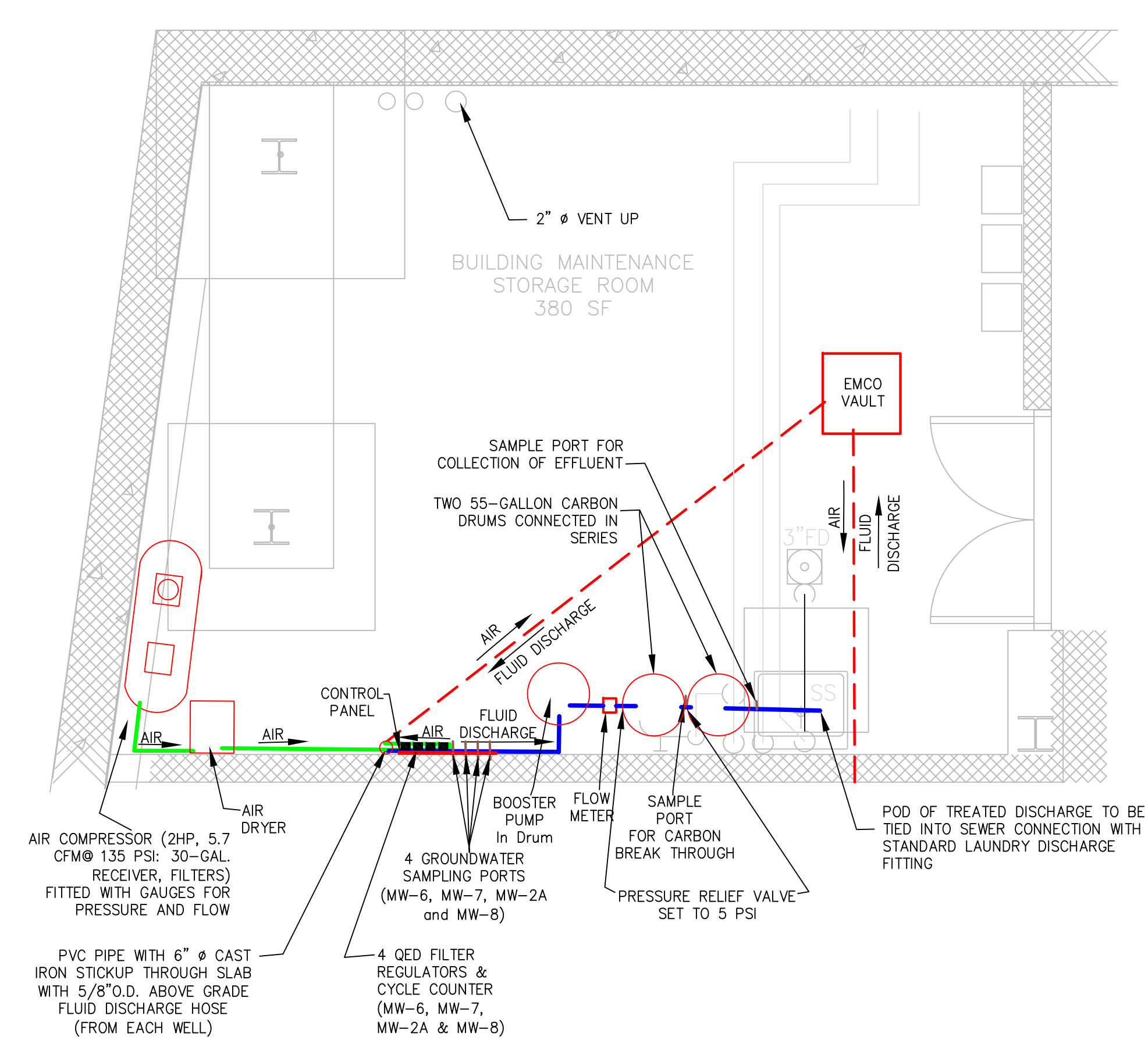
DRAWN BY:

J.T.C.

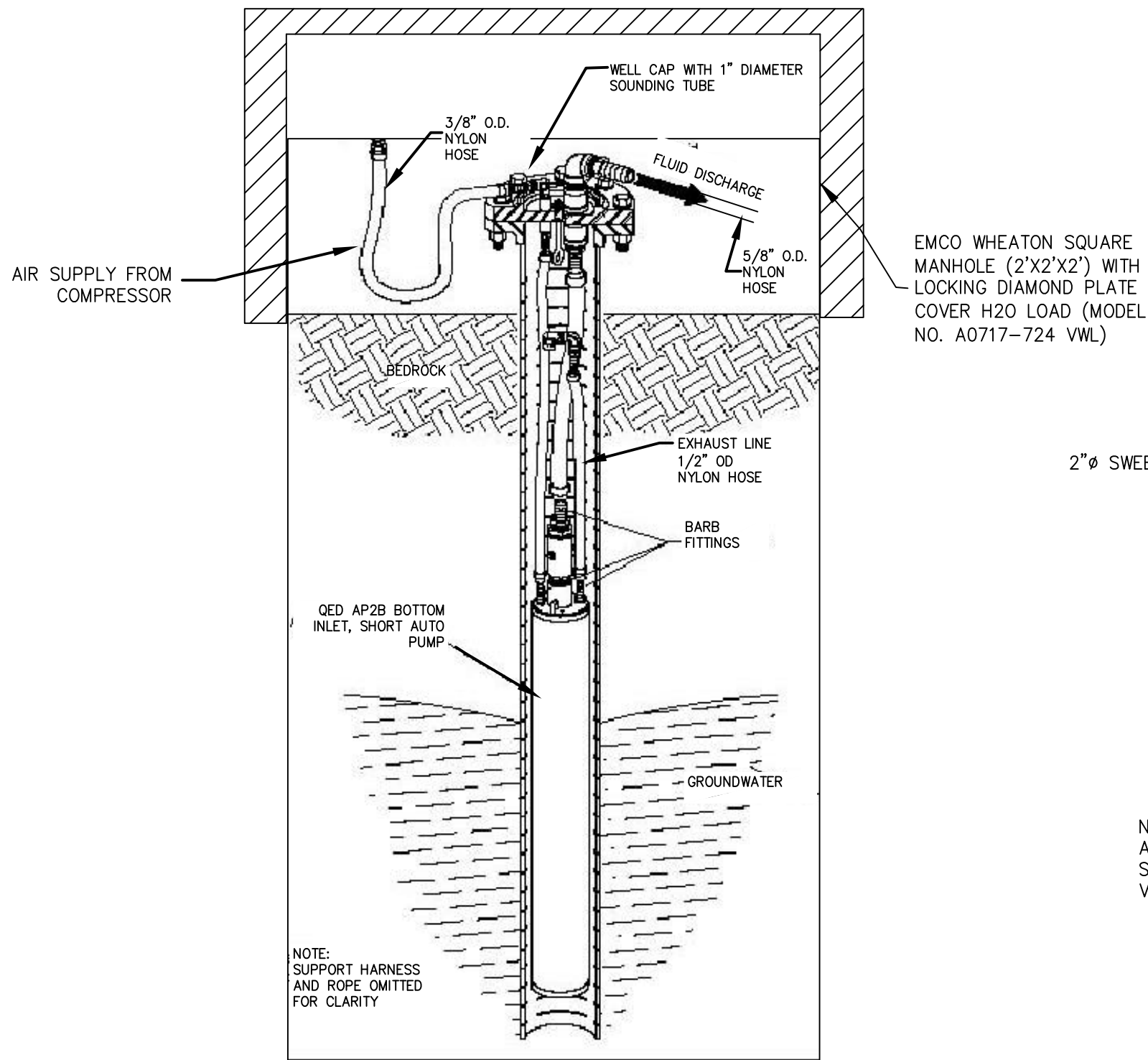
APPR. BY:

S.J.O.

BUILDING MAINTENANCE ROOM AND TREATMENT SYSTEM DETAIL

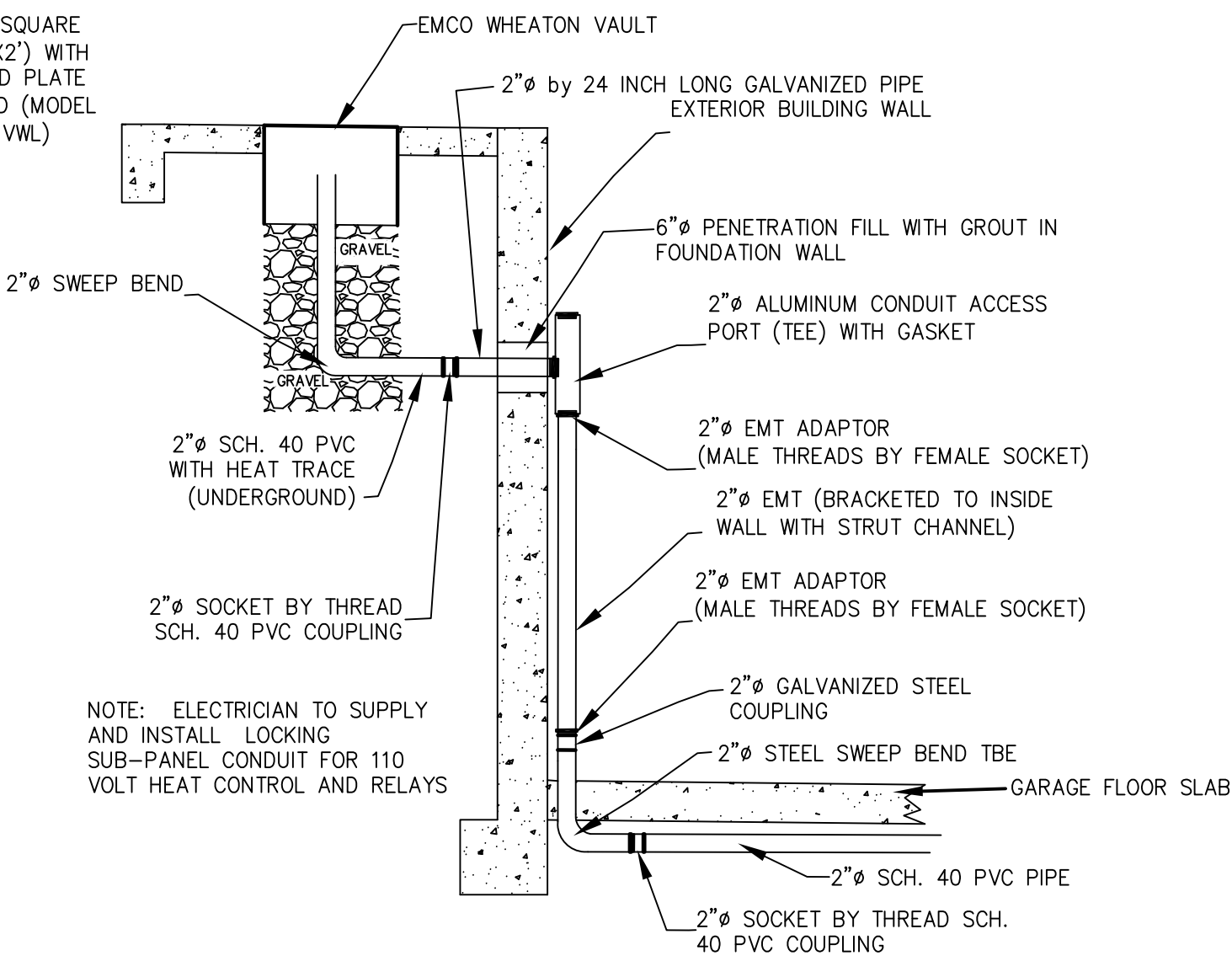


TYPICAL VAULT WITH PUMP DETAILS

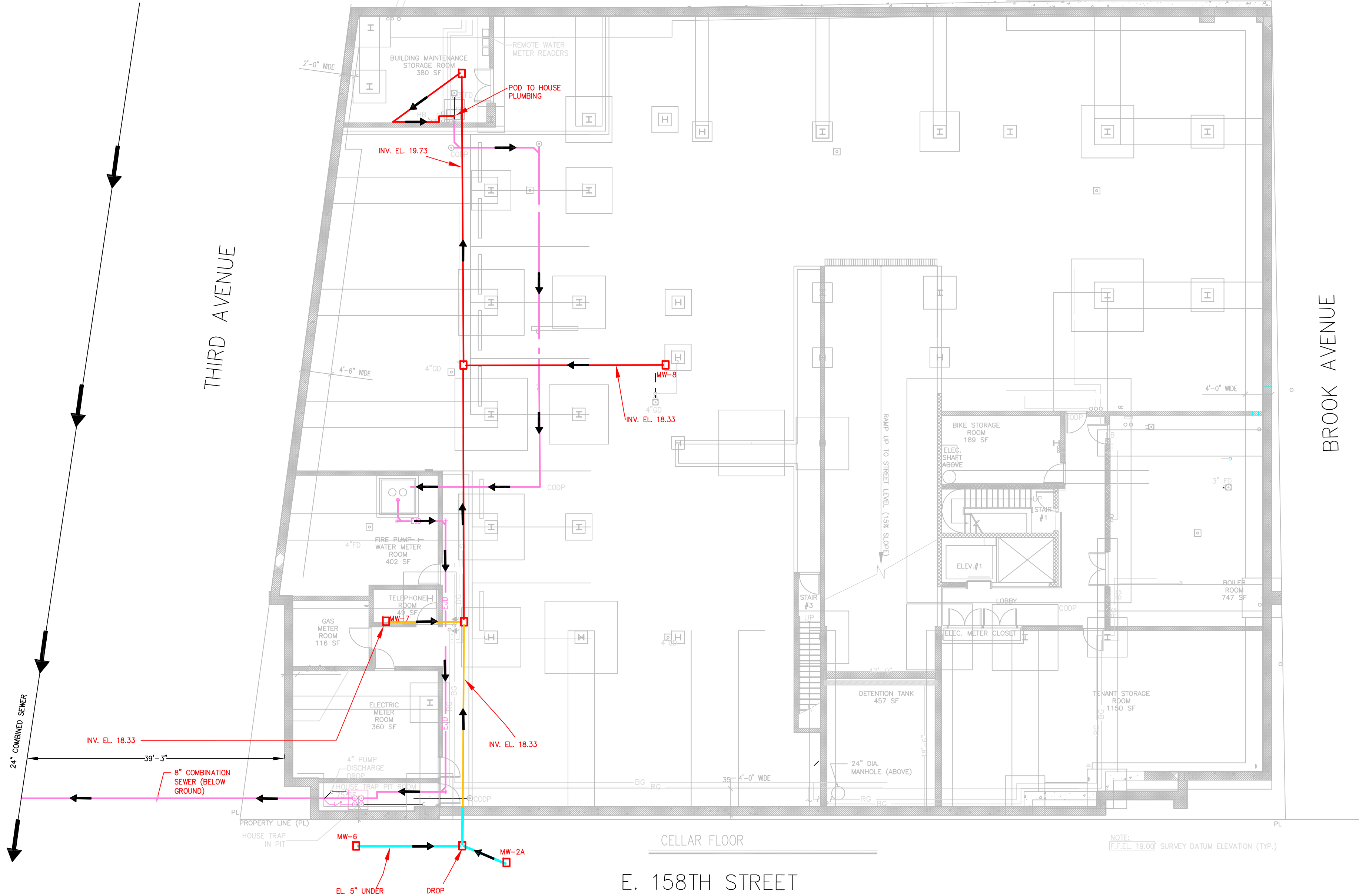


NOT TO SCALE

WALL PENETRATION DETAIL

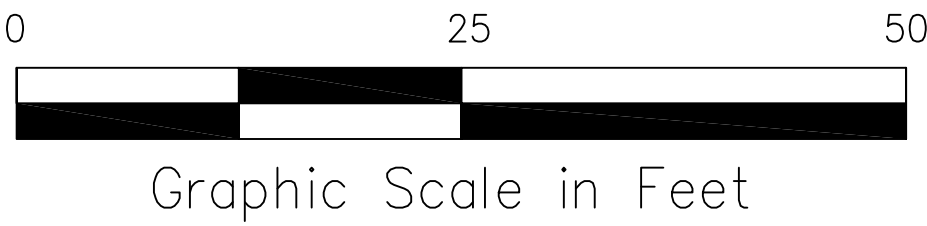


NOT TO SCALE



LEGEND

- EMCO WHEATON FLUSH-MOUNT MANHOLE WITH WELL AND PUMP
- EMCO WHEATON FLUSH-MOUNT MANHOLE WITHOUT WELL AND PUMP
- 4" ϕ SCHEDULE 40 SOCKET WELDED PVC PIPE CARRYING 3/8" O.D. AIR LINE, 1/2" O.D. EXHAUST LINE and 5/8" O.D. FLUID DISCHARGE
- 2" ϕ SCHEDULE 40 SOCKET WELDED PVC PIPE WITH HEAT TRACING CARRYING 3/8" O.D. AIR LINE, 1/2" O.D. EXHAUST LINE and 5/8" O.D. FLUID DISCHARGE
- 2" ϕ SCHEDULE 40 SOCKET WELDED PVC PIPE CARRYING 3/8" O.D. AIR LINE, 1/2" O.D. EXHAUST LINE and 5/8" O.D. FLUID DISCHARGE
- HOUSE PLUMBING CARRYING SYSTEM EFFLUENT TO SEWER
- 3/8" O.D. AIR HOUSE
- 5/8" O.D. FLUID DISCHARGE HOSE



CA RICH CONSULTANTS, INC.

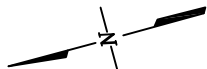
Environmental Specialists Since 1982
17 Dupont Street, Plainview, New York 11803

Stephen J. Osmundsen, P.E.

Consulting Engineer
514 Pantigo Road # 16, East Hampton New York 11937

TITLE: PUMP AND TREAT SYSTEM LAYOUT AND DETAIL		DATE: 6/30/10
FIGURE: 14		SCALE: AS SHOWN
DRAWING NO: 2009-50A	CORNERSTONE B1 3100 THIRD AVENUE THE BRONX, NEW YORK	DRAWN BY: S.T.M./J.T.C.
		APPR. BY: S.J.O.

DRAWING ADAPTED FROM MAP CELLAR FLOOR FRAMING PLAN AND PLUMBING DETAIL



LEGEND

- Soil Excavation End-point
- Sample Location

Sample ID		
Sample Collection Date		
Depth (Feet)		
PID (ppm)		

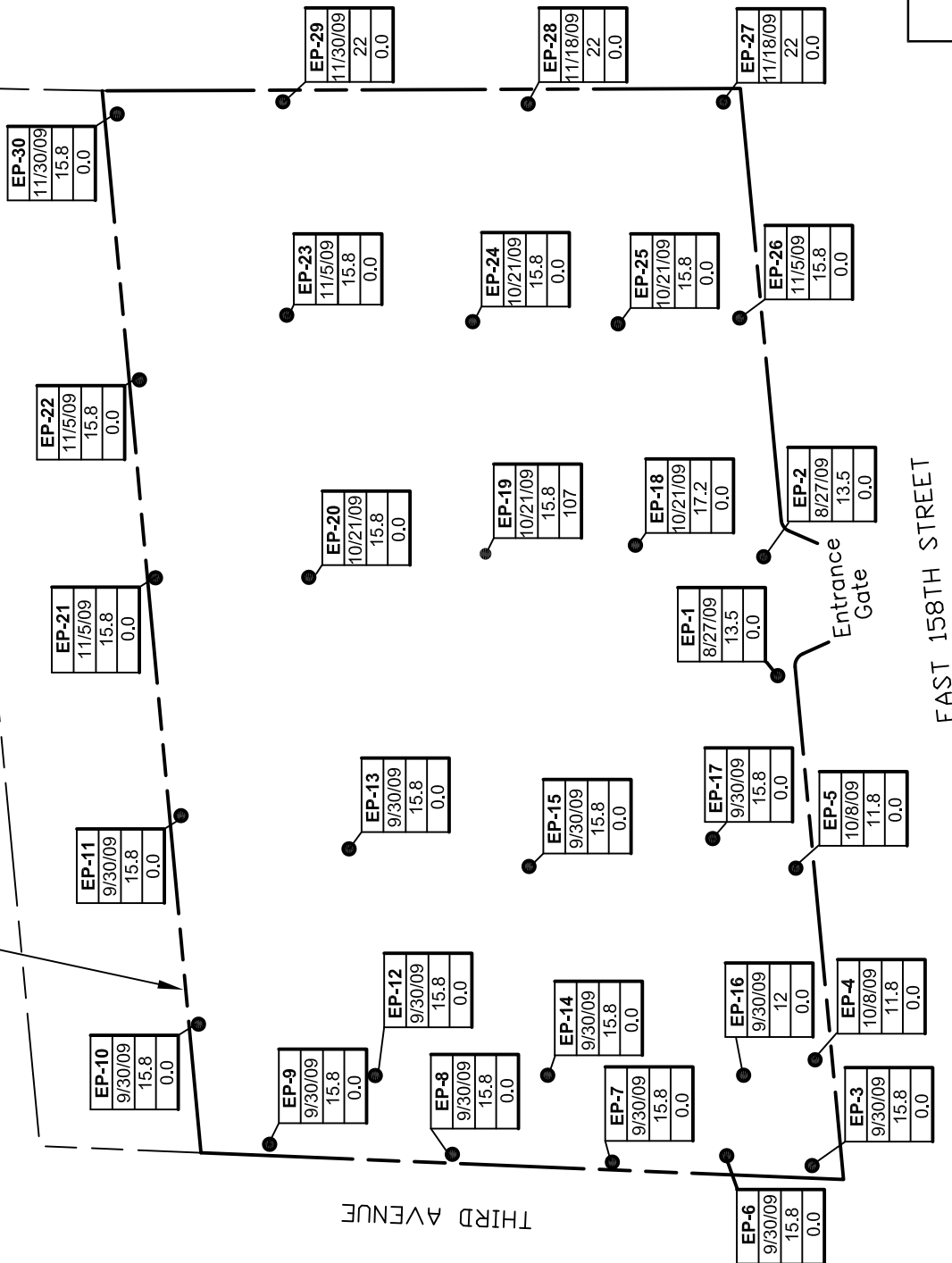
BROOK AVENUE

Graphic Scale In Feet



Approximate Redevelopment Site Boundary

Approximate BCP Site Boundary



EAST 158TH STREET

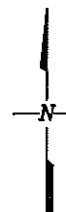
THIRD AVENUE

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17 Dupont Street, Plainview, New York 11803

TITLE		DATE	SCALE	As Shown
Soil Excavation End-Point Sample Location Map		2/22/2010		
FIGURE 15	CORNERSTONE B1	DRAWN BY: J.T.C.		
DRAWING NO: 2010-4	3100 THIRD AVENUE THE BRONX, NEW YORK	APPR. BY: D.S.		

THIRD AVENUE



LEGEND

- Soil Excavation End-point
Sample Location

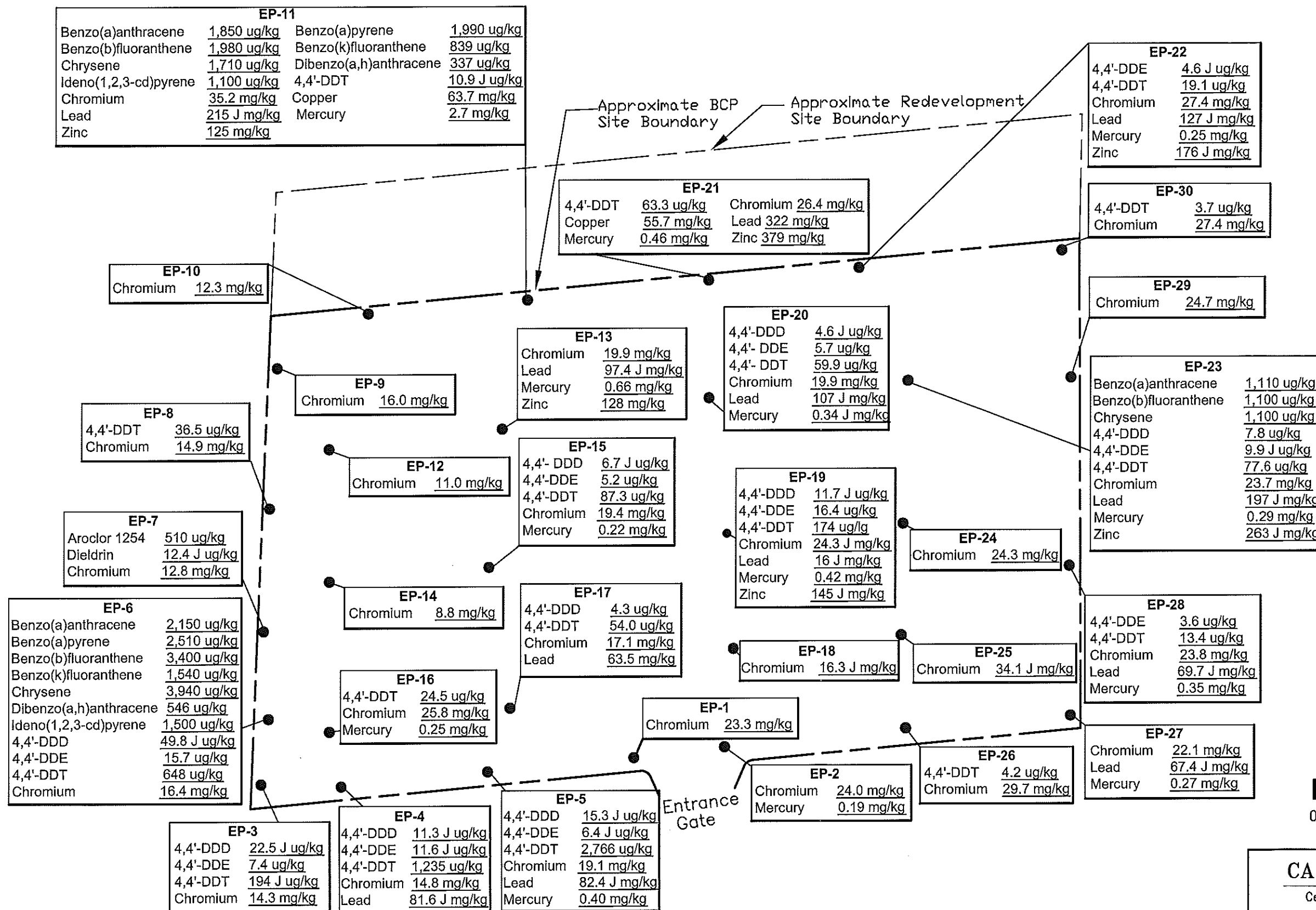
Sample ID
Compound Concentration

BROOK AVENUE

Graphic Scale in Feet



EAST 158TH STREET



CA RICH CONSULTANTS, INC.

Certified Groundwater and Environmental Specialists
17 Dupont Street, Plainview, New York 11803

TITLE: Compounds Detected in Soil Excavation
Endpoint Samples Above Part 375-Track 1
Unrestricted Use Soil Cleanup Objectives

DATE:
4/15/2010

SCALE:
AS SHOWN

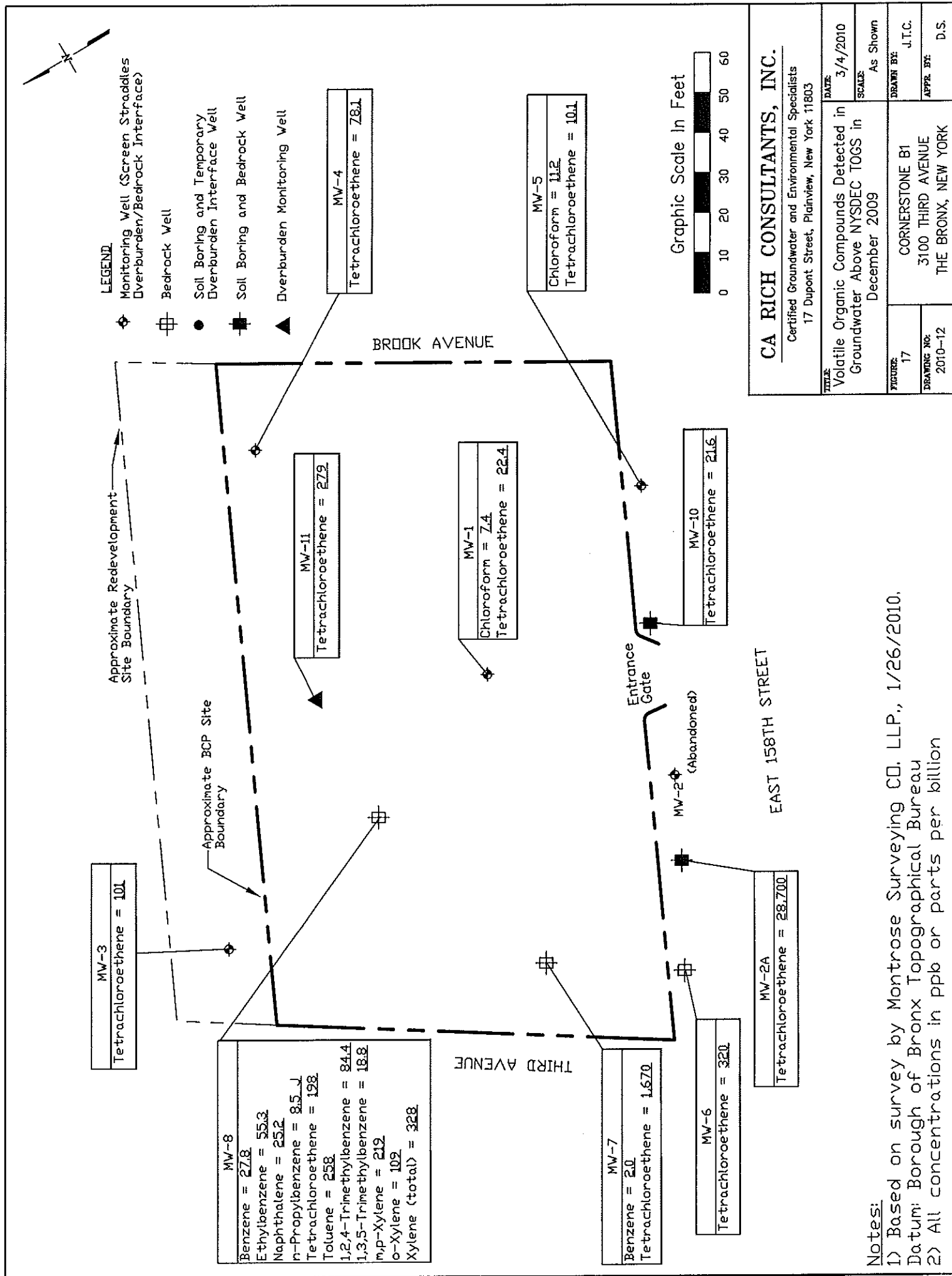
FIGURE:
16

DRAWING NO:
2010-15

CORNERSTONE B1
3100 THIRD AVENUE
THE BRONX, NEW YORK

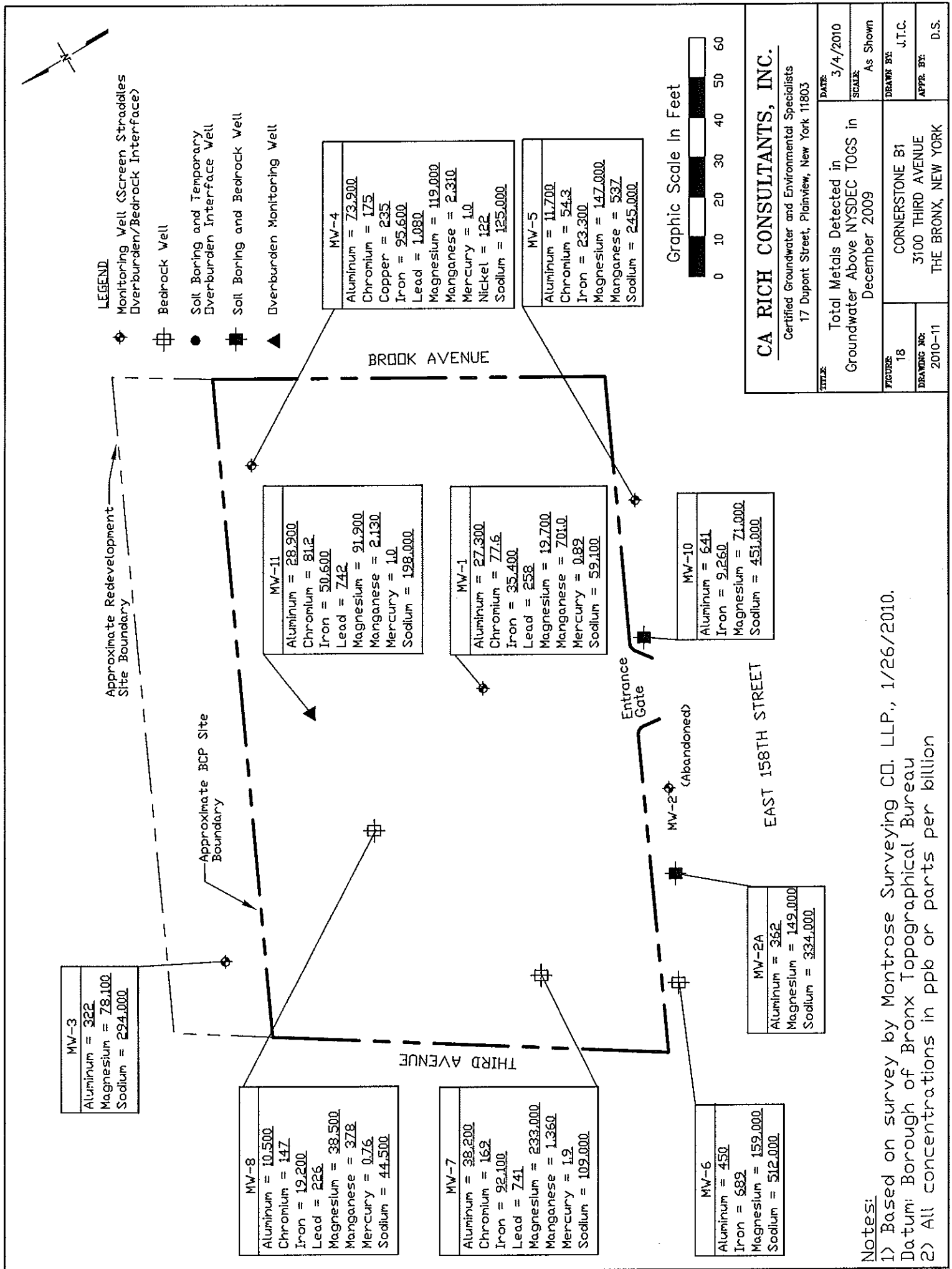
DRAWN BY:
J.T.C.

APPR BY:
D.S.



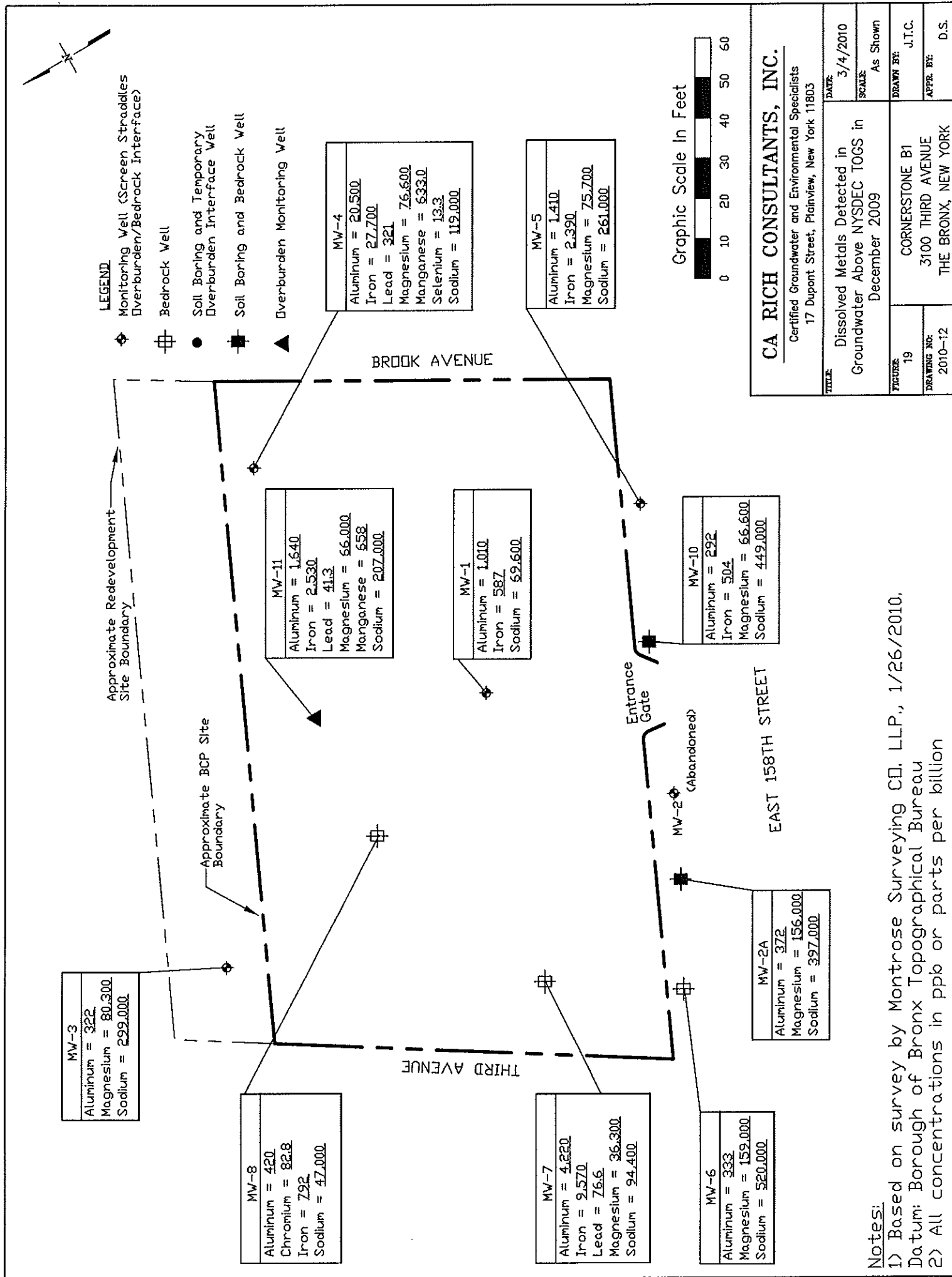
Notes:

- 1) Based on survey by Montrose Surveying CO. LLP., 1/26/2010.
Datum: Borough of Bronx Topographical Bureau
- 2) All concentrations in ppb or parts per billion



Notes:

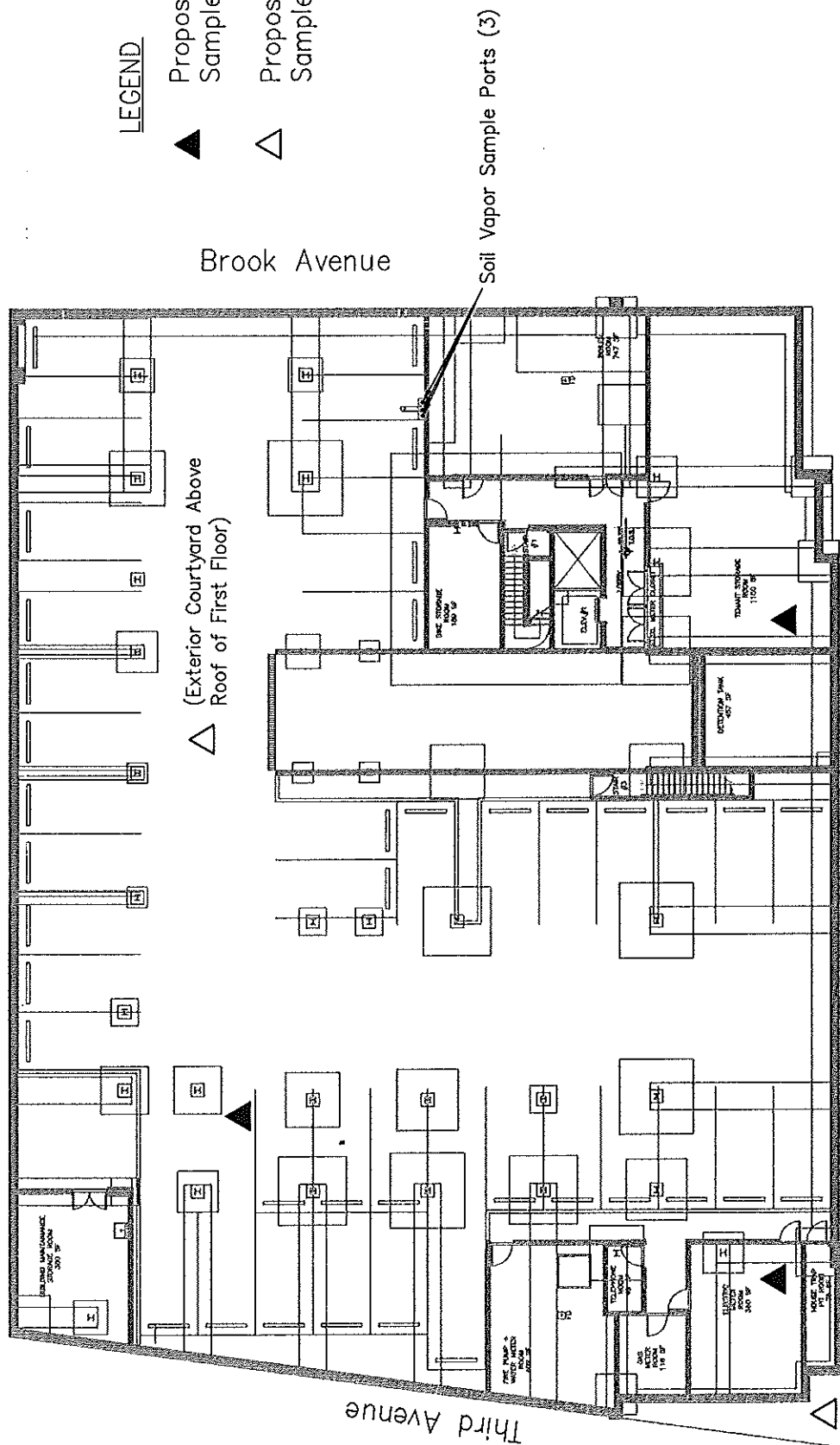
- 1) Based on survey by Montrose Surveying CO. LLP., 1/26/2010.
Datum: Borough of Bronx Topographical Bureau
- 2) All concentrations in ppb or parts per billion





LEGEND

- ▲ Proposed Indoor Air Sample Locations
- △ Proposed Ambient Air Sample Locations



Brook Avenue

Soil Vapor Sample Ports (3)

East 158th Street

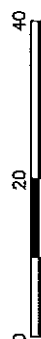
Redevelopment Site Boundary

Third Avenue

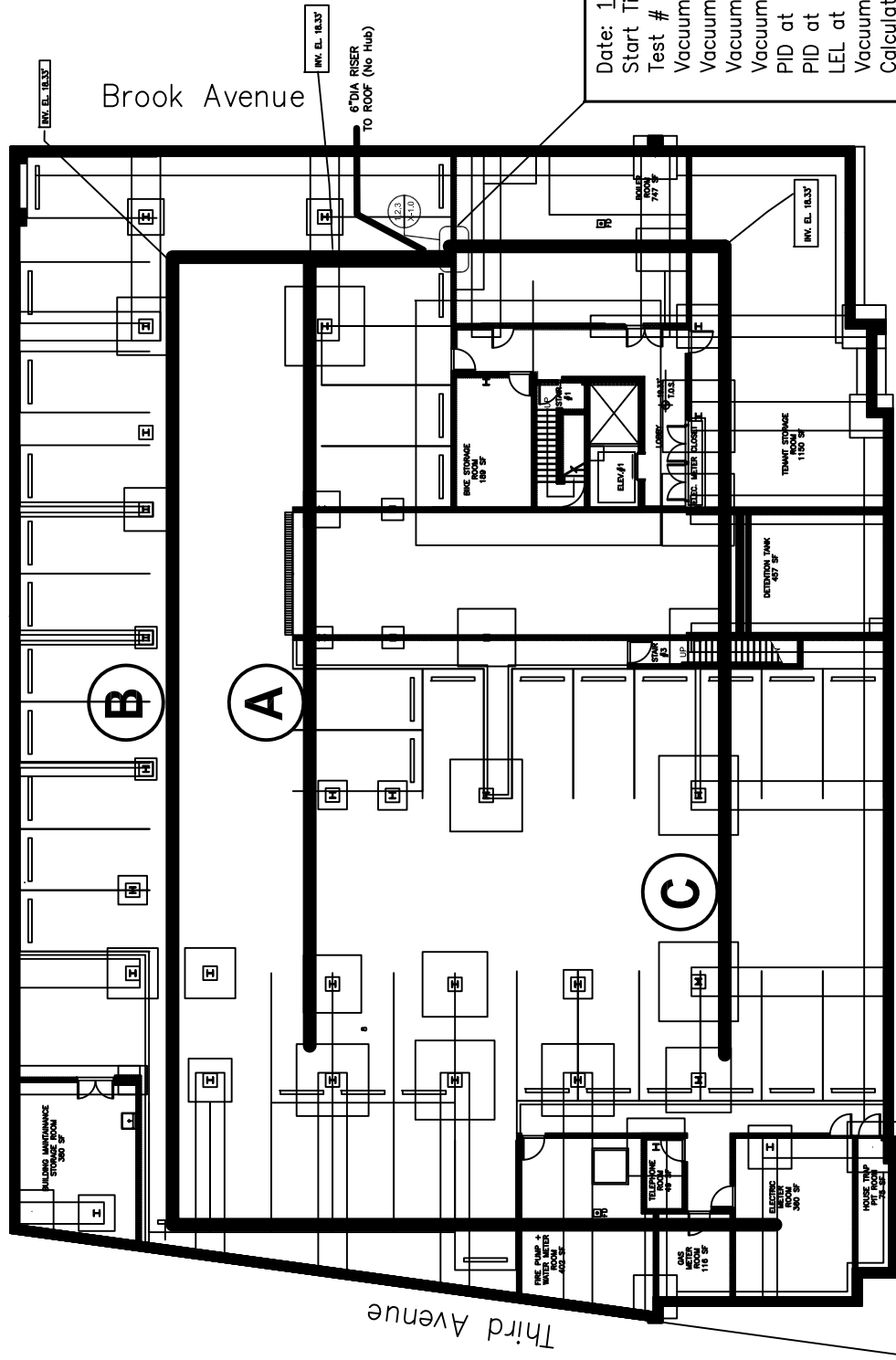
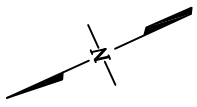
CA RICH CONSULTANTS, INC.

Certified Groundwater and Environmental Specialists
17 Dupont Street, Plainview, New York 11803

TITLE	Indoor/Ambient Air/ Soil Vapor Sampling Locations	DATE	3/4/2010
FIGURE	20	SCALE	As Shown
DRAWING NO.	2010-14	DRAWN BY	J.T.C.
		APPR. BY	D.S.



Graphic Scale in Feet

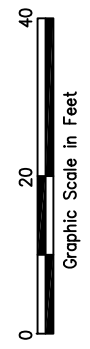


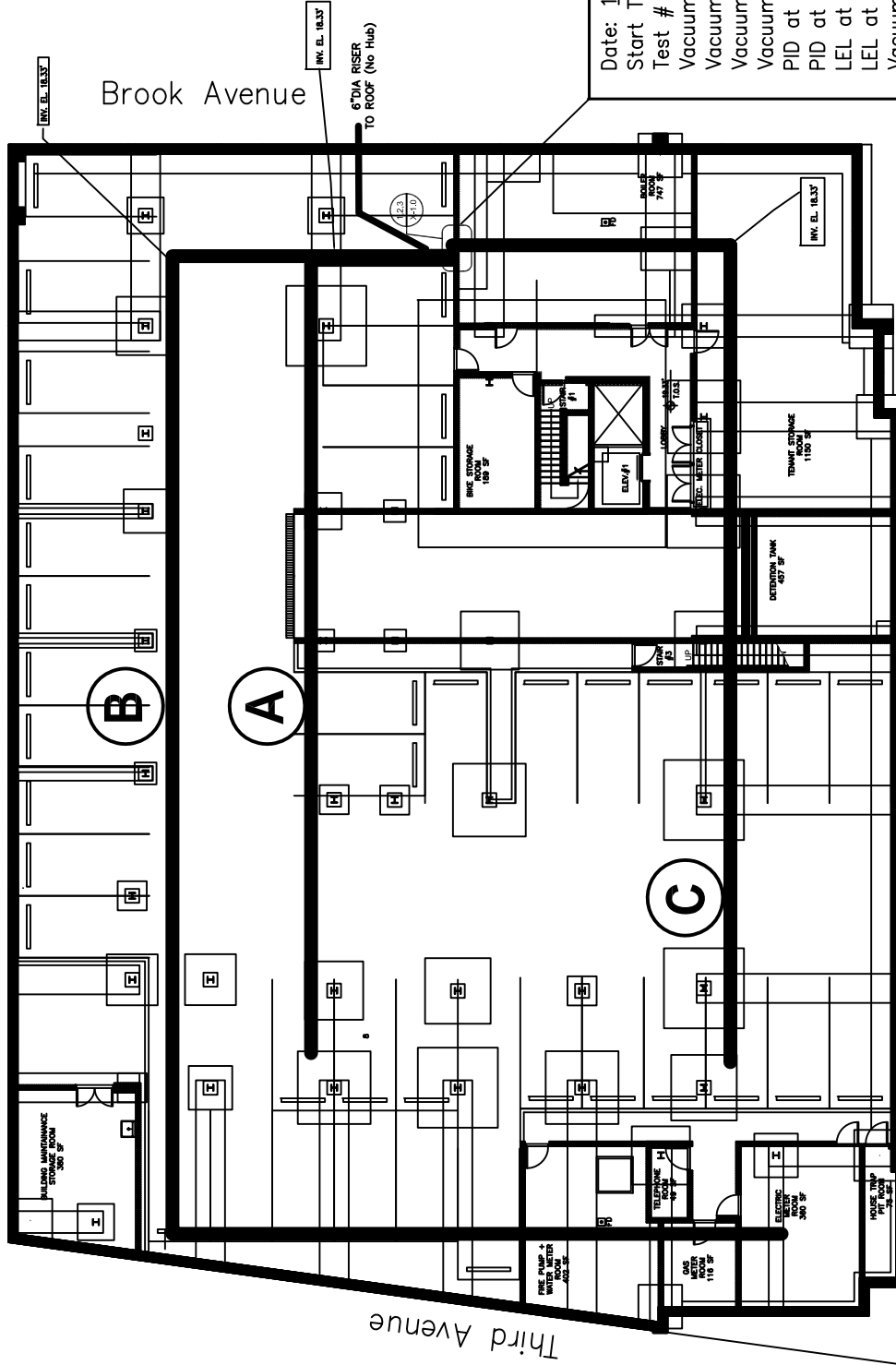
Date: 1/26/2010
Start Time: 10:41 End Time: 10:56
Test # 2 Duration: 15 Minutes
Vacuum Applied to Vent: A
Vacuum at Vent A: 0.5 Inches of Water
Vacuum at Vent B: 0.02 Inches of Water
Vacuum at Vent C: 0.02 Inches of Water
PID at Blower at 10:41: 0.4 ppm
PID at Blower at 10:56: 0.1 ppm
LEL at Blower at 10:56: 0
Vacuum at Blower: 0.5 Inches of Water
Calculated Flow Rate: 45 SCFM
Hz at Blower: 10.75
 ΔP : 0.22

East 158th Street

Redevelopment Site Boundary

CA RICH CONSULTANTS, INC.	
Certified Groundwater and Environmental Specialists 17 Dupont Street, Plainview, New York 11803	
TITLE: Pilot Test #2 of Vent A January 26, 2010	DATE: 2/19/2010
FIGURE: 22	SCALE: As Shown
DRAWING NO: 2010-15B	DRAWN BY: J.T.C.
	APPR. BY: D.S.





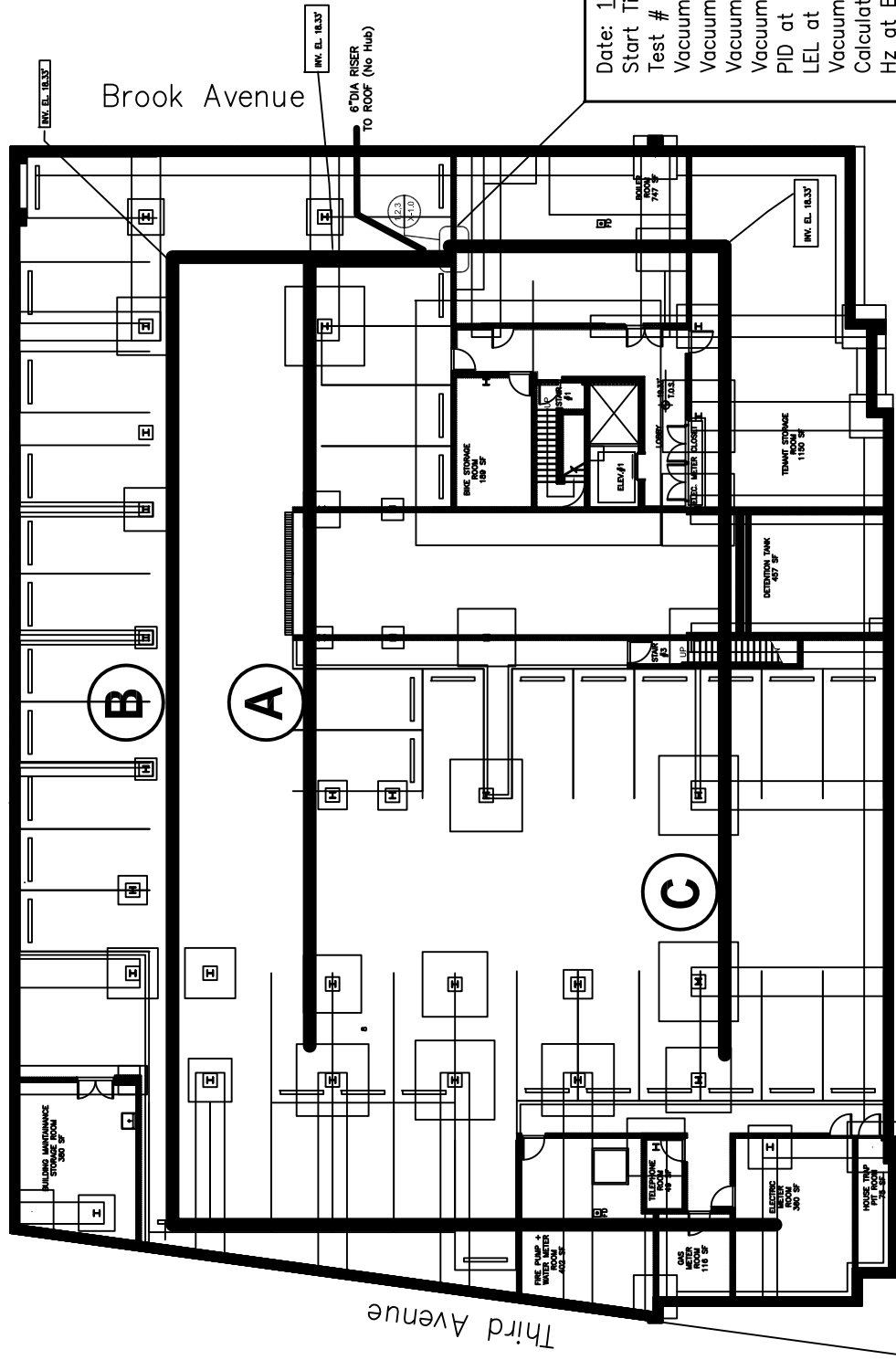
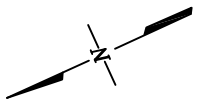
Date: 1/26/2010
Start Time: 11:15 End Time: 11:30
Test # 4 Duration: 15 Minutes
Vacuum Applied to Vent: B
Vacuum at Vent A: 0.05 Inches of Water
Vacuum at Vent B: 2.5 Inches of Water
Vacuum at Vent C: 0.04 Inches of Water
PID at Blower at 11:15: 0.4 ppm
PID at Blower at 11:30: 0.3 ppm
LEL at Blower at 11:15: 0
LEL at Blower at 11:30: 0
Vacuum at Blower: 2.5 Inches of Water
Calculated Flow Rate: 90 SCFM
Hz at Blower: 24.5
 ΔP : 0.1

East 158th Street

Redevelopment Site Boundary

CA RICH CONSULTANTS, INC.	
Certified Groundwater and Environmental Specialists 17 Dupont Street, Plainview, New York 11803	
TITLE: Pilot Test #2 of Vent B January 26, 2010	DATE: 2/19/2010
FIGURE: 24	SCALE: As Shown
DRAWING NO: 2010-15D	DRAWN BY: J.T.C.
	APPR. BY: D.S.





Brook Avenue

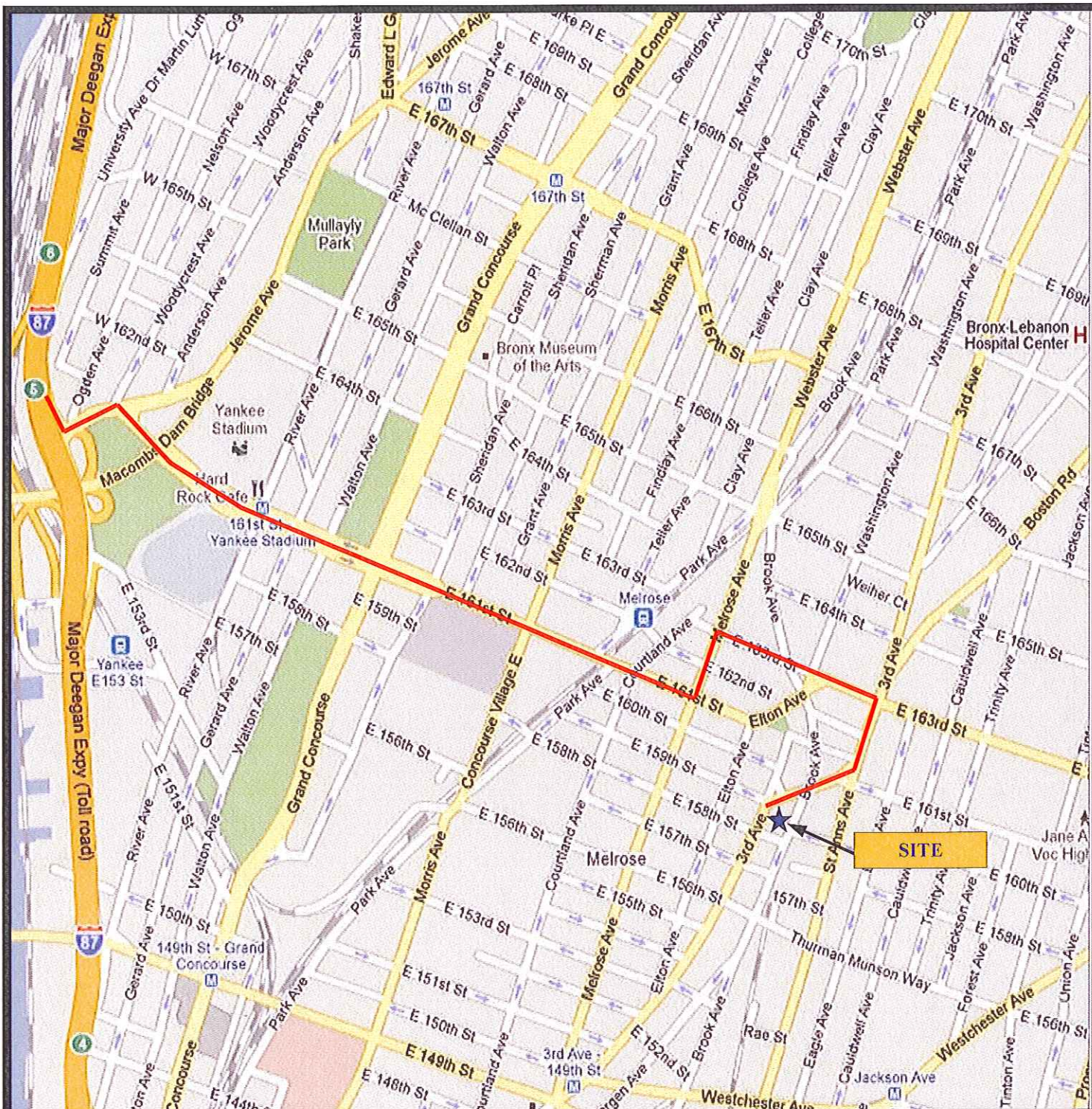
East 158th Street

Redevelopment Site Boundary

Date: 1/26/2010
Start Time: 11:50 End Time: 12:05
Test # 6 Duration: 15 Minutes
Vacuum Applied to Vent: C
Vacuum at Vent A: 0.075 Inches of Water
Vacuum at Vent B: 0.03 Inches of Water
Vacuum at Vent C: 2.5 Inches of Water
PID at Blower: 0.3 ppm
LEL at Blower: 0
Vacuum at Blower: 2.5 Inches of Water
Calculated Flow Rate: 92 SCFM
Hz at Blower: 24
 ΔP : 1

CA RICH CONSULTANTS, INC.	
Certified Groundwater and Environmental Specialists 17 Dupont Street, Plainview, New York 11803	
TITLE: Pilot Test #2 of Vent C January 26, 2010	DATE: 2/19/2010
FIGURE: 26	SCALE: As Shown
DRAWING NO: 2010-15F	DRAWN BY: J.T.C.
	APPR. BY: D.S.





Truck Route



Adapted from Google Maps



CA RICH
ENVIRONMENTAL SPECIALISTS

CA RICH CONSULTANTS, INC.
17 Dupont Street,
Plainview, NY 11803

TITLE:

TRUCK TRANSPORT ROUTE MAP

DATE:

1/21/2010

SCALE:

NTS

FIGURE: **27**

Cornerstone B1
3100 Third Avenue
Bronx, New York

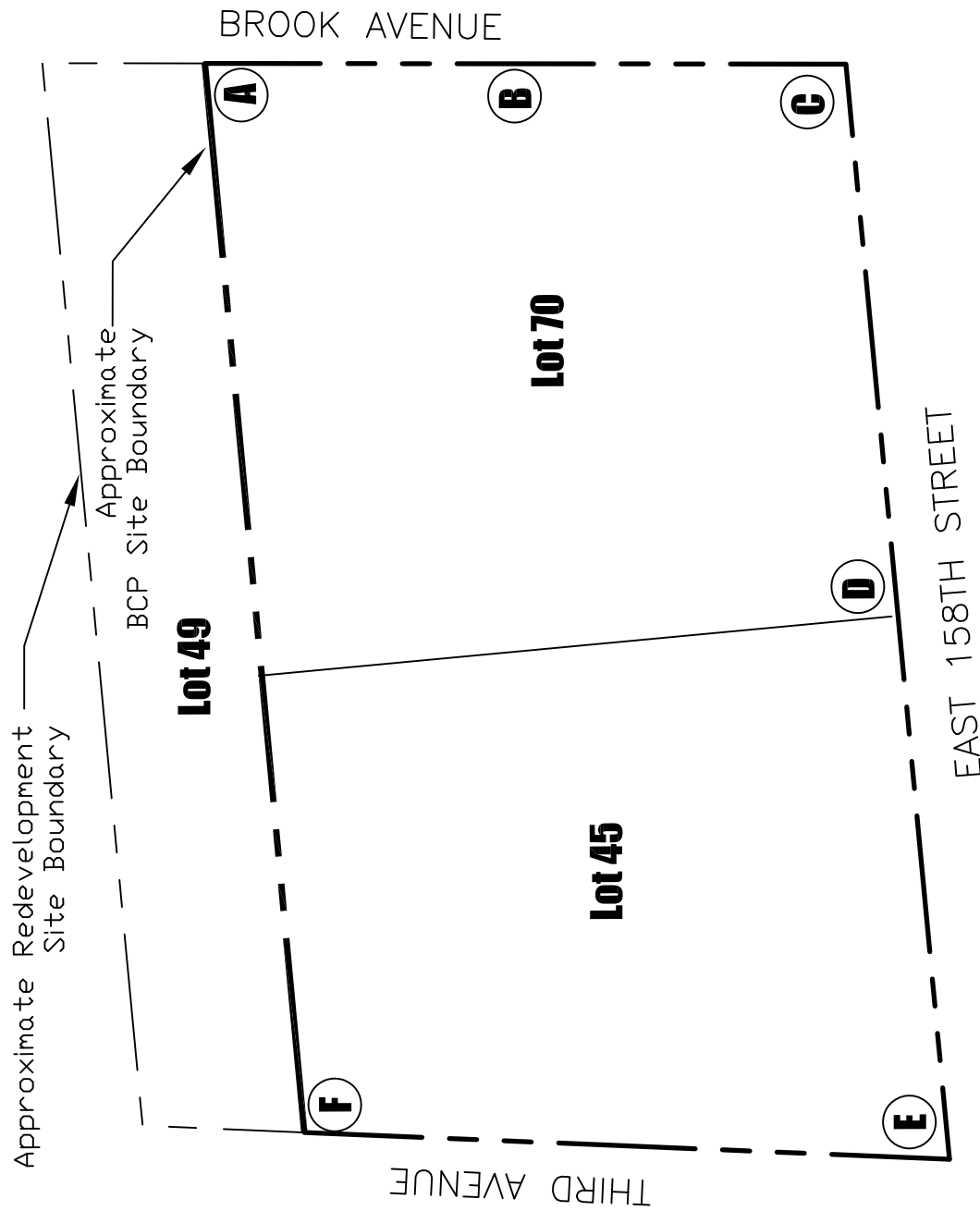
DRAWING:

DRAWN BY:

JTC

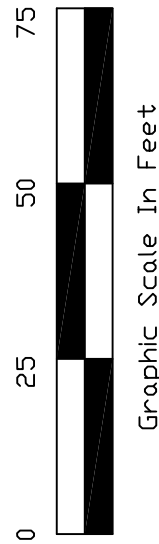
APPR. BY:

DS



A = Northeast corner of BCP Site at Brook Avenue
B = Eastern side of BCP Site at Brook Avenue
C = Southeast corner of BCP Site at Brook Avenue and East 158th Street
D = Southern side of BCP Site near East 158th Street
E = Southwest corner of BCP Site at Third Avenue and 158th Street
F = Northwest corner of BCP Site at Third Avenue

CA RICH CONSULTANTS, INC. Certified Groundwater and Environmental Specialists 17 Dupont Street, Plainview, New York 11803		TITLE: Air Monitoring Stations	DATE: 2/22/2010 SCALE: As Shown
FIGURE: 28	CORNERSTONE B1 3100 THIRD AVENUE THE BRONX, NEW YORK		
DRAWING NO: 2010-6	APPR. BY: J.T.C. D.S.		



Note:
Based on survey by Montrose Surveying CO. LLP., 1/26/2010
Datum: Borough of Bronx Topographical Bureau

APPENDIX A

Metes and Bounds

SCHEDULE "A" PROPERTY DESCRIPTION

Legal Description
Tax Block 2364 Tax Lots 45 & 70

ALL that certain plot or piece or parcel of land, situate lying and being in the Borough and County of the Bronx, City and State of New York bounded and described as follows:

BEGINNING at the corner formed by the intersection of the northerly side of East 158th Street (50 feet wide) with the easterly side of 3rd Avenue (80 feet wide);

RUNNING THENCE northerly, along the easterly side of 3rd Avenue, 99.53 feet to the southerly boundary of former Tax Lot 49;

RUNNING THENCE easterly, along the southerly boundary of former Tax Lot 49 and along a line forming an angle of 97 degrees 44 minutes 38 seconds on the southeast with the easterly side of 3rd Avenue, 154.46 feet to the westerly boundary of the Land now or formerly of the Port Morris Branch of The New York & Harlem Railroad Company;

RUNNING THENCE southerly, along the westerly boundary of the Land now or formerly of the Port Morris Branch of The New York & Harlem Railroad Company, the following three courses and distances;

1. THENCE southerly along a line forming an angle of 90 degrees 39 minutes 57 seconds on the southwest with the last mentioned course, 11.74 feet to a point;
2. THENCE southerly along a line forming an exterior angle of 178 degrees 42 minutes 0 seconds on the east with the last mentioned course, 30.58 feet to a point;
3. THENCE southerly, along a line forming an exterior angle of 181 degrees 20 minutes 54 seconds in the east with the last mentioned course, 56.17 feet to the northerly side of East 158th Street;

RUNNING THENCE westerly, along the northerly side of East 158th Street, 169.65 feet to the corner, the point or place of BEGINNING.

APPENDIX B

Excavation Work Plan

APPENDIX B – EXCAVATION WORK PLAN

A-1 NOTIFICATION

At least 15 days prior to the start of any activity that is anticipated to encounter remaining contamination, the Site owner or their representative will notify the Department. Currently, this notification will be made to:

Mr. Sadique Ahmed, P.E.

Central Office Environmental Engineer

NYSDEC, Remedial Bureau B, 625 Broadway, Albany, New York 12233-7016

This notification will include:

- A detailed description of the work to be performed, including the location and areal extent, plans for Site re-grading, intrusive elements or utilities to be installed below the soil cover, estimated volumes of contaminated soil to be excavated and any work that may impact an engineering control;
- A summary of environmental conditions anticipated in the work areas, including the nature and concentration levels of contaminants of concern, potential presence of grossly contaminated media, and plans for any pre-construction sampling;
- A schedule for the work, detailing the start and completion of all intrusive work;
- A summary of the applicable components of this EWP;
- A statement that the work will be performed in compliance with this EWP and 29 CFR 1910.120;
- A copy of the contractor's health and safety plan, in electronic format, if it differs from the HASP provided in Appendix C of this SMP;
- Identification of disposal facilities for potential waste streams; and,
- Identification of sources of any anticipated backfill, along with all required chemical testing results.

A-2 SOIL SCREENING METHODS

Visual, olfactory and instrument-based soil screening will be performed by a qualified environmental professional during all remedial and development excavations into known or potentially contaminated material (remaining contamination). Soil screening will be performed regardless of when the invasive work is done and will include all excavation and invasive work performed during development, such as excavations for foundations and utility work, after issuance of the COC.

Soils will be segregated based on previous environmental data and screening results into material that requires off-site disposal, material that requires testing, material that can be returned to the subsurface, and material that can be used as cover soil.

A-3 STOCKPILE METHODS

A hose connected to a NYS fire hydrant will be available at the Site for dust control.

Soil stockpiles will be continuously encircled with a berm and/or silt fence. Hay bales will be used as needed near catch basins, surface waters and other discharge points.

Stockpiles will be kept covered at all times with appropriately anchored tarps. Stockpiles will be routinely inspected and damaged tarp covers will be promptly replaced.

Stockpiles will be inspected at a minimum once each week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by NYSDEC.

A-4 MATERIALS EXCAVATION AND LOAD OUT

A qualified environmental professional or person under their supervision will oversee all invasive work and the excavation and load-out of all excavated material.

The owner of the property and its contractors are solely responsible for safe execution of all invasive and other work performed under this Plan.

The presence of utilities and easements on the Site will be investigated by the qualified environmental professional. It will be determined whether a risk or impediment to the planned work under this SMP is posed by utilities or easements on the Site.

Loaded vehicles leaving the Site will be appropriately lined, tarped, securely covered, manifested, and placarded in accordance with appropriate Federal, State, local, and NYSDOT requirements (and all other applicable transportation requirements).

A truck wash will be operated on-site. The qualified environmental professional will be responsible for ensuring that all outbound trucks will be washed at the truck wash before leaving the Site until the activities performed under this section are complete.

Locations where vehicles enter or exit the Site shall be inspected daily for evidence of off-Site soil tracking.

The qualified environmental professional will be responsible for ensuring that all egress points for truck and equipment transport from the Site are clean of dirt and other materials derived from the Site during intrusive excavation activities. Cleaning of the adjacent streets will be performed as needed to maintain a clean condition with respect to Site-derived materials.

A-5 MATERIALS TRANSPORT OFF-SITE

All transport of materials will be performed by licensed haulers in accordance with appropriate local, State, and Federal regulations, including 6 NYCRR Part 364. Haulers will be appropriately licensed and trucks properly placarded.

Material transported by trucks exiting the Site will be secured with tight-fitting covers. Loose-fitting canvas-type truck covers will be prohibited. If loads contain wet material capable of producing free liquid, truck liners will be used.

All trucks will be washed prior to leaving the Site. Truck wash waters will be collected and disposed of off-Site in an appropriate manner.

The truck transport route is as follows: Take Third Avenue north to East 163rd Street. Turn left at East 163rd Street. Turn left at Melrose Avenue. Turn right onto East 161st Street. Turn left at Jerome Ave. Take the I-87 N/Maj Deegan Expy ramp on the left to Albany. Merge onto I-87 N. Take exit 7H for US-1 N/I-95 N/Cr Bronx Expy toward New Haven. Take exit 7S on the left for US-1 S/I-95 S/G Washington Bridge toward Trenton. Merge onto I-95 S/US-1 S. Slight right at George Washington Bridge. See Figure 27 for a map of this route. All trucks loaded with Site materials will exit the vicinity of the Site using only this approved truck route. This is the most appropriate route and takes into account: (a) limiting transport through residential areas and past sensitive Sites; (b) use of city mapped truck routes; (c) prohibiting off-site queuing of trucks entering the facility; (d) limiting total distance to major highways; (e) promoting safety in access to highways; and (f) overall safety in transport.

Trucks will be encouraged not to stop and idle in the neighborhood outside the project Site. Egress points for truck and equipment transport from the Site will be kept clean of dirt and other materials during Site remediation and development.

Queuing of trucks will be performed on-site to the extent possible in order to minimize off-site disturbance. Off-site queuing will be used only when necessary.

A-6 MATERIALS DISPOSAL OFF-SITE

All soil/fill/solid waste excavated and removed from the Site will be treated as contaminated and regulated material and will be transported and disposed in accordance with all local, State (including 6NYCRR Part 360) and Federal regulations. If disposal of soil/fill from this Site is proposed for unregulated off-site disposal (i.e. clean soil removed for development purposes), a formal request with an associated plan will be made to the NYSDEC. Unregulated off-site management of materials from this Site will not occur without formal NYSDEC approval.

Off-site disposal locations for excavated soils will be identified in the pre-excavation notification. This will include estimated quantities and a breakdown by class of disposal facility if appropriate, i.e. hazardous waste disposal facility, solid waste landfill, petroleum treatment facility, C/D recycling facility, etc. Actual disposal quantities and associated documentation will be reported to the NYSDEC in the Periodic Review Report. This documentation will include: waste profiles, test results, facility acceptance letters, manifests, bills of lading and facility receipts.

Non-hazardous historic fill and contaminated soils taken off-site will be handled, at minimum, as a Municipal Solid Waste per 6NYCRR Part 360-1.2. Material that does not meet Track 1 unrestricted SCOs is prohibited from being taken to a New York State recycling facility (6NYCRR Part 360-16 Registration Facility).

A-7 MATERIALS REUSE ON-SITE

If on-site reuse of soil/fill is needed, all of the materials to be reused will comply with Track 4 SSSALs. The chemical criteria for on-site reuse of material have been approved by NYSDEC and are listed in Table 1 of this SMP. The qualified environmental professional will ensure that procedures defined for materials reuse in this SMP are followed and that unacceptable material does not remain on-site. Contaminated on-site material, including historic fill and contaminated soil, that is acceptable for re-use on-site

will be placed below the demarcation layer or impervious surface, and will not be reused within a cover soil layer, within landscaping berms, or as backfill for subsurface utility lines.

Any demolition material proposed for reuse on-site will be sampled for asbestos and the results will be reported to the NYSDEC for acceptance. Concrete crushing or processing on-site will not be performed without prior NYSDEC approval. Organic matter (wood, roots, stumps, etc.) or other solid waste derived from clearing and grubbing of the Site will not be reused on-site.

A-8 FLUIDS MANAGEMENT

All liquids to be removed from the Site, including excavation dewatering and groundwater monitoring well purge and development waters, will be handled, transported and disposed in accordance with applicable local, State, and Federal regulations. Dewatering, purge and development fluids will not be recharged back to the land surface or subsurface of the Site, but will be managed off-site.

Discharge of water generated during large-scale construction activities to surface waters (i.e. a local pond, stream or river) will be performed under a SPDES permit.

A-9 COVER SYSTEM RESTORATION

After the completion of soil removal and any other invasive activities the cover system will be restored in a manner that complies with the RAWP. The demarcation layer, consisting of the vapor barrier will be replaced to provide a visual reference to the top of the 'Remaining Contamination Zone', the zone that requires adherence to special conditions for disturbance of remaining contaminated soils defined in this Site Management Plan. If the type of cover system changes from that which exists prior to the excavation (i.e., a soil cover is replaced by asphalt), this will constitute a modification of the cover element of the remedy and the upper surface of the 'Remaining Contamination.

A figure showing the modified surface will be included in the subsequent Periodic Review Report and in any updates to the Site Management Plan.

A-10 BACKFILL FROM OFF-SITE SOURCES

All materials proposed for import onto the Site will be approved by the qualified environmental professional and will be in compliance with provisions in this SMP prior to receipt at the Site.

Material from industrial Sites, spill Sites, or other environmental remediation Sites or potentially contaminated Sites will not be imported to the Site.

All imported soils will meet the backfill and cover soil quality standards established in 6NYCRR 375-6.7(d). Based on an evaluation of the land use, protection of groundwater and protection of ecological resources criteria, the resulting soil quality standards are restricted residential clean up objectives per Table 375-6.8b of 6 NYCRR listed in Table 13. Soils that meet 'exempt' fill requirements under 6 NYCRR Part 360, but do not meet backfill or cover soil objectives for this Site, will not be imported onto the Site without prior approval by NYSDEC. Solid waste will not be imported onto the Site.

Trucks entering the Site with imported soils will be securely covered with tight fitting covers. Imported soils will be stockpiled separately from excavated materials and covered to prevent dust releases.

A-11 STORMWATER POLLUTION PREVENTION

Construction activities at this Site will minimize soil erosion, sedimentation of surrounding storm drains, pollution of storm-water runoff leaving the Site, and the migration of dust and dirt from the Site to surrounding streets and buildings. To achieve this requirement, Contractors will employ the measures in this plan to satisfy the following objectives:

1. Minimize unnecessary soil disturbance and dust generation on Site.
2. Minimize storm-water contamination from on-site activities.
3. Inhibit or slow the flow of runoff across the Site.
4. Remove sediment from on-site runoff before it leaves the Site.
5. Remove soil from vehicles leaving the Site.
6. Inhibit dust migration from the Site to surrounding streets and buildings without excessive use of water.
7. Prevent concrete washout from filling catch basins.
8. Minimize on-site pollution due to construction activity.

A-11.1 Minimize Unnecessary Soil Disturbance and Dust Generation

Soil excavation and removal/re-use (if needed) for environmental purposes is covered by the HASP and CAMP. The HASP and CAMP outline the requirements for dust monitoring and dust control during construction activities and record keeping requirements.

Perimeter fencing at the Site will also provide protection from the wind thus reducing the potential for wind blown dust from leaving the Site.

A-11.2 Minimize Storm-Water Contamination

On-site soils/fill are permeable and storm-water is expected to freely leach into the ground if exposed. If ponding does occur, pumping of storm-water to a New York City storm sewer may be required. Storm-water discharge permits will be obtained as required from NYCDEP before storm-water may be pumped to the sewer. As a precautionary measure, sediment control measures such as silt fencing and/or hay bales may be put in place along the northwestern perimeter of the Site to minimize any sediment carried by storm-water leaving the Site.

On-site soils/fill that are stockpiled for transportation will be positioned such that all storm-water and any soil erosion will be prevented from leaving the Site by the proper grading around the pile. This will cause run-off to flow to the on-site low point or a retention area.

Stockpiled materials for off-site disposal will be properly enveloped in plastic sheeting to prevent storm-water contamination, on-site migration of sediments during rain events, and to minimize dust generation from these materials.

A-11.3 Inhibit or Slow the Flow of Run-off Across the Site

On-site control of flow across the Site should only become a problem if the excavation of the Site does not proceed uniformly. Areas in the excavation where steep slopes occur should be bermed at the top of the slope to prevent run-off from the upper bench from flowing over the open fence of the excavation.

Due to the permeability of the soils on Site, storm-water control should not be a difficult task and normal prudent excavating procedures should be capable of controlling the storm-water flow.

A-11.4 Remove Sediment from Storm-Water before Leaving the Site

NYCDEP has established standards for storm-water discharged to the City's sewer system. The standards for suspended solids usually require that storm-water be settled and sometimes filtered before it can be discharge to the sewer. Any storm-water pumped from the Site would have to meet the requirement.

A-11.5 Remove Soil from Vehicles Leaving the Site

A tracking control pad will be constructed. This is a crushed stone pad to prevent tracking of Site soils and mud from the Site to the nearby roadways. Each truck leaving

the Site will be inspected for soil/fill or mud on its tires. If found, the soil/fill or mud will be washed off by a laborer, with a hose before the truck leaves the Site.

Additional stone may have to be added to the tracking control pad from time to time as it becomes fouled with on-site soils.

In the event sediment from the trucks leaving the Site does begin to flow down the street, such as on rainy days, the following procedures will be employed.

- Disposable absorbent socks will be laid on the ground in front of the downgradient stormdrains to catch the sediment. The sediment will then be pushed up the street and back onto the Site with brooms.
- In extreme cases when even the use of absorbent socks will not prevent all of the sediment from flowing toward the storm drain, a drain insert filter will be placed in the storm drain to catch the sediment that flows into the drain.

A-11.6 Prevent Concrete Washout from Filling Catch Basins

A specific area will be designated on-Site for concrete truck wash down. No wash down water will be allowed to flow off the Site. Excess concrete delivered to the Site, but not used, shall remain on the truck and be returned to the supplier. If minor amounts of excess concrete are discharged at the Site, it shall be collected by the contractor after it has hardened and placed in a roll-off container for recycling.

During construction, wash water generated from the delivery trucks will be discharged to the ground and allowed to percolate into the soil.

A-11.7 Minimize Site Pollution Due to Construction Activities

Construction waste management practices are described earlier in this EWP. These include fluids management, construction & demolition debris management, soil materials management and re-use, and Site clearing waste management. Additional preventative measures are described below in A-11.10.

A-11.8 Permit Requirements

The only permit that may be required for storm-water and erosion control is a Storm-water Discharge permit from the NYCDEP. However, discharge of storm-water to the public sewer is not anticipated at this time.

A-11.9 Control Measures for SWPPP

- Construction fencing with wind screen shall be erected.
- Dust control during Site excavation by Site Contractor - monitored by an environmental professional.
- Limited trucking of excavated materials to recycle or disposal in covered trucks - monitored by an environmental professional
- Controlled sprinkling of the Site with water by Site Contractor as need to suppress dust - monitored by an environmental professional
- Use of a ready mix company that can washout concrete trucks off-Site and limit on-Site washouts to concrete chutes only. Use on-Site washout tanks only if necessary.
- Soil and dust shall be rinsed from trucks before leaving Site at gravel covered Tracking Control Station.
- The construction manager shall designate storage areas for construction materials and areas for staging equipment at the Site.
- Waste materials from the Site will be handled according to the EWP.

- On rainy days, disposable absorbent socks will be laid on the ground in front of the downgradient storm drain to catch the sediment. The trapped sediments will then be pushed up the street and back onto the Site with brooms.
- In extreme cases when even the use of absorbent socks will not prevent all of the sediment from flowing toward the storm drain, a drain insert filter will be placed in the storm drain to catch the sediment that flows into the drain.

A-11.10 Other Related Items

- Good housekeeping efforts shall be employed during vehicle refueling. A contracted vendor supplies a delivery truck that is used to fuel construction vehicles. The operator shall be careful to prevent overfill or spillage of fuel.
- If any minor spills occur, they shall be quickly and completely cleaned up and the impacted soil shall be disposed of off-site. All major releases of fuel shall be reported to the NYSDEC in accordance with regulations.
- Waste chemicals, such as used motor oil or used oil filters, shall be disposed of off-site in accordance with NYSDEC regulations.

A-11.11 Recommendations

- Line up ready mix and concrete pump trucks that can do off-site wash-out and/or can supply portable wash-out tanks.
- Set-up a Site inspection log documenting the SWPP Practices, noting any deficiencies or improvements that can be made. This should be done on a weekly basis at a minimum.

- Site Contractor should hold monthly SWPPP meetings to coordinate all contractors and subcontractor efforts.
- Barriers and hay bale checks will be installed and inspected once a week and after every storm event. Results of inspections will be recorded in a logbook and maintained at the Site and available for inspection by NYSDEC. All necessary repairs shall be made immediately.
- Accumulated sediments will be removed as required to keep the barrier and hay bale check functional.
- All undercutting or erosion of the silt fence toe anchor shall be repaired immediately with appropriate backfill materials.
- Manufacturer's recommendations will be followed for replacing silt fencing damaged due to weathering.
- Erosion and sediment control measures identified in the SMP shall be observed to ensure that they are operating correctly. Where discharge locations or points are accessible, they shall be inspected to ascertain whether erosion control measures are effective in preventing significant impacts to receiving waters.
- Silt fencing or hay bales will be installed at the low point of the construction area.

A-12 CONTINGENCY PLAN

If underground tanks or other previously unidentified contaminant sources are found during post-remedial subsurface excavations or development related construction, excavation activities will be suspended until sufficient equipment is mobilized to address the condition.

Sampling will be performed on product, sediment and surrounding soils, etc. as necessary to determine the nature of the material and proper disposal method. Chemical analysis will be performed for a full list of analytes (TAL metals; TCL volatiles and semi-volatiles, TCL pesticides and PCBs), unless the Site history and previous sampling results

provide a sufficient justification to limit the list of analytes. In this case, a reduced list of analytes will be proposed to the NYSDEC for approval prior to sampling.

Identification of unknown or unexpected contaminated media identified by screening during invasive Site work will be promptly communicated by phone to NYSDEC's Project Manager. Reportable quantities of petroleum product will also be reported to the NYSDEC spills hotline. These findings will be also included in the periodic reports prepared pursuant to Section 5 of the SMP.

A-13 COMMUNITY AIR MONITORING PLAN

The Community Air Monitoring Plan is included in the HASP which is enclosed as Appendix C. A figure showing the location of air sampling stations based on generally prevailing wind conditions is shown in Figure 28. These locations will be adjusted on a daily or more frequent basis based on actual wind directions to provide an upwind and at least two downwind monitoring stations.

Exceedances of action levels listed in the CAMP will be reported to NYSDEC and NYSDOH Project Managers.

A-14 ODOR CONTROL PLAN

This odor control plan is capable of controlling emissions of nuisance odors off-site and on-site. Specific odor control methods to be used on a routine basis will include use of a PID meter to screen for VOCs and olfactory observations by Field Technicians. If nuisance odors are identified at the Site boundary, or if odor complaints are received, work will be halted and the source of odors will be identified and corrected. Work will not resume until all nuisance odors have been abated. NYSDEC and NYSDOH will be notified of all odor events and of any other complaints about the project. Implementation of all odor controls, including the halt of work, is the responsibility of the property

owner's Remediation Engineer, and any measures that are implemented will be discussed in the Periodic Review Report.

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

If nuisance odors develop during intrusive work that cannot be corrected, or where the control of nuisance odors cannot otherwise be achieved due to on-site conditions or close proximity to sensitive receptors, odor control will be achieved by sheltering the excavation and handling areas in a temporary containment structure equipped with appropriate air venting/filtering systems.

A-15 DUST CONTROL PLAN

A dust suppression plan that addresses dust management during invasive on-site work will include, at a minimum, the items listed below:

- Dust suppression will be achieved through the use of a dedicated on-site hose connected to a fire hydrant. The hose will be equipped with a nozzle capable of spraying water directly onto off-road areas including excavations and stockpiles.
- Clearing and grubbing of larger Sites will be done in stages to limit the area of exposed, unvegetated soils vulnerable to dust production.
- Gravel will be used on roadways to provide a clean and dust-free road surface.

- On-site roads will be limited in total area to minimize the area required for water truck sprinkling.

A-16 OTHER NUISANCES

A plan for rodent control will be developed and utilized by the contractor prior to and during Site clearing and Site grubbing, and during all remedial work.

The rodent plan includes the following.

Within the construction Site, tamper resistant rodent bait stations will be installed in appropriate locations and active rodent burrows will be baited.

Upon installation, each bait station will be baited, labeled, and secured to the ground. Bait will be replenished and bait stations relocated as necessary to control rodent populations. A baiting program will be initiated prior to mobilization by the contractor in the construction area. Regular inspections and rebaiting of bait stations will be performed to ensure rodents will not be dispersed by construction activities and that rodents will not infest work areas.

Safety signs will be posted on the Site, which will include a copy of the product label and MSDS for the rodenticide in used. Signs will also list practical medical treatment, first aid procedures, and antidote. Caution signs in English and Spanish will be posted when bait stations are placed in areas accessible to the general public, domestic animals, and pets.

APPENDIX C

Health and Safety Plan



**HEALTH AND SAFETY PLAN
&
COMMUNITY AIR MONITORING PLAN**

**FOR THE
SITE MANAGEMENT PLAN**

**Cornerstone B1
3100 Avenue
Bronx, New York**

BCP Site #C203044

February 2010

Prepared For:

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HEALTH AND SAFETY PLAN & COMMUNITY AIR MONITORING PLAN

FOR THE
SITE MANAGEMENT PLAN
AT
Cornerstone Site B-1
3100 Third Avenue
Bronx, New York
BCP #C203044

1.0 INTRODUCTION

This Health and Safety Plan (HASP) is developed for utilization during implementation of the Site Management Plan (SMP) at Cornerstone Site B-1, 3100 Third Avenue, Bronx, New York (the Site). The HASP is to be enforced by the Project Health and Safety Manager and on-site Health & Safety Coordinator (HSC). The on-site HSC will interface with the Project Manager and is vested with the authority to make field decisions including the termination of on-site activities if an imminent health and safety hazard, condition or related concern arises. Information and protocol in the HASP is applicable to all on-site personnel who will be entering the work zone.

2.0 POTENTIAL HAZARDS

2.1 Chemical Hazards

Soil excavation endpoint samples were collected from the final excavation depths (or higher if bedrock was encountered). The analytical results from the samples illustrated that the polycyclic aromatic hydrocarbons benzo(a)anthracene, benzo(a)pyrene, benzo(b)fluoranthene, benzo(k)fluoranthene, chrysene, dibenzo(a,h)anthracene, and indeno(1,2,3-cd)pyrene, the pesticides 4,4'-DDE, 4,4'-DDT, Dieldrin, and 4,4'-DDD, the PCB Aroclor-1254, and the metals chromium, copper, lead, mercury, and zinc were detected above Track 1 Soil Cleanup Objectives in limited areas throughout the Site.

The initial round of post-remedial groundwater monitoring and sampling illustrated that the volatile organic compounds (VOCs) benzene, chloroform, ethylbenzene, naphthalene, n-propylbenzene, tetrachloroethene, toluene, 1,2,4-trimethylbenzene, 1,3,5-trimethylbenzene, and m,p-xylene, o-xylene, and the metals aluminum, chromium, iron, lead, magnesium, manganese, selenium, and sodium.

Physical properties and toxicological information is included in Appendix A.

2.2 Other Health and Safety Risks

The HASP addresses the environmentally-related chemical hazards identified on the Site. Normal physical hazards associated with using drilling equipment and hand tools as well as hazards associated with adverse climatic conditions (heat and cold) also exist and represent a certain degree of risk to be assumed by on-site personnel.

Certain provisions in this Plan, specifically the use of personnel protective equipment, may tend to increase the risk of physical injury, as well as susceptibility to cold or heat stress. This is primarily due to restrictions in dexterity, hearing, sight, and normal body heat transfer inherent in the use of protective gear.

3.0 RISK MANAGEMENT

3.1 Work / Exclusion Zones

For each proposed activity (e.g., soil excavation, groundwater sampling, etc.), a work/exclusion zone will be established. Access to this area will be limited to properly trained, properly protected personnel directly involved with the on-site activities. Enforcement of the work/exclusion zone boundaries is the responsibility of the on-site Health & Safety Coordinator.

3.2 Personnel Protection

Health & Safety regulatory personnel have developed different levels of personnel protection to deal with differing degrees of potential risks of exposure to chemical constituents. The levels are designated as **A**, **B**, **C**, and **D** and ranked according to the amount of personnel protection afforded by each level. Level **A** is the highest level of protection, and Level **D** is the lowest level of protection as described below.

A – Fully encapsulating suit, SCBA, hard hat, chemical-resistant steel-toed boots, boot covers, inner and outer gloves.

B – One-piece, hooded chemical-resistant splash suit, SCBA, hard hat, chemical-resistant steel-toed boots, boot covers, inner and outer gloves.

C – One-piece, hooded chemical-resistant splash suit, hard hat, canister equipped face mask, chemical-resistant steel-toed boots, boot covers, inner and outer gloves.

D – Work clothes, hard hat (optional), work boots/shoes, gloves (as needed).

The different levels are primarily dependent upon the degree of respiratory protection necessary, in conjunction with appropriate protective clothing. Levels of protection mandate a degree of respiratory protection. However, flexibility exists within the lower levels (B, C, and D) concerning proper protective clothing.

The four levels of protection were developed for utilization in situations which involve suspected or known atmospheric and/or environmental hazards including airborne contamination and skin-affecting substances.

It is anticipated that all of the on-site work will be performed using Level D protection (no respiratory protection with protective clothing requirements limited to long sleeved shirts, long pants or coveralls, work gloves and steel-toe leather work boots).

Level D may be modified by the HSC to include protective clothing or equipment (Saran-coated disposable coveralls or PVC splash suits, safety glasses, hard hat with face shield, and chemically resistant boots) based upon physical hazards, skin contact concerns, and real-time monitoring.

Real-time air monitoring for total airborne organics using either an photoionization detector(PID) or a flame ionization detector (FID) will determine if and when an upgrade from Level D to a higher level of respiratory protection is warranted. Decisions for an upgrade from Level D to higher levels of protection, mitigative actions, and/or suspension of work are the responsibility of the Project Manager and/or the designated on-site Health & Safety Coordinator.

3.3 Air Monitoring

The Health & Safety Coordinator or his properly trained assignee will conduct “Real Time” air monitoring for total organic vapor and total particulates. “Real-time” monitoring refers to the utilization of instrumentation, which yields immediate measurements. The utilization of real time monitoring helps determine immediate or long-term risks to on-site personnel and the general public, the appropriate level of personnel respiratory protection necessary, and actions to mitigate the recognized hazard. Air monitoring will be conducted in accordance with NYSDOH's Community Air Monitoring Program.

3.3.1. Particulate Monitoring

a. Instrumentation

Dust particulates in air will be monitored using a light scattering technique MINIRAM Model PDM-3 Miniature Real-time Aerosol Monitor (MINIRAM) or equivalent. The MINIRAM is capable of measuring airborne dust particles within the range of 10 to 100,000 micrograms per cubic meter ($\mu\text{g}/\text{m}^3$).

b. Application

Dust monitoring will occur at regular intervals of excavation work activities. Monitoring will be conducted in upgradient and downgradient locations, relative to prevailing wind direction along the perimeter of the work zone. The HSC or his designee will perform monitoring. As outlined in the NYSDOH Community Air Monitoring Plan, if particulate levels in the downwind location are $150 \text{ mg}/\text{m}^3$ greater than those measured in the upwind location, dust suppression techniques shall be employed.

3.3.2 Organic Vapor

a. Instrumentation

Real-time monitoring for total organic vapor (TOV) utilizes either a photoionization detector (PID) or flame ionization detector (FID). The appropriate PID is an intrinsically safe HNU Systems Model PI-101 photoionization detector (HNU) or MiniRAE™ photoionization detector or equivalent, which is factory calibrated to benzene. The appropriate FID is a Foxboro model 128 Organic Vapor Analyzer (OVA) or equivalent, which is factory calibrated to methane.

b. Application

Organic vapor monitoring is performed as outlined in the NYSDOH Community Air Monitoring Plan. Specifically, monitoring shall be conducted at the downwind perimeter of the work zone periodically during work activities. If TOV levels exceed 5 parts per million (ppm) above established pre-work background levels, work activities will be halted and monitoring will be continued under the provision of a Vapor Emission Response Plan (as outlined in the Community Air Monitoring Plan).

3.4 Worker Training

Personnel overseeing the remedial activities will be trained, fit-tested, and medically certified (OSHA 29 CFR 1910.134). This includes the Health & Safety Coordinator or his/her properly trained assignee.

Prior to any work, all workers involved with the project should be aware of the potential chemical, physical and biological hazards discussed in this document, as well as the general safety

practices outlined below. A safety briefing by the on-site HSC and/or assistant designee shall take place at the outset of work activities.

The HSC will be available to address project-related health and safety issues a site worker (such as an equipment operator or laborer) may have regarding the site conditions. Once an issue is brought to the HSC's attention, he or she will evaluate the issue and apply the procedures outlined in this Health & Safety Plan.

3.5 General Safety Practices

All project personnel shall follow the following safety practices:

1. Avoid unnecessary skin exposure to subsurface materials. Long-sleeved shirts tucked into long pants (or coveralls), work gloves, and steel-toe leather work boots are required unless modified gear is approved by the HSC. Remove any excess residual soil from clothes prior to leaving the site.
2. No eating, drinking, gum or tobacco chewing, or smoking allowed in designated work areas. Thoroughly wash hands prior to these activities outside the work area. Avoid sitting on the ground during breaks or while eating and drinking. Thoroughly wash all exposed body areas at the end of the workday.
3. Some symptoms of acute exposure include: nausea, dizziness, light-headedness, impaired coordination, headache, blurred vision, and nose/throat/eye irritation. If these symptoms are experienced or strong odor is detected, leave the work area and immediately report the incident to the on-site HSC.

3.6 Enforcement

Enforcement of the Site Safety Plan will be the responsibility of the HSC. The Coordinator should be on-site on a full-time basis and perform or directly oversee all aspects of Project Health & Safety operations including: air monitoring; environmental mitigation; personnel respiratory and skin protection; general safety practices; documentation; emergency procedures and protocol; and reporting and recordkeeping as described below.

3.7 Reporting and Recordkeeping

Incidents involving injury, symptoms of exposure, discovery of contained (potentially hazardous) materials, or unsafe work practices and/or conditions should be immediately reported to the HSC.

A log book must be maintained on-site to document all aspects of HASP enforcement. The log is paginated and dated with entries made on a daily basis in waterproof ink, initialed by the HSC or designee. Log entries should include date and time of instrument monitoring, instrument type, measurement method, test results, calibration and maintenance information, as well as appropriate mitigative actions responding to detections. Miscellaneous information to be logged may include weather conditions, reported complaints or symptoms, regulatory inspections, and reasons to upgrade personnel protection above the normal specification (Level D).

4.0 EMERGENCIES

4.1 EMERGENCY RESPONSE SERVICES

- | | | |
|-----|---|-----------------------|
| (1) | HOSPITAL
Lincoln Medical and Mental Health Center
234 East 149th Street
Bronx, New York 10451
(See Figure 1 for Map Route) | (718) 579-5000 |
| (2) | AMBULANCE | 911 |
| (3) | FIRE DEPARTMENT
HAZARDOUS MATERIAL | 911 |
| (4) | POLICE DEPARTMENT | 911 |
| (5) | POISON CONTROL CENTER | (800) 222-1222 |

The preceding list and associated attached map (Figure 1) illustrating the fastest route to the nearest hospital must be conspicuously posted in areas of worker congregation and adjacent to all on-site telephones (if any).

4.2 EMERGENCY PROCEDURES

4.2.1 Contact or Exposure to Suspected Hazardous Materials

In the event of a fire, chemical discharge, or medical emergency, workers are instructed to immediately notify the HSC and proper emergency services (posted). Should physical contact with unknown or questionable materials occur, immediately wash the affected body areas with clean water and notify the HSC. Anyone experiencing symptoms of exposure should exit the work area, notify the HSC, and seek medical attention.

4.2.2 Personnel Decontamination, First Aid, and Fire Protection

The first step in the treatment of skin exposure to most chemicals is to rinse the affected area with water. For this reason, adequate amounts of potable water and soap are maintained on-site in a clearly designated and readily-accessible location. Portable emergency eyewash stations and a first aid kit must be made available and maintained in the same locations as the potable water. Fire extinguishers are also to be maintained on-site in designated locations. All on-site personnel are to be made aware of the locations of the above-mentioned on-site Health & Safety accommodations during the initial Health and Safety briefing.

4.2.3 Ingress/egress

Clear paths of ingress/egress to work zones and site entrances/exits must be maintained at all times. Unauthorized personnel are restricted from accessing the site.

5.0 COMMUNITY AIR MONITORING PLAN

Real-time air monitoring for volatile compounds and particulate levels at the perimeter of the work area is necessary. This plan includes the following:

- Volatile organic compounds must be monitored at the downwind perimeter of the work area on a continuous basis. If total organic vapor levels exceed 5 ppm above background, work activities must be halted and monitoring continued under the provisions of a Vapor Emission Response Plan. All readings must be recorded and be available for State (NYSDEC and NYSDOH) personnel to review.
- Particulates should be continuously monitored upwind, downwind and within the work area at temporary particulate monitoring stations during excavation activities. If the downwind particulate level is 150 $\mu\text{g}/\text{m}^3$ greater than the upwind particulate level, then dust suppression techniques must be employed. All readings must be recorded and be available for State (NYSDEC and NYSDOH) personnel to review.

5.1 Vapor Emission Response Plan

If the ambient air concentration of organic vapors exceeds 5 ppm above background at the perimeter of the work area, activities will be halted and monitoring continued. If the organic vapor level decreases below 5 ppm above background, work activities can resume. If the organic vapor levels are greater than 5 ppm over background but less than 25 ppm over background at the perimeter of the work area, activities can resume provided:

- The organic vapor level 200 feet downwind of the work area or half the distance to the nearest residential or commercial structure, whichever is less, is below 5 ppm over background.

If the organic vapor level is above 25 ppm at the perimeter of the work area, activities must be shut down. When work shutdown occurs, downwind air monitoring as directed by the Safety Officer will be implemented to ensure that vapor emission does not impact the nearest residential or commercial structure at levels exceeding those specified in the Major Vapor Emission section.

5.2 Major Vapor Emission

If any organic levels greater than 5 ppm over background are identified 200 feet downwind from the work area or half the distance to the nearest residential or commercial property, whichever is less, all work activities must be halted.

If, following the cessation of the work activities, or as the result of an emergency, organic levels persist above 5 ppm above background 200 feet downwind or half the distance to the nearest residential or commercial property from the work area, then the air quality must be monitored within 20 feet of the perimeter of the nearest residential or commercial structure (20 Foot Zone).

If efforts to abate the emission source are unsuccessful and, if organic vapor levels are approaching 5 ppm above background for more than 30 minutes in the 20 Foot Zone, then the Major Vapor Emission Response Plan shall automatically be placed into effect.

However, the Major Vapor Emission Response Plan shall be immediately placed into effect if organic vapor levels are greater than 10 ppm above background.

5.3 Major Vapor Emission Response Plan

Upon activation of the plan, the following activities will be undertaken:

1. All Emergency Response Contacts as listed in the Health and Safety Plan of the Remedial Action Plan will go into effect.
2. The local police authorities will immediately be contacted by the Safety Officer and advised of the situation.
3. Frequent air monitoring will be conducted at 30 minutes intervals within the 20 Foot Zone. If two successive readings below action levels are measured, air monitoring may be halted or modified by the Safety Officer.

6.0 HEALTH AND SAFETY PLAN REFERENCES

1. American Conference Governmental Industrial Hygienists, 1989; Threshold Limit Values And Biological Exposure Indices, 111 Pp.
2. Geoenvironmental Consultants, Inc., 1987; Safety & Operations At Hazardous Materials Sites
3. NIOSH Guide To Chemical Hazards, 1985; US Department Of Health And Human Services, Centers For Disease Control
4. US Department Of Labor Occupational Safety & Health Administration, 1989; Hazardous Waste Operations And Emergency Response Interim Final Rule, 29 CFR Part 1910
5. Sax, N. I., Dangerous Properties Of Industrial Materials; © 1984

7.0 KEY PERSONNEL

<u>Responsibility</u>	<u>Name and Phone Number</u>	<u>Task Description</u>
Project Manager	<u>Deborah Shapiro (516) 576-8844</u>	Oversee and coordinate all technical aspects for the project
Site Safety Officer	<u>Michael Yager (516) 576-8844</u>	Coordinate and inspect all health and safety operations from the project Site

Project Manager Alternate: Stephen Malinowski (516) 576-8844

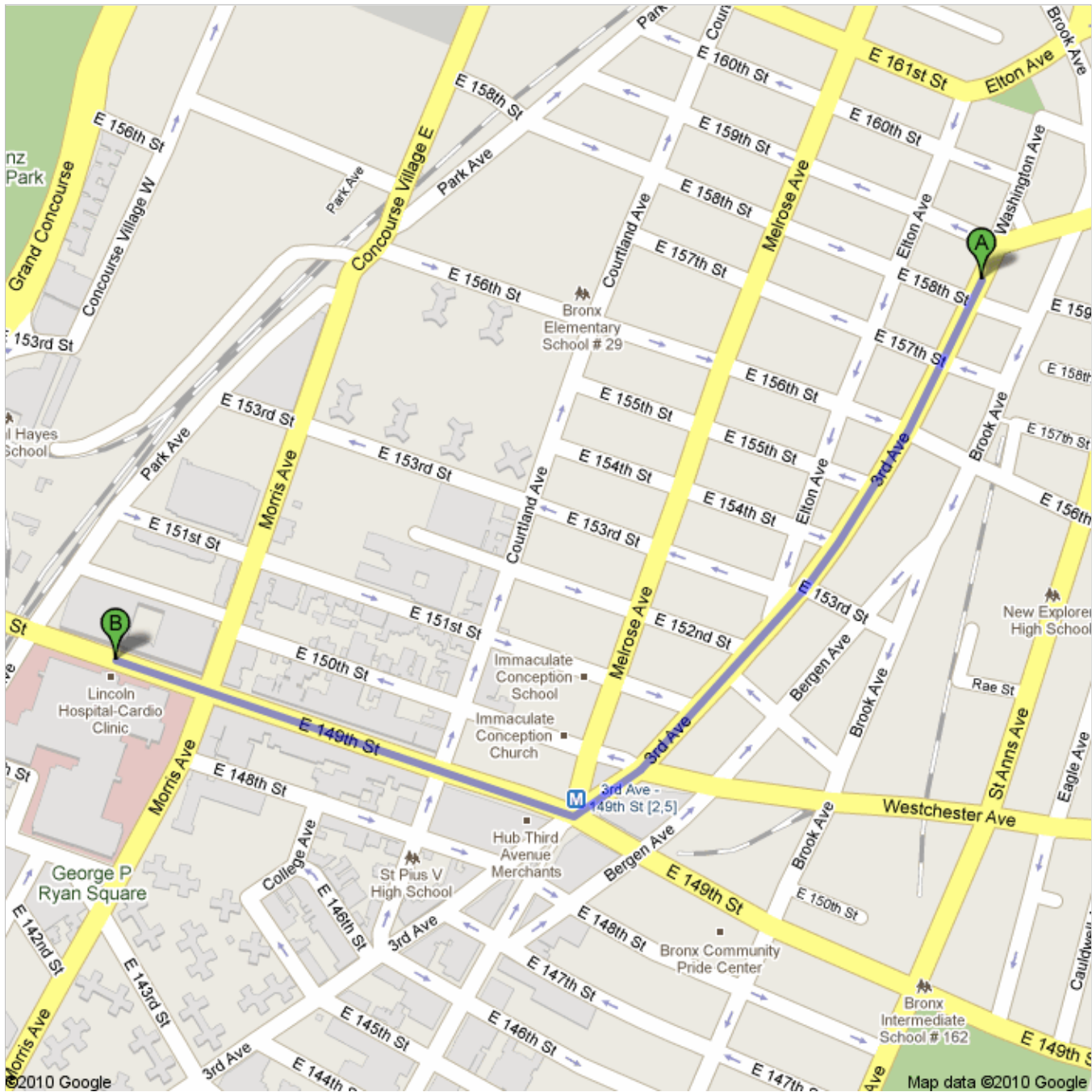
Site Safety Officer Alternate: Victoria Whelan (516) 576-8844

Client Representative: Debbie Kenyon (914) 833-3000

FIGURE



Directions to 234 E 149th St, Bronx, NY 10451
0.8 mi – about 2 mins



APPENDIX A

Physical Properties and Toxicological Information



Material Safety Data Sheet

Material Name: **Benzene**

MSDS ID: NOVA-0011

Section 1 - Product and Company Identification

Synonyms: Benzene, benzol

Chemical Name: Benzene

Chemical Family: Aromatic hydrocarbons

Material Use: Petrochemical Industry: Solvent, raw material for petrochemicals

Chemical Formula: (C₆H₆)

NOVA Chemicals

P.O. Box 2518, Station M

Calgary, Alberta, Canada T2P 5C6

Product Information: 1-412-490-4083

MSDS Information Email:

msdsemall@novachem.com

EMERGENCY Telephone Numbers:

North America (Canada and US):

1-800-561-8682, 1-403-314-8767 (NOVA Chemicals) (24 hours)

1-800-424-9300 (CHEMTREC-USA) (24 hours)

1-613-996-6666 (Canutec-Canada) (24 hours)

Mexico and South America: +44 208 762 8322 (NCEC) (24 hours)

Section 2 - Hazards Identification

HMIS Ratings: Health: 2* Fire: 3 Physical Hazard: 0 Personal Protection: chemical goggles, gloves, respirator, coveralls

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe * = Chronic hazard

NFPA Ratings: Health: 2 Fire: 3 Reactivity: 0

Hazard Scale: 0 = Minimal 1 = Slight 2 = Moderate 3 = Serious 4 = Severe

Emergency Overview

DANGER! TOXIC! FLAMMABLE! CANCER HAZARD! Product is a clear liquid at room temperature with a sweet, solvent-like odor. Vapor is heavier than air and may spread long distances. Distant ignition and flashback are possible. Flammable liquid and vapor can accumulate static charge. Product will float on water and may travel to distant locations and/or spread fire. This product is considered harmful by inhalation, by skin contact, and if it is swallowed. This product is irritating to the eyes and skin. Excessive inhalation may result in heartbeat irregularities and adverse central nervous system effects including headache, sleepiness, dizziness, nausea, loss of coordination, tremors, and in extreme conditions, coma and death. Systemic absorption effects may include long-term damage to the blood-forming system, kidney and liver damage, and/or cancer (leukemia). Ingestion may also cause adverse central nervous system effects, blood disorders, kidney and/or liver damage. Small amounts, if aspirated into the lungs, may cause mild to severe pulmonary injury.

Potential Health Effects: Eye

Contact with liquid and high concentrations of this product's vapors are irritating to the eyes.

Potential Health Effects: Skin

Product may be rapidly absorbed through the skin. Prolonged and/or repeated skin contact may cause mild to severe irritation/dermatitis and chemical blistering. Prolonged contact may also cause skin sensitization and secondary skin infections.

Potential Health Effects: Ingestion

This product may be harmful if swallowed. Ingestion of this product may result in adverse central nervous system effects including headache, sleepiness, dizziness, nausea, loss of coordination, and in extreme conditions coma and/or death. Ingestion may also cause kidney and liver damage and blood disorders. Small amounts of this product, if aspirated into the lungs, may cause mild to severe pulmonary injury.

Potential Health Effects: Inhalation

This product may be harmful if inhaled. Excessive inhalation may result in heartbeat irregularities and adverse central nervous system effects including headache, sleepiness, dizziness, nausea, loss of coordination, and in extreme conditions, coma and death. Additional adverse inhalation effects may also include long-term damage to blood-forming system, kidney and liver damage, and/or cancer (leukemia). Small amounts of this product, if aspirated into the lungs, may cause mild to severe pulmonary injury.

Material Safety Data Sheet

Material Name: **Benzene**

MSDS ID: NOVA-0011

Section 3 - Composition/Information on Ingredients

CAS #	Component	Percent by Wt.
71-43-2	Benzene	99.87-99.99
Not Available	Other hydrocarbons	0.01-0.10
Not Available	Other hydrocarbons	0.10-0.13

Additional Information

* May include cyclohexane (CAS # 110-82-7), cyclohexene (CAS # 110-83-8) and/or toluene (CAS # 108-88-3) as impurities.

The actual components and weight % concentrations vary based on operating conditions.

This product is considered hazardous under 29 CFR 1910.1200 (Hazard Communication).

This material is a controlled product under Canadian WHMIS regulations.

This material is regulated as a hazardous material / dangerous goods for transportation.

See Section 8 for applicable exposure limits. See Section 11 for applicable toxicity data.

Section 4 - First Aid Measures

First Aid: Eyes

Remove contact lenses, if it can be done safely. Immediately flush eyes with water for at least 15 minutes, while holding eyelids open. Seek medical if symptoms develop or persist.

First Aid: Skin

Remove contaminated clothing and shoes. Wash immediately with soap and water. Seek medical attention if symptoms develop or persist. Completely decontaminate clothing, shoes and other protective equipment before reuse or discard.

First Aid: Inhalation

Move affected individual to non-contaminated air. Loosen tight clothing such as a collar, tie, belt or waistband to facilitate breathing. Seek immediate medical attention if the individual is not breathing, is unconscious or if any other symptoms persist. WARNING: Contact through mouth-to-mouth resuscitation may pose a secondary risk to the rescuer. Avoid mouth-to-mouth contact by using a mouth shield or guard to perform artificial respiration.

First Aid: Ingestion

DO NOT INDUCE VOMITING. Loosen tight clothing such as a collar, tie, belt or waistband. Seek immediate medical attention.

First Aid: Notes to Physician

For more detailed medical emergency support information call 1-800-561-6682 or 1-403-314-8767 (24 hours, NOVA Chemicals Emergency Response). Ensure thorough eye and skin decontamination. Treat unconsciousness, nausea, hypotension, seizures and cardiac arrhythmias in the conventional manner. Aspiration of this product during induced emesis can result in lung injury. If evacuation of stomach contents is considered necessary use the method least likely to cause aspiration, such as gastric lavage after protecting the airway. Observe hospitalized patients for delayed chemical pneumonia, acute tubular necrosis, encephalopathy and dysrhythmias. Monitor for urinary phenol within 72 hours of acute exposure.

Section 5 - Fire Fighting Measures

See Section 9: Physical Properties for flammability limits, flash point and auto-ignition information.

General Fire Hazards

Fire and container explosion hazards are serious when this product is exposed to heat or flame. Vapors are heavier than air and may travel along the ground to some distant source of ignition and flash back. Consider need for immediate emergency isolation and evacuation for at least 300 meters (984 feet). If tank is involved in a fire, ISOLATE for 800 meters (1/2 miles) in all directions.

Explosion Hazards

Vapors may form explosive mixture with air. Keep containers away from source of heat or fire. Containers may explode when involved in a fire. Evacuate personnel to a distance of at least 0.8 to 1.6 kilometers (1/2 mile) if a fire or rail car, tank car, or major vessel rupture is possible.

Material Safety Data Sheet

Material Name: **Benzene**

MSDS ID: NOVA-0011

Hazardous Combustion Products

Upon combustion, this product emits carbon monoxide, carbon dioxide, and/or low molecular weight hydrocarbons.

Extinguishing Media

Dry chemical, foam, carbon dioxide, and water spray or fog. Use water to cool fire-exposed containers and to protect personnel. Water may be an ineffective extinguishing medium. Use of an inert foam extinguishing material may also assist in short term flammable vapor suppression. Monitor water run-off for flammability, and prevent entry into ditches, sewers, drains and, waterways, or other confined or underground spaces.

Fire Fighting Equipment/Instructions

Reference 2004 Emergency Response Guidebook, Guide # 130. Position upwind. Keep unnecessary personnel away. Move containers from fire area if you can do so without risk. Fight fire from maximum distance or use unmanned holders or monitor nozzles. Immediately withdraw in case of fire and container venting or heat discoloration of a container. Fire fighters should wear full-face, self-contained breathing apparatus and thermal protective clothing. Avoid inhaling any smoke and combustion materials. Remove and clean or destroy any contaminated clothing. Cool containers with flooding quantities of water until well after the fire is out. Control runoff waters to prevent entry into ditches, sewers, drains, underground or confined spaces and waterways.

Section 6 - Accidental Release Measures

Evacuation Procedures

Isolate area. Keep unnecessary personnel away. Alert stand-by emergency and fire fighting personnel. Monitor surrounding area for build-up of flammable concentrations in air.

Small Spills

Eliminate ignition sources. Spill or leak area should be isolated immediately for 25 to 50 meters (82 to 164 feet) in all directions. Keep upwind and out of low areas. Stop discharge if safe to do so. Contain discharge by booming on water or diking on ground. Spills on water will volatilize rapidly, making containment or recovery difficult. Remove liquid material with non-sparking approved pumps, skimmers or vacuum equipment. Absorb/adsorb residual materials and clean up with non-sparking tools. Prevent entry into ditches, sewers, drains, underground or confined spaces, water intakes and waterways. Shovel material with non-sparking tools into appropriate container for disposal.

Large Spills

Consider downwind evacuation for 300 meters (984 feet). Eliminate ignition sources. Keep upwind and out of low areas. Stop discharge if safe to do so. Contain liquids by booming on water or by diking on land to prevent entry into ditches, sewers, drains or waterways. Spills on water will volatilize rapidly, making containment or recovery difficult. Recover any pooled liquid material with approved, non-sparking pumps, skimmers or vacuum equipment. An inert foam cover material may assist in short term vapor suppression. Absorb with DRY earth, sand or other non-combustible material and clean up with non-sparking tools. Soil remediation may be required.

Special Procedures

Contact local police/emergency services and appropriate emergency telephone numbers provided in Section 1. Ensure that statutory and regulatory reporting requirements in the applicable jurisdiction are met. Wear appropriate protective equipment and clothing during cleanup. Individuals without appropriate protective equipment should be excluded from area of spill until cleanup has been completed.

See Section 8 for recommended Personal Protective Equipment and see Section 13 for waste disposal considerations.

Section 7 - Handling and Storage

Handling Procedures

Keep locked up or secured. Handle in fully grounded, properly designed and approved equipment systems that are suitable for flammable liquids. Use with adequate ventilation. Do not ingest or inhale. Keep away from heat and ignition sources. No smoking or open flames permitted in storage, use, or handling areas. Dissipate static electricity during transfer by grounding and bonding containers and equipment. Avoid draining or venting to atmosphere if possible. Take special precautions when cold cutting or breaking into lines, or when cleaning and disposing of empty containers. Do not breathe product gas, fumes, vapor, or spray. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately. Avoid contact with skin and eyes. Keep away from incompatible materials such as oxidizing agents and acids. After handling,

Material Safety Data Sheet

Material Name: **Benzene**

MSDS ID: NOVA-0011

always wash hands thoroughly with soap and water.

Storage Procedures

Storage area should be clearly identified, well-illuminated, clear of obstruction and accessible only to trained and authorized personnel. Adequate security must be provided so that unauthorized personnel do not have access to material. Store in grounded, properly designed vessels and away from incompatible materials. Store and use away from heat, sparks, open flame, or any other ignition source. Store according to applicable regulations for flammable materials for storage tanks, containers, piping, buildings, rooms, cabinets, allowable quantities and minimum storage distances. Use non-sparking ventilation systems, approved explosion-proof equipment, and intrinsically safe electrical systems. Have appropriate extinguishing capability in storage area (e.g. portable fire extinguishers (dry chemical, foam or carbon dioxide)) and flammable gas detectors. Keep absorbents for leaks and spills readily available. Consider use of internal floating roof tanks or flame arrestors. Inspect vents during winter conditions for vapor ice build-up. Storage tanks should be above ground and diked to hold entire contents. A refrigerated room is generally recommended for warehouse storage of materials with a flash point lower than 37.8°C (100°F).

See Section 8: Exposure Controls/Personal Protection for appropriate Personal Protective Equipment. See Section 10 for information on Incompatibilities.

Section 8 - Exposure Controls / Personal Protection

Exposure Guidelines

A: General Product Information

Refer to published exposure limits - use effective control measures and PPE to maintain worker exposure to concentrations that are below these limits. Ensure that eyewash stations and safety showers are in close proximity to work locations.

B: Component Exposure Limits

ACGIH, OSHA, NIOSH, EPA, Alberta, and Ontario exposure limit lists have been checked for major components listed with CAS registry numbers. Other exposure limits may apply, check with proper authorities.

*Note: The Vacated OSHA Permissible Exposure Limits (PELs) are those provided in the 1989 update to OSHA's Air Contaminants Standard 29 CFR 1910.1000. These limits were vacated by the U.S. Court of Appeals, Eleventh Circuit but may be enforceable in some states.

Benzene (71-43-2)

ACGIH:	0.5 ppm TWA; 1.6 mg/m ³ TWA; 2.5 ppm STEL; 8 mg/m ³ STEL; BEI Skin - potential significant contribution to overall exposure by the cutaneous route
OSHA (Vacated)*:	0.5 ppm Action Level; 1 ppm TWA; 5 ppm STEL (Cancer hazard, Flammable - see 29 CFR 1910.1028)
OSHA Final:	0.5 ppm Action Level; 1 ppm TWA; 5 ppm STEL (Cancer hazard, Flammable - see 29 CFR 1910.1028); 1 ppm TWA; 10 ppm TWA (applies to industry segments exempt from the benzene standard at 29 CFR 1910.1028); 5 ppm STEL (see 29 CFR 1910.1028); 25 ppm Ceiling (applies to industry segments exempt from the 1 ppm TWA and 5 ppm STEL of the benzene standard)
NIOSH:	0.1 ppm TWA; 0.32 mg/m ³ TWA; 1 ppm STEL; 3.2 mg/m ³ STEL 500 ppm IDLH
Alberta:	1 ppm TWA; 3.2 mg/m ³ TWA; 5 ppm STEL; 16 mg/m ³ STEL Substance may be readily absorbed through intact skin
Ontario:	0.5 ppm TWAEV (applies to workplaces to which the designated substance regulation does not apply); 0.5 ppm TWAEV (designated substance regulation) 2.5 ppm STEV (applies to workplaces to which the designated substance regulation does not apply); 2.5 ppm STEV (designated substances regulation)

Material Safety Data Sheet

Material Name: **Benzene**

MSDS ID: NOVA-0011

Cyclohexane (110-82-7)

ACGIH: 100 ppm TWA; 344 mg/m3 TWA
OSHA (Vacated)*: 300 ppm TWA; 1050 mg/m3 TWA
OSHA Final: 300 ppm TWA; 1050 mg/m3 TWA
NIOSH: 300 ppm TWA; 1050 mg/m3 TWA
1300 ppm IDLH
Alberta: 300 ppm TWA; 1030 mg/m3 TWA
Ontario: 100 ppm TWAEV

Cyclohexene (110-83-8)

ACGIH: 300 ppm TWA; 1010 mg/m3 TWA
OSHA (Vacated)*: 300 ppm TWA; 1015 mg/m3 TWA
OSHA Final: 300 ppm TWA; 1015 mg/m3 TWA
NIOSH: 300 ppm TWA; 1015 mg/m3 TWA
2000 ppm IDLH
Alberta: 300 ppm TWA; 1010 mg/m3 TWA
Ontario: 300 ppm TWAEV; 1010 mg/m3 TWAEV

Toluene (108-88-3)

ACGIH: 20 ppm TWA; 75 mg/m3 TWA; BEI
OSHA (Vacated)*: 100 ppm TWA; 375 mg/m3 TWA; 150 ppm STEL; 560 mg/m3 STEL
OSHA Final: 200 ppm TWA; 300 ppm Ceiling
NIOSH: 100 ppm TWA; 375 mg/m3 TWA; 150 ppm STEL; 560 mg/m3 STEL
500 ppm IDLH
Alberta: 60 ppm TWA; 188 mg/m3 TWA
Substance may be readily absorbed through intact skin
Ontario: 20 ppm TWAEV (also known as methylbenzene)

ENGINEERING CONTROLS

Engineering methods to reduce hazardous exposure are preferred controls. Methods include mechanical ventilation (dilution and local exhaust) process or personal enclosure, remote and automated operation, control of process conditions, leak detection and repair systems, and other process modifications. Ensure all exhaust ventilation systems are discharged to outdoors, away from air intakes and ignition sources. Supply sufficient replacement air to make up for air removed by exhaust systems. Administrative (procedure) controls and use of personal protective equipment may also be required.

PERSONAL PROTECTIVE EQUIPMENT

Personal Protective Equipment: Eyes/Face

Wear safety glasses; chemical goggles are recommended to prevent eye irritation or injury from splashing or vapors.

Personal Protective Equipment: Skin/Hands/Feet

Use chemically resistant gloves when handling product. Wear chemical-resistant safety footwear with good traction to prevent slipping. Work clothing that sufficiently prevents skin contact should be worn, such as coveralls and/or long sleeves and pants. If splashing or contact with liquid material is possible, consider the need for an impervious overcoat. Fire resistant (i.e., Nomex) or natural fiber clothing (i.e., cotton or wool) is recommended. Synthetic clothing can generate static electricity and is not recommended where a flammable vapor release may occur.

Personal Protective Equipment: Respiratory

If engineering controls and ventilation is not sufficient to control exposure to below the allowable limits then an appropriate NIOSH/MSHA approved air-purifying respirator or self-contained breathing apparatus (SCBA) should be used. Supplied air breathing apparatus must be used when oxygen concentrations are low or if airborne concentrations exceed the limits of the air-purifying respirators.

Personal Protective Equipment: General

Personal protective equipment (PPE) should not be considered a long-term solution to exposure control. Employer programs to properly select, fit, maintain, and train employees to use equipment must accompany PPE. Consult a competent industrial hygiene resource, the PPE manufacturer's recommendation, and/or applicable regulations to determine hazard potential and ensure adequate protection.

Material Safety Data Sheet

Material Name: **Benzene**

MSDS ID: NOVA-0011

Section 9 - Physical & Chemical Properties

Physical State and Appearance:	Liquid	Color:	Colorless
Odor:	Sweet, solvent-like	Odor Threshold:	Detectable at 2-5 ppm, but not reliable as warning
pH:	Not applicable	Vapor Pressure:	75 mm Hg at 20°C (68°F)
Vapor Density @ 0°C (Air=1):	2.8	Dispersion Properties:	Is not dispersed in cold or hot water.
Boiling Point:	80°C (176°F)	Melting Point:	5.5°C (41.9°F)
Solubility (H2O):	Slightly soluble (0.1- 0.3%), rapidly volatilizes	Specific Gravity (Water=1):	0.88 at 15°C (59°F)
Ionicity (In water):	Not applicable	Evaporation Rate (n-Butyl Acetate=1):	Not available
Octanol/H2O Coeff.:	Kow = 2.13	Percent Volatile:	100%
Auto Ignition:	498°C (928°F) (benzene)	Flash Point:	-11°C (12°F) (benzene)
Flash Point Method:	Closed cup	Upper Flammable Limit (UFL):	7.8% (volume/volume) (benzene)
Lower Flammable Limit (LFL):	1.2 % (volume/volume) (benzene)	Flammability Classification:	Flammable

Section 10 - Stability & Reactivity Information

Chemical Stability

This product is stable under normal use conditions for shock, vibration, pressure, or temperature.

Chemical Stability: Conditions to Avoid

Keep away from heat, sparks, or open flame.

Incompatibility

Reactive with oxidizing agents, acids and halogens. May attack some forms of plastics, rubbers and coatings.

Vapors may form explosive mixture with air.

Hazardous Polymerization

Not likely to occur.

Corrosivity

Not considered to be corrosive.

Hazardous Decomposition

Upon decomposition, this product emits carbon monoxide, carbon dioxide and/or low molecular weight hydrocarbons.

Section 11 - Toxicological Information

A: Acute Toxicity - General Product Information

Benzene may cause corneal injury to the eye. It is also a skin irritant that may be absorbed through the skin in harmful amounts. Inhalation of benzene can irritate the respiratory tract and may result in central nervous system (CNS) depression and possible death due to respiratory failure. Ingestion and subsequent aspiration into the lungs may cause chemical pneumonitis.

B: Component Analysis - LD50/LC50

Benzene (71-43-2)

Inhalation LC50 Rat: 13,050-14,380 ppm/4H; Oral LD50 Rat: 1800 mg/kg

Cyclohexane (110-82-7)

Inhalation LC50 Rat: 13.9 mg/L/4H; Oral LD50 Rat: >5000 mg/kg; Dermal LD50 Rabbit: >2000 mg/kg

Cyclohexene (110-83-8)

Oral LD50 Rat: 2400 µL/kg

Toluene (108-88-3)

Inhalation LC50 Rat: 12.5 mg/L/4H; Inhalation LC50 Rat: >26,700 ppm/1H; Oral LD50 Rat: 636 mg/kg; Dermal LD50 Rabbit: 8390 mg/kg; Dermal LD50 Rat: 12,124 mg/kg

Material Safety Data Sheet

Material Name: **Benzene**

MSDS ID: NOVA-0011

C: Chronic Toxicity - General Product Information

Prolonged and/or repeated exposure can cause drying and scaling of the skin. Long-term exposure has been associated with certain types of leukemia in humans. IARC and OSHA consider benzene to be a human carcinogen. EPA has classified benzene as a Group A, known human carcinogen. Chronic exposure to benzene has been reported to cause bone marrow abnormalities and adverse blood effects including anemia. Progressive deterioration of hematopoietic function expressed as a decrease in absolute lymphocyte count is the most sensitive indicator of benzene exposure. Benzene may cause fetotoxicity and teratogenicity. Chromosomal aberrations have been noted in animal tests.

D: Chronic Toxicity - Carcinogenic Effects

ACGIH, EPA, IARC, OSHA, and NTP carcinogen lists have been checked for selected similar materials or those components with CAS registry numbers.

Benzene (71-43-2)

ACGIH: A1 - Confirmed Human Carcinogen

OSHA: 0.5 ppm Action Level; 1 ppm TWA; 5 ppm STEL (Cancer hazard, Flammable - see 29 CFR 1910.1028)

EPA: Classification: known human carcinogen for all routes of exposure

NTP: Known Human Carcinogen (Select Carcinogen)

IARC: Supplement 7 [1987], Monograph 29 [1982] (Group 1 (carcinogenic to humans))

Toluene (108-88-3)

ACGIH: A4 - Not Classifiable as a Human Carcinogen

EPA: Classification: under the Guidelines for Carcinogen Risk Assessment (U.S. EPA, 2005), there is inadequate information to assess the carcinogenic potential of toluene.

IARC: Monograph 71 [1999], Monograph 47 [1989] (Group 3 (not classifiable))

E: Special Remarks on Chronic Effects

Benzene may pose a cancer hazard and may cause adverse birth and reproductive effects. Bone marrow abnormalities, leukemia, multiple myelomas, fetotoxicity, teratogenicity (ex. encephaly, angulated ribs and dilated brain ventricles) have been linked to benzene exposure.

Section 12 - Ecological Information

Ecotoxicity

A: General Product Information

Product is largely insoluble in water, and evaporates rapidly. Product has moderate absorption into soil and sediment. It is considered toxic to fish.

B: Component Analysis - Ecotoxicity - Aquatic Toxicity

Benzene (71-43-2)

Test & Species		Conditions
96 Hr LC50 <i>Pimephales promelas</i>	12.6 mg/L	flow-through
96 Hr LC50 <i>Oncorhynchus mykiss</i>	5.3 mg/L	flow-through
96 Hr LC50 <i>Lepomis macrochirus</i>	22 mg/L	static
96 Hr LC50 <i>Poecilia reticulata</i>	28.6 mg/L	static
72 Hr EC50 <i>Selenastrum capricornutum</i>	29 mg/L	
48 Hr EC50 water flea	356 mg/L	static
48 Hr EC50 <i>Daphnia magna</i>	10 mg/L	

Cyclohexane (110-82-7)

Test & Species		Conditions
96 Hr LC50 <i>Pimephales promelas</i>	4.53 mg/L	flow-through
96 Hr LC50 <i>Lepomis macrochirus</i>	34.72 mg/L	
96 Hr LC50 <i>Poecilia reticulata</i>	48.0 mg/L	
72 Hr EC50 <i>Scenedesmus subspicatus</i>	>500 mg/L	
5 min EC50 <i>Photobacterium phosphoreum</i>	85.5 mg/L	
10 min EC50 <i>Photobacterium phosphoreum</i>	93 mg/L	
48 Hr EC50 water flea	400.0 mg/L	

Material Safety Data Sheet

Material Name: **Benzene**

MSDS ID: NOVA-0011

Toluene (108-88-3)		Conditions
Test & Species		
96 Hr LC50 <i>Pimephales promelas</i>	25 mg/L	1 day old
96 Hr LC50 <i>Oncorhynchus mykiss</i>	24.0 mg/L	flow-through
96 Hr LC50 <i>Lepomis macrochirus</i>	24.0 mg/L	static
96 Hr LC50 <i>Lepomis macrochirus</i>	13 mg/L	static
96 Hr EC50 <i>Selenastrum capricornutum</i>	>433 mg/L	
30 min EC50 <i>Photobacterium phosphoreum</i>	19.7 mg/L	
48 Hr EC50 water flea	11.3 mg/L	
48 Hr EC50 water flea	310 mg/L	
48 Hr EC50 <i>Daphnia magna</i>	11.3 mg/L	

Environmental Fate/Mobility

When released to soil or water, product will rapidly begin to volatilize. At 20°C (68°F) and moderate wind speeds, the evaporation rate for benzene is calculated to be over 2 g per m² per sec. At 0°C (32°F) and moderate wind speeds, the evaporation rate is calculated to drop to below 0.1 g per m² per sec. And at a warmer temperature of 30°C, the evaporation rate increases to over 3 g per m² per sec. Benzene migrates in soils and in ground waters. Its airborne levels of benzene can be reduced by rain or water spray.

Persistence/Degradability

Benzene in air will photo-degrade with a calculated half-life of 13.4 days. This is accelerated in polluted atmospheres containing nitrogen or sulfur oxides. By-products include phenol, nitrophenols, nitrobenzene, formic acid and peroxyacetyl nitrate. Benzene will biodegrade in soils and ground waters (half-life 16-28 days) under aerobic conditions. Limited degradation occurs under anaerobic conditions. Sewage treatment plants have been shown to remove 44-100%.

Bioaccumulation/Accumulation

Benzene has a reported K_{ow} = 2.13. Metabolites may partially bioaccumulate in fatty fish tissues liver and brain.

Ecological Summary

The high volatility and water solubility of benzene suggests that readily available benzene will partition to the atmosphere from the surface of water and soil within seven days. Estimated volatilization half-life of benzene for soil was 7.2 to 38.4 days (Jury, WA et al., 1984). Benzene that does not evaporate will be highly to very highly mobile in the soil and may leach down into the ground water. Benzene may be subject to biodegradation based on reported biodegradation of 24% and 47% of the initial 20 ppm benzene in a base-rich, para-brownish soil within 1 to 10 weeks. Half-life of volatilization from a model river 1m deep, was 2.7 hours at 20°C (68°F). In the atmosphere, benzene will exist predominantly in the vapor phase. It will react with oxygen photochemically to produce hydroxyl radicals with a half-life of 13.4 days. Products of photo-oxidation include phenol, nitrophenols, nitrobenzene, formic acid and peroxyacetyl nitrate. Based on the reported and estimated BCF, benzene is not expected to bioconcentrate in aquatic organisms.

Section 13 - Disposal Considerations

U.S./Canadian Waste Number & Descriptions

A: General Product Information

This product is known to be a hazardous waste according to US RCRA and Canadian regulations. The use, mixing or processing of this product may alter this product. Contact federal, provincial/state and local authorities in order to generate or ship a waste material associated with this product to ensure materials are handled appropriately and meet all criteria for disposal of hazardous waste. **DO NOT ATTEMPT TO DISPOSE OF BY UNCONTROLLED IGNITION.** Since emptied containers retain product/material residue, follow safe handling/label warnings even after container is emptied.

See Section 7: Handling and Storage and Section 8: Exposure Controls/Personal Protection for additional handling information that may be applicable for safe handling and the protection of employees.

Waste generator is advised to carefully consider hazardous properties and control measures needed for other materials that may be found in the waste.

Material Safety Data Sheet

Material Name: **Benzene**

MSDS ID: NOVA-0011

B: Component Waste Numbers

Benzene (71-43-2)

RCRA: waste number U019 (Ignitable waste, Toxic waste); 0.5 mg/L regulatory level

Cyclohexane (110-82-7)

RCRA: waste number U056 (Ignitable waste)

Toluene (108-88-3)

RCRA: waste number U220

Section 14 - Transportation Information

US DOT Information

Shipping Name: Benzene

UN/NA #: UN1114 Hazard Class: 3 Packing Group: II

Required Label(s): FLAMMABLE LIQUID

Additional Info.: NOTE: The Reportable Quantity for benzene is 10 lbs. (4.54). The Reportable quantity for toluene is 1000 lbs. (454kg).

2004 Emergency Response Guidebook: Guide No. 130.

Canadian TDG Information

Shipping Name: Benzene

UN#: UN1114 Hazard Class: 3 Packing Group: II

Required Label(s): FLAMMABLE LIQUID

Additional Info.: 2004 Emergency Response Guidebook, Guide No. 130.

International Air Transport Association (IATA) Regulations

Shipping Name: Benzene

UN# 1114 Hazard Class: 3 Packing Group: II

Required Label(s): FLAMMABLE LIQUID

International Maritime Dangerous Goods (IMDG) Code

Shipping Name: Benzene

UN# 1114 Hazard Class: 3 Packing Group: II

Required Label(s): FLAMMABLE LIQUID

Additional Info.: EmS No.: F-E, S-D

Section 15 - Regulatory Information

A: International Regulations

Component Analysis - Inventory

Component	CAS #	US - TSCA	CANADA - DSL	EU - EINECS
Benzene	71-43-2	Yes	Yes	Yes

B: USA Federal & State Regulations

Ongoing occupational hygiene, medical surveillance programs, or site emission or spill reporting may be required by Federal or State regulations. Check for applicable regulations.

USA OSHA Hazard Communication Class

This product is considered hazardous under 29 CFR 1910.1200 (Hazard Communication). HCS Classes:

HCS CLASS: Flammable liquid IB having a flash point lower than 22.8°C (73°F) and having a boiling point at or above 37.8°C (100°F).

HCS CLASS: Highly Toxic

HCS CLASS: HUMAN CARCINOGEN

HCS CLASS: Irritating substance

HCS CLASS: Target organ effects

USA Right-to-Know - Federal

This material contains one or more of the following chemicals required to be identified under SARA Section 302 (40 CFR 355 Appendix A), SARA Section 313 (40 CFR 372.65) and/or CERCLA (40 CFR 302.4).

Material Safety Data Sheet

MSDS ID: NOVA-0011

Material Name: **Benzene**

Benzene (71-43-2)

SARA 313: 0.1 % de minimis concentration

CERCLA: 10 lb final RQ (received an adjusted RQ of 10 lbs based on potential carcinogenicity in an August 14, 1989 final rule); 4.54 kg final RQ (received an adjusted RQ of 10 lbs based on potential carcinogenicity in an August 14, 1989 final rule)

Cyclohexane (110-82-7)

SARA 313: 1.0 % de minimis concentration

CERCLA: 1000 lb final RQ; 454 kg final RQ

Toluene (108-88-3)

SARA 313: 1.0 % de minimis concentration

CERCLA: 1000 lb final RQ; 454 kg final RQ

USA Right-to-Know - State

The following components appear on one or more of the following state hazardous substances lists. Some components (including those present only in trace quantities, and therefore not listed in this document) may be included on the Right-To-Know lists of other U.S. states. The reader is therefore cautioned to contact his or her NOVA Chemicals' representative or NOVA Chemicals' Product Integrity group for further U.S. State Right-To-Know information.

Component	CAS	NJ	PA
Benzene	71-43-2	Yes	Yes
Cyclohexene	110-83-8	Yes	Yes
Toluene	108-88-3	Yes	Yes

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

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

WARNING! This product contains a chemical known to the state of California to cause reproductive/developmental effects.

C: Canadian Regulations - Federal and Provincial

WHMIS Ingredient Disclosure List (IDL)

The following components are identified under the Canadian Hazardous Products Act Ingredient Disclosure List (IDL):

Component	CAS #	Minimum Concentration
Benzene	71-43-2	0.1 %
Cyclohexane	110-82-7	1 %
Cyclohexene	110-83-8	1 %
Toluene	108-88-3	1 %

WHMIS Classification

Workplace Hazardous Materials Information System (WHMIS): This product has been classified in accordance with the hazard criteria of the CPR (Canadian Controlled Products Regulations) and the MSDS contains all of the information required by the CPR.

WHMIS CLASS B2: Flammable liquid with a flash point lower than 37.8°C (100°F).

WHMIS CLASS D2A: Carcinogen (Benzene)

WHMIS CLASS D2B: Toxic

Other Regulations

Ongoing occupational hygiene, medical surveillance programs, or site emission or spill reporting may be required by Federal or Provincial regulations. Check for applicable regulations.

Material Safety Data Sheet

Material Name: **Benzene**

MSDS ID: NOVA-0011

Section 16 - Other Information

Label Information

DANGER! TOXIC! FLAMMABLE! CANCER HAZARD! Product is a clear liquid at room temperature with a sweet, solvent-like odor. Vapor is heavier than air and may spread long distances. Distant ignition and flashback are possible. Flammable liquid and vapor can accumulate static charge. Product will float on water and may travel to distant locations and/or spread fire. This product is considered harmful by inhalation, by skin contact, and if it is swallowed. This product is irritating to the eyes and skin. Excessive inhalation may result in heartbeat irregularities and adverse central nervous system effects including headache, sleepiness, dizziness, nausea, loss of coordination, tremors, and in extreme conditions, coma and death. Systemic absorption effects may include long-term damage to the blood-forming system, kidney and liver damage, and/or cancer (leukemia). Ingestion may also cause adverse central nervous system effects, blood disorders, kidney and/or liver damage. Small amounts, if aspirated into the lungs, may cause mild to severe pulmonary injury.

FIRST AID:

SKIN: Remove contaminated clothing and shoes. Wash immediately with soap and water. Seek medical attention if symptoms develop or persist. Completely decontaminate clothing, shoes and other protective equipment before reuse or discard.

EYES: Remove contact lenses, if it can be done safely. Immediately flush eyes with water for at least 15 minutes, while holding eyelids open. Seek medical if symptoms develop or persist.

INHALATION: Move affected individual to non-contaminated air. Loosen tight clothing such as a collar, tie, belt or waistband to facilitate breathing. Seek immediate medical attention if the individual is not breathing, is unconscious or if any other symptoms persist. **WARNING:** Contact through mouth-to-mouth resuscitation may pose a secondary risk to the rescuer. Avoid mouth-to-mouth contact by using a mouth shield or guard to perform artificial respiration.

INGESTION: DO NOT INDUCE VOMITING. Loosen tight clothing such as a collar, tie, belt or waistband. Seek immediate medical attention.

IN CASE OF A LARGE SPILL: Consider downwind evacuation for 300 meters (984 feet). Eliminate ignition sources. Keep upwind and out of low areas. Stop discharge if safe to do so. Contain liquids by booming on water or by diking on land to prevent entry into ditches, sewers, drains or waterways. Spills on water will volatilize rapidly, making containment or recovery difficult. Recover any pooled liquid material with approved, non-sparking pumps, skimmers or vacuum equipment. An inert foam cover material may assist in short term vapor suppression. Absorb with DRY earth, sand or other non-combustible material and clean up with non-sparking tools. Soil remediation may be required.

References

Available on request.

Special Considerations

For additional information on equipment bonding and grounding, refer to the American Petroleum Institute (API) Recommended Practice 2003, "Protection Against Ignitions Arising out of Static, Lightning, and Stray Currents" or National Fire Protection Association (NFPA) 77, "Recommended Practice on Static Electricity".

Key/Legend

ACGIH = American Conference of Governmental Industrial Hygienists; BLEVE = Boiling Liquid Expanding Vapor Explosion; BOD = Biochemical Oxygen Demand; CAS = Chemical Abstracts Service; CERCLA = Comprehensive Environmental Response, Compensation, and Liability Act; CPR = Controlled Products Regulations; DOT = Department of Transportation; DSL = Domestic Substances List; EINECS = European Inventory of Existing Commercial Substances; EPA = Environmental Protection Agency; EU = European Union; FDA = Food and Drug Administration; IARC = International Agency for Research on Cancer; IDL = Ingredient Disclosure List; Kow = Octanol/water partition coefficient; LEL = Lower Explosive Limit; NIOSH = National Institute for Occupational Safety and Health; NJTSR = New Jersey Trade Secret Registry; NTP = National Toxicology Program; OSHA = Occupational Safety and Health Administration; RCRA = Resource Conservation and Recovery Act; SARA = Superfund Amendments and Reauthorization Act; TDG = Transportation of Dangerous Goods; TSCA = Toxic Substances Control Act.

MSDS Prepared by: NOVA Chemicals

MSDS Information Phone Number: 1-412-490-4063

Other Information

Notice to Reader:

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Material Safety Data Sheet

Material Name: **Benzene**

MSDS ID: NOVA-0011

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This is the end of MSDS # NOVA-0011.

Material Safety Data Sheet Toluene

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

Section 1 - Chemical Product and Company Identification

MSDS Name: Toluene

Synonyms: Methacide; Methylbenzene; Methylbenzol; Phenylmethane; Toluol

Company Identification:

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

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

Section 2 - Composition, Information on Ingredients

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

Hazard Symbols: XN F

Risk Phrases: 11 20

Section 3 - Hazards Identification

Emergency Overview

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

Target Organs: Kidneys, central nervous system, liver.

Potential Health Effects

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

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

Ingestion: Aspiration hazard. May cause irritation of the digestive tract. May cause effects similar to those for inhalation exposure. Aspiration of material into the lungs may cause chemical pneumonitis, which may be fatal.

Inhalation: Inhalation of high concentrations may cause central nervous system effects characterized by nausea, headache, dizziness, unconsciousness and coma. Inhalation of vapor may cause respiratory tract irritation. May cause liver and kidney damage. Vapors may cause dizziness or suffocation. Overexposure may cause dizziness, tremors, restlessness, rapid heart beat, increased blood pressure, hallucinations, acidosis, kidney failure.

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

Section 4 - First Aid Measures

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

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

Ingestion: Do NOT induce vomiting. If victim is conscious and alert, give 2-4 cupfuls of milk or water. Never give anything by mouth to an unconscious person. Possible aspiration hazard. Get medical aid immediately.

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

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

Section 5 - Fire Fighting Measures

General Information: Containers can build up pressure if exposed to heat and/or fire. As in any fire, wear a self-contained breathing apparatus in pressure-demand, MSHA/NIOSH (approved or equivalent), and full protective gear. Water runoff can cause environmental damage. Dike and collect water used to fight fire. Vapors may form an explosive mixture with air. Vapors can travel to a source of ignition and flash back. Flammable Liquid. Can release vapors that form explosive mixtures at temperatures above the flashpoint. Use water spray to keep fire-exposed containers cool. Water may be ineffective. Material is lighter than water and a fire may be spread by the use of water. Vapors may be heavier than air. They can spread along the ground and collect in low or confined areas. Containers may explode when heated.

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

Section 5 -

Fire Fighting Measures

Autoignition Temperature: 422°C (792°F)
Flash Point: 7°C (45°F)
Explosion Limits, lower: 1.2 vol%
Explosion Limits, upper: 7.1 vol%
NFPA Rating: (estimated) Health: 2; Flammability: 3; Instability: 0

Section 6 -

Accidental Release Measures

General Information: Use proper personal protective equipment as indicated in Section 8.
Spills/Leaks: Avoid runoff into storm sewers and ditches which lead to waterways. Remove all sources of ignition. Absorb spill using an absorbent, non-combustible material such as earth, sand, or vermiculite. Do not use combustible materials such as saw dust. A vapor suppressing foam may be used to reduce vapors. Water spray may reduce vapor but may not prevent ignition in closed spaces.

Section 7 -

Handling and Storage

Handling: Wash thoroughly after handling. Use with adequate ventilation. Ground and bond containers when transferring material. Avoid contact with eyes, skin, and clothing. Empty containers retain product residue, (liquid and/or vapor), and can be dangerous. Keep container tightly closed. Avoid contact with heat, sparks and flame. Avoid ingestion and inhalation. Do not pressurize, cut, weld, braze, solder, drill, grind, or expose empty containers to heat, sparks or open flames.
Storage: Keep away from heat, sparks, and flame. Keep away from sources of ignition. Store in a tightly closed container. Store in a cool, dry, well-ventilated area away from incompatible substances.

Section 8 -

Exposure Controls, Personal Protection

Chemical Name	ACGIH	NIOSH	OSHA - Final PELs	OSHA - Vacated PELs
Toluene	50 ppm TWA	100 ppm TWA 375 mg/m3 TWA 500 ppm IDLH	200 ppm TWA C 300 ppm	100 ppm TWA 375 mg/m3 TWA 150 ppm STEL 560 mg/m3 STEL

Engineering Controls: Facilities storing or utilizing this material should be equipped with an eyewash facility and a safety shower. Use adequate general or local exhaust ventilation to keep airborne concentrations below the permissible exposure limits.

Personal Protective Equipment

Eyes: Wear appropriate protective eyeglasses or chemical safety goggles as described by OSHA's eye and face protection regulations in 29 CFR 1910.133 or European Standard EN166.

Skin: Wear appropriate protective gloves to prevent skin exposure.

Clothing: Wear appropriate protective clothing to prevent skin exposure.

Respirators: Follow the OSHA respirator regulations found in 29CFR 1910.134 or European Standard EN 149. Always use a NIOSH or European Standard EN 149 approved respirator when necessary.

Section 9 -

Physical and Chemical Properties

Physical State: Clear liquid
Appearance: Colorless
Odor: Sweet, pleasant
pH: Not available
Vapor Pressure: 36.7 mm Hg @ 30° C
Vapor Density: 3.1
Evaporation Rate: 2.4
Viscosity: 0.59 cP @ 20° C

Boiling Point: 232° F
Freezing/Melting Point: -139° F
Decomposition Temperature: Not available
Solubility: Insoluble
Specific Gravity/Density: 0.9
Molecular Formula: C₆H₅CH₃
Molecular Weight: 92.066

Section 10 -

Stability and Reactivity

Chemical Stability: Stable under normal temperatures and pressures.

Conditions to Avoid: Incompatible materials, ignition sources, excess heat.

Incompatibilities with Other Materials: Nitrogen tetroxide, nitric acid plus sulfuric acid, silver perchlorate, strong oxidizers, sodium difluoride.

Hazardous Decomposition Products: Carbon monoxide, carbon dioxide.

Hazardous Polymerization: Has not been reported.

Section 11 -

Toxicological Information

Carcinogenicity:

CAS# 108-88-3:

ACGIH: A4 - Not Classifiable as a Human Carcinogen

IARC: Group 3 carcinogen

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

Epidemiology: No information available.

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

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

Neurotoxicity: No information available.

Mutagenicity: No information available.

Section 12 -**Ecological Information**

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

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

Physical: Photochemically produced hydroxyl radicals degrade substance.

Other: None.

Section 13 -**Disposal Considerations**

Chemical waste generators must determine whether a discarded chemical is classified as a hazardous waste. US EPA guidelines for the classification determination are listed in 40 CFR Parts 261.3. Additionally, waste generators must consult state and local hazardous waste regulations to ensure complete and accurate classification.

RCRA P-Series: None listed.

RCRA U-Series: CAS# 108-88-3; waste number U220.

Section 14 -**Transport Information**

	US DOT	Canada TDG
Shipping Name	Toluene	Toluene
Hazard Class	3	3 (9.2)
UN Number	UN1204	UN1204
Packing Group	II	II
Other		FP 4C

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

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

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

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

Chemical Test Rules: None of the chemicals in this product are under a Chemical Test Rule.

Section 12b: None of the chemicals are listed under TSCA Section 12b.

TSCA Significant New Use Rule: None of the chemicals in this material have a SNUR under TSCA.

SARA:

Section 302 (RQ): CAS# 108-88-3; final RQ = 1000 pounds (454 kg)

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

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

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

Clean Air Act: CAS# 108-88-3 is listed as a hazardous air pollutant (HAP). This material does not contain any Class 1 Ozone depleters. This material does not contain any Class 2 Ozone depleters.

Clean Water Act: CAS# 108-88-3 is listed as a Hazardous Substance under the CWA. CAS# 108-88-3 is listed as a Priority Pollutant under the Clean Water Act. CAS# 108-88-3 is listed as a Toxic Pollutant under the Clean Water Act.

OSHA: None of the chemicals in this product are considered highly hazardous by OSHA.

STATE: CAS# 108-88-3 can be found on the following state right to know lists: California, New Jersey, Florida, Pennsylvania, Minnesota, Massachusetts.

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

European/International Regulations

European Labeling in Accordance with EC Directives

Hazard Symbols: XN F

Risk Phrases:

R 11 Highly flammable.

R 20 Harmful by inhalation

Section 15 -

Regulatory Information (continued)

Safety Phrases:

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

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

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

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

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

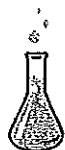
Exposure Limits: CAS# 108-88-3: OEL-AUSTRALIA:TWA 100 ppm (375 mg/m³);STEL 150 ppm (560 mg/m³) OEL-BELGIUM:TWA 100 ppm (377 g/m³);STEL 150 ppm (565 mg/m³) OEL-CZECHOSLOVAKIA:TWA 200 mg/m³;STEL 1000 mg/m³ OEL-DENMARK:TWA 50 ppm (190 mg/m³);Skin OEL-FINLAND:TWA 100 ppm (375 mg/m³);STEL 150 ppm;Skin OEL-FRANCE:TWA 100 ppm (375 mg/m³);STEL 150 ppm (560 mg/m³) OEL-GERMANY:TWA 100 ppm (380 mg/m³) OEL-HUNGARY:TWA 100 mg/m³;STEL 300 mg/m³;Skin OEL-JAPAN:TWA 100 ppm (380 mg/m³) OEL-THE NETHERLANDS:TWA 100 ppm (375 mg/m³);Skin OEL-THE PHILIPPINES:TWA 100 ppm (375 mg/m³) OEL-POLAND:TWA 100 mg/m³ OEL-USSIA:TWA 100 ppm;STEL 50 mg/m³ OEL-SWEDEN:TWA 50 ppm (200 mg/m³);STEL 100 ppm (400 mg/m³);Skin OEL-SWITZERLAND:TWA 100 ppm (380 mg/m³);STEL 500 ppm OEL-THAILAND:TWA 200 ppm;STEL 300 ppm OEL-TURKEY:TWA 200 ppm (750 mg/m³) OEL-UNITED KINGDOM :TWA 100 ppm (375 mg/m³);STEL 150 ppm;Skin OEL IN BULGARIA, COLOMBIA,JORDAN, KOREA check ACGIH TLV OEL IN NEW ZEALAND, SINGAPORE, VIETNAM check ACGI TLV

Section 16 -

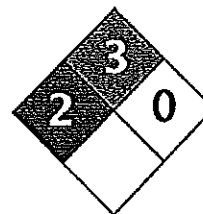
Additional Information

MSDS Creation Date: 09/07/2004

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Health	2
Fire	3
Reactivity	0
Personal Protection	H

Material Safety Data Sheet Ethylbenzene MSDS

Section 1: Chemical Product and Company Identification

Product Name: Ethylbenzene

Catalog Codes: SLE2044

CAS#: 100-41-4

RTECS: DA0700000

TSCA: TSCA 8(b) Inventory: Ethylbenzene

CI#: Not available.

Synonym: Ethyl Benzene; Ethylbenzol; Phenylethane

Chemical Name: Ethylbenzene

Chemical Formula: C₈H₁₀

Contact Information:

Sciencelab.com, Inc.

14025 Smith Rd.

Houston, Texas 77396

US Sales: 1-800-901-7247

International Sales: 1-281-441-4400

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Ethylbenzene	100-41-4	100

Toxicological Data on Ingredients: Ethylbenzene: ORAL (LD50): Acute: 3500 mg/kg [Rat].

Section 3: Hazards Identification

Potential Acute Health Effects:

Hazardous in case of eye contact (Irritant), of ingestion, of inhalation. Slightly hazardous in case of skin contact (Irritant, permeator).

Potential Chronic Health Effects:

Slightly hazardous in case of skin contact (Irritant, sensitizer).

CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC.

MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast.

TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY: Not available.

The substance may be toxic to central nervous system (CNS).

Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at least 15 minutes. Cold water may be used. WARM water MUST be used. Get medical attention.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. WARNING: It may be hazardous to the person providing aid to give mouth-to-mouth resuscitation when the inhaled material is toxic, infectious or corrosive. Seek medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. Loosen tight clothing such as a collar, tie, belt or waistband. Get medical attention if symptoms appear.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 432°C (809.6°F)

Flash Points:

CLOSED CUP: 15°C (59°F). (Tagliabue.) OPEN CUP: 26.667°C (80°F) (Cleveland) (CHRIS, 2001)

CLOSED CUP: 12.8 C (55 F) (Bingham et al, 2001; NIOSH, 2001)

CLOSED CUP: 21 C (70 F) (NFPA)

Flammable Limits: LOWER: 0.8% - 1.6% UPPER: 6.7% - 7%

Products of Combustion: These products are carbon oxides (CO, CO₂).

Fire Hazards in Presence of Various Substances: Highly flammable in presence of open flames and sparks, of heat.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available.

Risks of explosion of the product in presence of static discharge: Not available.

Slightly explosive in presence of heat.

Fire Fighting Media and Instructions:

Flammable liquid, soluble or dispersed in water.

SMALL FIRE: Use DRY chemical powder.

LARGE FIRE: Use alcohol foam, water spray or fog.

Special Remarks on Fire Hazards:

Vapor may travel considerable distance to source of ignition and flash back. Vapors may form explosive mixtures with air. When heated to decomposition it emits acrid smoke and irritating fumes.

Special Remarks on Explosion Hazards: Vapors may form explosive mixtures in air.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:

Flammable liquid.

Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapor/spray. Avoid contact with eyes. Wear suitable protective clothing. In case of insufficient ventilation, wear suitable respiratory equipment. If ingested, seek medical advice immediately and show the container or the label. Keep away from incompatibles such as oxidizing agents.

Storage:

Store in a segregated and approved area. Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Sensitive to light. Store in light-resistant containers.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection:

Splash goggles. Lab coat. Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Vapor respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 100 STEL: 125 (ppm) from OSHA (PEL) [United States]

TWA: 435 STEL: 545 from OSHA (PEL) [United States]

TWA: 435 STEL: 545 (mg/m³) from NIOSH [United States]

TWA: 100 STEL: 125 (ppm) from NIOSH [United States]

TWA: 100 STEL: 125 (ppm) from ACGIH (TLV) [United States]

TWA: 100 STEL: 125 (ppm) [United Kingdom (UK)]

TWA: 100 STEL: 125 (ppm) [Belgium]

TWA: 100 STEL: 125 (ppm) [Finland]

TWA: 50 (ppm) [Norway]

Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid.

Odor: Sweetish. Gasoline-like. Aromatic.

Taste: Not available.

Molecular Weight: 106.16 g/mole

Color: Colorless.

pH (1% soln/water): Not available.

Boiling Point: 136°C (276.8°F)

Melting Point: -94.9 (-138.8°F)

Critical Temperature: 617.15°C (1142.9°F)

Specific Gravity: 0.867 (Water = 1)

Vapor Pressure: 0.9 kPa (@ 20°C)

Vapor Density: 3.66 (Air = 1)

Volatility: 100% (v/v).

Odor Threshold: 140 ppm

Water/Oil Dist. Coeff.: The product is more soluble in oil; $\log(\text{oil/water}) = 3.1$

Ionicity (In Water): Not available.

Dispersion Properties: See solubility in water, diethyl ether.

Solubility:

Easily soluble in diethyl ether.

Very slightly soluble in cold water or practically insoluble in water.

Soluble in all proportions in Ethyl alcohol.

Soluble in Carbon tetrachloride, Benzene.

Insoluble in Ammonia.

Slightly soluble in Chloroform.

Solubility in Water: 169 mg/l @ 25 deg. C.; 0.014 g/100 ml @ 15 deg. C.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, Ignition sources (flames, sparks, static), incompatible materials, light

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Not considered to be corrosive for metals and glass.

Special Remarks on Reactivity:

Can react vigorously with oxidizing materials.

Sensitive to light.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Absorbed through skin. Inhalation.

Toxicity to Animals: Acute oral toxicity (LD50): 3500 mg/kg [Rat].

Chronic Effects on Humans:

CARCINOGENIC EFFECTS: Classified 2B (Possible for human.) by IARC.

MUTAGENIC EFFECTS: Mutagenic for mammalian somatic cells. Mutagenic for bacteria and/or yeast.

May cause damage to the following organs: central nervous system (CNS).

Other Toxic Effects on Humans:

Hazardous in case of ingestion, of inhalation.

Slightly hazardous in case of skin contact (Irritant, permeator).

Special Remarks on Toxicity to Animals:

Lethal Dose/Conc 50% Kill:

LD50 [Rabbit] - Route: Skin; Dose: 17800 ul/kg

Lowest Published Lethal Dose/Conc:

LDL[Rat] - Route: Inhalation (vapor); Dose: 4000 ppm/4 H

Special Remarks on Chronic Effects on Humans:

May cause adverse reproductive effects and birth defects (teratogenic) based on animal test data.

May cause cancer based on animals data. IARC evidence for carcinogenicity in animals is sufficient. IARC

evidence of carcinogenicity in humans inadequate.

May affect genetic material (mutagenic).

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects:

Skin: Can cause mild skin irritation. It can be absorbed through intact skin.

Eyes: Contact with vapor or liquid can cause severe eye irritation depending on concentration. It may also cause conjunctivitis. At a vapor exposure level of 85 - 200 ppm, it is mildly and transiently irritating to the eyes; 1000 ppm causes further irritation and tearing; 2000 ppm results in immediate and severe irritation and tearing; 5,000 ppm is intolerable (ACGIH, 1991; Clayton and Clayton, 1994). Standard draize test for eye irritation using 500 mg resulted in severe irritation (RTECS)

Inhalation: Exposure to high concentrations can cause nasal, mucous membrane and respiratory tract irritation and can also result in chest constriction and, trouble breathing, respiratory failure, and even death. It can also affect behavior/Central Nervous System. The effective dose for CNS depression in experimental animals was 10,000 ppm (ACGIH, 1991). Symptoms of CNS depression include headache, nausea, weakness, dizziness, vertigo, irritability, fatigue, lightheadedness, sleepiness, tremor, loss of coordination, judgement and consciousness, coma, and death. It can also cause pulmonary edema. Inhalation of 85 ppm can produce fatigue, insomnia, headache, and mild irritation of the respiratory tract (Haley & Berndt, 1987).

Ingestion: Do not drink, pipet or siphon by mouth. May cause gastrointestinal/digestive tract irritation with abdominal pain, nausea, vomiting. Ethylbenzene is a pulmonary aspiration hazard. Pulmonary aspiration of even small amounts of the liquid may cause fatal pneumonitis. It may also affect behavior/central nervous system with

Section 12: Ecological Information

Ecotoxicity:

Ecotoxicity in water (LC50): 14 mg/l 96 hours [Fish (Trout)] (static). 12.1 mg/l 96 hours [Fish (Fathead Minnow)] (flow-through). 150 mg/l 96 hours [Fish (Blue Gill/Sunfish)] (static). 275 mg/l 96 hours [Fish (Sheepshead Minnow)]. 42.3 mg/l 96 hours [Fish (Fathead Minnow)](soft water). 87.6mg/l 96 hours [Shrimp].

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are less toxic than the product itself.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 3: Flammable liquid.

Identification: : Ethylbenzene UNNA: 1175 PG: II

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

Connecticut hazardous material survey.: Ethylbenzene

Illinois toxic substances disclosure to employee act: Ethylbenzene

Illinois chemical safety act: Ethylbenzene

New York release reporting list: Ethylbenzene

Rhode Island RTK hazardous substances: Ethylbenzene

Pennsylvania RTK: Ethylbenzene

Minnesota: Ethylbenzene

Massachusetts RTK: Ethylbenzene

Massachusetts spill list: Ethylbenzene

New Jersey: Ethylbenzene

New Jersey spill list: Ethylbenzene

Louisiana spill reporting: Ethylbenzene

California Director's List of Hazardous Substances: Ethylbenzene

TSCA 8(b) inventory: Ethylbenzene

TSCA 4(a) proposed test rules: Ethylbenzene

TSCA 8(d) H and S data reporting: Ethylbenzene; Effective Date: 6/19/87; Sunset Date: 6/19/97

SARA 313 toxic chemical notification and release reporting: Ethylbenzene

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:**WHMIS (Canada):**

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).

CLASS D-2A: Material causing other toxic effects (VERY TOXIC).

CLASSE D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):

R11- Highly flammable.

R20- Harmful by Inhalation.

S16- Keep away from sources of ignition - No smoking.

S24/25- Avoid contact with skin and eyes.

S29- Do not empty into drains.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: h

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves.

Lab coat.

Vapor respirator. Be sure to use an approved/certified respirator or equivalent. Wear appropriate respirator when ventilation is inadequate.

Splash goggles.

Section 16: Other Information

References:

- Manufacturer's Material Safety Data Sheet.
- Fire Protection Guide to Hazardous Materials, 13th ed., National Fire Protection Association (NFPA)
- Registry of Toxic Effects of Chemical Substances (RTECS)
- Chemical Hazard Response Information System (CHRIS)
- Hazardous Substance Data Bank (HSDB)
- New Jersey Hazardous Substance Fact Sheet
- Ariel Global View
- Reprotext System

Other Special Considerations: Not available.

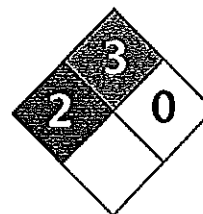
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Health	2
Fire	3
Reactivity	0
Personal Protection	J

Material Safety Data Sheet m-Xylene MSDS

Section 1: Chemical Product and Company Identification

Product Name: m-Xylene	Contact Information:
Catalog Codes: SLX1066	Sciencelab.com, Inc. 14025 Smith Rd. Houston, Texas 77396
CAS#: 108-38-3	US Sales: 1-800-901-7247 International Sales: 1-281-441-4400
RTECS: ZE2275000	Order Online: ScienceLab.com
TSCA: TSCA 8(b) Inventory: m-Xylene	CHEMTREC (24HR Emergency Telephone), call: 1-800-424-9300
CI#: Not applicable.	International CHEMTREC, call: 1-703-527-3887
Synonym: m-Methyltoluene	For non-emergency assistance, call: 1-281-441-4400
Chemical Name: 1,3-Dimethylbenzene	
Chemical Formula: C ₆ H ₄ (CH ₃) ₂	

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
{m-}Xylene	108-38-3	100

Toxicological Data on Ingredients: m-Xylene: ORAL (LD50): Acute: 5000 mg/kg [Rat.]. DERMAL (LD50): Acute: 14100 mg/kg [Rabbit].

Section 3: Hazards Identification

Potential Acute Health Effects:

Very hazardous in case of skin contact (irritant), of eye contact (irritant). Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation. Inflammation of the eye is characterized by redness, watering, and itching. Skin inflammation is characterized by itching, scaling, reddening, or, occasionally, blistering.

Potential Chronic Health Effects:

Hazardous in case of skin contact (irritant), of eye contact (irritant).
Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation.
CARCINOGENIC EFFECTS: Not available.
MUTAGENIC EFFECTS: Not available.
TERATOGENIC EFFECTS: Not available.
DEVELOPMENTAL TOXICITY: Not available.
The substance is toxic to blood, kidneys, the nervous system, liver.
Repeated or prolonged exposure to the substance can produce target organs damage.

Section 4: First Aid Measures

Eye Contact: Check for and remove any contact lenses. Do not use an eye ointment. Seek medical attention.

Skin Contact:

After contact with skin, wash immediately with plenty of water. Gently and thoroughly wash the contaminated skin with running water and non-abrasive soap. Be particularly careful to clean folds, crevices, creases and groin. Cover the irritated skin with an emollient. If irritation persists, seek medical attention. Wash contaminated clothing before reusing.

Serious Skin Contact:

Wash with a disinfectant soap and cover the contaminated skin with an anti-bacterial cream. Seek medical attention.

Inhalation: Allow the victim to rest in a well ventilated area. Seek immediate medical attention.

Serious Inhalation: Not available.

Ingestion:

Do not induce vomiting. Loosen tight clothing such as a collar, tie, belt or waistband. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek immediate medical attention.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: 527°C (980.6°F)

Flash Points: CLOSED CUP: 25°C (77°F). OPEN CUP: 28.9°C (84°F) (Cleveland).

Flammable Limits: LOWER: 1.1% UPPER: 7%

Products of Combustion: These products are carbon oxides (CO, CO₂).

Fire Hazards in Presence of Various Substances: Highly flammable in presence of open flames and sparks, of heat.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available.

Risks of explosion of the product in presence of static discharge: Not available.

Fire Fighting Media and Instructions:

Flammable liquid, insoluble in water.

SMALL FIRE: Use DRY chemical powder.

LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards:

Explosive in the form of vapor when exposed to heat or flame. Vapor may travel considerable distance to source of ignition and flash back. When heated to decomposition it emits acrid smoke and irritating fumes.

Special Remarks on Explosion Hazards: Not available.

Section 6: Accidental Release Measures

Small Spill: Absorb with an inert material and put the spilled material in an appropriate waste disposal.

Large Spill:

Flammable liquid, insoluble in water.

Keep away from heat. Keep away from sources of ignition. Stop leak if without risk. Absorb with DRY earth, sand or other non-combustible material. Do not get water inside container. Do not touch spilled material. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal. Be careful that the product is not present at a concentration level above TLV. Check TLV on the MSDS and with local authorities.

Section 7: Handling and Storage

Precautions:

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not ingest. Do not breathe gas/fumes/ vapour/spray. If ingested, seek medical advice immediately and show the container or the label. Avoid contact with skin and eyes. Keep away from incompatibles such as oxidizing agents.

Storage:

Flammable materials should be stored in a separate safety storage cabinet or room. Keep away from heat. Keep away from sources of ignition. Keep container tightly closed. Keep in a cool, well-ventilated place. Ground all equipment containing material. A refrigerated room would be preferable for materials with a flash point lower than 37.8°C (100°F).

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Provide exhaust ventilation or other engineering controls to keep the airborne concentrations of vapors below their respective threshold limit value. Ensure that eyewash stations and safety showers are proximal to the work-station location.

Personal Protection: Splash goggles. Lab coat. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Boots. Gloves. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits:

TWA: 100 STEL: 150 (ppm) from ACGIH (TLV)

TWA: 434 STEL: 651 (mg/m³) from ACGIH Consult local authorities for acceptable exposure limits.

Section 9: Physical and Chemical Properties

Physical state and appearance: Liquid. (Liquid.)

Odor: Not available.

Taste: Not available.

Molecular Weight: 106.17 g/mole

Color: Colorless.

pH (1% soln/water): Not applicable.

Boiling Point: 139.3°C (282.7°F)

Melting Point: -47.87°C (-54.2°F)

Critical Temperature: Not available.

Specific Gravity: 0.86 (Water = 1)

Vapor Pressure: 6 mm of Hg (@ 20°C)

Vapor Density: 3.7 (Air = 1)

Volatility: Not available.

Odor Threshold: 0.62 ppm

Water/Oil Dist. Coeff.: Not available.

Ioncity (In Water): Not available.

Dispersion Properties: See solubility in water, methanol, diethyl ether.

Solubility:

Easily soluble in methanol, diethyl ether.

Insoluble in cold water, hot water.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Not available.

Incompatibility with various substances: Reactive with oxidizing agents.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity: Not available.

Special Remarks on Corrosivity: Not available.

Polymerization: No.

Section 11: Toxicological Information

Routes of Entry: Eye contact.

Toxicity to Animals:

Acute oral toxicity (LD50): 5000 mg/kg [Rat.].

Acute dermal toxicity (LD50): 14100 mg/kg [Rabbit.].

Chronic Effects on Humans: The substance is toxic to blood, kidneys, the nervous system, liver.

Other Toxic Effects on Humans:

Very hazardous in case of skin contact (Irritant).

Slightly hazardous in case of skin contact (permeator), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans:

0347 Animal: embryotoxic, foetotoxic, passes through the placental barrier.

0900 Detected in maternal milk in human.

Narcotic effect; may cause nervous system disturbances.

Special Remarks on other Toxic Effects on Humans: Material is irritating to mucous membranes and upper respiratory tract.

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The products of degradation are more toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Section 14: Transport Information

DOT Classification: Class 3: Flammable liquid.

Identification: : Xylene : UN1307 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

Pennsylvania RTK: m-Xylene

Massachusetts RTK: m-Xylene

TSCA 8(b) Inventory: m-Xylene

SARA 313 toxic chemical notification and release reporting: m-Xylene

CERCLA: Hazardous substances.: m-Xylene

Other Regulations: OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

Other Classifications:

WHMIS (Canada):

CLASS B-2: Flammable liquid with a flash point lower than 37.8°C (100°F).

CLASS D-2B: Material causing other toxic effects (TOXIC).

DSCL (EEC):

R10- Flammable.

R38- Irritating to skin.

R41- Risk of serious damage to eyes.

HMIS (U.S.A.):

Health Hazard: 2

Fire Hazard: 3

Reactivity: 0

Personal Protection: j

National Fire Protection Association (U.S.A.):

Health: 2

Flammability: 3

Reactivity: 0

Specific hazard:

Protective Equipment:

Gloves.

Lab coat.

Wear appropriate respirator when ventilation is inadequate.

Splash goggles.

Section 16: Other Information

References:

- Hawley, G.G., The Condensed Chemical Dictionary, 11e ed., New York N.Y., Van Nostrand Reinold, 1987.
- Material safety data sheet emitted by: la Commission de la Santé et de la Sécurité du Travail du Québec.
- SAX, N.I. Dangerous Properties of Industrial Materials. Toronto, Van Nostrand Reinold, 6e ed. 1984.
- The Sigma-Aldrich Library of Chemical Safety Data, Edition II.
- Guide de la loi et du règlement sur le transport des marchandises dangereuses au Canada. Centre de conformité international Ltée. 1986.

Other Special Considerations: Not available.

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Chloroform

CAS 67-66-3

CHCl₃

RTECS FS9100000

Synonyms & Trade Names

Methane trichloride, Trichloromethane

DOT ID & Guide

1888 151

Exposure Limits

NIOSH REL: Ca ST 2 ppm (9.78 mg/m³) [60-minute] [See Appendix A](#)OSHA PEL†: C 50 ppm (240 mg/m³)IDLH Ca [500 ppm] [See: 67663](#)Conversion 1 ppm = 4.88 mg/m³

Physical Description

Colorless liquid with a pleasant odor.

MW: 119.4

BP: 143°F

FRZ: -82°F

Sol(77°F): 0.5%

VP: 160 mmHg

IP: 11.42 eV

Sp.Gr: 1.48

F.L.P: NA

UEL: NA

LEL: NA

Noncombustible Liquid

Incompatibilities & Reactivities

Strong caustics; chemically-active metals such as aluminum or magnesium powder, sodium & potassium; strong oxidizers [Note: When heated to decomposition, forms phosgene gas.]

Measurement Methods

NIOSH 1003

[See: NMAM](#) or [OSHA Methods](#)

Personal Protection & Sanitation (See protection codes)

Skin: Prevent skin contact

Eyes: Prevent eye contact

Wash skin: When contaminated

Remove: When wet or contaminated

Change: No recommendation

Provide: Eyewash, Quick drench

First Aid (See procedures)

Eye: Irrigate immediately

Skin: Soap wash promptly

Breathing: Respiratory support

Swallow: Medical attention immediately

Respirator Recommendations NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection](#)

Exposure Routes

inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms Irritation eyes, skin; dizziness, mental dullness, nausea, confusion; headache, lassitude (weakness, exhaustion); anesthesia; enlarged liver; [potential occupational carcinogen]

Target Organs Liver, kidneys, heart, eyes, skin, central nervous system

Cancer Site [in animals: liver & kidney cancer]

[See also: INTRODUCTION](#) [See ICSC CARD: 0027](#) [See MEDICAL TESTS: 0047](#)


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Naphthalene

CAS 91-20-3

C₁₀H₈

RTECS QJ0525000

Synonyms & Trade Names

Naphthalin, Tar camphor, White tar

DOT ID & Guide

1334 133 (crude or refined)
2304 133 (molten)

Exposure Limits

NIOSH REL: TWA 10 ppm (50 mg/m³) ST 15 ppm (75 mg/m³)OSHA PEL†: TWA 10 ppm (50 mg/m³)

IDLH 250 ppm See: 91203

Conversion 1 ppm = 5.24 mg/m³

Physical Description

Colorless to brown solid with an odor of mothballs. [Note: Shipped as a molten solid.]

MW: 128.2

BP: 424°F

MLT: 176°F

Sol: 0.003%

VP: 0.08 mmHg

IP: 8.12 eV

Sp.Gr: 1.15

F.P: 174°F

UEL: 5.9%

LEL: 0.9%

Combustible Solid, but will take some effort to ignite.

Incompatibilities & Reactivities

Strong oxidizers, chromic anhydride

Measurement Methods

NIOSH 1501; OSHA 35

See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection codes)

Skin: Prevent skin contact

Eyes: Prevent eye contact

Wash skin: When contaminated

Remove: When wet or contaminated

Change: Daily

First Aid (See procedures)

Eye: Irrigate immediately

Skin: Molten flush immediately/solid-liquid soap wash promptly

Breathing: Respiratory support

Swallow: Medical attention immediately

Respirator Recommendations NIOSH/OSHA

Up to 100 ppm:

(APF = 10) Any air-purifying half-mask respirator with organic vapor cartridge(s) in combination with an N95, R95, or P95 filter. The following filters may also be used: N99, R99, P99, N100, R100, P100. [Click here](#) for information on selection of N, R, or P filters.*

(APF = 10) Any supplied-air respirator*

Up to 250 ppm:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode*

(APF = 50) Any air-purifying full-facepiece respirator equipped with organic vapor cartridge(s) in combination with an N100, R100, or P100 filter. [Click here](#) for information on selection of N, R, or P filters.

(APF = 25) Any powered air-purifying respirator with an organic vapor cartridge in combination with a high-efficiency particulate filter.*

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having an N100, R100, or P100 filter. [Click here](#) for information on selection of N, R, or P filters./Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection

Exposure Routes Inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms Irritation eyes; headache, confusion, excitement, malaise (vague feeling of discomfort); nausea, vomiting, abdominal pain; irritation bladder; profuse sweating; jaundice; hematuria (blood in the urine), renal shutdown; dermatitis, optical neuritis, corneal damage

Target Organs Eyes, skin, blood, liver, kidneys, central nervous system

See also: [INTRODUCTION](#) See ICSC CARD: [0667](#) See MEDICAL TESTS: [0152](#)

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Tetrachloroethylene		CAS 127-18-4	
Cl₂C=CCl₂		RTECS <u>KX3850000</u>	
Synonyms & Trade Names Perchloroethylene, Perchloroethylene, Perk, Tetrachlorethylene		DOT ID & Guide 1897 160	
Exposure Limits	NIOSH REL: Ca Minimize workplace exposure concentrations. <u>See Appendix A</u>		
	OSHA PEL†: †: TWA 100 ppm C 200 ppm (for 5 minutes in any 3-hour period), with a maximum peak of 300 ppm		
IDLH Ca [150 ppm] See: 127184	Conversion 1 ppm = 6.78 mg/m ³		
Physical Description Colorless liquid with a mild, chloroform-like odor.			
MW: 165.8	BP: 250°F	FRZ: -2°F	Sol: 0.02%
VP: 14 mmHg	IP: 9.32 eV		Sp.Gr: 1.62
FLP: NA	UEL: NA	LEL: NA	
Noncombustible Liquid, but decomposes in a fire to hydrogen chloride and phosgene.			
Incompatibilities & Reactivities Strong oxidizers; chemically-active metals such as lithium, beryllium & barium; caustic soda; sodium hydroxide; potash			
Measurement Methods NIOSH <u>1003</u> ; OSHA <u>1001</u> See: <u>NMAM</u> or OSHA Methods			
Personal Protection & Sanitation (See protection codes) Skin: Prevent skin contact Eyes: Prevent eye contact Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Eyewash, Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash promptly Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode (APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus Escape: (APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister/Any appropriate escape-type, self-contained breathing apparatus <u>Important additional information about respirator selection</u>			
Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact			
Symptoms Irritation eyes, skin, nose, throat, respiratory system; nausea; flush face, neck; dizziness, incoordination; headache, drowsiness; skin erythema (skin redness); liver damage; [potential occupational carcinogen]			
Target Organs Eyes, skin, respiratory system, liver, kidneys, central nervous system			
Cancer Site [in animals: liver tumors]			
See also: <u>INTRODUCTION</u> See ICSC CARD: 0076 See MEDICAL TESTS: 0179			


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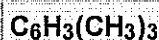
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1,2,4-Trimethylbenzene

CAS 95-63-6



RTECS DC3325000

Synonyms & Trade Names

Asymmetrical trimethylbenzene, psi-Cumene, Pseudocumene [Note: hemimellitene is a mixture of the 1,2,3-isomer with up to 10% of related aromatics such as the 1,2,4-isomer.]

DOT ID & Guide

Exposure Limits

NIOSH REL: TWA 25 ppm (125 mg/m³)

OSHA PEL†: none

IDLH N.D. See: [IDLH INDEX](#)Conversion 1 ppm = 4.92 mg/m³

Physical Description

Clear, colorless liquid with a distinctive, aromatic odor.

MW: 120.2

BP: 337°F

FRZ: -77°F

Sol: 0.006%

VP(56°F): 1 mmHg

IP: 8.27 eV

Sp.Gr: 0.88

F.P.: 112°F

UEL: 6.4%

LEL: 0.9%

Class II Flammable Liquid

Incompatibilities & Reactivities

Oxidizers, nitric acid

Measurement Methods

OSHA PV2091

See: [NMAM](#) or [OSHA Methods](#)

Personal Protection & Sanitation (See [protection codes](#))

Skin: Prevent skin contact

Eyes: Prevent eye contact

Wash skin: When contaminated

Remove: When wet or contaminated

Change: No recommendation

First Aid (See [procedures](#))

Eye: Irrigate immediately

Skin: Soap wash

Breathing: Respiratory support

Swallow: Medical attention immediately

Respirator Recommendations Not available.

Important additional information about respirator selection

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms Irritation eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, fatigue, dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)

Target Organs Eyes, skin, respiratory system, central nervous system, blood
See also: [INTRODUCTION](#) See ICSC CARD: 1433
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1,3,5-Trimethylbenzene

CAS 108-67-8



RTECS OX6825000

Synonyms & Trade Names

Mesitylene, Symmetrical trimethylbenzene, sym-Trimethylbenzene

DOT ID & Guide

2325 129

Exposure

Limits

NIOSH REL: TWA 25 ppm (125 mg/m³)

OSHA PEL†: none

IDLH N.D. See: [IDLH INDEX](#)Conversion 1 ppm = 4.92 mg/m³

Physical Description

Clear, colorless liquid with a distinctive, aromatic odor.

MW: 120.2

BP: 329°F

FRZ: -49°F

Sol: 0.002%

VP: 2 mmHg

IP: 8.39 eV

Sp.Gr: 0.86

F.P.: 122°F

UEL: ?

LEL: ?

Class II Flammable Liquid

Incompatibilities & Reactivities

Oxidizers, nitric acid

Measurement Methods

OSHA PV2091

See: [NMAM](#) or [OSHA Methods](#)

Personal Protection & Sanitation (See protection codes)

Skin: Prevent skin contact

Eyes: Prevent eye contact

Wash skin: When contaminated

Remove: When wet or contaminated

Change: No recommendation

First Aid (See procedures)

Eye: Irrigate immediately

Skin: Soap wash

Breathing: Respiratory support

Swallow: Medical attention immediately

Respirator Recommendations Not available.

Important additional information about respirator selection

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms Irritation eyes, skin, nose, throat, respiratory system; bronchitis; hypochromic anemia; headache, drowsiness, lassitude (weakness, exhaustion), dizziness, nausea, incoordination; vomiting, confusion; chemical pneumonitis (aspiration liquid)

Target Organs Eyes, skin, respiratory system, central nervous system, blood
See also: [INTRODUCTION](#) See ICSC CARD: 1155
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Coal tar pitch volatiles

CAS 85996-93-2

RTECS GF8655000

DOT ID & Guide
2713 153 (acridine)

Synonyms & Trade Names

Synonyms vary depending upon the specific compound (e.g., pyrene, phenanthrene, acridine, chrysene, anthracene & benzo(a)pyrene). [Note: NIOSH considers coal tar, coal tar pitch, and creosote to be coal tar products.]

Exposure

NIOSH REL: Ca TWA 0.1 mg/m³ (cyclohexane-extractable fraction) See Appendix A See Appendix C

Limits

OSHA PEL: TWA 0.2 mg/m³ (benzene-soluble fraction) [1910.1002] See Appendix C

IDLH Ca [80 mg/m³] See: 65996932

Conversion

Physical Description

Black or dark-brown amorphous residue.

Properties vary depending upon
the specific compound.

Combustible Solids

Incompatibilities & Reactivities

Strong oxidizers

Measurement Methods

OSHA 58

See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection)

Skin: Prevent skin contact

Eyes: Prevent eye contact

Wash skin: Daily

Remove: No recommendation

Change: Daily

First Aid (See procedures)

Eye: Irrigate immediately

Skin: Soap wash immediately

Breathing: Respiratory support

Swallow: Medical attention immediately

Respirator Recommendations NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having an N100, R100, or P100 filter. [Click here](#) for information on selection of N, R, or P filters./Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection](#)

Exposure Routes inhalation, skin and/or eye contact

Symptoms Dermatitis, bronchitis, [potential occupational carcinogen]

Target Organs respiratory system, skin, bladder, kidneys

Cancer Site [lung, kidney & skin cancer]

See also: [INTRODUCTION](#) See ICSC CARD: 1415 See MEDICAL TESTS: 0054

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Chlorodiphenyl (54% chlorine)	CAS 11097-69-1
C₆H₃Cl₂C₆H₂Cl₃ (approx)	RTECS TQ1360000
Synonyms & Trade Names Aroclor® 1254, PCB, Polychlorinated biphenyl	DOT ID & Guide 2315 171

Exposure Limits	NIOSH REL*: Ca TWA 0.001 mg/m ³ See Appendix A [*Note: The REL also applies to other PCBs.]
	OSHA PEL: TWA 0.5 mg/m ³ [skin]

IDLH Ca [5 mg/m ³] See: IDLH INDEX	Conversion
---	-------------------

Physical Description

Colorless to pale-yellow, viscous liquid or solid (below 50°F) with a mild, hydrocarbon odor.

MW: 326 (approx)	BP: 689-734°F	FRZ: 50°F	Sol: Insoluble
VP: 0.00006 mmHg	IP: ?		Sp.Gr(77°F): 1.38
F.P: NA	UEL: NA	LEL: NA	

Nonflammable Liquid, but exposure in a fire results in the formation of a black soot containing PCBs, polychlorinated dibenzofurans, and chlorinated dibenzo-p-dioxins.

Incompatibilities & Reactivities

Strong oxidizers

Measurement Methods

NIOSH 5503; OSHA PV2088

See: [NMAM](#) or [OSHA Methods](#)

Personal Protection & Sanitation [\(See protection codes\)](#)

Skin: Prevent skin contact
 Eyes: Prevent eye contact
 Wash skin: When contaminated
 Remove: When wet or contaminated
 Change: Daily
 Provide: Eyewash, Quick drench

First Aid [\(See procedures\)](#)

Eye: Irrigate immediately
 Skin: Soap wash immediately
 Breathing: Respiratory support
 Swallow: Medical attention immediately

Respirator Recommendations NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having an N100, R100, or P100 filter. [Click here](#) for information on selection of N, R, or P filters./Any appropriate escape-type, self-contained breathing apparatus[Important additional information about respirator selection](#)

Exposure Routes

inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms

Irritation eyes, chloracne; liver damage; reproductive effects; [potential occupational carcinogen]

Target Organs

Skin, eyes, liver, reproductive system

Cancer Site

[in animals: tumors of the pituitary gland & liver, leukemia]


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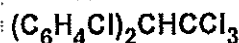
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DDT

CAS 50-29-3

RTECS [KJ3325000](#)

Synonyms & Trade Names

p,p'-DDT; Dichlorodiphenyltrichloroethane; 1,1,1-Trichloro-2,2-bis(p-chlorophenyl)ethane

DOT ID & Guide
2761 151

Exposure Limits

NIOSH REL: Ca TWA 0.5 mg/m³ [See Appendix A](#)OSHA PEL: TWA 1 mg/m³ [skin]IDLH Ca [500 mg/m³] [See: 50293](#)

Conversion

Physical Description

Colorless crystals or off-white powder with a slight, aromatic odor. [pesticide]

MW: 354.5

BP: 230°F (Decomposes)

MLT: 227°F

Sol: Insoluble

VP: 0.0000002 mmHg

IP: ?

Sp.Gr: 0.99

F.P: 162-171°F

UEL: ?

LEL: ?

Combustible Solid

Incompatibilities & Reactivities

Strong oxidizers, alkalis

Measurement Methods

NIOSH [S274 \(II-3\)](#)[See: NMAM](#) or [OSHA Methods](#)

Personal Protection & Sanitation ([See protection](#))

Skin: Prevent skin contact

Eyes: Prevent eye contact

Wash skin: When contaminated/Daily

Remove: When wet or contaminated

Change: Daily

Provide: Eyewash, Quick drench

First Aid ([See procedures](#))

Eye: Irrigate immediately

Skin: Soap wash promptly

Breathing: Respiratory support

Swallow: Medical attention immediately

Respirator Recommendations NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having an N100, R100, or P100 filter. [Click here for information on selection of N, R, or P filters.](#) Any appropriate escape-type, self-contained breathing apparatus[Important additional information about respirator selection](#)

Exposure Routes Inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms Irritation eyes, skin; paresthesia tongue, lips, face; tremor; anxiety, dizziness, confusion, malaise (vague feeling of

: discomfort), headache, lassitude (weakness, exhaustion); convulsions; paresis hands; vomiting; [potential occupational carcinogen]

Target Organs Eyes, skin, central nervous system, kidneys, liver, peripheral nervous system

Cancer Site [in animals: liver, lung & lymphatic tumors]

See also: [INTRODUCTION](#) See ICSC CARD: [0034](#) See MEDICAL TESTS: [0065](#)

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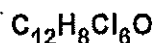
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Dieldrin

CAS 60-57-1



RTECS IO1750000

Synonyms & Trade Names

HEOD; 1,2,3,4,10,10-Hexachloro-6,7-epoxy-1,4,4a,5,6,7,8,8a-octahydro-1,4-endo,exo-5,8-dimethanonaphthalene

 DOT ID & Guide
2761 151

Exposure Limits

NIOSH REL: Ca TWA 0.25 mg/m³ [skin] See Appendix AOSHA PEL: TWA 0.25 mg/m³ [skin]IDLH Ca [50 mg/m³] See: 60571

Conversion

Physical Description

Colorless to light-tan crystals with a mild, chemical odor. [insecticide]

MW: 380.9

BP: Decomposes

MLT: 349°F

Sol: 0.02%

VP(77°F): 8 x 10⁻⁷ mmHg

IP: ?

Sp.Gr: 1.75

FLP: NA

UEL: NA

LEL: NA

Noncombustible Solid

Incompatibilities & Reactivities

Strong oxidizers, active metals such as sodium, strong acids, phenols

Measurement Methods

NIOSH S283 (II-3)

See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection)

Skin: Prevent skin contact

Eyes: Prevent eye contact

Wash skin: When contaminated/Daily

Remove: When wet or contaminated

Change: Daily

Provide: Eyewash, Quick drench

First Aid (See procedures)

Eye: Irrigate immediately

Skin: Soap wash immediately

Breathing: Respiratory support

Swallow: Medical attention immediately

Respirator Recommendations NIOSH

At concentrations above the NIOSH REL, or where there is no REL, at any detectable concentration:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted organic vapor canister having an N100, R100, or P100 filter. [Click here](#) for information on selection of N, R, or P filters./Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms Headache, dizziness; nausea, vomiting, malaise (vague feeling of discomfort), sweating; myoclonic limb jerks; clonic, tonic convulsions; coma; [potential occupational carcinogen]; In animals: liver, kidney damage

Target Organs central nervous system, liver, kidneys, skin

Cancer Site [In animals: lung, liver, thyroid & adrenal gland tumors]

See also: [INTRODUCTION](#) See ICSC CARD: [0787](#) See MEDICAL TESTS: [0077](#)

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Chromium metal			CAS 7440-47-3
Cr			RTECS GB4200000
Synonyms & Trade Names Chrome, Chromium			DOT ID & Guide
Exposure Limits	NIOSH REL: TWA 0.5 mg/m ³ See Appendix C		
	OSHA PEL*: TWA 1 mg/m ³ See Appendix C [*Note: The PEL also applies to insoluble chromium salts.]		
IDLH 250 mg/m ³ (as Cr) See: 7440473	Conversion		
Physical Description Blue-white to steel-gray, lustrous, brittle, hard, odorless solid.			
MW: 52.0	BP: 4788°F	MLT: 3452°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 7.14
F.P: NA	UEL: NA	LEL: NA	
Noncombustible Solid in bulk form, but finely divided dust burns rapidly if heated in a flame.			
Incompatibilities & Reactivities Strong oxidizers (such as hydrogen peroxide), alkalis			
Measurement Methods NIOSH 7024, 7300, 7301, 7303, 9102; OSHA ID121, ID125G See: NMAM or OSHA Methods			
Personal Protection & Sanitation (See protection codes) Skin: No recommendation Eyes: No recommendation Wash skin: No recommendation Remove: No recommendation Change: No recommendation		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH Up to 2.5 mg/m ³ : (APF = 5) Any quarter-mask respirator. Click here for information on selection of N, R, or P filters.* Up to 5 mg/m ³ : (APF = 10) Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100. Click here for information on selection of N, R, or P filters.* (APF = 10) Any supplied-air respirator* Up to 12.5 mg/m ³ : (APF = 25) Any supplied-air respirator operated in a continuous-flow mode* (APF = 25) Any powered air-purifying respirator with a high-efficiency particulate filter.* Up to 25 mg/m ³ : (APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. Click here for information on selection of N, R, or P filters. (APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter* (APF = 50) Any self-contained breathing apparatus with a full facepiece (APF = 50) Any supplied-air respirator with a full facepiece Up to 250 mg/m ³ : (APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode			

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. [Click here](#) for information on selection of N, R, or P filters./Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection](#)

Exposure Routes Inhalation, ingestion, skin and/or eye contact

Symptoms Irritation eyes, skin; lung fibrosis (histologic)

Target Organs Eyes, skin, respiratory system

See also: [INTRODUCTION](#) See ICSC CARD: [0029](#) See MEDICAL TESTS: [0052](#)

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Copper (dusts and mists, as Cu)

CAS 7440-50-8

Cu

RTECS GL5325000

Synonyms & Trade Names

DOT ID & Guide

Copper metal dusts, Copper metal fumes

Exposure
LimitsNIOSH REL*: TWA 1 mg/m³ [*Note: The REL also applies to other copper compounds (as Cu) except Copper fume.]OSHA PEL*: TWA 1 mg/m³ [*Note: The PEL also applies to other copper compounds (as Cu) except copper fume.]IDLH 100 mg/m³ (as Cu) See:
7440508

Conversion

Physical Description

Reddish, lustrous, malleable, odorless solid.

MW: 63.5

BP: 4703°F

MLT: 1981°F

Sol: Insoluble

VP: 0 mmHg (approx)

IP: NA

Sp.Gr: 8.94

F.P: NA

UEL: NA

LEL: NA

Noncombustible Solid in bulk form, but powdered form may ignite.

Incompatibilities & Reactivities

Oxidizers, alkalis, sodium azide, acetylene

Measurement Methods

NIOSH 7029, 7300, 7301, 7303, 9102; OSHA ID121, ID125G

See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection codes)

Skin: Prevent skin contact

Eyes: Prevent eye contact

Wash skin: When contaminated

Remove: When wet or contaminated

Change: Daily

First Aid (See procedures)

Eye: Irrigate immediately

Skin: Soap wash promptly

Breathing: Respiratory support

Swallow: Medical attention immediately

Respirator Recommendations NIOSH/OSHA

Up to 5 mg/m³:(APF = 5) Any quarter-mask respirator. [Click here](#) for information on selection of N, R, or P filters.*Up to 10 mg/m³:(APF = 10) Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100. [Click here](#) for information on selection of N, R, or P filters.*

(APF = 10) Any supplied-air respirator*

Up to 25 mg/m³:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode*

(APF = 25) Any powered air-purifying respirator with a high-efficiency particulate filter.*

Up to 50 mg/m³:(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. [Click here](#) for information on selection of N, R, or P filters.

(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter*

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Up to 100 mg/m³:

(APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. [Click here](#) for information on selection of N, R, or P filters./Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection](#)

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms Irritation eyes, respiratory system; cough, dyspnea (breathing difficulty), wheezing

Target Organs Eyes, skin, respiratory system, liver, kidneys (increase(d) risk with Wilson's disease)

See also: [INTRODUCTION](#) See ICSC CARD: [0240](#) See MEDICAL TESTS: [0057](#)

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Iron oxide dust and fume (as Fe)

CAS 1309-37-1

Fe₂O₃RTECS NO7400000
NO7525000 (fume)

Synonyms & Trade Names

Ferric oxide, Iron(III) oxide

DOT ID & Guide
1376 135 (spent)

Exposure Limits

NIOSH REL: TWA 5 mg/m³OSHA PEL: TWA 10 mg/m³IDLH 2500 mg/m³ (as Fe) See:
1309371

Conversion

Physical Description

Reddish-brown solid. [Note: Exposure to fume may occur during the arc-welding of iron.]

MW: 159.7

BP: ?

MLT: 2664°F

Sol: Insoluble

VP: 0 mmHg (approx)

IP: NA

Sp.Gr: 5.24

F.P: NA

UEL: NA

LEL: NA

Noncombustible Solid

Incompatibilities & Reactivities

Calcium hypochlorite

Measurement Methods

NIOSH 7300, 7301, 7303, 9102; OSHA ID121, ID125G

See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection codes)

Skin: No recommendation

Eyes: No recommendation

Wash skin: No recommendation

Remove: No recommendation

Change: No recommendation

First Aid (See procedures)

Breathing: Respiratory support

Respirator Recommendations NIOSH

Up to 50 mg/m³:(APF = 10) Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100. [Click here](#) for information on selection of N, R, or P filters.

(APF = 10) Any supplied-air respirator

Up to 125 mg/m³:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

(APF = 25) Any powered air-purifying respirator with a high-efficiency particulate filter.

Up to 250 mg/m³:(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. [Click here](#) for information on selection of N, R, or P filters.

(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode

(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Up to 2500 mg/m³:

(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode
(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus
Escape:
(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. [Click here](#) for information on selection of N, R, or P filters./Any appropriate escape-type, self-contained breathing apparatus
[Important additional information about respirator selection](#)

Exposure Routes inhalation

Symptoms Benign pneumoconiosis with X-ray shadows indistinguishable from fibrotic pneumoconiosis (siderosis)

Target Organs respiratory system

See also: [INTRODUCTION](#) See ICSC CARD: [1577](#) MEDICAL TESTS: [0122](#)

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Manganese compounds and fume (as Mn)	CAS 7439-96-5 (metal)
Mn (metal)	RTECS 009275000 (metal)
Synonyms & Trade Names Manganese metal: Colloidal manganese, Manganese-55 Synonyms of other compounds vary depending upon the specific manganese compound.	DOT ID & Guide

Exposure Limits	NIOSH REL*: TWA 1 mg/m ³ ST 3 mg/m ³ [*Note: Also see specific listings for Manganese cyclopentadienyl tricarbonyl, Methyl cyclopentadienyl manganese tricarbonyl, and Manganese tetroxide.]
	OSHA PEL*: C 5 mg/m ³ [*Note: Also see specific listings for Manganese cyclopentadienyl tricarbonyl and Methyl cyclopentadienyl manganese tricarbonyl.]

IDLH 500 mg/m ³ (as Mn) See: 7439965	Conversion
--	-------------------

Physical Description

A lustrous, brittle, silvery solid.

MW: 54.9	BP: 3564°F	MLT: 2271°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 7.20 (metal)
FLP: NA	UEL: NA	LEL: NA	

Metal: Combustible Solid

Incompatibilities & Reactivities

Oxidizers [Note: Will react with water or steam to produce hydrogen.]

Measurement Methods

NIOSH 7300, 7301, 7303, 9102; OSHA ID121, ID125G

See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection codes)

Skin: No recommendation
Eyes: No recommendation
Wash skin: No recommendation
Remove: No recommendation
Change: No recommendation

First Aid (See procedures)

Breathing: Respiratory support
Swallow: Medical attention immediately

Respirator Recommendations NIOSH

Up to 10 mg/m³:(APF = 10) Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100. [Click here](#) for information on selection of N, R, or P filters.

(APF = 10) Any supplied-air respirator

Up to 25 mg/m³:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

(APF = 25) Any powered air-purifying respirator with a high-efficiency particulate filter.

Up to 50 mg/m³:(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. [Click here](#) for information on selection of N, R, or P filters.

(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode

(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Up to 500 mg/m³:

(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. [Click here](#) for information on selection of N, R, or P filters./Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection](#)

Exposure Routes inhalation, ingestion

Symptoms Manganism; asthenia, insomnia, mental confusion; metal fume fever: dry throat, cough, chest tightness, dyspnea (breathing difficulty), rales, flu-like fever; low-back pain; vomiting; malaise (vague feeling of discomfort); lassitude (weakness, exhaustion); kidney damage

Target Organs respiratory system, central nervous system, blood, kidneys

See also: [INTRODUCTION](#) See ICSC CARD: [0174](#) See MEDICAL TESTS: [0131](#)

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Selenium		CAS 7782-49-2	
Se		RTECS <u>VS7700000</u>	
Synonyms & Trade Names Elemental selenium, Selenium alloy		DOT ID & Guide 2658 152 (powder)	
Exposure Limits	NIOSH REL*: TWA 0.2 mg/m ³ [*Note: The REL also applies to other selenium compounds (as Se) except Selenium hexafluoride.]		
	OSHA PEL*: TWA 0.2 mg/m ³ [*Note: The PEL also applies to other selenium compounds (as Se) except Selenium hexafluoride.]		
IDLH 1 mg/m³ (as Se) See: <u>7782492</u>	Conversion		
Physical Description Amorphous or crystalline, red to gray solid. [Note: Occurs as an impurity in most sulfide ores.]			
MW: 79.0	BP: 1265°F	MLT: 392°F	Sol: Insoluble
VP: 0 mmHg (approx)	IP: NA		Sp.Gr: 4.28
F.P: NA	UEL: NA	LEL: NA	
Combustible Solid			
Incompatibilities & Reactivities Acids, strong oxidizers, chromium trioxide, potassium bromate, cadmium			
Measurement Methods NIOSH 7300, 7301, 7303, 9102, S190 (II-7); OSHA ID121 See: <u>NMAM</u> or <u>OSHA Methods</u>			
Personal Protection & Sanitation (See protection codes) Skin: Prevent skin contact Eyes: No recommendation Wash skin: When contaminated Remove: When wet or contaminated Change: No recommendation Provide: Quick drench		First Aid (See procedures) Eye: Irrigate immediately Skin: Soap wash immediately Breathing: Respiratory support Swallow: Medical attention immediately	
Respirator Recommendations NIOSH/OSHA Up to 1 mg/m ³ . (APF = 5) Any quarter-mask respirator. Click here for information on selection of N, R, or P filters.* (APF = 10) Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100. Click here for information on selection of N, R, or P filters.* (APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. Click here for information on selection of N, R, or P filters. (APF = 25) Any powered air-purifying respirator with a high-efficiency particulate filter.* (APF = 10) Any supplied-air respirator* (APF = 50) Any self-contained breathing apparatus with a full facepiece Emergency or planned entry into unknown concentrations or IDLH conditions: (APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode (APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus Escape: (APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. Click here for information on selection of N, R, or			

P filters./Any appropriate escape-type, self-contained breathing apparatus
Important additional information about respirator selection

Exposure Routes inhalation, ingestion, skin and/or eye contact

Symptoms Irritation eyes, skin, nose, throat; visual disturbance; headache; chills, fever; dyspnea (breathing difficulty), bronchitis; metallic taste, garlic breath, gastrointestinal disturbance; dermatitis; eye, skin burns; in animals: anemia; liver necrosis, cirrhosis; kidney, spleen damage

Target Organs Eyes, skin, respiratory system, liver, kidneys, blood, spleen

See also: [INTRODUCTION](#) See ICSC CARD: [0072](#) See MEDICAL TESTS: [0202](#)

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Zinc oxide

CAS 1314-13-2

ZnO

RTECS ZH4810000

Synonyms & Trade Names

Zinc peroxide

DOT ID & Guide

1516 143

Exposure Limits

NIOSH REL: Dust: TWA 5 mg/m³ C 15 mg/m³Fume: TWA 5 mg/m³ ST 10 mg/m³OSHA PEL†: TWA 5 mg/m³ (fume) TWA 15 mg/m³ (total dust) TWA 5 mg/m³ (resp dust)IDLH 500 mg/m³ See: 1314132

Conversion

Physical Description

White, odorless solid.

MW: 81.4

BP: ?

MLT: 3587°F

Sol(64°F): 0.0004%

VP: 0 mmHg (approx)

IP: NA

Sp.Gr: 5.61

F.P: NA

UEL: NA

LEL: NA

Noncombustible Solid

Incompatibilities & Reactivities

Chlorinated rubber (at 419°F), water [Note: Slowly decomposed by water.]

Measurement Methods

NIOSH 7303, 7502; OSHA ID121, ID143

See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection codes)

Skin: No recommendation

Eyes: No recommendation

Wash skin: No recommendation

Remove: No recommendation

Change: No recommendation

First Aid (See procedures)

Breathing: Respiratory support

Respirator Recommendations NIOSH/OSHA

Up to 50 mg/m³:(APF = 10) Any particulate respirator equipped with an N95, R95, or P95 filter (including N95, R95, and P95 filtering facepieces) except quarter-mask respirators. The following filters may also be used: N99, R99, P99, N100, R100, P100. [Click here](#) for information on selection of N, R, or P filters.

(APF = 10) Any supplied-air respirator

Up to 125 mg/m³:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

(APF = 25) Any powered air-purifying respirator with a high-efficiency particulate filter.

Up to 250 mg/m³:(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. [Click here](#) for information on selection of N, R, or P filters.

(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode

(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Up to 500 mg/m³:

(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. [Click here](#) for information on selection of N, R, or P filters./Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection](#)

Exposure Routes inhalation

Symptoms Metal fume fever: chills, muscle ache, nausea, fever, dry throat, cough; lassitude (weakness, exhaustion); metallic taste; headache; blurred vision; low back pain; vomiting; malaise (vague feeling of discomfort); chest tightness; dyspnea (breathing difficulty), rales, decreased pulmonary function

Target Organs respiratory system

See also: [INTRODUCTION](#) See ICSC CARD: [0208](#) See MEDICAL TESTS: [0246](#)

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NIOSH Publication No. 2005-149:

September 2005

NIOSH Pocket Guide to Chemical Hazards

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Lead

CAS 7439-92-1

Pb

RTECS OF7625000

Synonyms & Trade Names

Lead metal, Plumbum

DOT ID & Guide

Exposure Limits

NIOSH REL*: TWA 0.050 mg/m³ See Appendix C [*Note: The REL also applies to other lead compounds (as Pb) -- see Appendix C.]OSHA PEL*: [1910.1025] TWA 0.050 mg/m³ See Appendix C [*Note: The PEL also applies to other lead compounds (as Pb) -- see Appendix C.]IDLH 100 mg/m³ (as Pb) See: 7439921

Conversion

Physical Description

A heavy, ductile, soft, gray solid.

MW: 207.2

BP: 3164°F

MLT: 621°F

Sol: Insoluble

VP: 0 mmHg (approx)

IP: NA

Sp.Gr: 11.34

FLP: NA

UEL: NA

LEL: NA

Noncombustible Solid in bulk form.

Incompatibilities & Reactivities

Strong oxidizers, hydrogen peroxide, acids

Measurement Methods

NIOSH 7082, 7105, 7300, 7301, 7303, 7700, 7701, 7702, 9100, 9102, 9105; OSHA ID121, ID125G, ID206

See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection)

Skin: Prevent skin contact

Eyes: Prevent eye contact

Wash skin: Daily

Remove: When wet or contaminated

Change: Daily

First Aid (See procedures)

Eye: Irrigate immediately

Skin: Soap flush promptly

Breathing: Respiratory support

Swallow: Medical attention immediately

Respirator Recommendations (See Appendix E) NIOSH/OSHA

Up to 0.5 mg/m³:(APF = 10) Any air-purifying respirator with an N100, R100, or P100 filter (including N100, R100, and P100 filtering facepieces) except quarter-mask respirators. [Click here](#) for information on selection of N, R, or P filters.

(APF = 10) Any supplied-air respirator

Up to 1.25 mg/m³:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

(APF = 25) Any powered, air-purifying respirator with a high-efficiency particulate filter

Up to 2.5 mg/m³:(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. [Click here](#) for information on selection of N, R, or P filters.

(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode

(APF = 50) Any powered, air-purifying respirator with a tight-fitting facepiece and a high-efficiency particulate filter

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Up to 50 mg/m³:

(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

Up to 100 mg/m³:

(APF = 2000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator with an N100, R100, or P100 filter. [Click here](#) for information on selection of N, R, or P filters./Any appropriate escape-type, self-contained breathing apparatus

[Important additional information about respirator selection](#)

Exposure Routes Inhalation, ingestion, skin and/or eye contact

Symptoms Lassitude (weakness, exhaustion), insomnia; facial pallor; anorexia, weight loss, malnutrition; constipation, abdominal pain, colic; anemia; gingival lead line; tremor; paralysis wrist, ankles; encephalopathy; kidney disease; irritation eyes; hypotension

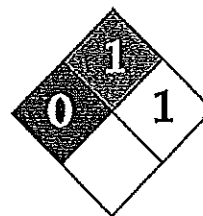
Target Organs Eyes, gastrointestinal tract, central nervous system, kidneys, blood, gingival tissue

See also: [INTRODUCTION](#) See ICSC CARD: [0052](#) See MEDICAL TESTS: [0127](#)

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Chemicals & Laboratory Equipment



Health	1
Fire	3
Reactivity	2
Personal Protection	E

Material Safety Data Sheet Magnesium MSDS

Section 1: Chemical Product and Company Identification

Product Name: Magnesium

Catalog Codes: SLM4408, SLM2263, SLM3637

CAS#: 7439-95-4

RTECS: OM2100000

TSCA: TSCA 8(b) Inventory: Magnesium

CI#: Not applicable.

Synonym: Magnesium ribbons, turnings or sticks

Chemical Name: Magnesium

Chemical Formula: Mg

Contact Information:

Sciencelab.com, Inc.
14025 Smith Rd.
Houston, Texas 77396

US Sales: 1-800-901-7247
International Sales: 1-281-441-4400

Order Online: ScienceLab.com

CHEMTREC (24HR Emergency Telephone), call:
1-800-424-9300

International CHEMTREC, call: 1-703-527-3887

For non-emergency assistance, call: 1-281-441-4400

Section 2: Composition and Information on Ingredients

Composition:

Name	CAS #	% by Weight
Magnesium	7439-95-4	100

Toxicological Data on Ingredients: Magnesium LD50: Not available. LC50: Not available.

Section 3: Hazards Identification

Potential Acute Health Effects: Slightly hazardous in case of skin contact (Irritant), of eye contact (Irritant), of ingestion, of inhalation.

Potential Chronic Health Effects:

CARCINOGENIC EFFECTS: Not available.

MUTAGENIC EFFECTS: Not available.

TERATOGENIC EFFECTS: Not available.

DEVELOPMENTAL TOXICITY: Not available.

Repeated or prolonged exposure is not known to aggravate medical condition.

Section 4: First Aid Measures

Eye Contact:

Check for and remove any contact lenses. In case of contact, immediately flush eyes with plenty of water for at

least 15 minutes. Get medical attention if irritation occurs.

Skin Contact: Wash with soap and water. Cover the irritated skin with an emollient. Get medical attention if irritation develops.

Serious Skin Contact: Not available.

Inhalation:

If inhaled, remove to fresh air. If not breathing, give artificial respiration. If breathing is difficult, give oxygen. Get medical attention.

Serious Inhalation:

Evacuate the victim to a safe area as soon as possible. Loosen tight clothing such as a collar, tie, belt or waistband. If breathing is difficult, administer oxygen. If the victim is not breathing, perform mouth-to-mouth resuscitation. Seek medical attention.

Ingestion:

Do NOT induce vomiting unless directed to do so by medical personnel. Never give anything by mouth to an unconscious person. If large quantities of this material are swallowed, call a physician immediately. Loosen tight clothing such as a collar, tie, belt or waistband.

Serious Ingestion: Not available.

Section 5: Fire and Explosion Data

Flammability of the Product: Flammable.

Auto-Ignition Temperature: Not available.

Flash Points: Not available.

Flammable Limits: Not available.

Products of Combustion: Some metallic oxides.

Fire Hazards in Presence of Various Substances:

Highly flammable in presence of open flames and sparks, of heat.

Flammable in presence of acids, of moisture.

Non-flammable in presence of shocks.

Explosion Hazards in Presence of Various Substances:

Risks of explosion of the product in presence of mechanical impact: Not available.

Risks of explosion of the product in presence of static discharge: Not available.

Explosive in presence of acids, of moisture.

Fire Fighting Media and Instructions:

Flammable solid.

SMALL FIRE: Use DRY chemical powder.

LARGE FIRE: Use water spray or fog. Cool containing vessels with water jet in order to prevent pressure build-up, autoignition or explosion.

Special Remarks on Fire Hazards:

Magnesium turnings, chips or granules, ribbons, are flammable. They can be easily ignited. They may reignite after fire is extinguished. Produces flammable gases on contact with water and acid. May ignite on contact with water or moist air.

Magnesium fires do not flare up violently unless moisture is present.

Special Remarks on Explosion Hazards: Reacts with acids and water to form hydrogen gas which is highly flammable and explosive

Section 6: Accidental Release Measures

Small Spill: Use appropriate tools to put the spilled solid in a convenient waste disposal container.

Large Spill:

Flammable solid.

Stop leak if without risk. Do not touch spilled material. Use water spray curtain to divert vapor drift. Prevent entry into sewers, basements or confined areas; dike if needed. Eliminate all ignition sources. Call for assistance on disposal.

Section 7: Handling and Storage

Precautions:

Keep away from heat. Keep away from sources of ignition. Ground all equipment containing material. Do not breathe dust. Keep away from incompatibles such as oxidizing agents, acids, moisture.

Storage:

Keep container in a cool, well-ventilated area. Keep container tightly closed and sealed until ready for use. Avoid all possible sources of ignition (spark or flame). Moisture sensitive. Dangerous when wet.

Section 8: Exposure Controls/Personal Protection

Engineering Controls:

Use process enclosures, local exhaust ventilation, or other engineering controls to keep airborne levels below recommended exposure limits. If user operations generate dust, fume or mist, use ventilation to keep exposure to airborne contaminants below the exposure limit.

Personal Protection: Safety glasses. Lab coat. Dust respirator. Be sure to use an approved/certified respirator or equivalent. Gloves.

Personal Protection in Case of a Large Spill:

Splash goggles. Full suit. Dust respirator. Boots. Gloves. A self contained breathing apparatus should be used to avoid inhalation of the product. Suggested protective clothing might not be sufficient; consult a specialist BEFORE handling this product.

Exposure Limits: Not available.

Section 9: Physical and Chemical Properties

Physical state and appearance: Solid. (Metal solid)

Odor: Odorless.

Taste: Not available.

Molecular Weight: 24.31 g/mole

Color: Silver-white

pH (1% soln/water): Not applicable.

Boiling Point: 1100°C (2012°F)

Melting Point: 651°C (1203.8°F)

Critical Temperature: Not available.

Specific Gravity: 1.74 (Water = 1)

Vapor Pressure: Not applicable.

Vapor Density: Not available.

Volatility: Not available.

Odor Threshold: Not available.

Water/Oil Dist. Coeff.: Not available.

Ionicity (In Water): Not available.

Dispersion Properties: Not available.

Solubility:

Very slightly soluble in hot water.

Insoluble in cold water.

Insoluble in chromium trioxides, and mineral acids, alkalies.

Slightly soluble with decomposition in hot water.

Soluble in concentrated hydrogen fluoride, and ammonium salts.

Section 10: Stability and Reactivity Data

Stability: The product is stable.

Instability Temperature: Not available.

Conditions of Instability: Heat, incompatible materials, water or moisture, moist air.

Incompatibility with various substances: Reactive with oxidizing agents, acids, moisture.

Corrosivity: Non-corrosive in presence of glass.

Special Remarks on Reactivity:

Violent chemical reaction with oxidizing agents.

Reacts with water to create hydrogen gas and heat. Must be kept dry.

Reacts with acids to form hydrogen gas which is highly flammable and explosive.

Magnesium forms hazardous or explosive mixtures with aluminum and potassium perchlorate; ammonium nitrate; barium nitrate, barium dioxide and zinc; beryllium oxide; boron phosphorodichloride; bromobenzyl trifluoride; cadmium cyanide; cadmium oxide; calcium carbide; carbonates; carbon tetrachloride; chlorine; chlorine trifluoride; chloroform; cobalt cyanide; copper cyanide; copper sulfate(anhydrous), ammonium nitrate, potassium chlorate and water; cupric oxide; cupric sulfate; fluorine; gold cyanide; hydrogen and calcium carbonate; hydrogen iodide; hydrogen peroxide; iodine; lead cyanide; mercuric oxide; mercury cyanide; methyl chloride; molybdenum trioxide; nickel cyanide; nitric acid; nitrogen dioxide; oxygen (liquid); performic acid; phosphates; potassium chlorate; potassium perchlorate; silver nitrate; silver oxide; sodium perchlorate; sodium peroxide; sodium peroxide and carbon dioxide; stannic oxide; sulfates; trichloroethylene; zinc cyanide; zinc oxide.

Special Remarks on Corrosivity: Not available.

Polymerization: Will not occur.

Section 11: Toxicological Information

Routes of Entry: Inhalation. Ingestion.

Toxicity to Animals:

LD50: Not available.

LC50: Not available.

Chronic Effects on Humans: Not available.

Other Toxic Effects on Humans: Slightly hazardous in case of skin contact (irritant), of ingestion, of inhalation.

Special Remarks on Toxicity to Animals: Not available.

Special Remarks on Chronic Effects on Humans: Not available.

Special Remarks on other Toxic Effects on Humans:

Acute Potential Health Effects:

Skin: May cause skin irritation by mechanical action. May get mechanical injury or embedding of chips/particles in skin. The particles that are embedded in the wounds may retard healing.

Eyes: May cause eye irritation by mechanical action. Mechanical injury may occur. Particles or chips may embed in eye and retard healing.

Inhalation: Low hazard for usual industrial handling. It may cause respiratory tract irritation. However, it is unlikely due to physical form. When Magnesium metal is heated during welding or smelting process, Metal Fume Fever may result from inhalation of magnesium fumes. Metal Fume Fever is a flu-like condition consisting of fever, chills, sweating, aches, pains, cough, weakness, headache, nausea, vomiting, and breathing difficulty. Other symptoms may include metallic taste, increased white blood cell count. There is no permanent ill-effect.

Ingestion: Low hazard for usual industrial handling. There are no known reports of serious industrial poisonings with Magnesium. Ingestion of large amounts of chips, turnings or ribbons may cause gastrointestinal tract irritation with nausea, vomiting, and diarrhea. Acute ingestion may also result in Hypermagnesia.

Hypermagnesia may cause hypotension, bradycardia, CNS depression, respiratory depression, and impairment of neuromuscular transmission (hyporeflexia, paralysis).

Section 12: Ecological Information

Ecotoxicity: Not available.

BOD5 and COD: Not available.

Products of Biodegradation:

Possibly hazardous short term degradation products are not likely. However, long term degradation products may arise.

Toxicity of the Products of Biodegradation: The product itself and its products of degradation are not toxic.

Special Remarks on the Products of Biodegradation: Not available.

Section 13: Disposal Considerations

Waste Disposal:

Waste must be disposed of in accordance with federal, state and local environmental control regulations.

Section 14: Transport Information

DOT Classification: CLASS 4.1: Flammable solid.

Identification: : Magnesium UNNA: 1869 PG: III

Special Provisions for Transport: Not available.

Section 15: Other Regulatory Information

Federal and State Regulations:

Connecticut hazardous material survey.: Magnesium
Rhode Island RTK hazardous substances: Magnesium
Pennsylvania RTK: Magnesium

Massachusetts RTK: Magnesium
Massachusetts spill list: Magnesium
New Jersey: Magnesium
TSCA 8(b) Inventory: Magnesium

Other Regulations:

OSHA: Hazardous by definition of Hazard Communication Standard (29 CFR 1910.1200).

EINECS: This product is on the European Inventory of Existing Commercial Chemical Substances.

Other Classifications:

WHMIS (Canada):

CLASS B-4: Flammable solid.

CLASS B-6: Reactive and very flammable material.

DSCL (EEC):

R11- Highly flammable.

R15- Contact with water liberates
extremely flammable gases.

S7/8- Keep container tightly closed and dry.

S43- In case of fire, use dry chemical. Never
use water.

HMIS (U.S.A.):

Health Hazard: 1

Fire Hazard: 3

Reactivity: 2

Personal Protection: E

National Fire Protection Association (U.S.A.):

Health: 0

Flammability: 1

Reactivity: 1

Specific hazard:

Protective Equipment:

Gloves.

Lab coat.

Dust respirator. Be sure to use an
approved/certified respirator or
equivalent. Wear appropriate respirator
when ventilation is inadequate.

Safety glasses.

Section 16: Other Information

References: Not available.

Other Special Considerations: Not available.

Created: 10/09/2005 06:00 PM

Last Updated: 10/09/2005 06:00 PM



NIOSH Pocket Guide to Chemical Hazards

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Mercury compounds [except (organo) alkyls] (as Hg)

CAS 7439-97-6 (metal)

Hg (metal)

RTECS OV4550000 (metal)

Synonyms & Trade Names

Mercury metal; Colloidal mercury; Metallic mercury; Quicksilver

Synonyms of "other" Hg compounds vary depending upon the specific compound.

DOT ID & Guide

2809 172 (metal)

Exposure Limits

NIOSH REL: Hg Vapor: TWA 0.05 mg/m³ [skin]Other: C 0.1 mg/m³ [skin]OSHA PEL†: C 0.1 mg/m³IDLH 10 mg/m³ (as Hg) See: 7439976

Conversion

Physical Description

Metal: Silver-white, heavy, odorless liquid. [Note: "Other" Hg compounds include all inorganic & aryl Hg compounds except (organo) alkyls.]

MW: 200.6

BP: 674°F

FRZ: -38°F

Sol: Insoluble

VP: 0.0012 mmHg

IP: ?

Sp.Gr: 13.6 (metal)

F.L.P: NA

UEL: NA

LEL: NA

Metal: Noncombustible Liquid

Incompatibilities & Reactivities

Acetylene, ammonia, chlorine dioxide, azides, calcium (amalgam formation), sodium carbide, lithium, rubidium, copper

Measurement Methods

NIOSH 6009; OSHA ID140

See: NMAM or OSHA Methods

Personal Protection & Sanitation (See protection)

Skin: Prevent skin contact

Eyes: No recommendation

Wash skin: When contaminated

Remove: When wet or contaminated

Change: Daily

First Aid (See procedures)

Eye: Irrigate immediately

Skin: Soap wash promptly

Breathing: Respiratory support

Swallow: Medical attention immediately

Respirator Recommendations

Mercury vapor: NIOSH

Up to 0.5 mg/m³:

(APF = 10) Any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern†

(APF = 10) Any supplied-air respirator

Up to 1.25 mg/m³:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

(APF = 25) Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern†(canister)

Up to 2.5 mg/m³:

(APF = 50) Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against the compound of concern†

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern†

(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode/PAPRTS(canister)

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Up to 10 mg/m³:

(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

Other mercury compounds: NIOSH/OSHA

Up to 1 mg/m³:

(APF = 10) Any chemical cartridge respirator with cartridge(s) providing protection against the compound of concern†

(APF = 10) Any supplied-air respirator

Up to 2.5 mg/m³:

(APF = 25) Any supplied-air respirator operated in a continuous-flow mode

(APF = 25) Any powered, air-purifying respirator with cartridge(s) providing protection against the compound of concern†(canister)

Up to 5 mg/m³:

(APF = 50) Any chemical cartridge respirator with a full facepiece and cartridge(s) providing protection against the compound of concern†

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern†

(APF = 50) Any supplied-air respirator that has a tight-fitting facepiece and is operated in a continuous-flow mode/PAPRTS(canister)

(APF = 50) Any self-contained breathing apparatus with a full facepiece

(APF = 50) Any supplied-air respirator with a full facepiece

Up to 10 mg/m³:

(APF = 1000) Any supplied-air respirator operated in a pressure-demand or other positive-pressure mode

Emergency or planned entry into unknown concentrations or IDLH conditions:

(APF = 10,000) Any self-contained breathing apparatus that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode

(APF = 10,000) Any supplied-air respirator that has a full facepiece and is operated in a pressure-demand or other positive-pressure mode in combination with an auxiliary self-contained positive-pressure breathing apparatus

Escape:

(APF = 50) Any air-purifying, full-facepiece respirator (gas mask) with a chin-style, front- or back-mounted canister providing protection against the compound of concern/Any appropriate escape-type, self-contained breathing apparatus

Important additional information about respirator selection

Exposure Routes inhalation, skin absorption, ingestion, skin and/or eye contact

Symptoms Irritation eyes, skin; cough, chest pain, dyspnea (breathing difficulty), bronchitis, pneumonitis; tremor, insomnia, irritability, indecision, headache, lassitude (weakness, exhaustion); stomatitis, salivation; gastrointestinal disturbance, anorexia, weight loss; proteinuria

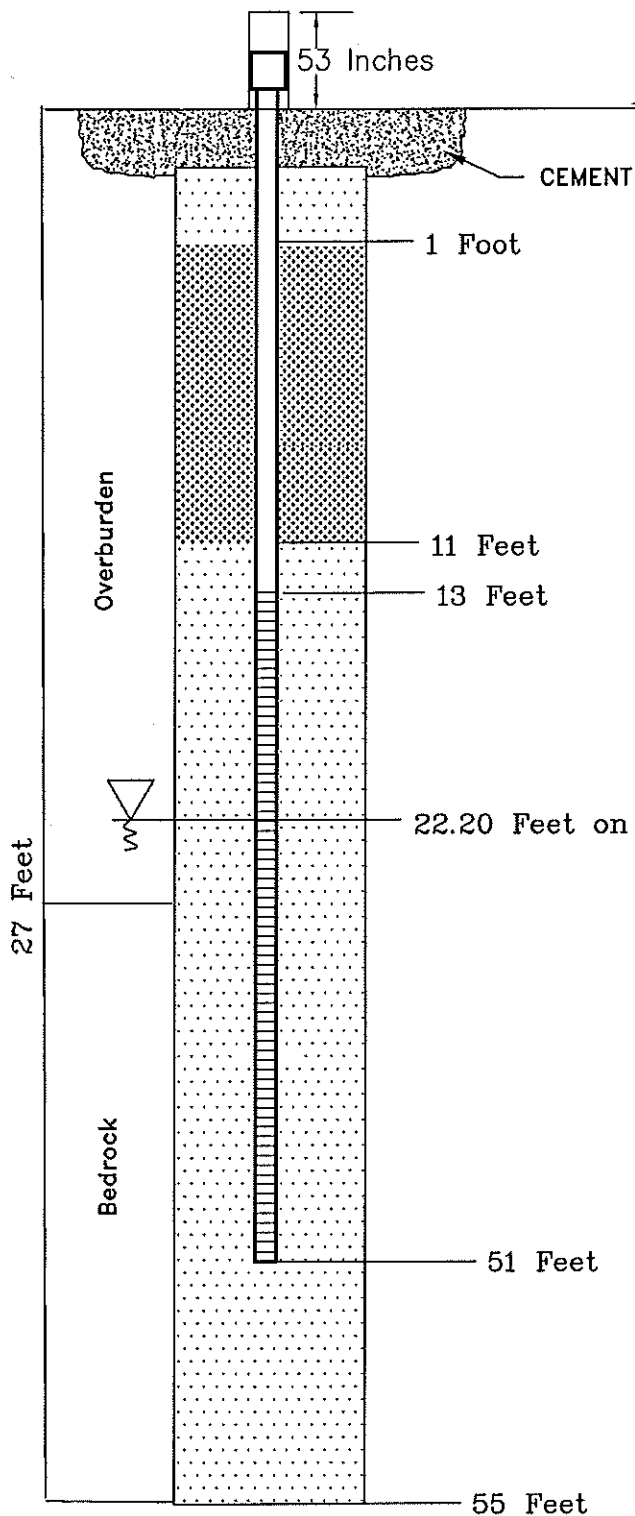
Target Organs Eyes, skin, respiratory system, central nervous system, kidneys

See also: [INTRODUCTION](#) See ICSC CARD: 0056 See MEDICAL TESTS: 0136

APPENDIX D

Well Construction Logs

MW-1



DRILLING SUMMARY

Drilling Company: Warren George
 Borehole Diameter: 6 Inches
 Drilling Method: Air Rotary
 Total Depth: 55 Feet
 Geologist: Eric Weinstock

WELL DESIGN

Casing Material: Schedule 40 PVC
 Screen Interval: 38 Feet
 Slot Size: 10 Slot
 Diameter: 4 Inches
 Sand Pack: 51-11 Feet
 Date Installed: 8/9/2007

Note: Top of well casing cut down to elevation 18.99 feet (Datum: Borough of Bronx Topographical Bureau) in March 2010.

LEGEND



Bentonite



#1 Sand Filter



Approximate Water
Table Surface

CA RICH CONSULTANTS, INC.

Certified Groundwater and Environmental Specialists
 17 Dupont Street, Plainview, New York 11803

TITLE

GROUNDWATER MONITORING WELL
 CONSTRUCTION DETAILS
 FOR MW-1

DATE

4/9/2010

SCALE

Not to Scale

FIGURE

D-1

DRAWING NO.

2007-32

CORNERSTONE B1
 3100 3rd AVENUE
 THE BRONX, NY

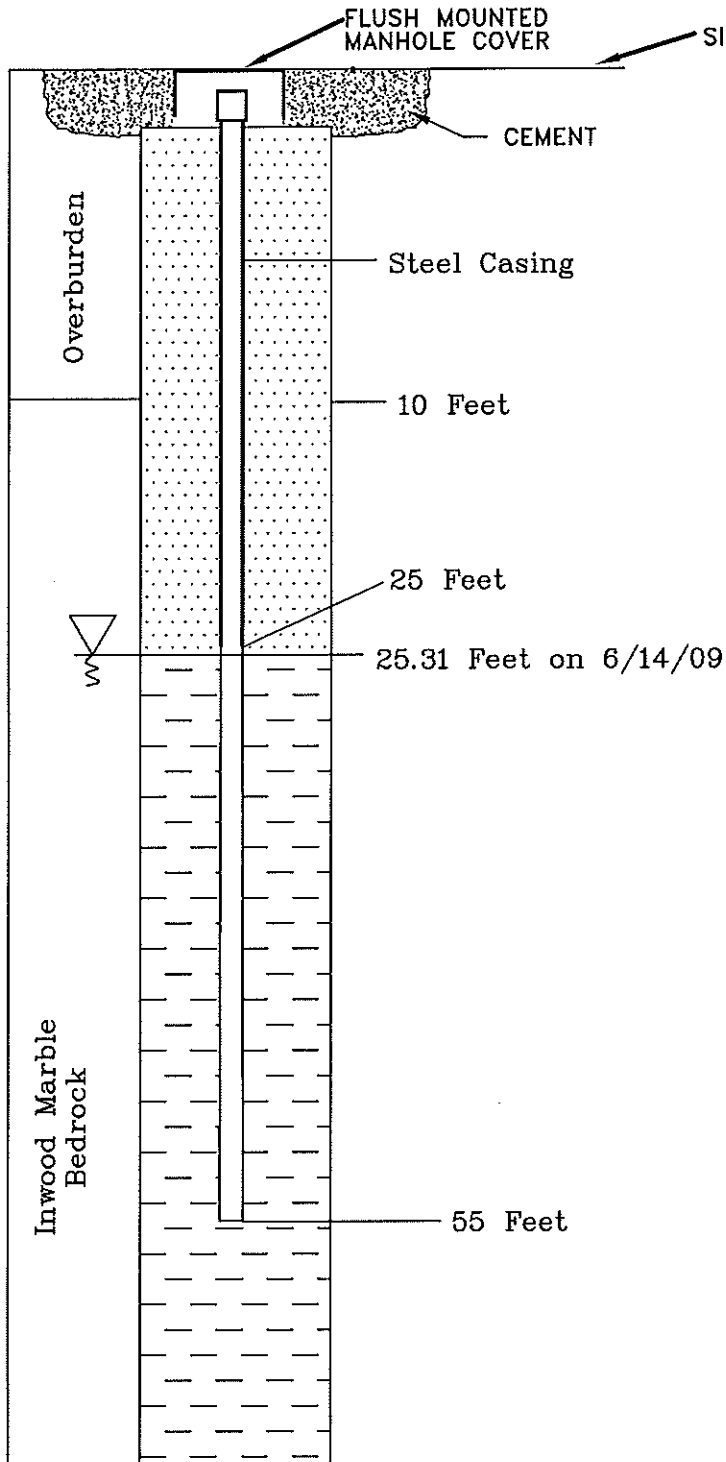
DRAWN BY:

J.T.C.

APPR BY:

D.S.

MW-2A



DRILLING SUMMARY

Drilling Company: Aquifer Drilling & Testing
 Borehole Diameter: 6 Inches
 Drilling Method: Air Rotary
 Total Depth: 55 Feet
 Geologist: Victoria Whelan

WELL DESIGN

Casing Material: Steel
 Screen Material: Open Hole
 Slot Size: Open Hole 25-55 Feet
 Diameter: 4 Inches
 Sand Pack: None

WELL DEVELOPMENT

Method: Whale Pump
 Static Depth to Water: 25.31 Feet
 Pumping Rate: 1 gallon/minute
 Volume Pumped: 50 gallons

TIME LOG

Install Casing: 5/26/2009 07:30-14:00
 Install Well: 5/28/2009 09:50-11:55
 Development: 5/28/2009 13:00-13:45

Note: Top of well casing cut down to elevation 28.85 feet (Datum: Borough of Bronx Topographical Bureau) in March 2010.

LEGEND



Approximate Water Table Surface



Cement



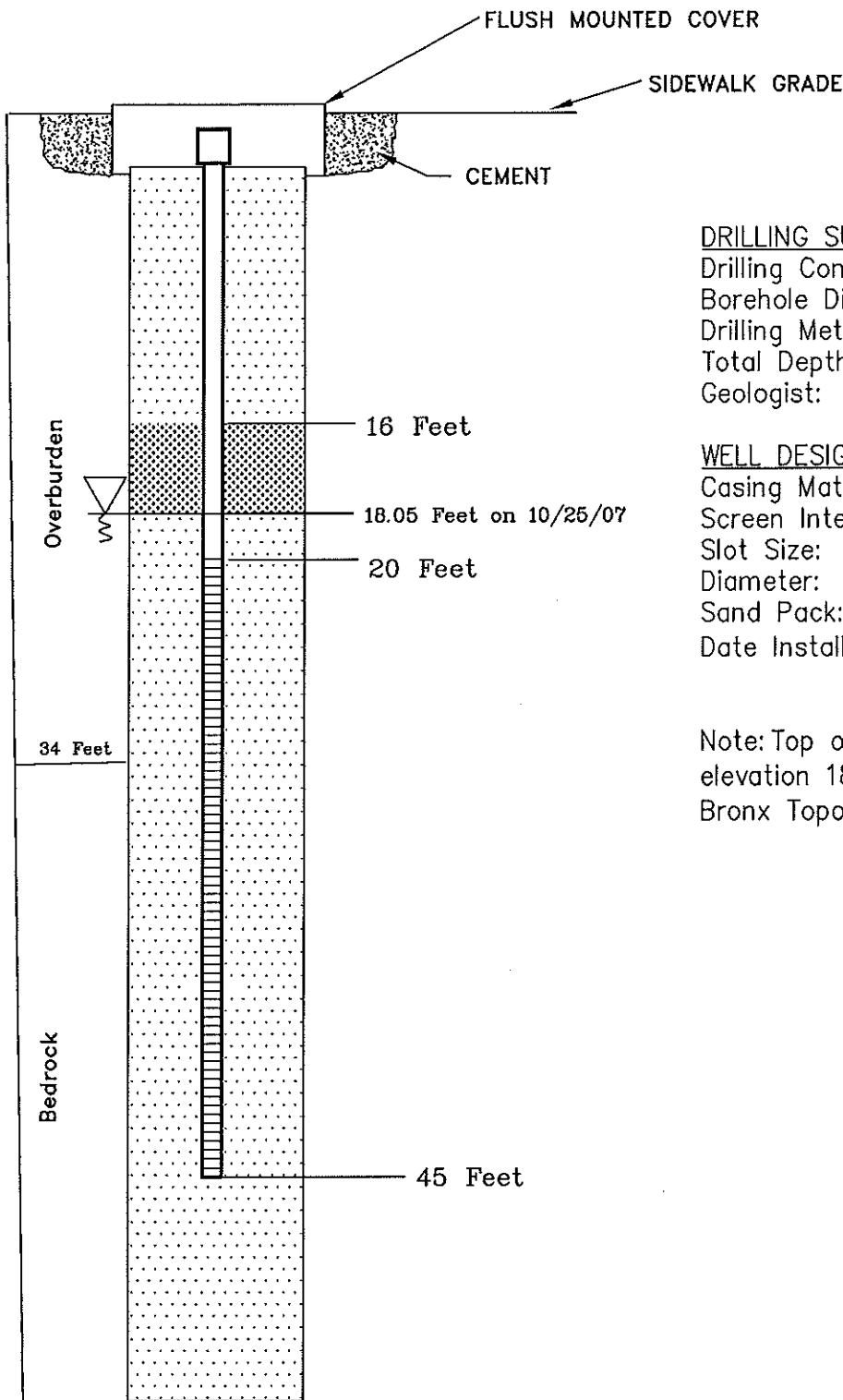
Inwood Marble (Bedrock)

CA RICH CONSULTANTS, INC.

Certified Groundwater and Environmental Specialists
 17 Dupont Street, Plainview, New York 11803

TITLE GROUNDWATER MONITORING WELL CONSTRUCTION DETAILS FOR MW-2A		DATE 4/9/2010
FIGURE D-2		SCALE Not to Scale
DRAWING NO: 2009-8	CORNERSTONE B1 3100 3rd AVENUE THE BRONX, NY	DRAWN BY: J.T.C.
		APPR. BY: D.S.

MW-3



DRILLING SUMMARY




Drilling Company: Warren George
 Borehole Diameter: 6 Inches
 Drilling Method: Air Rotary
 Total Depth: 45 Feet
 Geologist: Victoria Whelan & Eric Weinstock

WELL DESIGN

Casing Material: Schedule 40 PVC
 Screen Interval: 25 Feet
 Slot Size: 10 Slot
 Diameter: 4 Inches
 Sand Pack: 45-18 Feet
 Date Installed: 8/9/2007

Note: Top of well casing cut down to elevation 18.66 feet (Datum: Borough of Bronx Topographical Bureau) in March 2010.

LEGEND

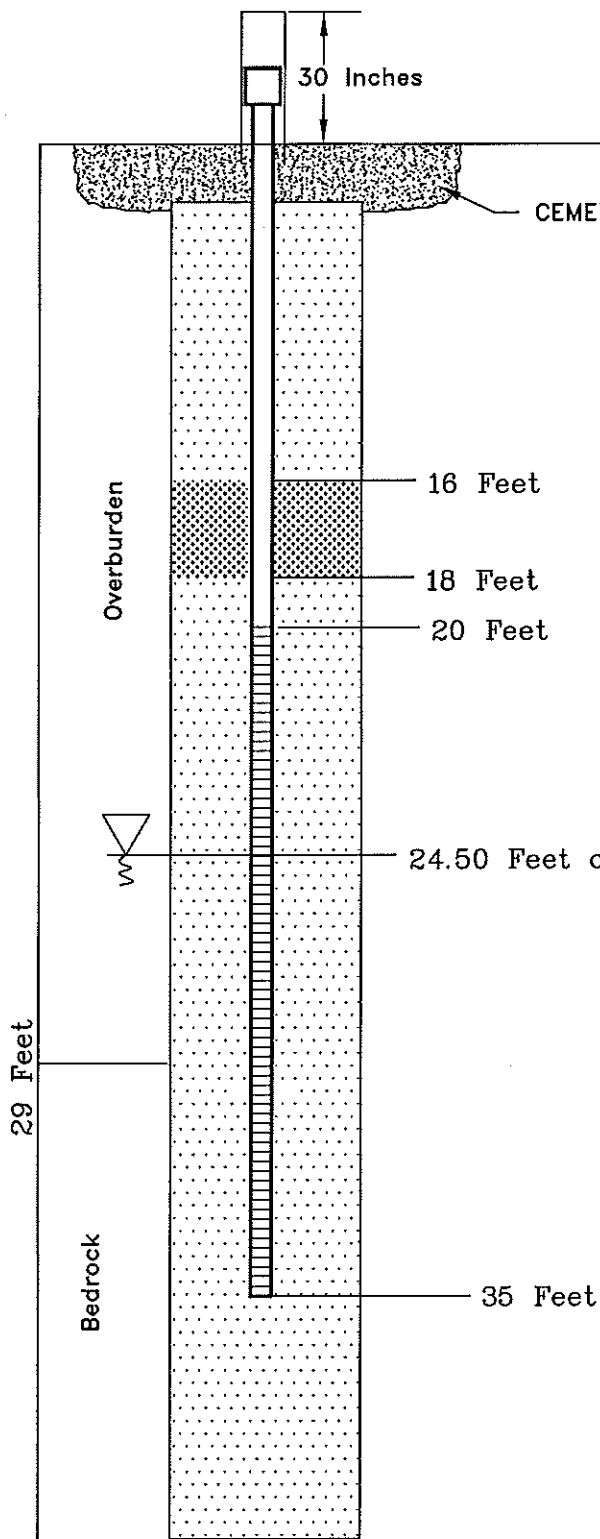
-  Bentonite
-  #1 Sand Filter
-  Approximate Water Table Surface

CA RICH CONSULTANTS, INC.

Certified Groundwater and Environmental Specialists
 17 Dupont Street, Plainview, New York 11803

FIGURE D-3		DATE 4/9/2010
DRAWING NO: 2007-34		SCALE Not to Scale
CORNERSTONE B1 3100 3rd AVENUE THE BRONX, NY		DRAWN BY: J.T.C.
		APPR BY: D.S.

MW-4



DRILLING SUMMARY

Drilling Company: Aquifer Drilling & Testing
 Borehole Diameter: 6 Inches
 Drilling Method: Air Rotary
 Total Depth: 35 Feet
 Geologist: Deborah Shapiro

WELL DESIGN

Casing Material: Schedule 40 PVC
 Screen Interval: 15 Feet
 Slot Size: 20 Slot
 Diameter: 4 Inches
 Sand Pack: 35-18 Feet
 Date Installed: 10/11/2007

Note: Top of well casing cut down to 18.97 feet (Datum: Borough of Bronx Topographical Bureau) in March 2010.

LEGEND



Bentonite



#1 Sand Filter



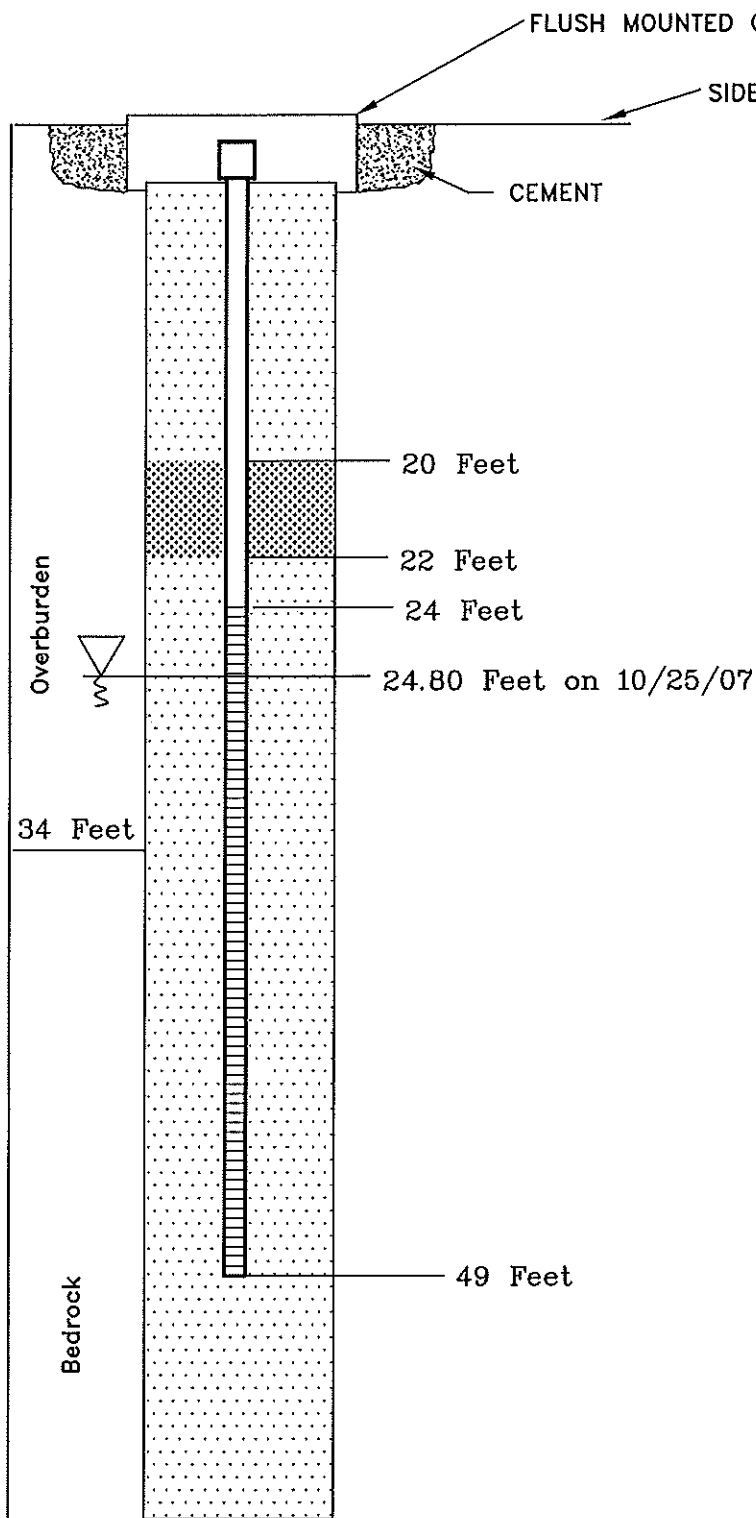
Approximate Water Table Surface

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 17 Dupont Street, Plainview, New York 11803

TITLE GROUNDWATER MONITORING WELL CONSTRUCTION DETAILS FOR MW-4		DATE 4/10/2010
FIGURE D-4		SCALE Not to Scale
DRAWING NO: 2007-30	CORNERSTONE B1 3100 3rd AVENUE THE BRONX, NY	DRAWN BY: J.T.C.
		APPR. BY: D.S.

MW-5



DRILLING SUMMARY

Drilling Company: Aquifer Drilling & Testing
 Borehole Diameter: 6 Inches
 Drilling Method: Air Rotary
 Total Depth: 49 Feet
 Geologist: Deborah Shapiro

WELL DESIGN

Casing Material: Schedule 40 PVC
 Screen Interval: 15 Feet
 Slot Size: 20 Slot
 Diameter: 4 Inches
 Sand Pack: 49-22 Feet
 Date Installed: 10/12/2007

Note: Top of well casing cut down to elevation 30.26 feet (Datum: Borough of Bronx Topographical Bureau) in March 2010.

LEGEND



Bentonite



#1 Sand Filter



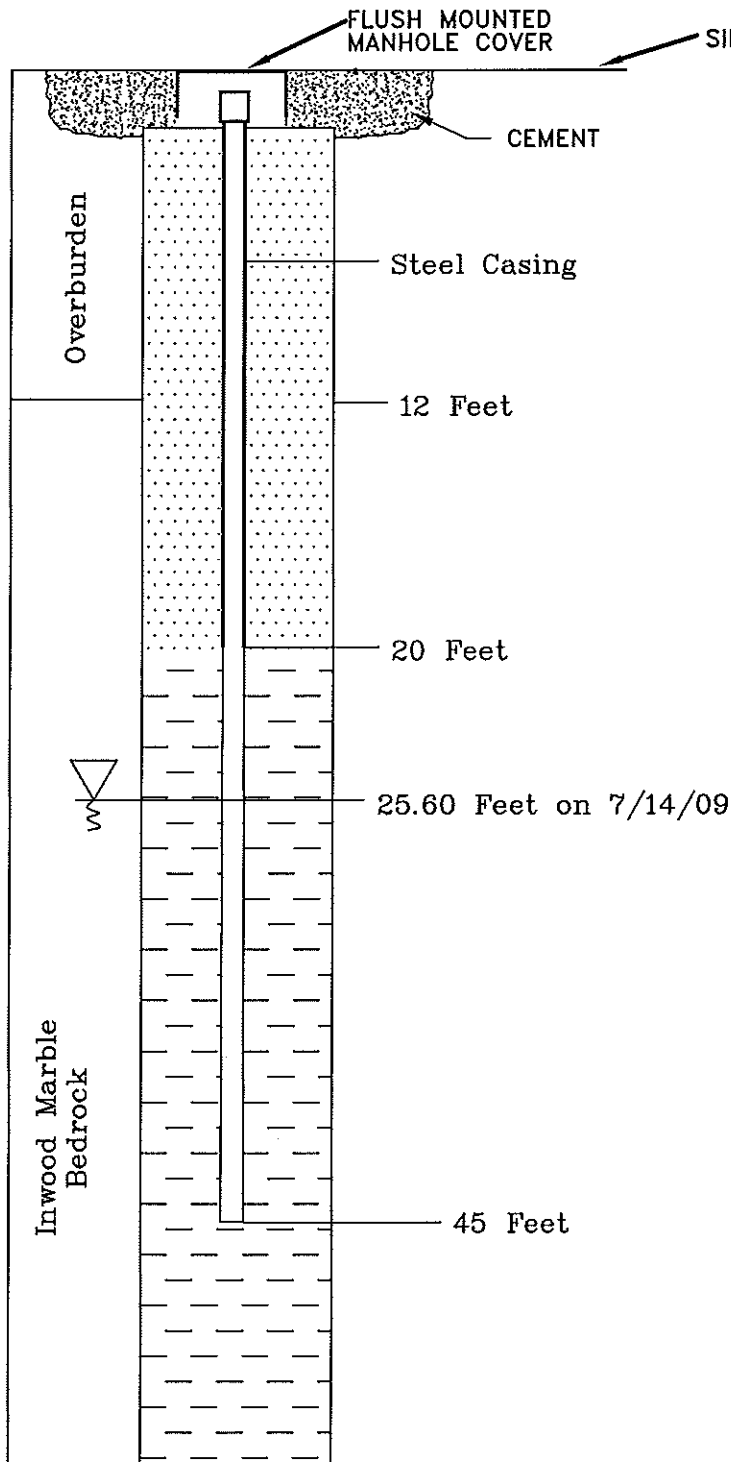
Approximate Water Table Surface

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TITLE GROUNDWATER MONITORING WELL CONSTRUCTION DETAILS FOR MW-5		DATE 4/09/2010
		SCALE Not to Scale
FIGURE D-5	CORNERSTONE B1 3100 3rd AVENUE THE BRONX, NY	DRAWN BY: J.T.C.
DRAWING NO: 2007-31		APPR BY: D.S.

MW-6



DRILLING SUMMARY

Drilling Company: Aquifer Drilling & Testing
 Borehole Diameter: 6 Inches
 Drilling Method: Roto Sonic
 Total Depth: 45 Feet
 Geologist: Victoria Whelan

WELL DESIGN

Casing Material: Steel
 Screen Material: Open Hole
 Slot Size: Open Hole 20-45 Feet
 Diameter: 4 Inches
 Sand Pack: None

WELL DEVELOPMENT

Method: Whale Pump
 Static Depth to Water: 25.60 Feet
 Pumping Rate: 1 gallon/minute
 Volume Pumped: 50 gallons

TIME LOG

Install Casing: 6/30/2009 12:15-13:30
 Install Well: 7/1/2009 14:30-16:45
 Development: 7/1/2009 16:45-18:00

Note: Top of well casing cut down to elevation 28.16 feet (Datum: Borough of Bronx Topographical Bureau) in March 2010.

LEGEND



Approximate Water Table Surface



Cement



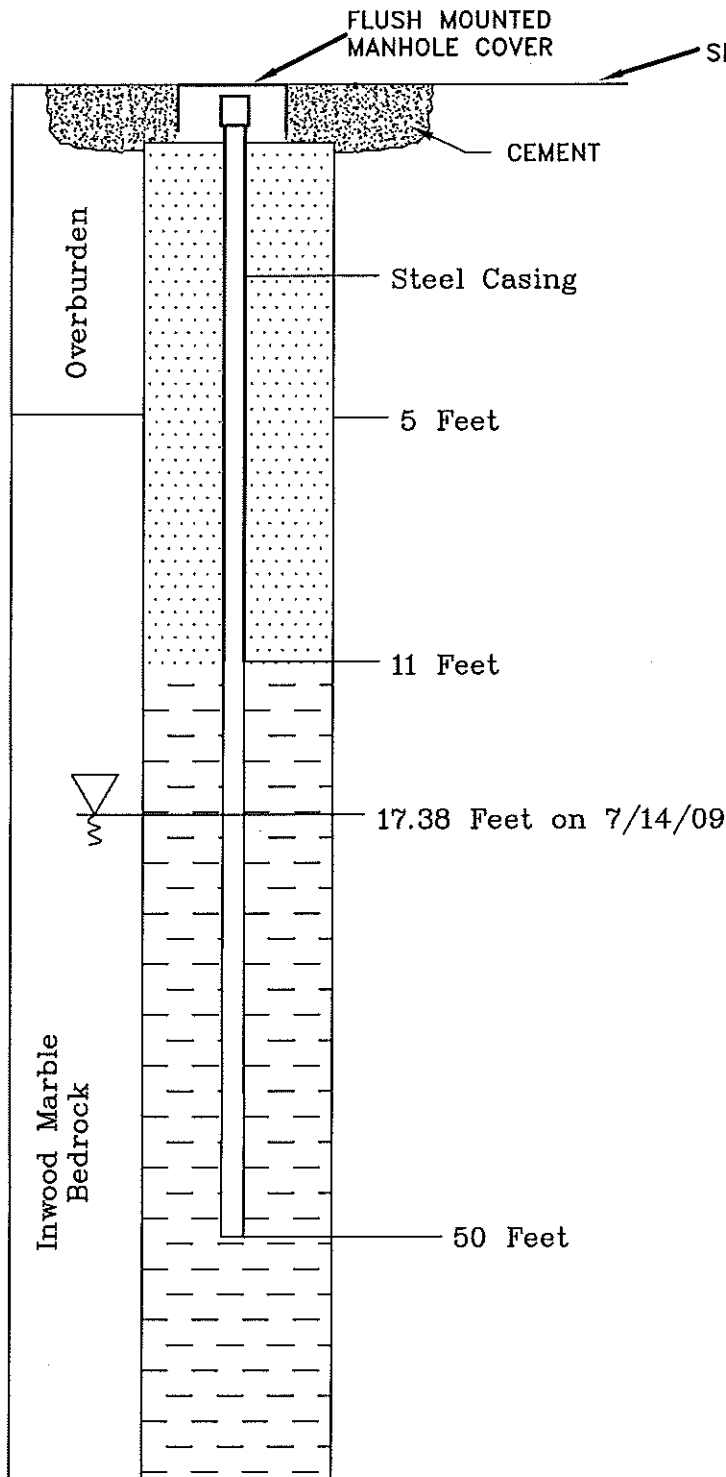
Inwood Marble (Bedrock)

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 17 Dupont Street, Plainview, New York 11803

TITLE GROUNDWATER MONITORING WELL CONSTRUCTION DETAILS FOR MW-6		DATE 4/9/2010
FIGURE D-6		SCALE Not to Scale
DRAWING NO. 2009-9	CORNERSTONE B1 3100 3rd AVENUE THE BRONX, NY	DRAWN BY: J.T.C.
		APPR. BY: D.S.

MW-7



DRILLING SUMMARY

Drilling Company: Aquifer Drilling & Testing
 Borehole Diameter: 6 Inches
 Drilling Method: Roto Sonic
 Total Depth: 50 Feet
 Geologist: Victoria Whelan

WELL DESIGN

Casing Material: Steel
 Screen Material: Open Hole
 Slot Size: Open Hole 11-50 Feet
 Diameter: 4 Inches
 Sand Pack: None

WELL DEVELOPMENT

Method: Whale Pump
 Static Depth to Water: 17.38 Feet
 Pumping Rate: 1 gallon/minute
 Volume Pumped: 50 gallons

TIME LOG

Install Casing: 6/30/2009 14:15-16:00
 Install Well: 7/2/2009 13:00-14:30
 Development: 7/2/2009 15:00-15:45

Note: Top of well casing cut down to elevation 17.99 feet (Datum: Borough of Bronx Topographical Bureau) in March 2010.

LEGEND

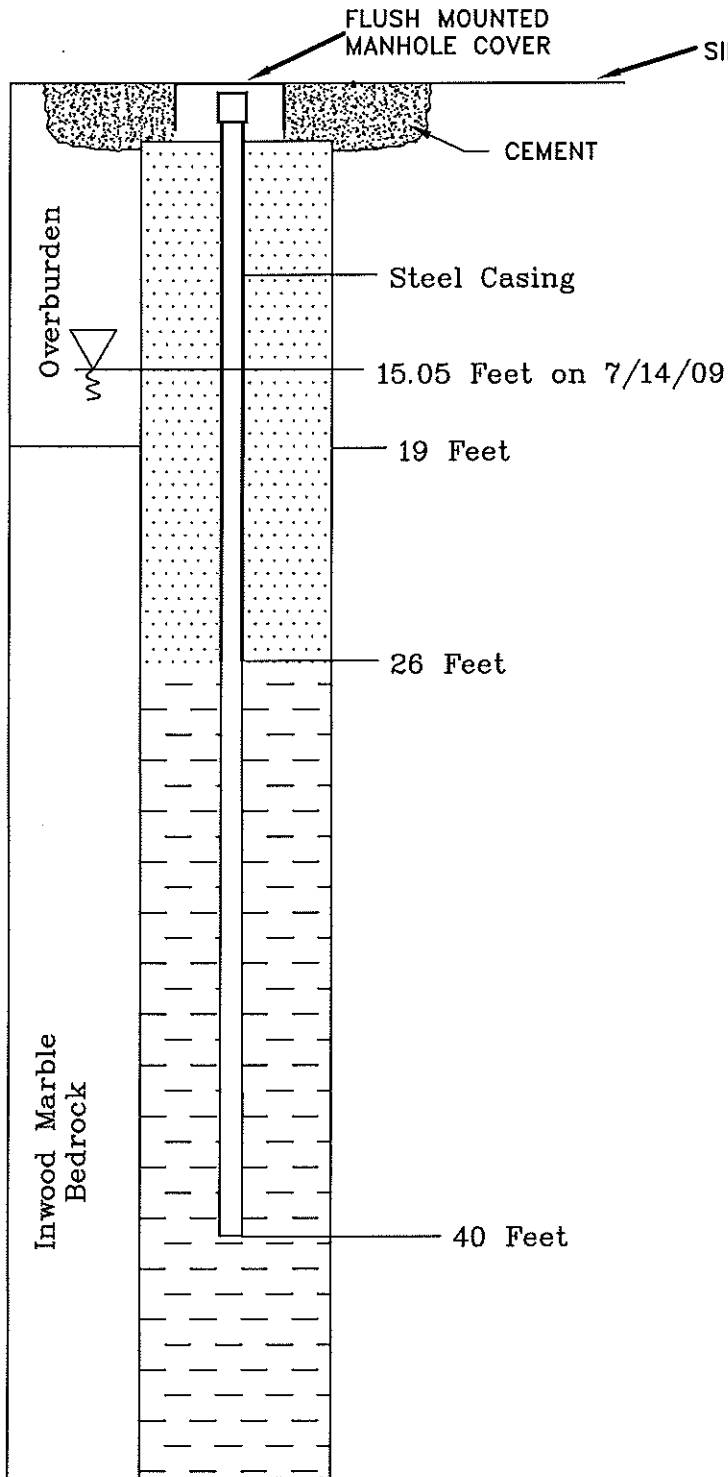
- Approximate Water Table Surface
- Cement
- Inwood Marble (Bedrock)

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TITLE GROUNDWATER MONITORING WELL CONSTRUCTION DETAILS FOR MW-7		DATE 4/9/2010
FIGURE D-7		SCALE Not to Scale
DRAWING NO. 2009-10	CORNERSTONE B1 3100 3rd AVENUE THE BRONX, NY	DRAWN BY: J.T.C.
		APPR BY: D.S.

MW-8



DRILLING SUMMARY

Drilling Company: Aquifer Drilling & Testing
 Borehole Diameter: 6 Inches
 Drilling Method: Roto Sonic
 Total Depth: 40 Feet
 Geologist: Victoria Whelan

WELL DESIGN

Casing Material: Steel
 Screen Material: Open Hole
 Slot Size: Open Hole 26-40 Feet
 Diameter: 4 Inches
 Sand Pack: None

WELL DEVELOPMENT

Method: Whale Pump
 Static Depth to Water: 15.05 Feet
 Pumping Rate: 1 gallon/minute
 Volume Pumped: 50 gallons

TIME LOG

Install Casing: 7/2/2009 08:50-12:30
 Install Well: 7/6/2009 08:30-10:00
 Development: 7/6/2009 10:15-13:30

Note: Top of well casing cut down to elevation 18.35 feet (Datum: Borough of Bronx Topographical Bureau) in March 2010.

LEGEND



Approximate Water Table Surface



Cement



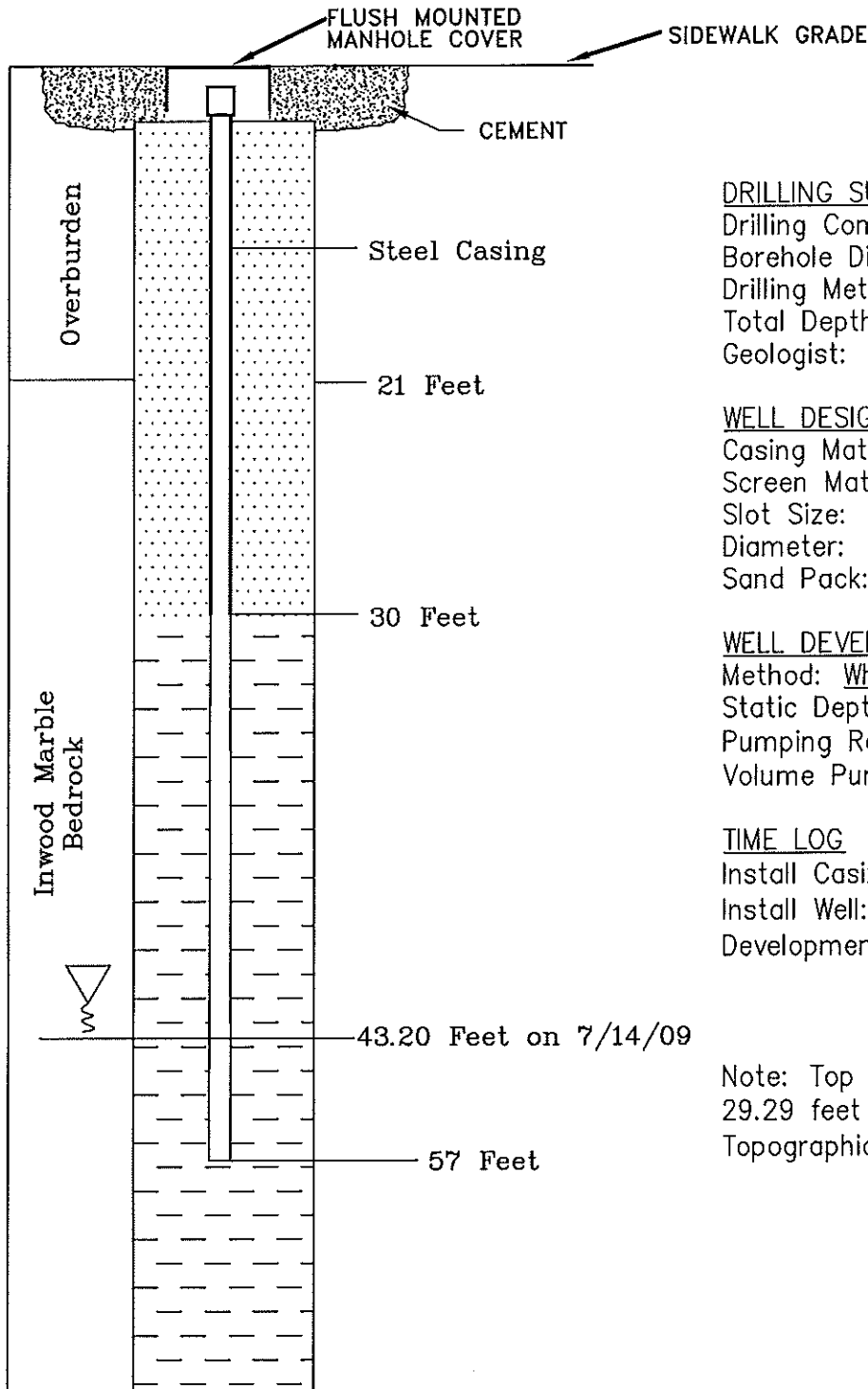
Inwood Marble (Bedrock)

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TITLE GROUNDWATER MONITORING WELL CONSTRUCTION DETAILS FOR MW-8		DATE 4/9/2010
FIGURE D-8		SCALE Not to Scale
DRAWING NO: 2009-11	CORNERSTONE B1 3100 3rd AVENUE THE BRONX, NY	DRAWN BY: J.T.C.
		APPR BY: D.S.

MW-10



DRILLING SUMMARY

Drilling Company: Aquifer Drilling & Testing
 Borehole Diameter: 6 Inches
 Drilling Method: Roto Sonic
 Total Depth: 57 Feet
 Geologist: Victoria Whelan

WELL DESIGN

Casing Material: Steel
 Screen Material: Open Hole
 Slot Size: Open Hole 30-57 Feet
 Diameter: 4 Inches
 Sand Pack: None

WELL DEVELOPMENT

Method: Whale Pump
 Static Depth to Water: 43.20 Feet
 Pumping Rate: 1-Gallon/minute
 Volume Pumped: 5 Gallons

TIME LOG

Install Casing: 7/1/2009 09:50-11:50
 Install Well: 7/6/2009 13:55 -7/7/2009 14:00
 Development: Dry upon installation. 7/9/2009 pumped until dry.

Note: Top of well casing cut down to elevation 29.29 feet (Datum: Borough of Bronx Topographical Bureau) in March 2010.

LEGEND



Approximate Water Table Surface



Cement



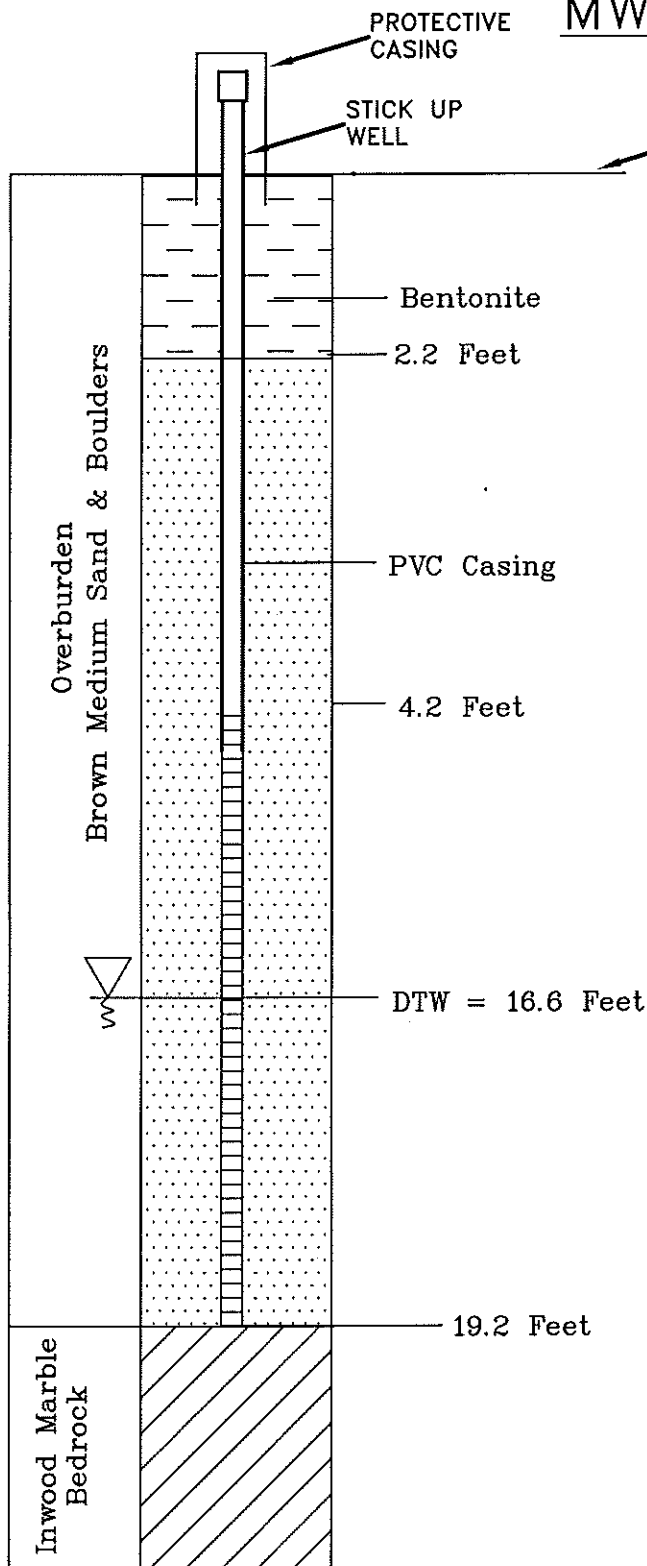
Inwood Marble (Bedrock)

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TITLE GROUNDWATER MONITORING WELL CONSTRUCTION DETAILS FOR MW-10		DATE 4/9/2010
FIGURE D-10		SCALE Not to Scale
DRAWING NO. 2009-12	CORNERSTONE B1 3100 3rd AVENUE THE BRONX, NY	DRAWN BY: J.T.C.
		APPR BY: D.S.

MW-11



DRILLING SUMMARY

Drilling Company: Eastern Environmental Sol.
 Borehole Diameter: 6 Inches
 Drilling Method: Hollow Stem Auger
 Total Depth: 16 Feet
 Geologist: Victoria Whelan

WELL DESIGN

Casing Material: Schedule 40 PVC
 Screen Material: PVC Screen 15 Feet
 Slot Size: 0.02 Slot
 Diameter: 4 Inches
 Sand Pack: Morie No. 2 Sand

WELL DEVELOPMENT

Method: Trash Pump
 Static Depth to Water: 16.6 Feet
 Pumping Rate: 1 gallon/minute
 Volume Pumped: 20 gallons

TIME LOG

Install Casing: 11/2/2009 10:00AM-11:00AM
 Install Well: 11/2/2009 11:00AM-11:30AM
 Development: 11/2/2009 12:00PM-12:20PM

LEGEND



Approximate Water Table Surface



Grout



Inwood Marble (Bedrock)



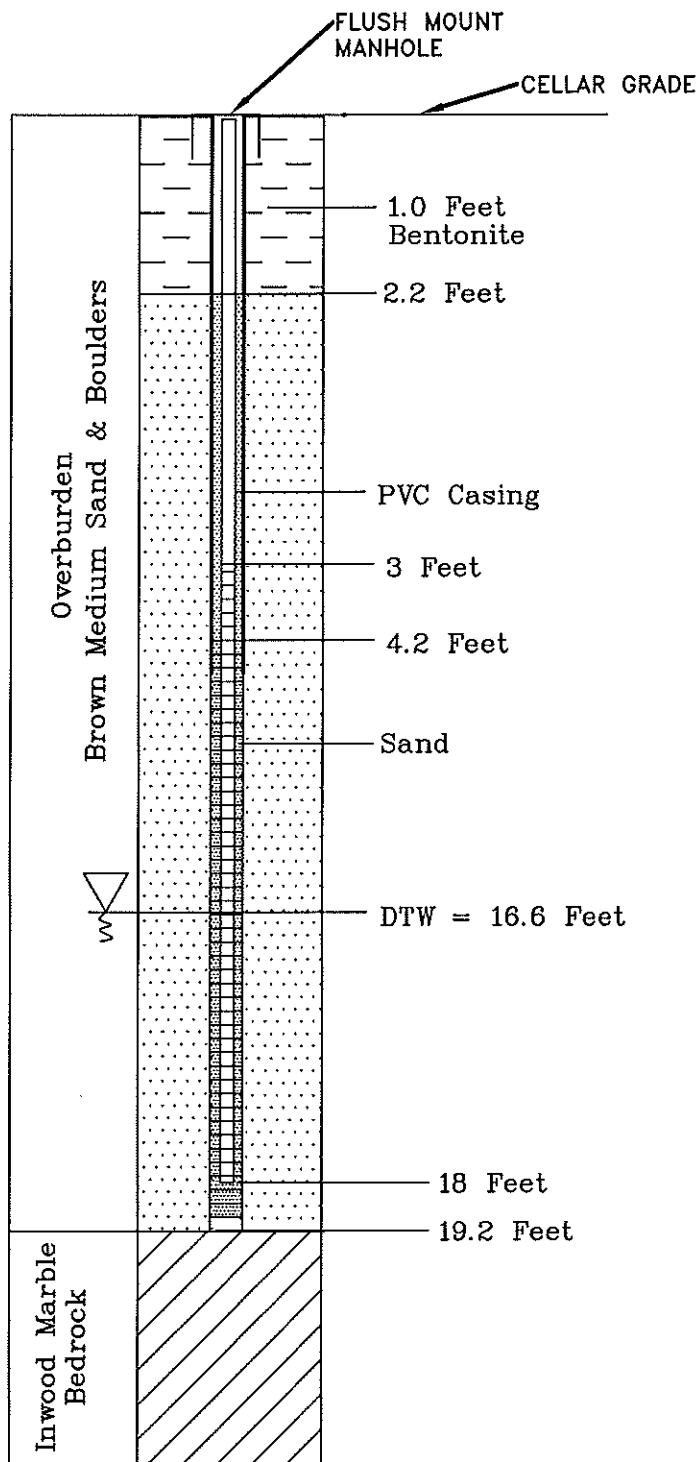
Sand

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TITLE GROUNDWATER MONITORING WELL CONSTRUCTION DETAILS FOR MW-11 IN 2009		DATE 1/7/2010
FIGURE D-11		SCALE Not to Scale
DRAWING NO: 2010-1	CORNERSTONE B1 3100 3rd AVENUE THE BRONX, NY	DRAWN BY: J.T.C.
		APPR BY: D.S.

MW-11 After Conversion



DRILLING SUMMARY

Drilling Company: Eastern Environmental Sol.
 Borehole Diameter: 6 Inches
 Drilling Method: Hollow Stem Auger
 Total Depth: 16 Feet
 Geologist: Victoria Whelan

WELL DESIGN

Casing Material: Schedule 40 PVC
 Screen Material: PVC Screen 15 Feet
 Slot Size: 0.02 Slot
 Diameter: 4 Inches
 Sand Pack: Morie No. 2 Sand

WELL DEVELOPMENT

Method: Trash Pump
 Static Depth to Water: 16.6 Feet
 Pumping Rate: 1 gallon/minute
 Volume Pumped: 20 gallons

TIME LOG

Install Casing: 11/2/2009 10:00AM-11:00AM
 Install Well: 11/2/2009 11:00AM-11:30AM
 Development: 11/2/2009 12:00PM-12:20PM

WELL DESIGN AFTER CONVERSION

Casing Material: Schedule 40 PVC
 Screen Material: PVC Screen 15 Feet
 Slot Size: 0.02 Slot
 Diameter: 2 Inches
 Sand Pack: Morie No. 2 Sand

WELL DEVELOPMENT

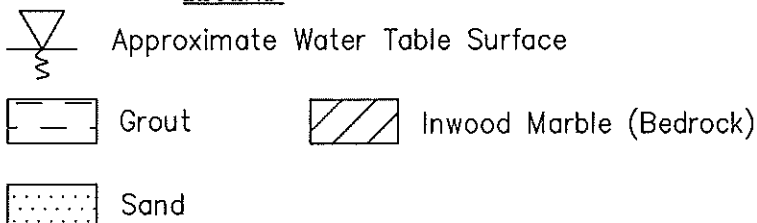
Method: Grundfos Pump
 Static Depth to Water: 13.96
 Pumping Rate: 1 gallon/minute
 Volume Pumped: 20 gallons

TIME LOG

Installed Well: 1/26/2010 8:00AM-9:00AM
 Development: 1/26/2010 9:00AM-9:30AM

Note: Elevation of top of casing is 19.14 feet (Datum: Borough of Bronx Topographical Bureau) in March 2010.

LEGEND



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TITLE: GROUNDWATER MONITORING WELL CONSTRUCTION DETAILS FOR MW-11		DATE: 4/9/2010
FIGURE: D-11A		SCALE: Not to Scale
DRAWING NO: 2010-10		DRAWN BY: J.T.C.
CORNERSTONE B1 3100 3rd AVENUE THE BRONX, NY		APPR BY: D.S.

APPENDIX E

Sample Groundwater Sampling Log

Groundwater Sampling Log
 Cornerstone Site B-1
 3100 Third Avenue
 Bronx, New York
 BCP #C203044

Sample ID	Well Integrity	Depth to Water	Depth to Bottom	Amount Purged	pH	Temperature	Conductivity	Oxygen/Reduction Potential	Dissolved Oxygen
MW-1									
MW-2A									
MW-3									
MW-4									
MW-5									
MW-6									
MW-7									
MW-8									
MW-10									
MW-11									

Comments:

APPENDIX F

Sample Engineering Control Inspection Form

Site-Wide Inspection Check List
 Cornerstone Site B-1
 3100 Third Avenue
 Bronx, New York
 BCP #C203044

Compliances to be Addressed	Comments
Provide an evaluation of the condition and continued effectiveness of engineering controls (foundation walls/slabs, ventilated parking garage, vapor barrier, and concrete sidewalks).	
Are all institutional controls, including Site usage in compliance?	
What are the general Site conditions?	
Are Site management activities being conducted including, confirmation sampling and a health and safety inspection?	
Are all Site records up to date?	
Does Site access remain available to maintain engineering controls?	
Are all permits and schedules included in the Operation and Maintenance Plan in Compliance?	

Inspector-
 Date/Time-

APPENDIX G

Quality Assurance Project Plan

QUALITY ASSURANCE PROJECT PLAN (QAPP)
FOR THE
SITE MANAGEMENT PLAN (SMP)
AT
Cornerstone Site B-1
3100 Third Avenue
Bronx, New York
BCP #C203044

This document describes sampling and analytical methods for end-point sampling.

1.0 Introduction - The following Quality Assurance Plan (QAPP) has been prepared specifically for the Cornerstone Site B-1 SMP. This Plan was prepared and approved as stated below:

Prepared by:  Date: 2-19-10

Deborah Shapiro, Project Manager

Approved by:  Date: 2-19-10

Stephen Malinowski, Associate

The following elements are included in this QAPP:

Table of Contents

Title Page and Introduction

Project Description

Project Organization

Quality Assurance Objectives for Data Measurements

Sampling Procedure

Sample and Document Custody Procedures

Calibration Procedures and Frequency

Analytical Procedures

Data Reduction, Validation and Reporting

Internal Quality Control Checks
Performance and System Audits
Preventive Maintenance
Data Measurement Assessment Procedures
Corrective Action
Quality Assurance Reports and Management

1.1 Project Description – The Cornerstone Site B-1 SMP subject to this QAPP has been prepared for implementation of the SMP. The SMP implements and manages 1) IC/ECs; 2) soil vapor, indoor/outdoor air, and groundwater monitoring; 3) operation and maintenance of a pump and treat and SSD system; and, 4) performance of inspections and submittal of reports.

1.2 Project Organization - Ms. Deborah Shapiro will serve as the Project Director/Manager (PM) and will be responsible for the overall scheduling and performance of all the SMP activities.

Mr. Stephen Malinowski will serve as the Quality Assurance Officer (QAO) for this project. His duties will include:

- Review of laboratory data packages
- Interface with laboratory
- Performance of Field Audits

Experienced CA RICH staff will complete the field activities described in the SMP.

1.3 Quality Assurance Objectives and Data Measurement – There are two sources of data collection methodology that will provide data information during this SMP.

Field Screening - Organic vapor and lower explosive limit (LEL) readings will be recorded from soil vapor and indoor/ambient air samples, if needed, during implementation of the SMP. This data is intended to be used only as a screening tool. To meet these goals, clean sampling tools will be used and the PID and LEL will be calibrated at the beginning of each screening day.

Laboratory Analysis – All environmental samples will be delivered to a NYS-Certified laboratory contracted to CA RICH for chemical analysis. The soil vapor and indoor/ambient air samples will be analyzed for VOCs via EPA Method TO-15. The post-remedial groundwater samples and pump and treat system effluent will be analyzed for VOCs via EPA Method 8260. The soil vapor, indoor/ambient air, and effluent sample data are intended to confirm that the ECs in effect are sufficient. The groundwater data will assess the performance of the pump and treat system. The laboratory will follow the NYSDEC – Analytical Services Protocol dated 1995. All samples will be analyzed using NYSDEC ASP Category B deliverables. All samples will be collected in pre-cleaned laboratory supplied containers, placed in iced-filled coolers, and delivered to the laboratory by CA RICH within 48 hours of collection.

Quality assurance objectives are generally defined in terms of five parameters:

- **Representativeness** - Representativeness is the degree to which sampling data accurately and precisely represents Site conditions, and is dependent on sampling and analytical variability. The SMP has been designed to assess the presence of the constituents at the time of sampling. The Plan presents the rationale for sample quantities and location. The SMP presents field sampling methodologies and laboratory analytical methodologies, respectively.

The use of the prescribed field and laboratory analytical methods with associated holding times and preservation requirements are intended to provide representative data. Further discussion of QC checks is presented in Section 1.5 of this document.

- **Comparability** - Comparability is the degree of confidence with which one data set can be compared to another. Comparability between the remedial activities and to the extent possible, with existing data will be maintained through consistent sampling and analytical methodology set forth in the QAPP, the NYSDEC ASP analytical methods with NYSDEC ASP QA/QC requirements (1995), and through use of QA/QC procedures and appropriately trained personnel.
- **Completeness** - Completeness is defined as a measure of the amount of valid data obtained from an event and/or investigation compared to the amount that was expected to be obtained under normal conditions. This will be determined upon assessment of the analytical results, as discussed in Section 1.12 of this document.
- **Precision** - Precision is the measure of reproducibility of sample results. The goal is to maintain a level of analytical precision consistent with the objectives of the Pre-Design Investigation and Remedial Action. To maximize precision, sampling and analytical procedures will be followed. All work for the SMP will adhere to established protocols presented in the QAPP. Checks for analytical precision will include the analysis of field duplicates. Checks for field measurement precision will include obtaining duplicate field measurements. Further discussion of precision QC checks is provided in Section 1.12 of this document.
- **Accuracy** - Accuracy is the deviation of a measurement from the true value of a known standard. Both field and analytical accuracy will be monitored through initial and continuing calibration of instruments. In addition, internal standards, matrix spikes, blank spikes, and surrogates (system monitoring compounds) will be used to assess the accuracy of the laboratory analytical data. Further discussion of these QC samples is provided in Section 1.12 of this document.

1.4 Sampling Procedures - The sampling procedures that will be employed are discussed in detail in Section 3.3 of the SMP.

1.5 Sample and Document Custody Procedures

- **General** - The Chain-of-Custody program allows for the tracing of possession and handling of the sample from the time of collection through laboratory analysis. The chain-of-custody program at this Site will include:
 - Sample labels
 - Chain-of-Custody records
 - Field records
- **Sample Labels** - To prevent misidentification of samples, a label will be affixed to the sample container and will contain the following information:
 - Site Name
 - Sample identification number
 - Date and time of collection
 - Name of Sampler
 - Preservation (if any)
 - Type of analysis to be conducted.
- **Chain-of-Custody Records** - To establish the documentation that is necessary to trace sample possession from the time of collection, a chain-of-custody record (sample attached as Figure 1) will be filled out and will accompany samples at all times. The record will contain the following information:
 - Project name:
 - Printed name and signature of samplers
 - Sample number
 - Date and time of collection
 - Sampling location
 - Number of containers for each sample

- Signature of individuals involved in sample transfer
(when relinquishing and accepting samples)
- Inclusive dates and times of possession.

- **Field Records** - Field records will be maintained during each sampling effort in a logbook. All aspects of sample collection, handling and visual observations will be recorded. All sample collection equipment, field analytical equipment and equipment utilized to make physical measurements will be identified in the field logbook.

All calculations, results and calibration data for field sampling, field analytical and field physical measurement equipment will also be recorded in the field logbook. Entries will be dated and initialed. Entries will be made in ink, and will be legible. The bottom of each page will be signed.

1.6 Calibration Procedures and Frequency - The contracted laboratory will follow the NYSDEC Category-B requirements for equipment calibration procedures and frequency.

The QA Officer and/or PM will be responsible for ensuring that the Field PID and/or LEL are calibrated at the beginning of each day of field sampling using calibration gas supplied by the manufacturer. A log of the meter calibration will be kept in the filed logbook.

1.7 Analytical Procedures - The laboratory analysis includes VOCs using EPA Method 8260 and VOCs using EPA Method TO-15 and will follow NYSDEC ASP (1995) protocols with Category B deliverables. The following samples will be collected for QA/QC purposes for the groundwater sampling: 1 trip blank, 1 field blank (per day of field work), 1 duplicate sample, 1 matrix spike, and 1 matrix spike duplicate. A qualified data validator will review the laboratory data and a Data Usability Summary Report (DUSR) will be prepared.

1.8 Data Reduction, Validation and Reporting

CA RICH will prepare summary tables of the analytical data using computer spread sheet software. The data entries will be reviewed using the red check-green check method. All entries will be reviewed and entry errors will be marked in red ink. Once these entries are corrected, the printouts will be marked with green ink and placed in the project file.

1.9 Internal Quality Control Checks

Both field and laboratory quality control checks are proposed for this project. In the event that there are any deviations from these checks, the Project Manager and Quality Assurance Officer will be notified. The proposed field and laboratory control checks are discussed below.

Field Quality Control Checks

- **Sample Containers** - Certified-clean sample containers in accordance with NYSDEC ASP (1995) will be supplied by the contracted laboratory.
- **Field Duplicates** - Field duplicates will be collected to check reproducibility of the sampling methods. In general, field duplicates will be analyzed at a five percent frequency (every 20 samples).

1.10 Performance and Systems Audits

Performance and systems audits will be completed in the field and the laboratory during implementation of the SMP as described below.

- **Field Audits** - The PM and QAO will monitor field performance. Field performance audit summaries will contain an evaluation of field measurements and field meter calibrations to verify that measurements are taken according to established protocols. The PM will review all field logs. In addition, the PM and the QAO will review the duplicate sample data to identify potential deficiencies in field sampling procedures.

- **Laboratory Audits** – The contracted laboratory will perform internal audits consistent with NYSDEC ASP (1995).

1.11 Preventive Maintenance

Preventive maintenance schedules have been developed for both field and laboratory instruments. A summary of the maintenance activities to be performed is presented below.

- **Field Instruments and Equipment** - Prior to any field sampling, each piece of field equipment will be inspected to assure it is operational. If the equipment is not operational, it must be serviced prior to use. All meters which require charging or batteries will be fully charged or have fresh batteries. If instrument servicing is required, it is the responsibility of the field personnel to follow the maintenance schedule and arrange for prompt service.
- **Laboratory Instruments and Equipment** - Laboratory instrument and equipment procedures will be documented by the laboratory. Documentation includes details of any observed problems, corrective measure(s), routine maintenance, and instrument repair (which will include information regarding the repair and the individual who performed the repair).

Preventive maintenance of laboratory equipment generally will follow the guidelines recommended by the manufacturer. A malfunctioning instrument will be repaired immediately by in-house staff or through a service call from the manufacturer.

1.12 Data Assessment Procedures

The analytical data generated during the SMP will be evaluated with respect to precision, accuracy, and completeness. The procedures utilized when assessing data precision, accuracy, and completeness are presented below.

- **Data Precision Assessment Procedures** - Field precision is difficult to measure because of temporal variations in field parameters. However, precision will be controlled through the use of experienced field personnel, properly calibrated meters, and duplicate field measurements. Field duplicates will be used to assess precision for the entire measurement system including sampling, handling, shipping, storage, preparation and analysis.

Laboratory data precision for organic analyses will be monitored through the use of duplicate sample analyses. For other parameters, laboratory data precision will be monitored through the use of field duplicates and/or laboratory duplicates.

The precision of data will be measured by calculation of the standard deviation (SD) and the coefficient of variation (CV) of duplicate sample sets. The SD and CV are calculated for duplicate sample sets by:

$$SD = (A-B)/1.414$$

$$CV = SD/((A+B)/2) = 1.414(A-B)/(A+B)$$

Where:

A = Analytical result from one of two duplicate measurements

B = Analytical result from the second measurement.

Where appropriate, A and B may be either the raw measurement or an appropriate mathematical transformation of the raw measurement (e.g., the logarithm of the concentration of a substance).

Alternately, the relative percent difference (RPD) can be calculated by the following equation:

$$\text{RPD} = \frac{(A-B)}{(A+B)/2} \times 100$$
$$\text{RPD} = 1.414 (\text{CV})(100)$$

- **Data Accuracy Assessment Procedures** - The accuracy of field measurements will be controlled by experienced field personnel, properly calibrated field meters, and adherence to established protocols. The accuracy of field meters will be assessed by review of calibration and maintenance logs.

Laboratory accuracy will be assessed via the use of matrix spikes, surrogate spikes, and internal standards. Where available and appropriate, QA performance standards will be analyzed periodically to assess laboratory accuracy. Accuracy will be calculated as a percent recovery as follows:

$$\text{Accuracy} = \frac{(A-X)}{B} \times 100$$

Where:

A = Value measured in spiked sample or standard

X = Value measured in original sample

B = True value of amount added to sample or true value of standard

This formula is derived under the assumption of constant accuracy over the original and spiked measurements. If any accuracy calculated by this formula is outside of the acceptable levels, data will be evaluated to determine whether the deviation represents unacceptable accuracy, or variable, but acceptable accuracy. Accuracy objectives for matrix spike recoveries and surrogate recovery objectives are identified in the NYSDEC ASP (1995).

- **Data Completeness Assessment Procedures** - Completeness of a field or laboratory data set will be calculated by comparing the number of samples collected or analyzed to the proposed number.

$$\text{Completeness} = \frac{\text{No. Valid Samples Collected or Analyzed}}{\text{No. Proposed Samples Collected or Analyzed}} \times 100$$

As general guidelines, overall project completeness is expected to be at least 90 percent. The assessment of completeness will require professional judgment to determine data useability for intended purposes.

1.13 Corrective Action

Corrective actions are required when field or analytical data are not within the objectives specified in this QAPP. Corrective actions include procedures to promptly investigate, document, evaluate, and correct data collection and/or analytical procedures. Field and laboratory corrective action procedures for this project are described below.

- **Field Procedures** - When conducting the field work, if a condition is noted that would have an adverse effect on data quality, corrective action will be taken so as not to repeat this condition. Condition identification, cause and corrective action implemented will be documented as a memo to the project file and reported to the PM.

Examples of situations which would require corrective actions are provided below:

- Protocols as defined by the QAPP and the SMP have not been followed;
- Equipment is not in proper working order or properly calibrated;
- QC requirements have not been met; and
- Issues resulting from performance or systems audits.

Project field personnel will continuously monitor ongoing work performance in the normal course of daily responsibilities.

- **Laboratory Procedures** - In the laboratory, when a condition is noted to have an adverse effect on data quality, corrective action will be taken as not to repeat this condition. Condition identification, cause and corrective action to be taken will be documented, and reported to the QAO.

Corrective action may be initiated, at a minimum, under the following conditions:

- Specific laboratory analytical protocols have not been followed;
- Predetermined data acceptance standards are not obtained;
- Equipment is not in proper working order or calibrated;
- Sample and test results are not completely traceable;
- QC requirements have not been met; and
- Issues resulting from performance or systems audits.

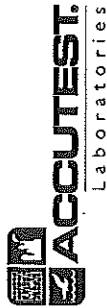
Laboratory personnel will continuously monitor ongoing work performance in the normal course of daily responsibilities.

1.14 Quality Assurance Reports to Management

- **Internal Reporting** -The analytical laboratory will submit analytical reports using NYSDEC ASP (1995), Category B requirements. The analytical reports will be submitted to the data validator for review. Supporting data (i.e., historic data, related field or laboratory data) will also be reviewed to evaluate data quality, as appropriate. The QAO will incorporate results of data validation reports (if any) and assessments of data usability into a summary report. This report will be filed in the project file and will include the following:
 - Assessment of data accuracy, precision, and completeness for field & laboratory data;
 - Results of the performance and systems audits;
 - Significant QA/AC problems, solutions, corrections, and potential consequences;

- Analytical data validation report; and
 - Data usability report.
-
- **Reporting** - The reports will contain a separate QA/QC section summarizing the quality of data collected and/or used as appropriate to the project DQOs. The QAO will prepare the QA/QC summaries using reports and memoranda documenting the data assessment and validation.

Example of Chain of Custody



PAGE OF

www.accutest.com

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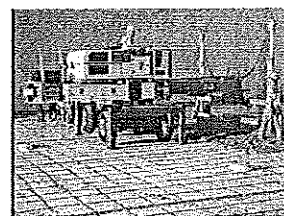
APPENDIX H

Vapor Barrier Specifications



Stego® Wrap Vapor Barrier

STEGO INDUSTRIES, LLC



Vapor Retarders

07260, 03300

Manufacturer

Stego Industries, LLC
216 Avenida Fabricante, Suite 101
San Clemente, CA 92672
Sales, Technical Assistance
Ph: (877) 464-7834
Fx: (949) 257-4113
www.stegoindustries.com

Product Description

USES: Stego Wrap Vapor Barrier is used as a true below-slab vapor barrier, and as a protection course for below grade waterproofing applications.

COMPOSITION: Stego Wrap Vapor Barrier is a multi-layer plastic extrusion manufactured with only the highest grade of prime, virgin, polyolefin resins.

ENVIRONMENTAL FACTORS:

Stego Wrap Vapor Barrier can be used in systems for the control of soil gases (radon, methane), soil poisons (oil by-products) and sulfates.

Installation

UNDER SLAB: Unroll Stego Wrap Vapor Barrier over an aggregate, sand or

tamped earth base. Overlap all seams a minimum of six inches and tape using Stego Tape. All penetrations must be sealed using a combination of Stego Wrap Vapor Barrier, Stego Tape and/or Stego Mastic.

VERTICAL WALL: Install Stego Wrap Vapor Barrier over the waterproofing membrane while still tacky. Mechanically fasten Stego Wrap Vapor Barrier to the wall at the top with termination bar and concrete nails. Drape Stego Wrap Vapor Barrier down across the footer and under the french drain.

Availability & Cost

Stego Wrap Vapor Barrier is available nationally via building supply distributors. For current cost information, contact your local Stego Wrap distributor or Stego Industries' sales department.

Warranty

Stego Industries, LLC believes to the best of its knowledge, that specifica-

tions and recommendations herein are accurate and reliable. However, since site conditions are not within its control, Stego Industries does not guarantee results from the use of the information provided and disclaims all liability from any loss or damage. No warranty, express or implied, is given as to the merchantability, fitness for a particular purpose, or otherwise with respect to the products referred to.

Maintenance

None required.

Technical Services

Technical advice, custom CAD drawings, and additional information can be obtained by contacting Stego Industries' technical assistance department or via the website.

Filing Systems

- Stego Industries' website
- Buildsite
- GreenFormat
- 4Specs

Technical Data

TABLE 1: PHYSICAL PROPERTIES OF STEGO WRAP VAPOR BARRIER

PROPERTY	TEST	RESULTS
Under Slab Vapor Retarders	ASTM E 1745 Class A, B & C - Standard Specification for Water Vapor Retarders Used in Contact with Soil or Granular Fill under Concrete Slabs	Exceeds Class A, B & C
Water Vapor Permeance	ASTM F 1249 - Test Method for Water Vapor Transmission Rate Through Plastic Film and Sheeting Using a Modulated Infrared Sensor	0.0084 perms *0.0035 WVTR
Puncture Resistance	ASTM D 1709 - Test Methods for Impact Resistance of Plastic Film by Free-Falling Dart Method	2326 grams
Tensile Strength	ASTM D 882 - Test Method for Tensile Properties of Thin Plastic Sheeting	79.6 lbf/in.
Permeance After Conditioning (ASTM E 1745 Sections 7.1.2 - 7.1.5)	ASTM E 154 Section 8, F 1249 - Permeance after wetting, drying, and soaking ASTM E 154 Section 11, F 1249 - Permeance after heat conditioning ASTM E 154 Section 12, F 1249 - Permeance after low temperature conditioning ASTM E 154 Section 13, F 1249 - Permeance after soil organism exposure	0.0091 perms 0.0092 perms 0.0089 perms 0.0092 perms
Methane Transmission Rate	ASTM D 1434 - Standard Test Method for Determining Gas Permeability Characteristics of Plastic Film and Sheeting	**149.6 GTR 2.12 x 10 ⁻⁶ perms
Radon Diffusion Coefficient		1.3 x 10 ⁻¹³ m ² /second
Chemical Resistance	ASTM E 154 - Test Methods for Water Vapor Retarders Used in Contact with Earth under Concrete Slabs, on Walls, or as Ground Cover	Unaffected
Life Expectancy	ASTM E 154 - Test Methods for Water Vapor Retarders Used in Contact with Earth under Concrete Slabs, on Walls, or as Ground Cover	Indefinite
Thickness	ACI 302.1R-04 - Minimum Thickness (10 mils)	15 mils
Roll Dimensions		14 ft. wide x 140 ft. long or 1,960 ft ²
Roll Weight		140 lbs.

Note: perm unit = grains/(ft² * hr * in.Hg) * WVTR = Water Vapor Transmission Rate ** GTR = Gas Transmission Rate



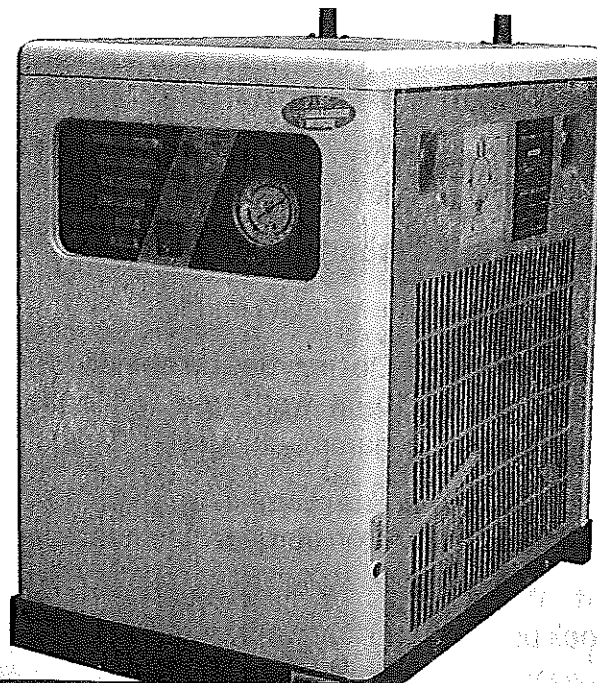
APPENDIX I

Operations Manuals

**CENTRAL
PNEUMATIC® INDUSTRIAL**

COMPRESSED AIR DRYER

**Model 40211
ASSEMBLY and OPERATING
INSTRUCTIONS**



Pappas Air Compressor, Co.

2449 Belmond Ave. N. Bellmore, NY 11710

Sales - Service - Repairs

Compressors, Motors, Pumps

Generators, Parts

Hydrostatic Tests

516-679-9607

Visit our

at.com

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For technical questions and replacement parts, please call 1-800-444-3353

Specifications

Power Source	110/120 Volts, 60 Hz
Horsepower	1/4 HP
Max. Operating Pressure	140 PSI
Recommended Operating Pressure	100 PSI
Air Inlet / Outlet	1/2" Steel Pipe-14 NPT
Flow Capacity	21.6 C.F.M.
Pressure / Temperature Range For R-134A Refrigerant	32-39 PSI (2-8°C)

Note: This Compressed Air Dryer Uses R-134A Refrigerant.

Note: Not for medical use. Do not use for hyperbaric chambers.

Save This Manual

You will need the manual for the safety warnings and precautions, assembly instructions, operating and maintenance procedures, parts list and diagram. Keep your invoice with this manual. Write the invoice number on the inside of the front cover. Keep the manual and invoice in a safe and dry place for future reference.

Safety Warnings and Precautions

WARNING: When using tool, basic safety precautions should always be followed to reduce the risk of personal injury and damage to equipment.

Read all instructions before using this tool!

1. **Keep work area clean.** Cluttered areas invite injuries.
2. **Observe work area conditions.** Do not use machines or power tools in damp or wet locations. Don't expose to rain. Keep work area well lighted. Do not use electrically powered tools in the presence of flammable gases or liquids.
3. **Keep children away.** Children must never be allowed in the work area. Do not let them handle machines, tools, extension cords, or air hoses.
4. **Store idle equipment.** When not in use, tools must be stored in a dry location to inhibit rust. Always lock up tools and keep out of reach of children.
5. **Use the right tool for the job.** Do not attempt to force a small tool or attachment to do the work of a larger industrial tool. There are certain applications for which this tool was designed. It will do the job better and more safely at the rate for which it was intended. Do not modify this tool and do not use this tool for a purpose for which it was not intended.
6. **Dress properly.** Do not wear loose clothing or jewelry as they can be caught in moving parts. Protective, electrically non-conductive clothes and non-skid footwear are recommended when working. Wear restrictive hair covering to contain long hair.
7. **Use eye and ear protection.** Always wear ANSI approved impact safety goggles. Wear a full face shield if you are producing metal filings or wood chips. Wear an ANSI approved dust mask or respirator when working around metal, wood, and chemical dusts and mists.

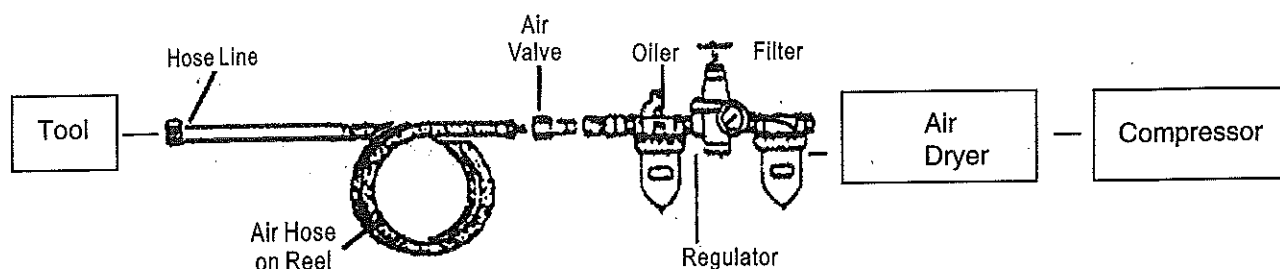
- wet
illy
8. **Do not overreach.** Keep proper footing and balance at all times. Do not reach over or across running machines or air hoses.
 9. **Maintain tools with care.** Keep tools clean for better and safer performance. Follow instructions for lubricating and changing accessories. Inspect tool cords and air hoses periodically and, if damaged, have them repaired by an authorized technician. The handles must be kept clean, dry, and free from oil and grease at all times.
 10. **Remove adjusting keys and wrenches.** Check that keys and adjusting wrenches are removed from the tool or machine work surface before plugging it in.
 11. **Avoid unintentional starting.** Be sure the switch is in the Off position when not in use and before plugging in.
 12. **Stay alert.** Watch what you are doing, use common sense. Do not operate any tool when you are tired.
 13. **Check for damaged parts.** Before using any tool, any part that appears damaged should be carefully checked to determine that it will operate properly and perform its intended function. Check for alignment and binding of moving parts; any broken parts or mounting fixtures; and any other condition that may affect proper operation. Any part that is damaged should be properly repaired or replaced by a qualified technician. Do not use the tool if any switch does not turn On and Off properly.
 14. **Guard against electric shock.** Prevent body contact with grounded surfaces such as pipes, radiators, ranges, and refrigerator enclosures.
 15. **Replacement parts and accessories.** When servicing, use only identical replacement parts. Use of any other parts will void the warranty. Only use accessories intended for use with this tool. Approved accessories are available from Harbor Freight Tools.
 16. **Do not operate tool if under the influence of alcohol or drugs.** Read warning labels on prescriptions to determine if your judgment or reflexes are impaired while taking drugs. If there is any doubt, do not operate the tool.
 17. **Use proper size and type extension cord.** If an extension cord is required, it must be of the proper size and type to supply the correct current to the tool without heating up. Otherwise, the extension cord could melt and catch fire, or cause electrical damage to the tool. Check your compressor's manual for the appropriate size cord.
 18. **Maintenance.** For your safety, maintenance should be performed regularly by a qualified technician.
 19. **Compressed air only.** Never use combustible gases as a power source.

Note: **Performance of the compressor (if powered by line voltage) may vary depending on variations in local line voltage. Extension cord usage may also affect tool performance.**

Warning: The warnings, cautions, and instructions discussed in this instruction manual cannot cover all possible conditions and situations that may occur. It must be understood by the operator that common sense and caution are factors which cannot be built into this product, but must be supplied by the operator

Unpacking

When unpacking, check to make sure the parts listed on page 9 are included. If any parts are missing or broken, please call Harbor Freight Tools at the number on the cover of this manual as soon as possible.



Recommended Air Line Components

For best service you should incorporate an oiler, regulator, and inline filter, as shown in the diagram above. Hoses, couplers, oilers, regulators, and filters are all available at Harbor Freight Tools.

Note: You will need to prepare valves and couplers (not included) from the compressor to the Air Dryer (1/2" Steel Pipe-14 NPT) and from the Air Dryer (1/2" Steel Pipe-14 NPT) to the tool. Use pipe thread seal tape or pipe dope in all of the connections. If you are not using an automatic oiler system, before operation, add a few drops of Pneumatic Tool Oil to the airline connection. Add a few drops more after each hour of continual use. Check the air connection for leaks before use.

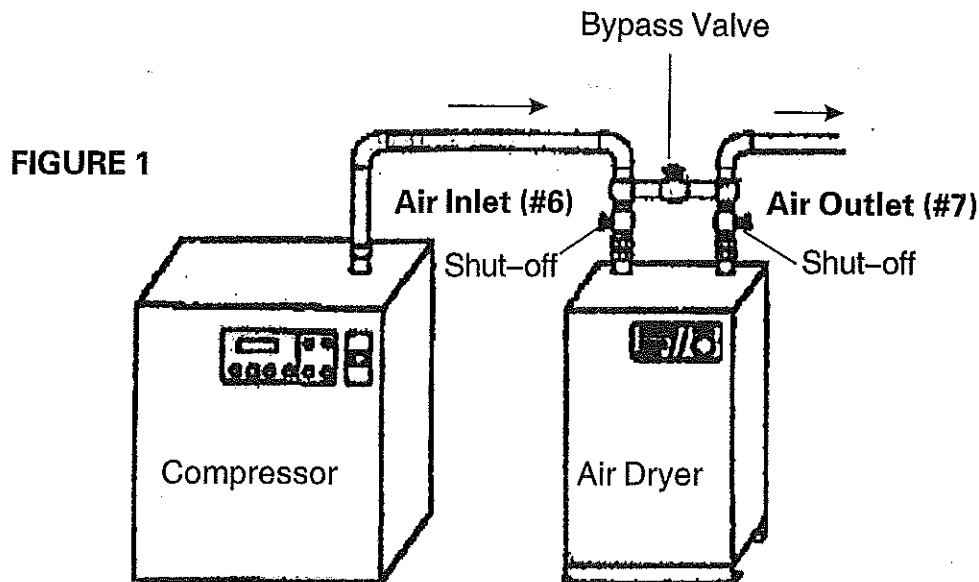
Installation

1. Install the Air Dryer at least 2 feet from the wall on all four sides. This will give the unit proper ventilation and allow space for maintenance and repair.
2. Make sure the floor is level.
3. Do not expose the unit to rain or any moisture.
4. Install the unit out of direct sunlight and away from any heat sources. Otherwise, the cooling function of the unit will continually run, eventually overheating the Air Dryer.
5. Position a small bucket to capture foul water from the drain hose at the bottom of the unit. Condensation water can be piped to a floor drain, if available; be sure to follow local plumbing codes.

Note: Electrical installation and installation of a recommended bypass valve (not included) are covered on page 5.

Installation (continued)

Note: We recommend that a bypass valve (not included) be added between the **Air Inlet (#6)** and the **Air Outlet (#7)** for applications when the Air Dryer is not needed. The bypass valve must be installed by a plumber or an authorized service technician. See **FIGURE 1**.



Note to professional installer: The shut-offs (not included) for both the air inlet and air outlet, must be plumbed below the horizontal piping containing the bypass valve. See **FIGURE 1**.

Using the bypass valve (not using the Air Dryer).

If you do not wish to use the Air Dryer with a certain application follow these steps:

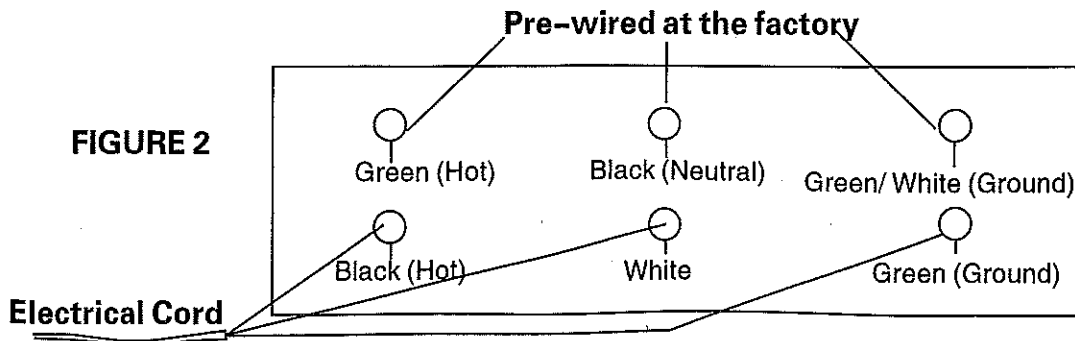
1. Turn off and unplug the compressor and the Air Dryer.
2. Engage the shut-off valves, closing both of the air inlets.
3. Open the bypass valve.
4. Plug in and turn on your compressor and you're ready to work without the Air Dryer

Using the Air Dryer without the bypass valve.

1. Before plugging in the compressor or the Air Dryer, open both of the shut-off valves.
2. Close the bypass valve.
3. Plug in and turn on the Compressor and Air Dryer.

Electrical Installation

Instructions for the following wiring diagram are on page 6.



Electrical Installation (continued)

Refer to **FIGURE 2** on page 5.

Note: Wiring must be done by a professionally certified electrician.

1. Remove the side panel.
2. The top three wires of the electrical box are pre-wired at the factory.
3. The wires from the electrical cord (not included) must be rated for a minimum of 10-1/2 load rated amps, and the plug on the electrical cord must be three pronged (recommended 12 gauge, 3 conductor electrical cord). Wire the bottom three wires as indicated in the wiring diagram in **FIGURE 2** on page 5.

Note: Make sure you run the wires through the hole in the rear panel using a UL approved cable clamp (not provided), so that you can close the unit when you are finished wiring. See **FIGURE 3**.

FIGURE 3

Remove this Side Panel to expose the electrical box

Run electrical cord through opening in rear panel.



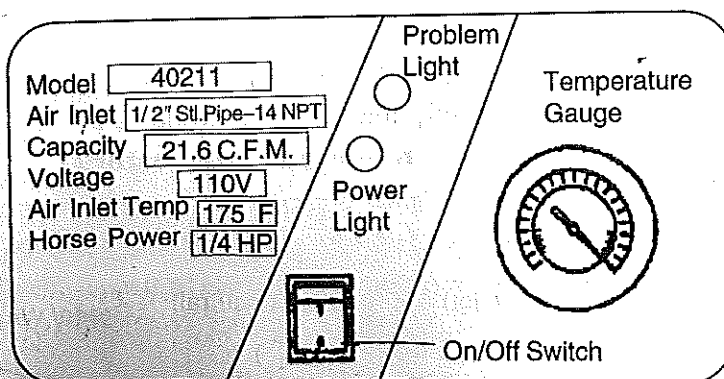
Operation

Note: If problem light is on, turn off Air Dryer and let the unit cool. Try it again after it cools. If the light is still lit, take the unit to an authorized service technician.

FIGURE 4

Note: The gauge should always be in a range between 32~39 PSI (2~8 °C)

If not, turn off Air Dryer and let the unit cool. Try it again after it cools. If the light is still lit, take the unit to an authorized service technician.



Operation (continued)

Note: The Air Dryer works using "Refrigerant 134A". The refrigerant system does not need to be serviced unless the unit begins to leak. If the unit leaks refrigerant, take it to an authorized service technician.

Note: Decide whether you want to use the Air Dryer or bypass the unit. Follow the instructions for using or not using the bypass valve on page 5. If you set the valves for "Using the Air Dryer", follow the instructions below.

1. Turn on the unit with the Switch on the control panel. See **FIGURE 4** on page 6.
2. If, after the unit has warmed up, you don't hear the fan running, there is likely not enough pressure to turn on the pressure switch. Turn off the unit and the compressor. Close the **Air Inlet (#6)**. Then, turn the Air Dryer back on and it will build up pressure in a few minutes. Open the **Air Inlet(#6)**. Turn on your compressor and let air in slowly at first. During operation, dry air will pass through the unit to the tool or application.
3. When you are finished, stop the air compressor first. Continue to run the Air Dryer until all of the compressed air runs through the system.
4. Turn off the Air Dryer.

Note: If the Air Dryer stops and the Problem Light (See **FIGURE 4** on page 6) goes on, the unit is running at too high of a temperature or pressure. Let the unit cool. Unplug the Air Dryer. Open the side panel (See **FIGURE 3** on page 6) and push the reset button on the **Pressure Switch (#14)**. See the Assembly drawing on page 10. Plug in the unit and restart. If the Problem Light stays on, or comes on continually, take the unit to an authorized service technician.

Troubleshooting

Warning!! Repairing this unit (other than trying to reset the **Pressure Switch (#14)**, as mentioned above) should only be performed by an authorized service technician.

Problem 1: Unit shuts off by itself.

Reason: Temperature or pressure is too high or fan is overheated. Or, the **Condenser (#11)** is dirty.

Solution: Reset pressure switch as described in the note above, or clean the **Condenser (#11)** as described in Maintenance on page 8.

Problem 2: No power light when the unit is on.

Reason: Loose connections at wiring panel.

Solution: Check the connections and tighten.

Problem 3: Unit won't cool/dry air.

Reason: Water in the refrigeration unit because of: Auto drain blocked, bad valve, bad connection to capacitor, bad capacitor, bad fan unit, low air pressure.

Solution: Clean auto drain and tube, replace valve, check capacitor connection, replace capacitor, replace fan unit, turn up air pressure on compressor.

Problem 4: Unit buzzes and won't operate.

Reason: Bad capacitor.

Solution: Replace capacitor.

Only done by a qualified electrician or service technician.

Problem 5: Fan isn't working at the correct temperature and pressure.

Reason: Bad fan bearing, bad fan capacitor, or bad temperature switch.

Solution: Replace fan bearing, fan capacitor, or temperature switch.

Only done by a qualified electrician or service technician.

Problem 6: Pressure on the inlet or outlet valves increase for no reason.

Reason: Bad internal pressure valve.

Solution: Replace internal pressure valve.

Problem 7: Ice accumulating in the dryer, and/or a pressure loss through the unit.

Reason: This may be caused by the formation of ice inside.

Solution: The Hot Gas Bypass Valve(not shown in the parts List or Assembly Diagram) needs to be adjusted. This adjustment should only be done after consultation

Maintenance

Note: Maintenance must be performed by an authorized service technician.

Never attempt to adjust the temperature; this adjustment should only be done by an authorized service technician.

1. See **FIGURE 5**. Periodically clean the **Condenser(#11)**. Use a dust collector and an air gun to clean dirt and debris. Be careful not to get too close to the unit with high pressure as you will damage the unit. If grease or oil are built up and won't blow off, wash it off with a mild detergent.

Note: The internal parts illustrated for step 2 below are a guide for the authorized service technician. They cannot be ordered separately. Only the parts on the parts list on page 9 can be ordered.

2. See **FIGURE 6**. Washing the auto drain. To wash the auto drain, close the 1/2 ball Filter Valve on top of the drain. Pull the manual drain shaft handle to empty the water. Take apart the drain and the fixed screw. Clean the strainer from inside to out. Take apart the manual drain shaft and the seal end cap. Take off the float ball and valve seat. Clean each component and reassemble.

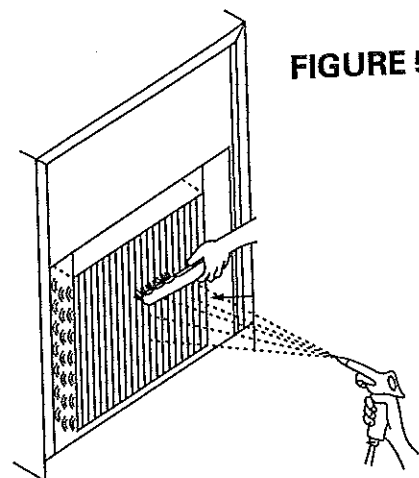
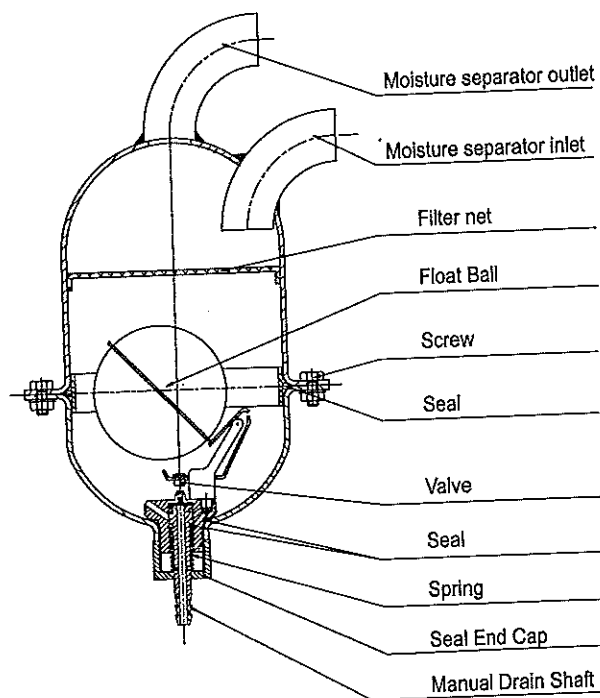


FIGURE 5

FIGURE 6



Parts List

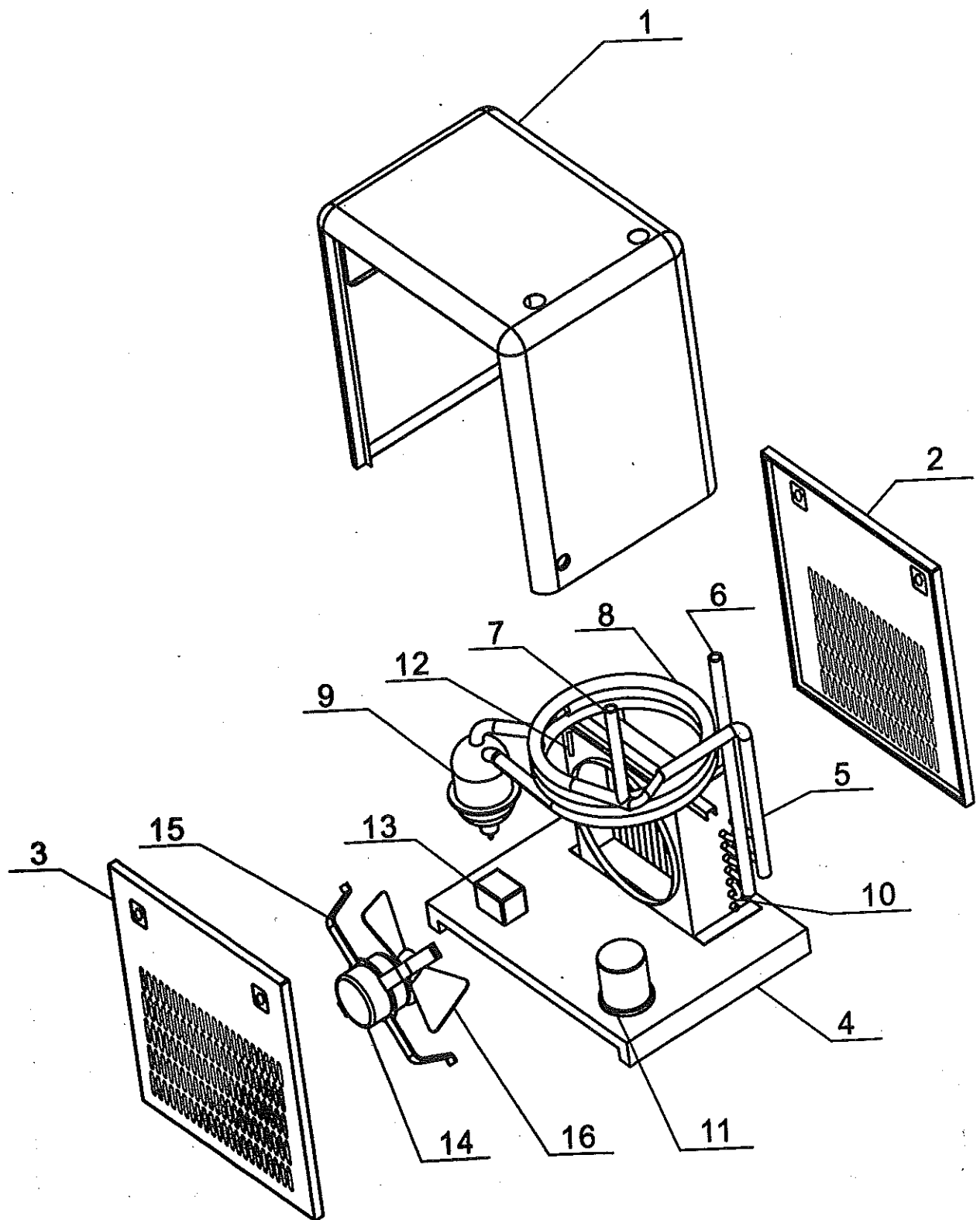
Part No.	Description
1	U-Housing
2	Left Plate
3	Right Plate
4	Base Plate
5	Connect Pipe
6	Air Inlet
7	Air Outlet
8	Evaporator
9	Drain
10	Condenser
11	Compressor
12	Fan Control Pressure Switch
13	Pressure Switch
14	Fan Motor
15	Fan Bracket
16	Fan

PLEASE READ THE FOLLOWING CAREFULLY

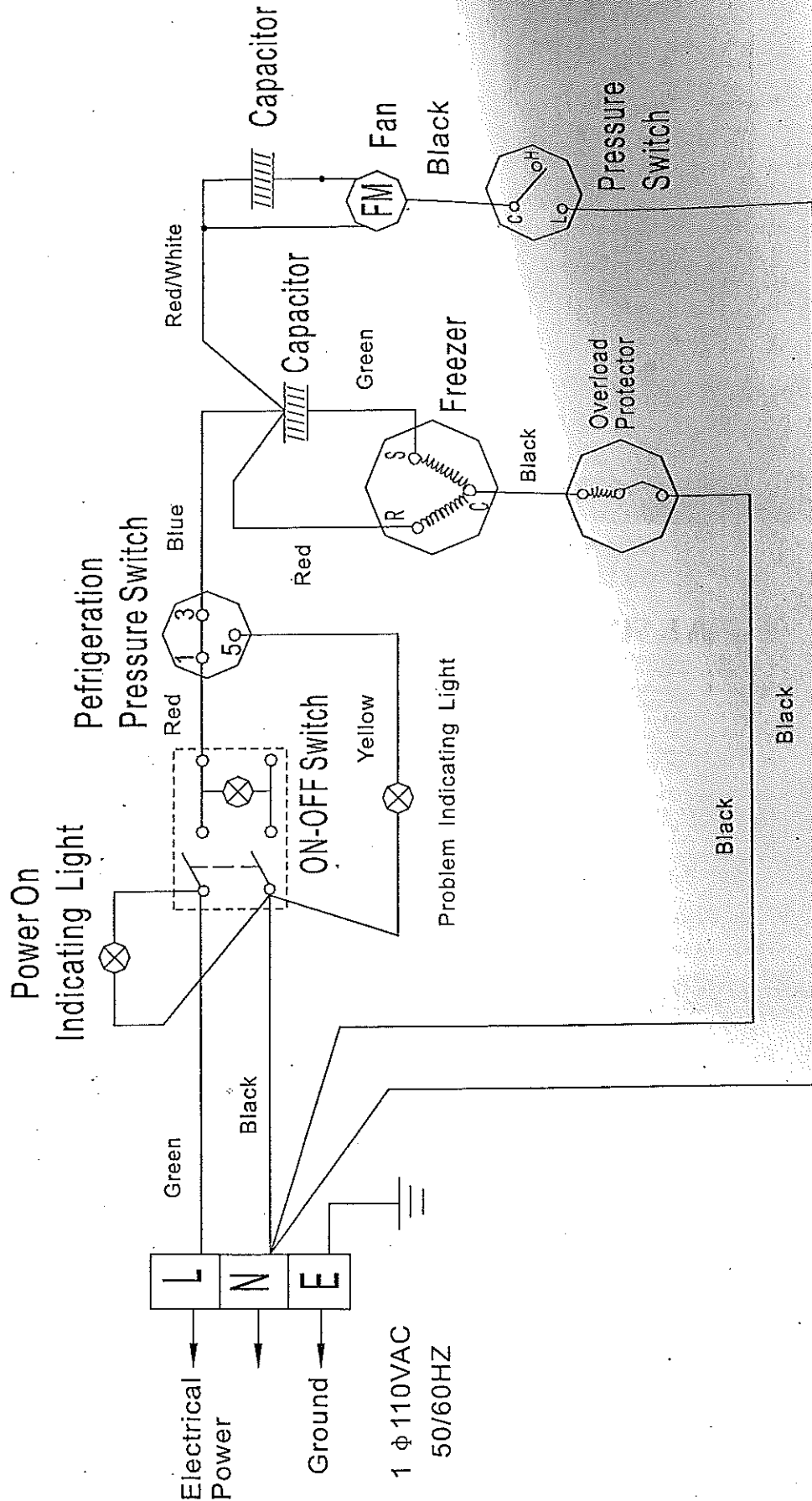
THE MANUFACTURER AND/OR DISTRIBUTOR HAS PROVIDED THE PARTS DIAGRAM IN THIS MANUAL AS A REFERENCE TOOL ONLY. NEITHER THE MANUFACTURER NOR DISTRIBUTOR MAKES ANY REPRESENTATION OR WARRANTY OF ANY KIND TO THE BUYER THAT HE OR SHE IS QUALIFIED TO MAKE ANY REPAIRS TO THE PRODUCT OR THAT HE OR SHE IS QUALIFIED TO REPLACE ANY PARTS OF THE PRODUCT. IN FACT, THE MANUFACTURER AND/OR DISTRIBUTOR EXPRESSLY STATES THAT ALL REPAIRS AND PARTS REPLACEMENTS SHOULD BE UNDERTAKEN BY CERTIFIED AND LICENSED TECHNICIANS AND NOT BY THE BUYER. THE BUYER ASSUMES ALL RISK AND LIABILITY ARISING OUT OF HIS OR HER REPAIRS TO THE ORIGINAL PRODUCT OR REPLACEMENT PARTS THERETO, OR ARISING OUT OF HIS OR HER INSTALLATION OF REPLACEMENT PARTS THERETO.

NOTE: Some parts are listed and shown for illustration purposes only and are not available individually as replacement parts.

Assembly Drawing



SCHEMATIC DIAGRAM



CENTRAL PNEUMATIC INDUSTRIAL®

LIMITED 3 YEAR WARRANTY

Harbor Freight Tools Co. makes every effort to assure that its products meet high quality and durability standards, and warrants to the original purchaser that this product is free from defects in materials and workmanship for the period of three years from the date of purchase. This warranty does not apply to damage due directly or indirectly to misuse, abuse, negligence or accidents; repairs or alterations outside our facilities; or to lack of maintenance. We shall in no event be liable for death, injuries to persons or property, or for incidental, contingent, special or consequential damages arising from the use of our product. Some states do not allow the exclusion or limitation of incidental or consequential damages, so the above limitation of exclusion may not apply to you.

To take advantage of this warranty, the product or part must be returned to us with transportation charges prepaid. Proof of purchase date and an explanation of the complaint must accompany the merchandise. If our inspection verifies the defect, we will either repair or replace the product at our election or we may elect to refund the purchase price if we cannot readily and quickly provide you with a replacement. We will return repaired products at our expense, but if we determine there is no defect, or that the defect resulted from causes not within the scope of our warranty, then you must bear the cost of returning the product.

This warranty gives you specific legal rights and you may also have other rights which vary from state to state.

3491 Mission Oaks Blvd. • P.O. Box 6009 • Camarillo, CA 93011 • [800]444-3353



5252 East 36th Street North
Wichita, KS USA 67220-3205
TEL: 316-686-7361
FAX: 316-686-6746

GREAT PLAINS INDUSTRIES, INC.

"A Great Plains Ventures Subsidiary"

www.gpi.net

1-888-996-3837

Operations Guide for Industrial Grade Aluminum, Brass & Stainless Steel Turbine Housings **CE**

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ENGLISH

GENERAL INFORMATION

Congratulations on receiving your GPI Turbine Housing. These instructions will help you install and maintain your turbine. (Figure 1) Information on computer electronics and accessory modules are contained in other manuals. Please reference those as necessary.

Note: "Figures" mentioned in this text refer to illustrations in the enclosed English Owner's Manual.

Safety Instructions

For your future safety, please review the safety instructions below.

1. Use only fluids that are compatible with the housing material and wetted components of your turbine.
2. When metering flammable liquids, observe precautions against fire or explosion.
3. When handling hazardous liquids, always follow the liquid manufacturer's safety precautions.
4. When working in hazardous environments, always exercise appropriate safety precautions.

5. Always dispose of used cleaning solvents in a safe manner according to the solvent manufacturer's instructions.
6. During turbine removal, liquid may spill. Follow the liquid manufacturer's safety precautions to clean up minor spills.
7. Do not blow compressed air through the turbine.
8. Do not allow liquids to dry inside the turbine.
9. Handle the rotor carefully. Even small scratches or nicks can affect accuracy.
10. When tightening the turbine, use a wrench only on the wrench flats.
11. For best results, always verify accuracy before use.

These Industrial Grade turbines are identified by the internal diameter of the inlet and outlet.

Information specific to your particular turbine, including serial number, model number, manufacturing date, and K-factor is etched into the surface of the turbine.

These GPI turbine meters are Factory Mutual Approved and cUL Classified with a Class 1, Division 1 Approval for hazardous environments.

INSTALLATION

The following suggestions help maximize performance. These turbines measure flow in one direction indicated by the arrow cast-molded in the turbine outlet.

Upstream from the turbine, allow a minimum straight pipe length at least 10 times the internal diameter of the turbine. Downstream from the turbine, allow a minimum straight pipe length at least 5 times the internal diameter of the turbine. Flow altering devices such as elbows, valves, and reducers can affect accuracy. Distances above are

minimum requirements; to improve results, double them.

A typical back pressure of 0.3 to 3.4 bar (5 to 50 PSI) will prevent cavitation. Install a control valve downstream as necessary.

Foreign material can clog the rotor. If the problem effects accuracy or material coats the rotor, install screens or filters. For 1/2", 3/4" and 1" turbines use a 125 micron or micrometer screen. For 1-1/2" or 2" turbines use a 500 micron or micrometer screen.

Connections

Seal all threads with an appropriate sealing compound. Make sure the sealing compound does not intrude into the flow path. Make sure the arrow on the outlet is pointed in the direction of the flow. Tighten the turbine onto the fittings. Use a wrench only on the wrench flats. If connecting to new male threads, burns and curls can adversely effect accuracy. Correct the problem prior to installation. Verify accuracy prior to use.

Verify Accuracy

Before each use, check the accuracy and verify calibration. Make sure there is no air in the system. Measure an exact known volume into an accurate container. Verify the volume against the readout or recording equipment. If necessary, use a correction factor to figure final volume.

MAINTENANCE

Always follow safety instructions given above during maintenance. For best results, accuracy should be verified periodically as part of a routine maintenance schedule.

Clean the Turbine

During daily use, these turbines are virtually maintenance-free. If liquids have dried and caked on the rotor, clean the internal parts with a penetrating lubricant such as WD-40 or a cleaning solvent. Internal parts can be soaked for 10 to 15 minutes in a compatible cleaning solution. Do not submerge the turbine housing. A soft brush or small probe can be used to

remove residue from the rotor. Do not blow compressed air through the turbine.

Internal parts can be removed or replaced. Carefully notice the orientation of all internal parts as they are removed, especially the orientation of the rotor to the flow direction arrow. (Figure 2) Gently pry one retaining ring from its groove and remove the support. Remove the rotor very carefully. Even small scratches or nicks can affect accuracy. Turn the turbine over and remove the other retaining ring and support. Clean as detailed above or replace parts as necessary. When clean, parts should drop easily into place with little or no force. When installing the rotor, make sure the wide end of the rotor blades face the flow direction. (Figure 3) Turn the turbine over and drop in the second support and final retaining ring.

TROUBLESHOOTING

MEASUREMENT IS NOT ACCURATE.

1. Turbine operated below minimum rate. Increase flow rate.
2. Turbine partially clogged with dried liquid. Remove turbine. Clean carefully. Make sure rotor spins freely.
3. Turbine bearings partially clogged with dried liquid. Remove turbine. Clean carefully. Make sure rotor spins freely.
4. Sealant wrapped around rotor. Remove turbine. Clear material from rotor. Make sure rotor spins freely.
5. Installed too close to fittings. Install correctly. See Installation Section.
6. Improper connections to recording device. Check all electrical connections. Reference appropriate installation instructions.
7. Accuracy needs verification. Complete normal accuracy verification procedures. Repeat periodically.

SERVICE

All GPI turbines are covered by a limited one year warranty. For warranty, parts, or other service information, please contact your local dealer or distributor.

ESPAÑOL

INFORMACIÓN GENERAL

Felicitaciones en la recepción de su compartimiento de la turbina de GPI. Las siguientes instrucciones le ayudarán a instalar la turbina y mantenerla en buen estado. (Figura 1) La información acerca del ordenador y de los módulos accesorios se encuentran en otros manuales. Consúltelos si es necesario.

Nota: las «figuras» mencionadas en el texto se refieren a las fotografías del manual de instrucciones inglés adjunto.

Instrucciones de Seguridad

Para su futura seguridad, le rogamos lea atentamente las advertencias hechas a continuación.

1. Utilizar solamente los líquidos que son compatibles con el material de construcción de su turbina.
2. Cuando mida líquidos inflamables, tome todas las precauciones necesarias para evitar incendios o explosiones.
3. Cuando trabaje con líquidos peligrosos, observe siempre las instrucciones de seguridad dadas por el fabricante de éstos.
4. Cuando trabaje en un entorno peligroso, tome siempre las precauciones de seguridad convenientes.
5. Observe siempre las instrucciones dadas por el fabricante de los disolventes que haya utilizado para limpiar.
6. Al quitar la turbina, puede derramarse líquido. Observe las instrucciones de seguridad dadas por el fabricante del líquido para limpiar fugas menores.
7. No utilice aire comprimido para limpiar la turbina.
8. Procure que no se sequen líquidos dentro de la turbina.
9. Maneje el rotor con precaución. La menor raya o corte pueden influir negativamente en la precisión.
10. Para sujetar la turbina, apriete con la llave únicamente en las muescas previstas para ello.
11. Para mejores resultados, compruebe siempre la calibración antes de utilizar la turbina.

Estas turbinas de calidad industrial se conocen por el diámetro interno de la entrada y de la salida.

Los datos específicos de su modelo particular de turbina (número de serie, fecha de fabricación y factor K), están grabados en la superficie de la turbina.

Estos metros de la turbinas del GPI son homólogo-gadas por Factory Mutual y cUL Classified, con a homología de Clase 1, División 1, para ser utilizadas en un entorno peligroso.

INSTALACIÓN

Los siguientes consejos le ayudarán a lograr un funcionamiento óptimo. Estas turbinas miden el flujo en la dirección indicada por la flecha moldeada en el metal, situada a la salida de la turbina.

Del lado de la turbina por donde entra el líquido, tiene que haber un tubo recto cuya longitud mínima ha de equivaler a, por lo menos, 10 veces el diámetro interno de la turbina. Del lado por donde sale el líquido, la longitud del tubo recto ha de ser por lo menos 5 veces superior al diámetro interno de la turbina. Elementos como codos, válvulas y tubos de reducción, que alteran el flujo, pueden influir negativamente en la precisión. Las longitudes indicadas aquí arriba son los requisitos mínimos. Para obtener mejores resultados, multiplíquelas por dos.

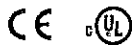
Una contrapresión de 0.3 a 3.4 baras (de 5 a 50 PSI) previene la cavitación. Si es necesario, coloque una válvula de control del lado por donde sale el flujo.

Las partículas extrañas pueden obstruir el rotor. Si este problema altera la precisión o si las partículas cubren el rotor, colóquele cithas o filtros. Para las turbinas de la pulgada del 1/2, 3/4 y 1, utilitzar una pantalla de 125 micrones o del micrómetro. Para las turbinas de 1-1/2 y 2 pulgadas, utilitzar una pantalla de 500 micrones o del micrómetro.

Empalmes

Asegure la estanqueidad de todas las roscas con una pasta para obturar. Asegúrese de que no obstruye el paso del líquido. La flecha situada del lado de la salida del flujo

Approvals:



ATEX Reviewed under Annex VIII
of ATEX Directive for Group
III, Category 3, G.



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Operations Guide for Industrial Grade 09 Computer Electronics



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ENGLISH

GENERAL INFORMATION

Congratulations on receiving your GPI Industrial Grade 09 Computer Electronics. These instructions will help you operate and maintain your computer electronics. (Figure 1)

Note: "Figures" mentioned in this text refer to illustrations in the enclosed English Owner's Manual.

Calibration procedures are given here. Information on turbine housings and accessory modules are contained in other manuals. Please reference those as necessary.

Safety Instructions

For your safety, please review the safety instructions below.

1. This equipment is approved to handle only fluids which are compatible with all wetted materials.
2. When measuring flammable liquids, observe precautions against fire or explosion.
3. When handling hazardous liquids, always follow the liquid manufacturer's safety precautions.

4. When working in hazardous environments, always exercise appropriate safety precautions.
5. For best results, always verify calibration before use.

These computer electronics are designed specifically for use on GPI Industrial Grade Turbine Housings. They are also designed to work with several accessory output modules.

The model number of your computer is displayed on the lower front side of the computer and also underneath a battery.

DAILY USE

On a day-to-day basis, the operations given below are the most commonly used. Others are listed in the Operations Section. Before use, review the Safety Instructions above.

The meter turns on automatically when flow starts and turns off automatically a few minutes after flow stops. The meter can also be turned on by pressing and releasing the DISPLAY button.

To see the exact volume measured with each use, use the Batch Total. To zero the Batch Total, make sure the meter is on and hold down the DISPLAY button for 3 seconds until zeros appear. If LOCKED appears on the readout, the Cumulative Total is displayed. It cannot be manually zeroed. Press and release DISPLAY until LOCKED does not appear. If the numbers in the readout are dim or fading, the batteries need replacement. See details in the Maintenance Section.

INSTALLATION

If you ordered your computer electronics with a turbine housing, it is installed at the factory. If you ordered your computer separately from your turbine, simply mount the computer on the turbine with the four screws at the corners of the faceplate. Make sure the O-ring is fully seated before tightening the screws. If you ordered the computer with turbine and an accessory module, please review and thoroughly understand all installation instructions before proceeding.

All GPI turbines are designed to measure flow in only one direction. The direction is indicated by the arrow cast-molded in the turbine outlet. If the computer display is upside down, remove the four screws, turn the display 180° and reinstall the screws.

Avoid electronically "noisy" environments. Install the computer at least 15.2 cm (6 inches) away from motors, relays, or transformers.

Verify Accuracy

Before use, check the accuracy and verify calibration. Make sure there is no air in the system. Measure an exact known volume into an accurate container. Verify the volume against the readout or recording equipment. If necessary, use a correction factor to figure final volume. For best results, accuracy should be verified periodically as part of a routine maintenance schedule.

OPERATIONS

All operations are reflected in the readout on the meter's face. (Figure 3) The top line identifies the calibration curve. The middle line reflects flow information. The bottom line shows information from the totalizer.

The Batch Total indicates flow during a single use. It is shown as TOTAL 2 on the bottom line. To zero the Batch Total, make sure the Batch Total is displayed and hold DISPLAY down until the readout changes to zeros.

The Cumulative Total is the total of all liquid measured since the meter's power supply was connected. This total is labeled TOTAL 1 LOCKED because it cannot be manually zeroed. (Figure 2) To change between totals, press and release DISPLAY. Generally, the readout changes when the buttons are released. The Cumulative Total returns to zero when batteries are removed or lose power or when the total reaches its maximum value of 999,999.

The two types of calibration curves, Field Calibration and Factory Calibration, are shown on the top line of the readout. A Field Calibration Curve is set by the user. It can be changed or modified at any time using procedures given in the Calibration Section. A Factory Calibration Curve is preset by the manufacturer and stored permanently in the meter's computer. Factory Calibration Curves display PRESET on the top line. (Figure 3)

To change Calibration Curves, hold the CALIBRATE button down while pressing and releasing DISPLAY. When the desired curve appears, release both buttons. Field Calibration is labeled with CAL followed by a letter. On most models this is CAL B. Factory Calibration always has the word PRESET displayed next to it. (Figure 3) In most models, Factory Calibration appears as GAL or LTR PRESET.

Some models include a Rate of Flow display, as opposed to the usual flow volume. When activated, the word FLOWRATE displays to the left on the bottom line. (Figure 4) When activated, the numbers on the middle line reflect the rate of flow, for example litres per minute. To activate this feature, press and release DISPLAY until FLOWRATE appears.

Any time liquid flows through the meter, a small propeller displays.

CALIBRATION

Factory Calibration is completed with light viscosity fluids. Readings using the standard factory calibration curves may not be accurate in some situations - for example, if the unit measures a "heavy" fluid such as motor oil, especially under extreme temperature conditions. A Field Calibration can improve accuracy under these conditions.

Due to high flowrate, it is strongly recommended that Field Calibration of 1-1/2 inch and 2 inch meters be completed with a combination of volume and weight using fine resolution scales.

For the most accurate Field Calibration, dispense at a flowrate which best simulates your actual operating conditions. Avoid "trubbling" more fluid or repeatedly starting and stopping the flow. Use an accurate calibration container.

During the calibration, make sure you meet the meter's minimum flowrate requirements: the 1/2 inch meter's minimum is 1 GPM (3.8 LPM), the 3/4 inch meter is 2 GPM (7.5 LPM), the 1 inch meter is 5 GPM (18.8 LPM), the 1-1/2 inch meter is 10 GPM (37.85 LPM), and the 2 inch meter's minimum is 20 GPM (75 LPM).

Use the correct button sequence during the calibration procedures. For best results, the meter should be installed and purged of air before field calibration.

Dispense-Display

Field Calibration Procedures

1. Hold down CALIBRATE while pressing and releasing DISPLAY until one of the Field Calibration curves appears. ("CAL B" or "CAL C" message will be displayed). Release both buttons.
2. To calibrate, press and hold the CALIBRATE button. While continuing to hold CALIBRATE, also press and hold the DISPLAY button. Hold both buttons for about 3 seconds until you see a blinking "dd-CAL" message. Once the "dd-CAL" message appears, release both buttons. You are now in Field Calibration mode.
3. Once the buttons have been released from Step 2, the display will show the blinking message "run 01". If you want to exit the calibration now before dispensing any fluid, go to Step 11.
4. If you want to continue with the calibration, but have not dispensed any fluid yet, make your final preparations to your pumping system, but don't start pumping yet.
5. Start your pumping system so that fluid flows through the meter. The display will stop blinking and show the "run 01" message. Dispense into a container that allows you to judge the amount of fluid pumped. When you have pumped the desired amount (for example, 10 gallons), stop the fluid flow quickly.
6. Once the flow has stopped, briefly press and release both buttons. At this point the computer display will change to "0000.00" with the left-hand digit blinking.
7. Enter the volume (amount) of fluid that you dispensed (for example, if your 10-gallon container is full, enter "10.00"). To enter numbers, use the CALIBRATE button to change the value of the digit that is blinking and use the DISPLAY button to shift the "blink" to the next digit.
8. Once the correct number is entered, briefly press and release both buttons. The display will now change to a blinking "run 02" message. You have installed the new cal-curve point. You are ready to end calibration (Step 10) or enter another new calibration point (Step 9).
9. To enter another calibration point, go back and repeat Steps 3 through 8. It is possible to set up to 15 cal-curve points, and the "run ##" message will increment each time you repeat the calibration process (run 01, run 02, run 03, etc., up to run 15).
10. To end calibration, press and hold both buttons for about 3 seconds until you see the "CAL End" message. After you release the buttons, the computer will resume normal operations with the new cal point(s) active.
11. If you HAVE NOT dispensed any fluid, you can exit calibration without changing the cal curve. If the message "run 01" is showing and you have not dispensed any fluid, hold both buttons for about 3 seconds until you see a "CAL End" message. After you release the buttons, the computer will resume normal operation and the old curve (if you have entered one in the past) is still intact.

MAINTENANCE

During daily use, these meters are virtually maintenance-free. Don't let liquids dry inside the meter. If liquids have dried and caked on the rotor, clean the internal parts with a penetrating lubricant such as WD-40 or a cleaning solvent. Do not submerge the meter. A soft brush or small probe can be used to remove residue from the rotor. Do not blow compressed air through the meter.

Battery Replacement

This meter is equipped with field replaceable lithium batteries which provide power for at least 9,000 hours of actual use. Under most conditions, batteries need to be replaced once a year. If you need to store the unit, removing the batteries will extend battery life. Check the batteries and clean the terminals at least every year to ensure proper operation. If the meter's readout should become dim or blank, power is low or exhausted. When batteries are disconnected or fail, the Batch and Cumulative Totals return to zero. Factory and Field Calibration Curves are not lost. Contact your local dealer or distributor for replacement batteries.

To replace batteries, remove the corner screws from the face of the meter and lift off the computer assembly. Remove the old batteries. If necessary, clean corrosion from the terminals. Place the new batteries in position with the positive posts in the correct position. You should immediately see the labels on the computer readout. Make sure the O-ring is fully seated. Put the computer assembly back on the turbine and secure with the corner screws.

TROUBLESHOOTING

A. METER IS NOT ACCURATE.

1. Field Calibration not performed properly. Field calibrate again or select Factory Calibration. See Operations and Calibration instructions.

2. Factory Calibration not suitable for liquid being measured. Perform a Field Calibration according to Calibration instructions.

3. Meter operated below minimum flowrate. Increase flowrate.
4. Meter partially clogged with dried liquid. Remove meter. Clean carefully.
5. Meter bearings partially clogged with dried liquid. Remove meter. Clean carefully.
6. Sealant material wrapped around rotor. Remove meter. Clear material from rotor. Make sure rotor spins freely.
7. Installed too close to fittings. Install correctly. See Installation instructions.
8. Installed too close to motors or electrically "noisy" environment. Install correctly. See Installation instructions.

B. READOUT FADED OR BLANK.

1. Batteries weak, dead, or not connected. Remove computer and replace batteries. See Maintenance section.
2. Computer defective. Contact local dealer or distributor.

C. NORMAL FLOWRATE BUT METER DOES NOT COUNT. (Meter comes on when DISPLAY button is pushed.)

1. Field Calibration not performed correctly. Field Calibrate again or select Factory Calibration. See Operations or Calibration sections.
2. Rotor stuck or damaged. Remove meter. Make sure rotor spins freely.
3. Sealant material wrapped around rotor. Remove meter. Clear material from rotor. Make sure rotor spins freely.
4. Computer defective. Contact your local dealer or distributor.

D. REDUCED FLOWRATE AND METER DOES NOT COUNT (Meter comes on when DISPLAY button is pushed.)

1. Meter clogged with dried liquids. Remove meter. Clean carefully. See Maintenance section. Make sure rotor spins freely.

E. CANNOT GET METER INTO FIELD CALIBRATION.

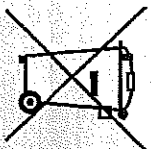
1. Factory Calibration PRESET curve active. See Calibration instructions.
2. Computer circuit board defective. Replace computer. Contact your local dealer or distributor.

SERVICE

All GPI meters are covered by a limited one year warranty. For warranty, parts, or other service information, please contact your local dealer or distributor.

GPI is a registered trademark of Great Plains Industries, Inc.

WEEE DIRECTIVE



The Waste Electrical and Electronic Equipment (WEEE) directive (2002/96/EC) was approved by the European Parliament and the Council of the European Union in 2003.

This symbol indicates that this product contains electrical and electronic equipment that may include batteries, printed circuit boards, liquid crystal displays or other components that may be subject to local disposal regulations at your location. Please understand those regulations and dispose of this product in a responsible manner.

DEUTSCH

ALLGEMEINES

Herzlichen Glückwunsch zu Ihrer Entscheidung für eine GPI-Rechnerelektronik für industrielle Anwendungen. Die nachstehenden Anweisungen werden Ihnen beim Bedienen und Warten Ihrer Rechnerelektronik behilflich sein (Bild 1).

Bemerkung: Die im nachstehenden Text erwähnten "Bilder" beziehen sich auf die Fotos in der beigelegten englischen Bedienanleitung.

Die Eichverfahren werden im Nachstehenden beschrieben. Information bezüglich der Turbinengehäuse und der Zubehörmodule ist in den anderen Anleitungen enthalten. Bitte ziehen Sie diese nach Bedarf heran.

Sicherheitsvorschriften

Damit die Sicherheit bei der Bedienung gewährleistet ist, sollten die nachstehenden Sicherheitsvorschriften eingehalten werden.

1. Diese Ausrüstung ist anerkannt zu arbeiten nur mit Flüssigkeiten, die mit den internen Bestandteilen kompatibel sind.
2. Bei der Messung von leichtentzündlichen Flüssigkeiten sollten sämtliche Brand- und Explosionsverhütungsvorschriften eingehalten werden.
3. Unter Verwendung von gefährlichen Flüssigkeiten sind die Sicherheitsvorschriften des Lieferanten immer strengstens einzuhalten.
4. Falls das Gerät in einer risikoreichen Umgebung betrieben wird, sollten entsprechende Sicherheitsmaßnahmen getroffen werden.
5. Damit man immer die bestmöglichen Resultate erreicht, sollte die Eichung vor jeder Verwendung überprüft werden.

Die vorliegende Rechnerelektronik wurde speziell für den Einsatz an den GPI-Turbinengehäusen für industrielle Anwendungen entworfen. Die Elektronik wurden auch zusammengebaut in Kombination mit abgehende elektro Zubehörmodulen.

Die Modellnummer Ihres Rechners wurde unten vorne am Rechner und unter einer der Batterien angebracht.

TÄGLICHER EINSATZ

Die im täglichen Einsatz meist durchgeführten Operationen werden nachstehend beschrieben. Weitere Operationen werden im Abschnitt Bedienung erläutert. Lesen Sie die oben angeführten Sicherheitsvorschriften vor dem Gebrauch aufmerksam durch.

Der Durchflußmeter schaltet automatisch ein, sobald der Fluß anfängt, und schaltet einige Minuten nach dem Aufhören des Flusses automatisch aus. Der Durchflußmeter kann außerdem eingeschaltet werden, indem man die Taste ANZEIGE ("DISPLAY") eindrückt und losläßt.

Um die genaue gemessene Menge pro Beförderung abzulesen, verwendet man die Teilsomme. Um die Teilsomme rückzusetzen, sollte man sicherstellen, daß der Durchflußmeter eingeschaltet ist, und die Taste ANZEIGE (DISPLAY) drei Sekunden lang eingedrückt halten, bis die Anzeige genullt ist. Wenn die Meldung GESPERRT ("LOCKED") erscheint, wird die Gesamtsumme angezeigt. Diese Summe kann nicht von Hand rückgesetzt werden. Die Taste ANZEIGE (DISPLAY) eindrücken und loslassen, bis die Meldung GESPERRT (LOCKED) verschwindet. Die Batterien einsetzen, sobald die Anzeige unleserlich wird. Für nähere Information verweisen wir auf den Abschnitt Wartung.

AUFSTELLUNG

Falls die Recherelektronik zusammen mit einem Turbinengehäuse bestellt wurde, so wird sie bereits im Werk eingebaut. Wurde die Elektronik jedoch separat bestellt, so reicht es aus, den Rechner mittels der vier Schrauben in den Boden der Frontplatte auf die Turbine zu befestigen. Stellen Sie sicher, daß sich der O-Ring einwandfrei in seinen Sitz befindet, bevor Sie die Schrauben anziehen. Wurde der Rechner zusammen mit der Turbine und mit einem

Zubehörmittel bestellt, so wird empfohlen, sämtliche Aufstellungsanweisungen gründlich zu lesen und sie sich einzuprügeln, bevor man mit der eigentlichen Installation anfängt.

Sämtliche GPI-Turbinen sind zur Messung des Flusses in einer einzigen Richtung vorgesehen. Diese Richtung wird angegeben durch den Pfeil an der Ausgangsseite der Turbine. Wenn das Computerfenster Oberseite unten ist, die vier Schrauben herausnehmen und das Fenster drehen 180 Grad und die Schrauben einsetzen.

Vermeiden Sie eine Aufstellung in einer elektronisch gestörten Umgebung. Der Rechner sollte in einer Mindestentfernung von 15,2 cm (6 Zoll) von eventuellen Motoren, Relais oder Trafos installiert werden.

Überprüfung der Genauigkeit

Bevor Sie verwenden die Genauigkeit überprüfen und die Kalibrierung überprüfen. Sicherstellen, daß sich im System keine Luft befindet. Eine genau bestimmte Menge Flüssigkeit in einen Eichbehälter befördern. Die beförderte Menge mit der Anzeige oder mit der Meßeinrichtung vergleichen. Bei Bedarf einen Korrekturfaktor verwenden, um das abschließende Volumen darzustellen. Die Genauigkeit ist im Rahmen der vorbeugenden Wartung regelmäßig zu überprüfen, damit man stets die besten Resultate erreicht.

BEDIENUNG

Sämtliche Operationen werden an der Frontseite des Durchflußmeters angezeigt (Bild 3). Die obere Zeile stellt die Eichkurve dar. Die mittlere Zeile zeigt die Information bezüglich des Flusses. Auf der unteren Zeile werden die Gesamt- und Teilsommen angezeigt.

Die Teilsomme stellt den Fluß während einer einzigen Beförderung dar. Es wird als TOTAL 2 auf der untersten Linie gezeigt. Um die Teilsomme rückzusetzen, sollte man sicherstellen, daß die Teilsomme angezeigt ist, und die Taste ANZEIGE ("DISPLAY") eingedrückt halten, bis die angezeigten Zahlen genullt sind.

Die Gesamtsumme stellt die Summe aller Messungen dar, seitdem die Speisung des Durchflußmeters angeschlossen wurde. Diese Gesamtmenge wird TOTAL 1 LOCKED beschriftet, weil sie nicht manuell auf Null eingestellt werden kann. (Bild 2). Um von einer Summe auf die andere umzuschalten, ist die Taste ANZEIGE (DISPLAY) einzudrücken und loszulassen. Im Allgemeinen verändert sich die Anzeige, sobald die Tasten losgelassen werden. Die Gesamtsumme wird genullt sobald die Batterien erschöpft sind oder entfernt werden, oder sobald die Summe den Höchstwert von 999,999 erreicht.

Die zwei Eichkurventypen, Eichung vor Ort und Werkszeichnung, werden auf der oberen Zeile angezeigt. Der Bediener stellt vor Ort eine Eichkurve ein. Diese Zeile kann zu jeder Zeit abgeändert werden, indem man die Anweisungen im Abschnitt Eichung befolgt. Die Werkszeichnung wird vom Hersteller eingestellt und permanent im Speicher des eingebauten Rechners festgehalten. Die Werkszeichnung werden angezeigt mit der Bezeichnung VORGEGBEN ("PRESET") auf der oberen Zeile (Bild 3).

Um die Eichkurven abzuändern, sollte die Taste EICHUNG ("CALIBRATE") eingedrückt gehalten werden, während man die Taste ANZEIGE ("DISPLAY") eindrückt und wieder losläßt. Sobald die gewünschte Kurve erscheint, läßt man beide Tasten los. Die Eichkurve vor Ort wird angezeigt mit der Bezeichnung EICHUNG ("CAL") und einem Buchstaben. Bei den meisten Modellen handelt es sich um den Buchstaben B ("CAL B"). Die Werkszeichnung wird immer mit der Bezeichnung VORGEGBEN ("PRESET") nebeneinander angezeigt (Bild 3). Bei den meisten Modellen wird die Werkszeichnung angezeigt durch die Meldung GAL oder LTR VORGEGBEN ("GAL PRESET").

Einige Modelle sind mit einer Anzeige des Durchsatzes ausgestattet, im Gegensatz zur normalen Flußmenge. Wenn diese Option aktiviert ist, wird die Bezeichnung DURCHSATZ ("FLOWRATE") auf der unteren Zeile links angezeigt (Bild 4), und stellen die

Zahlen auf der mittleren Zeile den Durchsatz dar, z. B. in Liter pro Minute. Um diese Option zu aktivieren, sollte man die Taste ANZEIGE (DISPLAY) eindrücken und loslassen, bis die Bezeichnung DURCHSATZ (FLOWRATE) erscheint. Jedemal, wenn Flüssigkeit durch den Durchflußmeter strömt, wird ein kleines Fliegegrad angezeigt.

EICHUNG

Fabrikkalibrierung wird mit dünnen Viskositätsflüssigkeiten durchgeführt. Kalibrierungsanzeigen, die die Standardabtriebskurven benutzen, können möglicherweise nicht in einigen Situationen genau sein. Z.B. wenn die Maßeinheit eine "schwere" Flüssigkeit wie Motoröl mißt, besonders unter extremen Temperaturbedingungen. Eine Nachzeichnung kann die Genauigkeit unter diesen Bedingungen verbessern.

Wegen der hohen Fließgeschwindigkeit, wird es stark empfohlen, daß die Nachzeichnung der Meßinstrumente des Zoll 1-1/2 und 2 Zoll mit einer Kombination des Volumens und des Gewichts mit Skalen feinsten Gradeneinteilung durchgeführt wird. Für die genaueste Nachzeichnung die Flüssigkeit mit einer Fließgeschwindigkeit zuführen, die gut Ihre tatsächlichen Betriebsbedingungen simuliert. Vermeiden, mehr Flüssigkeit "zu tröpfeln" oder wiederholt den Fluß zu beginnen und zu stoppen. Finen genauen Kalibrierungsbehälter benutzen.

Während der Kalibrierung überprüfen Sie, daß die minimalen Flüssiggeschwindigkeitsanforderungen des Messgerätes erreicht werden. Das Minimum des 1/2-zoll-Meßinstrument ist 1 GPM (3,8 LPM), das 3/4-zoll-Meßinstrument ist 2 GPM (7,5 LPM), das 1-zoll-Meßinstrument ist 5 GPM (18,8 LPM), das Meßinstrument des Zoll 1-1/2 ist 10 GPM (37,85 LPM), und das Minimum des 2 Zollmeßinstruments ist 20 GPM (75 LPM).

Die korrekte Tastenreihenfolge während der Kalibrierungsverfahren verwenden. Für beste Resultate sollte das Meßinstrument vor der Nachzeichnung installiert und von Luft freigemacht sein.

Limited Warranty Policy

Great Plains Industries, Inc. 5252 E. 36th Street North, Wichita, KS USA 67220-3205, hereby provides a limited warranty against defects in material and workmanship on all products manufactured by Great Plains Industries, Inc. This product includes a 1 year warranty. Manufacturer's sole obligation under the foregoing warranties will be limited to either, at Manufacturer's option, replacing or repairing defective Goods (subject to limitations hereinafter provided) or refunding the purchase price for such Goods theretofore paid by the Buyer, and Buyer's exclusive remedy for breach of any such warranties will be enforcement of such obligations of Manufacturer. The warranty shall extend to the purchaser of this product and to any person to whom such product is transferred during the warranty period.

The warranty period shall begin on the date of manufacture or on the date of purchase with an original sales receipt. This warranty shall not apply if:

- A. the product has been altered or modified outside the warrantor's duly appointed representative;
- B. the product has been subjected to neglect, misuse, abuse or damage or has been installed or operated other than in accordance with the manufacturer's operating instructions.

To make a claim against this warranty, contact the GPI Customer Service Department at 316-686-7361 or 888-996-3837. Or by mail at:

Great Plains Industries, Inc.
5252 E. 36th St. North
Wichita, KS, USA 67220-3205

The company shall, notify the customer to either send the product, transportation prepaid, to the company at its office in Wichita, Kansas, or to a duly authorized service center. The company shall perform all obligations imposed on it by the terms of this warranty within 60 days of receipt of the defective product.

GREAT PLAINS INDUSTRIES, INC., EXCLUDES LIABILITY UNDER THIS WARRANTY FOR DIRECT, INDIRECT, INCIDENTAL AND CONSEQUENTIAL DAMAGES INCURRED IN THE USE OR LOSS OF USE OF THE PRODUCT WARRANTED HEREUNDER.

The company herewith expressly disclaims any warranty of merchantability or fitness for any particular purpose other than for which it was designed.

This warranty gives you specific rights and you may also have other rights which vary from U.S. state to U.S. state.

Note: In compliance with MAGNUSON MOSS CONSUMER WARRANTY ACT -- Part 702 (governs the resale availability of the warranty terms).



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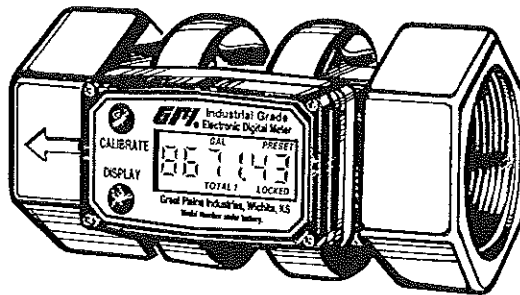
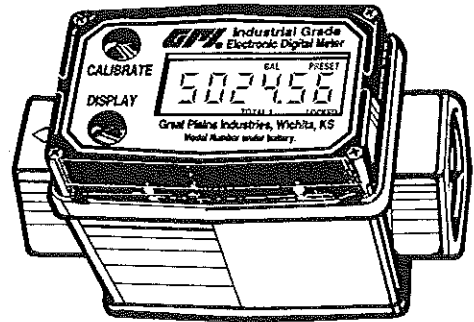
"A Great Plains Ventures Subsidiary"

www.gpi.net

1-888-996-3837

Industrial Grade 09 COMPUTER ELECTRONICS Owner's Manual

*Computer Electronics
shown with 1 inch
and 2 inch Turbine
Housings which are
sold separately.*



5252 East 36th Street North
Wichita, KS USA 67220-3205
TEL: 316-686-7361
FAX: 316-686-6746

GREAT PLAINS INDUSTRIES, INC.

"A Great Plains Ventures Subsidiary"

www.gpi.net

1-888-996-3837

To the owner . .

Congratulations on receiving your GPI Industrial Grade Computer Electronics. We are pleased to provide you with a product designed to give you maximum reliability and efficiency.

Our business is the design, manufacture, and marketing of liquid handling, agricultural, and recreational products. We succeed because we provide customers with innovative, reliable, safe, timely, and competitively-priced products. We pride ourselves in conducting our business with integrity and professionalism.

We are proud to provide you with a quality product and the support you need to obtain years of safe, dependable service.

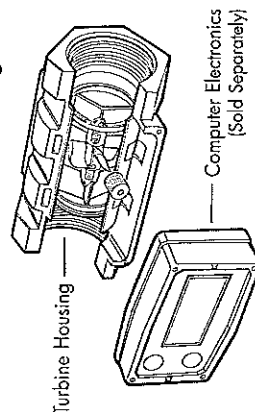
Grant Utter

President
Great Plains Industries, Inc.

GENERAL INFORMATION

This manual will assist you in operating and maintaining the Computer Electronics of the GPI Industrial Grade Meters. (See Figure 1) Calibration details are given in this manual. Information on turbine housings and accessory modules are contained in other manuals. Please reference those as necessary.

Figure 1



For best results, take the time to fully acquaint yourself with all information about all components of your GPI Electronic Digital Metering System prior to installation and use.

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If you need assistance, contact the distributor from whom you purchased your computer.

! This symbol is used throughout the manual to call your attention to safety messages.

Warnings alert you to the potential for personal injury.

Cautions call your attention to practices or procedures which may damage your equipment.

Notes give information that can improve efficiency of operations.

It is your responsibility to make sure that all operators have access to adequate instructions about safe operating and maintenance procedures.

Safety Instructions

For your safety, review the major warnings and cautions below before operating your equipment.

1. This equipment is approved to handle only fluids which are compatible with all wetted materials.

2. When measuring flammable liquids, observe precautions against fire or explosion.
3. When handling hazardous liquids, always follow the liquid manufacturer's safety precautions.
4. When working in hazardous environments, always exercise appropriate safety precautions.
5. For best results, always verify accuracy before use.

Product Description

These computer electronics are designed specifically for use on GPI Industrial Grade Turbine Housings. They are also designed to work with several accessory output modules.

The CMOS, microprocessor-based electronics have extremely low power requirements and data retention capabilities in both RAM and ROM. Information is clearly displayed on a large 6-digit LCD readout with two-point floating decimal for totals from .01 to 999,999. All operations are easily accessed with the two buttons on the front panel.

Liquid flows through the turbine housing causing an internal rotor to spin. As the rotor spins, an electrical signal is generated in the pickup coil. This pulse data is translated from the turbine into calibrated flow units shown on the computer's readout.

Upon receipt, examine your equipment for visible damage. The computer is a precision measuring instrument and should be handled as such. If any items appear damaged or missing, contact your distributor.

Make sure your computer model meets your specific needs. Refer to the Specifications Section to confirm required features. The model number of your computer is displayed on the lower front side of the computer and also underneath a battery.

INSTALLATION

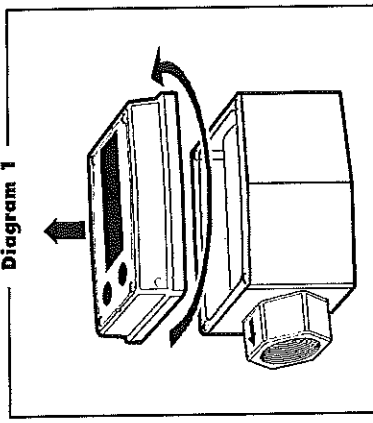
If you ordered your computer electronics with a turbine housing, it is installed at the factory.

If you ordered your computer separately from your turbine, simply mount the computer on the turbine with the four screws at the corners of the faceplate. Make sure the O-ring is fully seated before tightening the screws.

If you ordered the computer with turbine and an accessory module, please review and thoroughly understand all installation instructions before proceeding.

All GPI turbines are designed to measure flow in only one direction. The direction is indicated by the arrow cast-molded in the turbine outlet. If the computer display is upside down, remove the four screws, turn the display 180° and reinstall the screws. See Diagram 1.

Diagram 1



Avoid electronically "noisy" environments. Install at least 6 inches (15.2cm) away from motors, relays, or transformers.

Our computer electronics are Factory Mutual Approved, C-UL Classified and carry a Class 1, Division 1 Approval for hazardous environments. In addition, GPI meters have NEMA Type 4 enclosures.

To ensure accurate measurement, remove all air from the system before use.

It is strongly recommended that accuracy be verified prior to use. To do this, remove all air from the system, measure an exact known volume into an accurate container, and verify the volume against the readout or recording equipment. If necessary, use a correction factor to figure final volume. For best results, accuracy should be verified periodically as part of a routine maintenance schedule.

OPERATIONS

All operations are reflected in the LCD readout. The top line identifies the calibration curve. The middle line reflects flow information. The bottom line shows information from the totalizer. Words or "flags" display on the top and bottom line to further identify specific information.

The computer is powered by field replaceable batteries. When the readout becomes dim or faded, the batteries need to be replaced. Reference the Maintenance Section for details.

NOTE: Operations can be practiced prior to installation. To simulate flow conditions, blow gently through the turbine.

Turn On

The meter is on when any display is present. It turns on automatically when liquid flows through the meter. It can be turned on manually by pressing and releasing the DISPLAY button.

Turn Off

Whenever no flow has been sensed for one minute, the unit automatically switches to a power-saving "sleep" mode with a blank display. The unit will automatically "wake up" the moment any flow is sensed and will remain awake as long as fluid is flowing. Totals are never lost during sleep periods.

Batch and Cumulative Totals

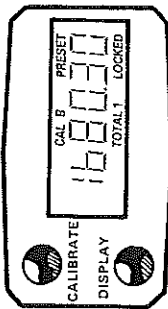
Total flags are displayed on the bottom line. The Cumulative Total (labeled TOTAL 1 LOCKED) is the total of all fluid measured since the meter's power was connected. (At your first use, the Cumulative Total may not read zero because of calibration at the factory.) The Batch Total (labeled TOTAL 2) indicates flow during a single use.

Clearing a Totalizer

The Batch totalizer register (TOTAL 2) may be independently cleared to 0.00 at any time. To clear a batch totalizer, with the desired totalizer displayed, press and hold the DISPLAY button. At about three seconds, the displayed total will be cleared to "0.00." You can do this even while fluid is flowing, in which case counting will resume after you release the DISPLAY button.

The Cumulative totalizer register is labeled as TOTAL 1 LOCKED indicating that it cannot be manually zeroed (See Figure 2). The Cumulative totalizer can be cleared only when the batteries are removed or go dead or when the Cumulative Total reaches the maximum value of 999,999.

Figure 2



Changing Display Registers

To change to another totalizer register or to FLOWRATE mode during normal operation, watch the bottom line display flags while you briefly press and release the DISPLAY button. When you press and release the display buttons, the mode will advance as follows: TOTAL 1 LOCKED (Cumulative Total), TOTAL 2 (Batch Total), FLOWRATE, TOTAL 1 LOCKED (etc.). You can change registers at any time, even during flow. Non-visible totalizer registers will continue to accumulate.

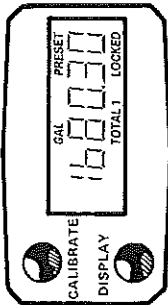
NOTE: Generally, display registers change when the buttons are released.

Factory and Field Calibration Curves

GPI "09" series flow computers have enhanced calibration features. All calibration information is visible to the user as words in the upper part of the display, above the numeric digits.

All units will be configured with a "factory" calibration curve, for which units of gallons or litres may be selected by the user ("GAL" or "LTR" will be visible). This curve is NOT user adjustable; the word "PRESET" is displayed to show this. (See Figure 3) The factory calibration is stored permanently in the computer's memory.

Figure 3



The "field" calibration curve(s) may be set by the user, and can be changed or modified at any time using the calibration procedure described below in the CALIBRATION section. Totals or flowrate derived from the field calibration are visible when the field calibration setting is selected ("CAL B" or "CAL C" will be visible).

Selecting a Different Calibration Setting

You can switch between GAL and LTR modes at will without "corrupting" totalizer contents. For example, the computer can totalize 10.00 gallons. If the user switches to LTR mode, the display will immediately change to "37.85" (the same amount in units of litres). GAL / LTR switching also works in FLOWRATE mode.

To select a different calibration setting, first press and hold the CALIBRATE button. Continue to hold it while also briefly pressing and releasing the DISPLAY button (you may then also release the CALIBRATE button).

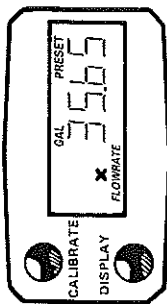
The flag indicators in the upper area of the display will change to show the newly selected calibration setting. Calibration settings change in this order: GAL, LTR, CAL B, CAL C, GAL (etc.). While fluid is flowing only the GAL and LTR selections may be made, however, when NO fluid flow is occurring, any setting may be selected.

Flowrate Mode

The Rate of Flow feature is accessed by briefly pressing and releasing the DISPLAY button as described above. When this feature is activated, the word "FLOWRATE" displays to the left on the bottom line (See Figure 4) and the numbers in the middle of the display reflect the rate of flow (instead of total). Units are set to update the display

every five seconds, so the first reading after flow starts or changes and the last reading after flow stops or changes will not be correct. This is normal.

Figure 4



Propeller

A small propeller displays to indicate liquid is flowing through the meter.

CALIBRATION

Factory Calibration settings are programmed into each flowmeter during production, and are correct for light fluids such as water, gasoline, or diesel fuel. Factory Calibration is completed with either standard test solvent (on 1" and smaller flowmeters) or water (on 1-1/2" and larger flowmeters) at 70°F (21°C). Readings using the standard factory calibration curves may not be accurate in some situations – for example, if the unit measures a "heavy" fluid such as motor oil, especially under extreme temperature conditions.

For improved accuracy under such conditions, the GPI flow computer allows for "field" calibration, that is, user entry of custom calibration parameters. A "single point" calibration may yield acceptable accuracy with light liquids, however, heavy liquids may require five or more calibration points to achieve a high level of accuracy. Up to 15 custom calibration points can be entered.

NOTE: A Field Calibration below the minimum flowrate can adversely affect accuracy.

The use of a uniformly dependable, accurate calibration container is highly recommended for the most accurate results. Due to high flowrate, it is strongly recommended that

Field Calibration of 1-1/2" and 2" meters be completed with a combination of volume and weight using fine resolution scales.

For the most accurate results, dispense at a flowrate which best simulates your actual operating conditions. Avoid "dribbling" more fluid or repeatedly starting and stopping the flow - these actions will result in less accurate calibrations.

Make sure you meet the meter's minimum flowrate requirements.

- 1/2 inch meters - 1 GPM (3.8 LPM)
- 3/4 inch meters - 2 GPM (7.5 LPM)
- 1 inch meters - 5 GPM (18.8 LPM)
- 1-1/2 inch meters - 10 GPM (37.5 LPM)
- 2 inch meters - 20 GPM (75 LPM)

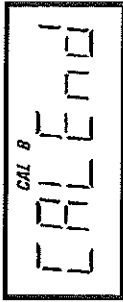
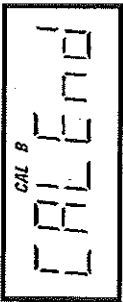
For best results, the meter should be installed and purged of air prior to Field Calibration.

Dispense-Display Field Calibration Procedures

Your Actions	Notes
1. Hold down CALIBRATE while pressing and releasing DISPLAY until the Field Calibration curve appears ("CAL B" or "CAL C" message will be displayed). Release both buttons.	Remember that Field Calibration curves are not preset.
2. To calibrate, press and hold the CALIBRATE button. While continuing to hold CALIBRATE, also press and hold the DISPLAY button. Hold both buttons for about 3 seconds until you see a blinking "dd-CAL" message. Once the "dd-CAL" message appears, release both buttons. You are now in field calibration mode.	This step puts the unit in dispense-display field calibration mode ("dd-CAL").
3. Once the buttons have been released from Step 2, the display will show the blinking message "run 01."	The computer is waiting for you to make a decision to either exit from field calibration mode or to begin a dispense run. If you want to exit the calibration now, go to Step 11.
4. If you want to continue with the calibration, but have not dispensed any fluid yet, make your final preparations to your pumping system, but don't start pumping yet.	

Your Actions	Notes
5. Start your pumping system so that fluid flows through the meter. The display will stop blinking and show the "run 01" message. Dispense into a container that allows you to judge the amount of fluid pumped. When you have pumped the desired amount (for example, 10 gallons), stop the fluid flow quickly.	When the computer displays a non-blinking "run 01" message, it is sensing fluid flow. For the most accurate results, dispense at a flow rate which best simulates your actual operating conditions. Avoid "dribbling" more fluid or repeatedly starting and stopping the flow - these actions will result in less accurate calibrations.
6. Once the flow has stopped, briefly press and release both buttons. At this point the computer display will change to "0000.00" with the left-hand digit blinking.	When the display shows "0000.00" the computer has stopped "watching" for fluid flow and is now waiting for you to enter some numbers.
7. Enter the volume (amount) of fluid that you dispensed (for example, if your 10-gallon container is full, enter "10.00" for gallons or "37.5" for litres). To enter numbers use the CALIBRATE button to change the value of the digit that is blinking and use the DISPLAY button to shift the "blink" to the next digit.	
8. Once the correct number has been entered, briefly press and release both buttons. The display will now change to a blinking "run 02" message.	You have installed the new calibration curve point. You are ready to end calibration (Step 10) or enter another new calibration point (Step 9).
9. To enter another calibration point, go back and repeat Steps 3 through 8.	It is possible to set up to 15 calibration points, and the "run ##" message will increment each time you repeat the calibration process (run 01, run 02, run 03, etc., up to run 15).

Dispense-Display Field Calibration Procedures - cont'd.

Your Actions	Notes
<p>10. To end calibration, press and hold both buttons for about 3 seconds until you see the "CAL End" message.</p> 	<p>After you release the buttons, the computer will resume normal operations with the new cal point(s) active.</p>
<p>11. If you HAVE NOT dispensed any fluid, you can exit calibration without changing the cal curve. If the message "run 01" is showing and you have not dispensed any fluid, hold both buttons for about 3 seconds until you see a "CAL End" message.</p> 	<p>After you release the buttons, the computer will resume normal operation and the old curve (if you have entered one in the past) is still intact.</p>

Replace Batteries

1. Remove the corner screws from the meter face and lift the computer electronics from the turbine.
2. Remove the batteries.
3. Check the battery terminals and remove any corrosion.
4. Install the new batteries and make sure the positive posts are positioned correctly. When the batteries are installed correctly, the computer powers on automatically and the readout displays information.
5. Make sure the O-ring is fully seated before placing the computer electronics on the turbine. Tighten the four screws.
6. Do not clean exterior of computer assembly with Isopropyl Alcohol.

K-Factor Entry Field Calibration

Presently all GPI computers are programmed with two different field calibration methods, only one of which is active, the "dispense-display" calibration procedure described above. It is possible to activate "K-Factor entry" field calibration by changing configuration settings. Contact your distributor or GPI to get the correct password, configuration code, and instructions for this calibration method. This information is also available on the GPI website. K-Factor Entry Calibration is similar to the dispense-display calibration procedure described above, and allows up to 15 calibration points to be entered using meter K-Factor inputs.

MAINTENANCE

The computer electronics are powered by lithium batteries which provide at least 9,000 hours (1 year). Under most conditions, the batteries need to be replaced about once a year. Removing the batteries before storing the meter will extend battery life. If the meter's readout should become dim or blank, the batteries should be replaced. Replacement batteries can be ordered from your distributor or the factory. See details in the Parts Section.

When batteries are disconnected or fail, the Batch and Cumulative Totals return to zero. Factory and Field Calibration Curves are retained in the meter's computer when power is lost.

It is strongly recommended that battery check and terminal cleaning be a part of a routine maintenance schedule. Battery terminals should be cleaned annually. Batteries can be replaced without removing the meter from the piping system.

USER CONFIGURATION

The new "09" series GPI flow computer has been programmed with many new features, most of which can be enabled by the end user by way of a configuration process. By disabling "unnecessary" features, day-to-day flowmeter operation can be greatly simplified, making the unit easier to use. There are several features that GPI disables by default when shipping standard meters. (For example, K-Factor Entry Field Calibration, described below.) For more advanced users, it may be desirable to enable ALL possible features. User configurable features include:

- Totalizers/Modes Enabled (Cumulative Total, Batch 1 Total, Batch 2 Total, Flowrate Mode)
- Flowrate Update Intervals (1, 2, 5, 10 seconds; 1, 2, 10 minutes; 1 hour)
- Flowrate Timebase (Units per Minute, Hour, or Day)

- Factory Calibration Curve Units Enabled (Gallons, Imperial Gallons or Litres)
- Field Calibration Curve B and/or C Enabled
- Dispense/Display or K-Factor Entry Calibration
- Maximum Resolution for Field Calibration (0, 1 or 2 Decimals)

Changing Configuration Settings

Access to the configuration process is restricted for security until a "password" is entered. Contact your distributor or GPI to get the password and instructions to unlock and reset configuration settings. This information is also available on the GPI website. Configurations are entered and stored as six-digit "codes" where each digit represents a setting for one of the configuration options. New configuration settings are stored in the

TROUBLESHOOTING

Symptom	Probable Cause	Corrective Action
Meter is not accurate	<ol style="list-style-type: none"> 1. Field Calibration not performed properly 2. Factory Calibration not suitable for liquid being measured 3. Meter operated below minimum flowrate 4. Meter partially clogged with dried liquid 5. Turbine bearings partially clogged with dried liquid 6. Sealant material wrapped around rotor 7. Installed too close to fittings 8. Installed too close to motors or electrically "noisy" environment 	<p>Field calibrate again or select Factory Calibration.</p> <p>Perform a Field Calibration according to Calibration Section.</p> <p>Increase flowrate.</p> <p>Remove meter. Clean carefully. Make sure rotor spins freely.</p> <p>Remove meter. Clean carefully. Make sure rotor spins freely.</p> <p>Remove meter. Make sure rotor spins freely.</p> <p>Install correctly.</p> <p>Install correctly.</p>
Readout faded or blank	<ol style="list-style-type: none"> 1. Batteries weak, dead, or not connected 2. Computer defective 	<p>Remove computer, check and replace batteries if necessary.</p> <p>Contact the factory.</p>
Normal flowrate but meter does not count (Meter comes on when DISPLAY button pushed)	<ol style="list-style-type: none"> 1. Field Calibration not performed correctly 2. Rotor stuck or damaged 3. Sealant material wrapped around rotor 4. Computer defective 	<p>Field Calibrate again or select Factory Calibration.</p> <p>Remove meter. Make sure rotor spins freely.</p> <p>Remove meter. Make sure rotor spins freely.</p> <p>Contact the factory.</p>
Reduced flowrate and meter does not count (Meter comes on when DISPLAY button pushed)	<ol style="list-style-type: none"> 1. Meter clogged with dried liquids 2. Below minimum flowrate 	<p>Remove meter. Clean carefully. Make sure rotor spins freely.</p> <p>Increase flow.</p>

Symptom	Probable Cause	Corrective Action
Cannot get meter into field calibration	<ol style="list-style-type: none"> 1. Factory Calibration (PRESET) curve active 2. Computer circuit board defective 3. Button defective 	<p>Hold down CALIBRATE and push and release DISPLAY until PRESET flag goes off. Proceed with calibration according to the Calibration Section.</p> <p>Replace computer. Contact the factory.</p> <p>Replace computer. Contact the factory.</p>

SPECIFICATIONS

Standard Features Include:

- 2 Totalizing Registers
- 1 Factory Calibration Curve
- 2 Field Calibration Curves
- Rate of Flow Feature
- Flowrate Time Base in Minutes

Temperatures:

- Operational: +14° to +140°F
(-10° to +60°C)
- Storage: -40° to +158°F
(-40° to +70°C)

If wider operating temperature ranges are desired, reference information on GPI Remote Kits.

Input Pulse Rate:

- Minimum Pulse In: DC
- Minimum Coil Input: 10 Hz
- Maximum Raw: 1,000 Hz

Power:

- Internal Power Supply: 2 Lithium Batteries at 3 volts each
- Minimum Battery Life: 9,000 hours of use (1 year)
- Optional External Power Module: 7-30 VDC

K-Factor:

- Minimum: .01 pulses/unit
- Maximum: > 999,999 pulses/unit

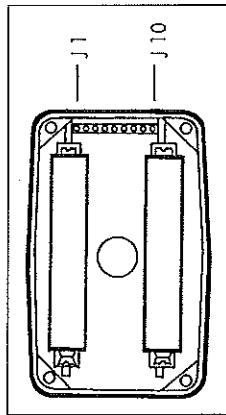
Field Calibration:

- Minimum Time: 10 seconds

Readout Totals:

- Minimum Display: 0.01
- Maximum Display: 999,999

Computer Electronics Terminal Connections



J-1

Reset

Programming interfaces. Not accessible to user.

J-2

Pulse Signal Output

This supplies a high-level amplified open collector signal. Output will withstand a maximum open-circuit voltage of 60 volts DC and a maximum closed-circuit of 100 mA.

J-4

Pulse Signal Input

Requires a sine or square wave with open-circuit voltage of 3-30 volts P-P, a maximum rise/fall rate of 0.01 V/ μ second and a maximum frequency of 750 Hz.

J-5

Power Input

When used with Ground (J1-6), this has reverse polarity protection, but no on-board voltage regulation. Supplied voltage may be 5 volts to 10 volts DC.

J-6

Ground

Programming interfaces. Not accessible to user.

J-7, 8,
9, 10

NOTE: Safety approvals are void if any external connections are made to computer electronics.

PARTS

The factory, when provided with model number and serial number, can replace your entire Computer Electronics Assembly.

Order replacement kits, parts, and accessories with the part numbers given here.

Part No.	Description
113520-1	Battery Replacement Kit
901002-52	O-Ring
116000-1	Large (5 gal.) Calibration Container

SERVICE

For warranty consideration, parts, or other service information, please contact your local distributor. If you need further assistance, call the GPI Customer Service Department in Wichita, Kansas, during normal business hours.

1-888-996-3837

To obtain prompt, efficient service, always be prepared with the following information:

1. The model number of your computer electronics.
2. The serial number or manufacturing date code of your computer electronics.
3. Specific information about part numbers and descriptions.

For warranty work always be prepared with your original sales slip or other evidence of purchase date.

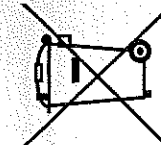
Returning Parts

Please contact the factory before returning any parts. It may be possible to diagnose the trouble and identify needed parts in a telephone call. GPI can also inform you of any special handling requirements you will need to follow covering the transportation and handling of equipment which has been used to transfer hazardous or flammable liquids.

CAUTION: Do not return computer electronics or meters without specific authority from the GPI Customer Service Department. Due to strict regulations governing transportation, handling, and disposal of hazardous or flammable liquids, GPI will not accept computer electronics or meters for rework unless they are completely free of liquid residue.

CAUTION: Meters not flushed before shipment can be refused and returned to the sender.

WEEE DIRECTIVE



The Waste Electrical and Electronic Equipment (WEEE) directive (2002/96/EC) was approved by the European Parliament and the Council of the European Union in 2003. This symbol indicates that this product contains electrical and electronic equipment that may include batteries, printed circuit boards, liquid crystal displays or other components that may be subject to local disposal regulations at your location. Please understand those regulations and dispose of this product in a responsible manner.

include batteries, printed circuit boards, liquid crystal displays or other components that may be subject to local disposal regulations at your location. Please understand those regulations and dispose of this product in a responsible manner.

**Copy the information located on the Turbine housing.
This information will be required by Customer Service.**

Model No: _____

Serial No: _____

MFD: _____

Distributor Name: _____

Distributor Phone Number: _____

Declaration of Conformity

Manufacturer's Name:
Manufacturer's Address:

Great Plains Industries, Inc.
5252 East 36th Street North
Wichita, KS USA 67220-3205

Declares, that the product:

Product Name:
Model Numbers:

Electronic Digital Meter
03*****
A1*****
A2*****
G2*****

*Model numbers include all combinations
of an alpha-numeric series as illustrated above.*

Conform to the following Standards:

EMC:

EN 50081-1 (Reference EN 55022)
EN 50082-1

Energy - Limited Apparatus:
I.P. Code:

EN 50021
BS EN 60529

Supplementary Information:

*"The products comply with the requirements of the EMC
Directive 89/336/EEC and the ATEX Directive 94/9/EC
(ANNEX VIII)."*

I, the undersigned, hereby declare that the equipment specified above
conforms to the above Directive(s) and Standard(s).

Signature:



Full Name:
Position:

Mr. Grant Nutter
President
Great Plains Industries, Inc.
Wichita, KS USA
May 2003

Place:

Limited Warranty Policy

Great Plains Industries, Inc. 5252 E. 36th Street North, Wichita, KS USA 67220-3205, hereby provides a limited warranty against defects in material and workmanship on all products manufactured by Great Plains Industries, Inc. This product includes a 1 year warranty. Manufacturer's sole obligation under the foregoing warranties will be limited to either, at Manufacturer's option, replacing or repairing defective Goods (subject to limitations hereinafter provided) or refunding the purchase price for such Goods theretofore paid by the Buyer, and Buyer's exclusive remedy for breach of any such warranties will be enforcement of such obligations of Manufacturer. The warranty shall extend to the purchaser of this product and to any person to whom such product is transferred during the warranty period.

The warranty period shall begin on the date of manufacture or on the date of purchase with an original sales receipt. This warranty shall not apply if:

- A. the product has been altered or modified outside the warrantor's duly appointed representative;
- B. the product has been subjected to neglect, misuse, abuse or damage or has been installed or operated other than in accordance with the manufacturer's operating instructions.

To make a claim against this warranty, contact the GPI Customer Service Department at 316-686-7361 or 888-996-3837. Or by mail at:

Great Plains Industries, Inc.
5252 E. 36th St. North
Wichita, KS, USA 67220-3205

The company shall, notify the customer to either send the product, transportation prepaid, to the company at its office in Wichita, Kansas, or to a duly authorized service center. The company shall perform all obligations imposed on it by the terms of this warranty within 60 days of receipt of the defective product.

GREAT PLAINS INDUSTRIES, INC., EXCLUDES LIABILITY UNDER THIS WARRANTY FOR DIRECT, INDIRECT, INCIDENTAL AND CONSEQUENTIAL DAMAGES INCURRED IN THE USE OR LOSS OF USE OF THE PRODUCT WARRANTED HEREUNDER.

The company herewith expressly disclaims any warranty of merchantability or fitness for any particular purpose other than for which it was designed.

This warranty gives you specific rights and you may also have other rights which vary from U.S. state to U.S. state.

Note: In compliance with MAGNUSON MOSS CONSUMER WARRANTY ACT - Part 702 (governs the resale availability of the warranty terms).



Factory Mutual Approved
Intrinsically Safe for Class I, II, III, Division 1, All Groups.



5252 East 36th Street North
Wichita, KS USA 67220-3205
TEL: 316-686-7361
FAX: 316-686-6746

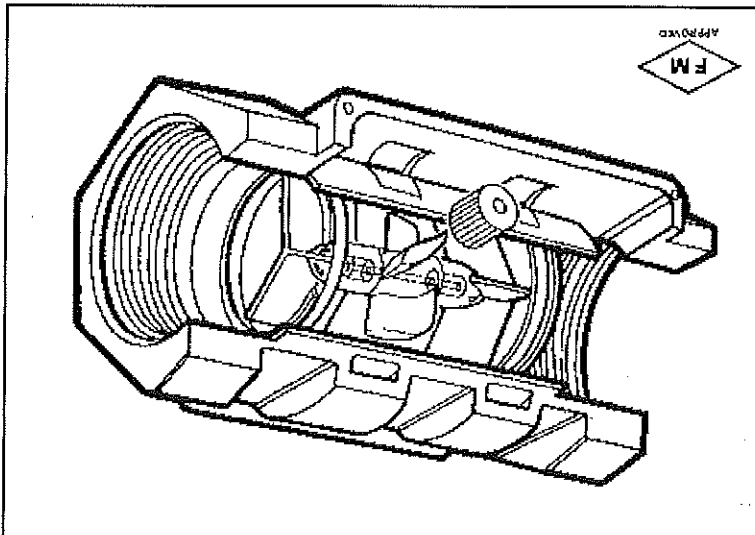
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Industrial Grade TURBINE HOUSING Owner's Manual

Includes Aluminum, Brass and Stainless Steel
Housings and ANSI Flange Fittings



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To the owner...

Congratulations on receiving your GPI Industrial Grade Turbine. We are pleased to provide you with a product designed to give you maximum reliability and efficiency.

Our business is the design, manufacture, and marketing of liquid handling, agricultural, and recreational products. We succeed because we provide customers with innovative, reliable, safe, timely, and competitively-priced products. We pride ourselves in conducting our business with integrity and professionalism.

We are proud to provide you with a quality product and the support you need to obtain years of safe, dependable service.

Quest-Nelson

President
Great Plains Industries, Inc.

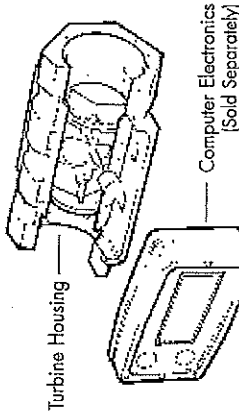
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GENERAL INFORMATION

This manual will assist you in installing and maintaining your GPI Industrial Grade turbine housing. (See Figure 1) Information on computer electronics and accessory modules are contained in other manuals. Please reference those as necessary.

Figure 1



For best results, take the time to fully acquaint yourself with all information about all components of your GPI Electronic Digital Metering System prior to installation and use. If you need assistance, contact the distributor from whom you purchased your turbine.



This symbol is used throughout the manual to call your attention to safety messages.

Warnings alert you to the potential for personal injury.

Cautions draw your attention to practices or procedures which may damage your equipment.

Notes give information that can improve efficiency of operations.

It is your responsibility to make sure that all operators have access to adequate instructions about safe operating and maintenance procedures.

Read Me!

For your safety, review the major warnings and cautions below before operating your equipment.

1. Use **only fluids** that are compatible with the housing material and wetted components of your turbine.

2. When measuring flammable liquids, observe precautions against fire or explosion.

3. When handling hazardous liquids, always follow the liquid manufacturer's safety precautions.

4. When working in hazardous environments, always exercise appropriate safety precautions.

5. Always dispose of used cleaning solvents in a safe manner according to the solvent manufacturer's instructions.

6. During turbine removal, liquid may spill. Follow the liquid manufacturer's safety precautions for clean up of minor spills.

7. Do not blow compressed air through the turbine.

8. Do not allow liquids to dry inside the turbine.

9. Handle the rotor carefully. Even small scratches or nicks can affect accuracy.

10. When tightening the turbine, use a wrench only on the wrench flats.

11. For best results, always verify accuracy before use.

Product Description

GPI Industrial Meter Turbines are identified by the internal diameter of the inlet and outlet.

Model 05 - 1/2 inch
Model 07 - 3/4 inch
Model 10 - 1 inch
Model 15 - 1-1/2 inch
Model 20 - 2 inch

Each turbine is designed to work with on-board computer electronics and/or with one of several accessory output modules.

Liquid flows through the turbine housing causing an internal rotor to spin. As the rotor spins, an electrical signal is generated in the pickup coil. This signal is converted into engineering units (gallons, litres, etc.) on the local display. Accessory modules can be used to export the signal to other equipment.

Upon receipt, examine your meter for visible damage. The turbine is a precision measuring instrument and should be handled as such. Remove the protective plugs and caps for a thorough inspection. If any items are damaged or missing, contact your distributor.

Make sure the turbine model meets your specific needs. Refer to the Specifications Section and confirm the following:

- ✓ The flowrate is within the limits of your model.
- ✓ The liquid is compatible with the turbine's wetted components.
- ✓ The system's pressure does not exceed the turbine's maximum pressure rating.

Information specific to your particular turbine, including serial number, model number, manufacturing date, and K-factor is etched on the meter. Be prepared to provide this information if you call customer service.

SN = Serial Number, a 6-digit number that identifies this particular turbine.

MODEL = Model Number begins with a letter indicating the housing material.

A for Aluminum

B for Brass

H for Stainless Steel High Pressure

S for Stainless Steel

Two digits follow the material code indicating the size.

05 - 1/2 inch

07 - 3/4 inch

10 - 1 inch

15 - 1-1/2 inch

20 - 2 inch

The final letter indicates the type of thread.

F for Flange

N for NPT

I for ISO

MFG DATE = Manufacturing Date indicating the week and year of manufacture.

KF = K-Factor given in pulses per gallon (PPG).

For your future reference, it might be useful to record this information in the manual in case it becomes unreadable on the turbine.

INSTALLATION

All GPI turbines are designed to measure flow in only one direction. The direction is indicated by the arrow, cast-molded in the turbine. If the computer display is upside down, remove the four screws, turn the display 180° and reinstall the screws. See Diagram 1.

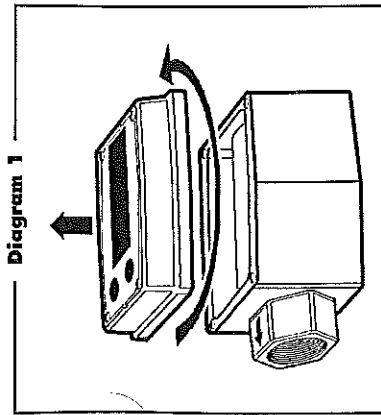


Diagram 1

Flow altering devices such as elbows, valves, and reducers can affect accuracy. See Diagram 2. The following recommended guidelines are given to enhance accuracy and maximize performance. Distances given here are minimum requirements; double them for desired straight pipe lengths.

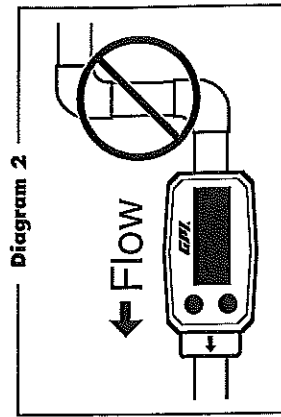


Diagram 2

Upstream from the turbine, allow a minimum straight pipe length at least 10 times the internal diameter of the turbine. For example, with the 1" turbine, there should be 10 inches (25.4cm) of straight pipe immediately upstream. The desired upstream straight pipe length is 20 inches (50.8cm).

Downstream from the turbine, allow a minimum straight pipe length at least 5 times the internal diameter of your turbine. For example, with the 1" turbine, there should be 5 inches (12.7cm) of straight pipe immediately downstream. The desired downstream distance is 10 inches (25.4cm). See Diagram 3.

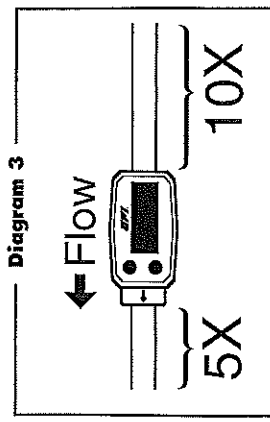


Diagram 3

A typical back pressure of 5 to 50 PSI (0.34 to 3.4 bar) will prevent cavitation. Create back pressure by installing a control valve on the downstream side of the meter at the proper distance detailed above.

Foreign material in the liquid being measured can clog the turbine's rotor and adversely affect accuracy. If this problem is anticipated or experienced, install screens to filter impurities from incoming liquids.

Models 1/2", 3/4" and 1":

Maximum Particulate Size	Inches:	0.005
	Microns:	125
Mesh:		55
Standard Sieve:		125 µm
Alternative Sieve:		No. 120

Models 1-1/2" and 2":

Maximum Particulate Size	Inches:	0.018
	Microns:	500
Mesh:		28
Standard Sieve:		500 µm
Alternative Sieve:		No. 35

To ensure accurate measurement, remove all air from the system before use.

Each turbine contains a removable back coverplate. Leave the coverplate installed unless accessory modules specify removal.

Connections

1. To protect against leakage, seal all threads with an appropriate sealing compound. Make sure the sealing compound does not intrude into the flow path.
2. Make sure the arrow on the outlet is pointed in the direction of the flow.
3. Tighten the turbine onto the fittings. Use a wrench only on wrench flats.

NOTE: If connecting to new male threads, burrs and curls can adversely effect accuracy. Correct the problem prior to turbine installation.

Verify accuracy after connections are complete. See Operations section.

Flange Connection

Use a gasket between the meter flange and mating flange. Determine the material of the gasket based on the operating conditions and type of fluid.

NOTE: Do not over tighten the flange bolts.

This may cause the gasket to be compressed into the flow stream and may decrease the accuracy of the meter.

OPERATIONS

Verify Accuracy

Before use, check the turbine's accuracy and verify calibration.

1. Make sure there is no air in the system.
2. Measure an exact known volume into an accurate container.
3. Verify the volume against the readout or recording equipment.

NOTE: If necessary, use a correction factor to figure final volume.

For best results, accuracy should be verified periodically as part of a routine maintenance schedule.

MAINTENANCE

Remove the Turbine

⚠ !!! WARNING !!!

During turbine removal, liquid may spill. Follow the liquid manufacturer's safety precautions for clean up of minor spills.

1. Drain all liquid from the turbine. Wear protective clothing as necessary.
2. Loosen both ends of the turbine. Use a wrench only on the turbine's wrench flats.
3. If the turbine is not immediately installed again, cap lines as necessary.

Clean the Turbine

During use, the turbine should be kept full of liquid to ensure that drying does not occur inside the turbine. If drying or caking should occur, the rotor will stick or drag, affecting accuracy. To determine if the rotor is stuck or dragging, gently blow air through the meter and listen for the quiet whir of the rotor.

CAUTION: Never blow compressed air through the meter. It could damage the rotor.

1. Remove the turbine from the system following the directions above.

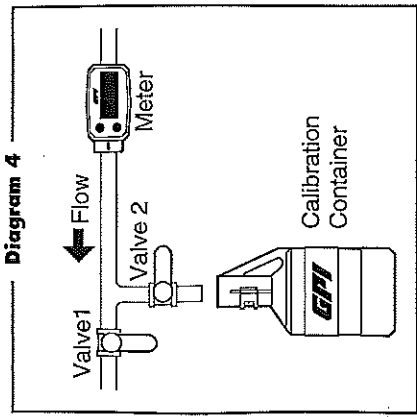
2. Carefully clean residue off all parts. Remove internal parts as detailed above. Note orientation carefully for correct assembly. Internal parts can be soaked for 10 to 15 minutes in compatible cleaning solutions. Use a soft brush or small probe to carefully remove residue from the rotor.

⚠ !!! WARNING !!!

Follow the liquid manufacturer's instructions for the disposal of contaminated cleaning solvents.

3. When the rotor turns freely, assemble and install it again following the instructions above.

4. Check accuracy after cleaning. See Diagram 4 for example of bucket test method.

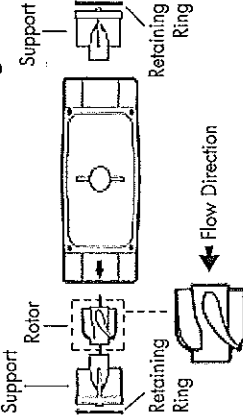


Replace Internal Parts

1. Remove the turbine from the system as detailed above.

NOTE: Carefully notice the orientation of all internal parts as they are removed, especially the orientation of the rotor to the flow direction arrow. See Figure 2.

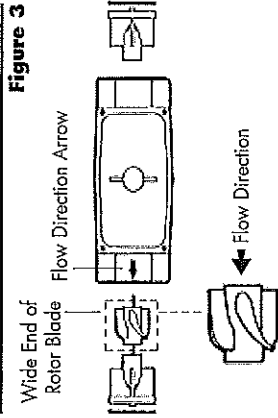
Figure 2



2. Using a small tool such as a screwdriver or awl, gently pry one retaining ring from its groove. Remove the support. If necessary, use needle nose pliers. Little or no force should be required.
3. Carefully remove the rotor.

CAUTION: Handle the rotor carefully. Even small scratches or nicks can affect accuracy.

4. Turn the turbine over and remove the other retaining ring. Remove the other support.
5. Clean, as detailed below, or discard as necessary.
6. Replace one support and retaining ring. Parts should drop easily into place with little or no force.
7. Install the rotor. Make sure the wide end of the rotor's blades faces the flow direction. See Figure 3.



8. Turn the turbine over and drop the second support into place. Put the final retaining ring into position.
9. Reinstall the turbine, purge the system of air, and verify accuracy before use.

TROUBLESHOOTING

Symptom	Probable Cause	Solution
Measurement is not accurate.	1. Turbine operated below minimum rate. 2. Turbine partially clogged with dried liquid. 3. Turbine bearings partially clogged with dried liquid. 4. Sealant wrapped around rotor. 5. Installed too close to fittings. 6. Improper connections to recording device. 7. Accuracy needs verification.	Increase flowrate. See Specifications. Remove turbine. Clean carefully. Make sure rotor spins freely. Remove turbine. Clean carefully. Make sure rotor spins freely. Remove turbine. Clear material from rotor. Make sure rotor spins freely. Install correctly. See Installation Section. Check all electrical connections. Reference appropriate installation instructions. Complete normal accuracy verification procedures. Repeat periodically.

MODEL NUMBER CHART

Normal Range GPM Water	Normal Range LPM Water	Inlet / Outlet Size NPT	Aluminum	Brass	Stainless Steel	Stainless Steel High Pressure
1 - 10	3.8 - 37.9	1/2"	A05	B05	S05	H05
2 - 20	7.6 - 75.7	3/4"	A07	B07	S07	H07
5 - 50	18.9 - 190	1"	A10	B10	S10	H10
10 - 100	38 - 380	1-1/2"	A15	B15	S15	H15
20 - 200	76 - 760	2"	A20	B20	S20	H20

SPECIFICATIONS - ALUMINUM

All data on Models 1/2", 3/4", and 1" determined with 1 centipoise solvent test fluid at 70°F (21°C). Data on Models 1-1/2" and 2" is determined with water at 70°F (21°C).

Model Size	1/2 in.	3/4 in.	1 in.	1-1/2 in.	2 in.
Linear Flow Range					
Gallons/minute (GPM)	1-10	2-20	5-50	10-100	20-200
Litres/minute (LPM)	3.8-37.9	7.6-75.7	18.9-190	38-380	76-760
Maximum Flow 1					
Gallons/minute (GPM)	15	30	75	150	300
Litres/minute (LPM)	56.8	113.6	284	568	1,136
Maximum Pressure Drop in 10:1 Range					
PSIG	8	7.5	5	4	4
bar	0.55	0.5	0.34	0.28	0.28
Frequency Range in Linear Flow Range	45-450 Hz	37-370 Hz	45-475 Hz	35-350 Hz	33-330 Hz
Connections					
NPT or ISO Threads	Yes	Yes	Yes	Yes	Yes
Female	Yes	Yes	Yes	Yes	Yes
Inlet/Outlet Size	1/2 in.	3/4 in.	1 in.	1-1/2 in.	2 in.
Wrench Size:					
Inch	1-1/16 in.	1-5/16 in.	1-5/8 in.	2-3/8 in.	3 in.
Millimeter	27mm	33mm	41mm	60mm	75mm
Weight*					
Pounds	0.6 lbs.	0.7 lbs.	0.8 lbs.	2.0 lbs.	3.1 lbs.
Kilograms	0.8kg	1.0kg	1.1kg	1.8kg	2.9kg

* Computer electronics add 0.2 lbs. (0.1kg) to total weight.

1 The meter can operate up to this flowrate without damage. Continuous operation will severely degrade meter life and performance.

Performance

Linear Range for 1/2 in.: 10:1 @ ±2.0% of reading
 Linear Range for 3/4 in. and 1 in.: 10:1 @ ±1.5% of reading
 Linear Range for 1-1/2 in. and 2 in.: 10:1 @ ±1.0% of reading
 Repeatability: ±0.1%

Pressure Rating

300 PSIG (21 bar)

Wetted Components

Housing: Aluminum
 Journal Bearings: Ceramic (96% Alumina)
 Shaft: Tungsten Carbide
 Rotor and Supports: PVDF
 Retaining Rings: 316 Stainless Steel

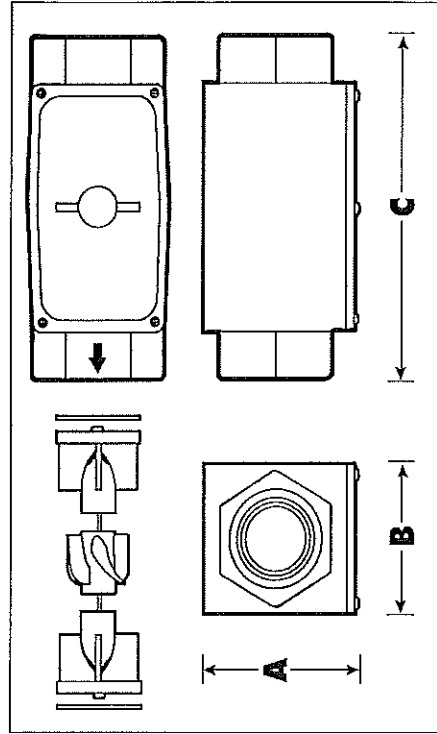
Temperature Range

-40° to +250°F (-40° to +121°C)
 These temperatures apply to operations and storage. They are only for the turbine without computer electronics. Final operational temperature range is determined by computer electronics or accessory modules.

Dimensions

Model Size	1/2 in.	3/4 in.	1 in.	1-1/2 in.	2 in.
A = Height: Inches Centimeters	1.8 in. 4.6cm	2.0 in. 5.1cm	2.2 in. 5.6cm	2.8 in. 7.1cm	3.2 in. 8.2cm
B = Width: Inches Centimeters	2.0 in. 5.1cm	2.0 in. 5.1cm	2.0 in. 5.1cm	2.7 in. 6.9cm	3.3 in. 8.4cm
C = Length: Inches Centimeters	4.2 in. 10.7cm	4.3 in. 10.9cm	4.5 in. 11.4cm	5.3 in. 13.5cm	6.3 in. 16.0cm

Computer electronics add 0.7 in. (1.8cm) to height of turbine.



SPECIFICATIONS - Brass

All data on Models 1/2", 3/4", and 1" determined with 1 centipoise solvent test fluid at 70°F (21°C). Data on Models 1-1/2" and 2" is determined with water at 70°F (21°C).

Model Size	1/2 in.	3/4 in.	1 in.	1-1/2 in.	2 in.
Linear Flow Range					
Gallons/minute (GPM)	1-10	2-20	5-50	10-100	20-200
Litres/minute (LPM)	3.8-37.9	7.6-75.7	18.9-190	38-380	76-760
Maximum Flow 1					
Gallons/minute (GPM)	15	30	75	150	300
Litres/minute (LPM)	56.8	113.6	284	568	1,136
Maximum Pressure Drop in 10:1 Range					
PSIG	8	7.5	5	4	4
bar	0.55	0.5	0.34	0.28	0.28
Frequency Range in Linear Flow Range	45-450 Hz	37-370 Hz	45-475 Hz	35-350 Hz	33-330 Hz
Connections					
NPT or ISO Threads	Yes	Yes	Yes	Yes	Yes
Female	Yes	Yes	Yes	Yes	Yes
Inlet/Outlet Size	1/2 in.	3/4 in.	1 in.	1-1/2 in.	2 in.
Wrench Size:					
Inch	1-1/16 in.	1-5/16 in.	1-5/8 in.	2-3/8 in.	3 in.
Millimeter	27mm	33mm	41mm	60mm	75mm
Weight*					
Pounds	2.0 lbs.	2.3 lbs.	2.7 lbs.	6.0 lbs.	9.6 lbs.
Kilograms	0.9kg	1.0kg	1.2kg	2.7kg	4.3kg

* Computer electronics add 0.2 lbs. (0.1kg) to total weight.

1 The meter can operate up to this flowrate without damage. Continuous operation will severely degrade meter life and performance.

Performance

Linear Range for 1/2 in.: 10:1 @ ±2.0% of reading
 Linear Range for 3/4 in. and 1 in.: 10:1 @ ±1.5% of reading
 Linear Range for 1-1/2 in. and 2 in.: 10:1 @ ±1.0% of reading
 Repeatability: ±0.1%

Pressure Rating 300 PSIG (21 bar)

Wetted Components

Housing: Brass
 Journal Bearings: Ceramic (96% Alumina)
 Shaft: Tungsten Carbide
 Rotor and Supports: PVDF
 Retaining Rings: 316 Stainless Steel

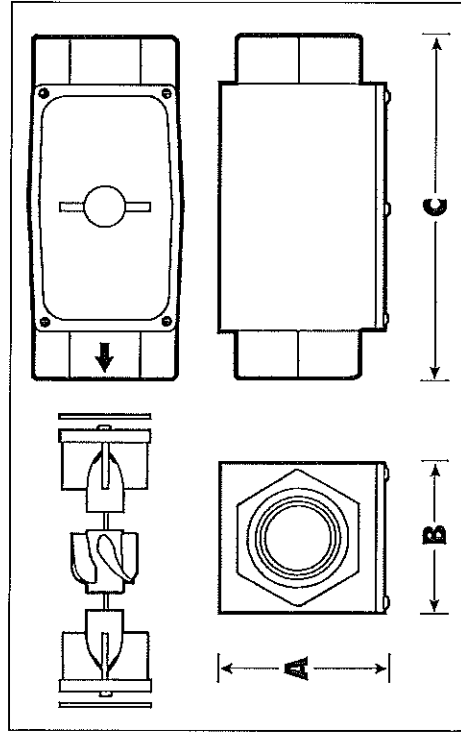
Temperature Range

-40° to +250°F (-40° to +121°C)
 These temperatures apply to operations and storage. They are only for the turbine without computer electronics. Final operational temperature range is determined by computer electronics or accessory modules.

Dimensions

Model Size	1/2 in.	3/4 in.	1 in.	1-1/2 in.	2 in.
A = Height:					
Inches	1.8 in.	2.0 in.	2.2 in.	2.8 in.	3.2 in.
Centimeters	4.6cm	5.1cm	5.6cm	7.1cm	8.2cm
B = Width:					
Inches	2.0 in.	2.0 in.	2.0 in.	2.7 in.	3.3 in.
Centimeters	5.1cm	5.1cm	5.1cm	6.9cm	8.4cm
C = Length:					
Inches	4.2 in.	4.3 in.	4.5 in.	5.3 in.	6.3 in.
Centimeters	10.7cm	10.9cm	11.4cm	13.5cm	16.0cm

Computer electronics add 0.7 in. (1.8cm) to height of turbine.



SPECIFICATIONS - Stainless Steel

All data on Models 1/2", 3/4", and 1" determined with 1 centipoise solvent test fluid at 70°F (21°C). Data on Models 1-1/2" and 2" is determined with water at 70°F (21°C).

Model Size	1/2 in.	3/4 in.	1 in.	1-1/2 in.	2 in.
Linear Flow Range	1-10	2-20	5-50	10-100	20-200
Gallons/minute (GPM)	3.8-37.9	7.6-75.7	18.9-190	38-380	76-760
Litres/minute (LPM)					
Maximum Flow 1					
Gallons/minute (GPM)	15	30	75	150	300
Litres/minute (LPM)	56.8	113.6	284	568	1,136
Maximum Pressure Drop in 10:1 Range					
PSIG	8	7.5	5	4	4
bar	0.55	0.5	0.34	0.28	0.28
Frequency Range in Linear Flow Range	45-450 Hz	37-370 Hz	45-475 Hz	35-350 Hz	33-330 Hz
Connections	Yes	Yes	Yes	Yes	Yes
NPT or ISO Threads	Yes	Yes	Yes	Yes	Yes
Female	Yes	Yes	Yes	Yes	Yes
Inlet/Outlet Size	1/2 in.	3/4 in.	1 in.	1-1/2 in.	2 in.
Wrench Size:					
Inch	1-1/16 in.	1-5/16 in.	1-5/8 in.	2-3/8 in.	3 in.
Millimeter	27mm.	33mm	41mm	60mm	75mm
Weight*					
Pounds	1.8 lbs.	2.0 lbs.	2.4 lbs.	4.0 lbs.	6.3 lbs.
Kilograms	0.8kg	1.0kg	1.1kg	1.8kg	2.9kg

* Computer electronics add 0.2 lbs. (0.1kg) to total weight.

1 The meter can operate up to this flowrate without damage. Continuous operation will severely degrade meter life and performance.

Performance

Linear Range for 1/2 in.: 10:1 @ ±2.0% of reading
 Linear Range for 3/4 in. and 1 in.: 10:1 @ ±1.5% of reading
 Linear Range for 1-1/2 in. and 2 in.: 10:1 @ ±1.0% of reading
 Repeatability: ±0.1%

Pressure Rating 1,500 PSIG (21 bar) - Standard Stainless Steel Meter
 3,000 PSIG (207 bar) - High Pressure Stainless Steel Meter

Wetted Components

Housing: 316 Stainless Steel
 Journal Bearings: Ceramic (96% Alumina)
 Shaft: Tungsten Carbide
 Rotor and Supports: PVDF
 Retaining Rings: 316 Stainless Steel

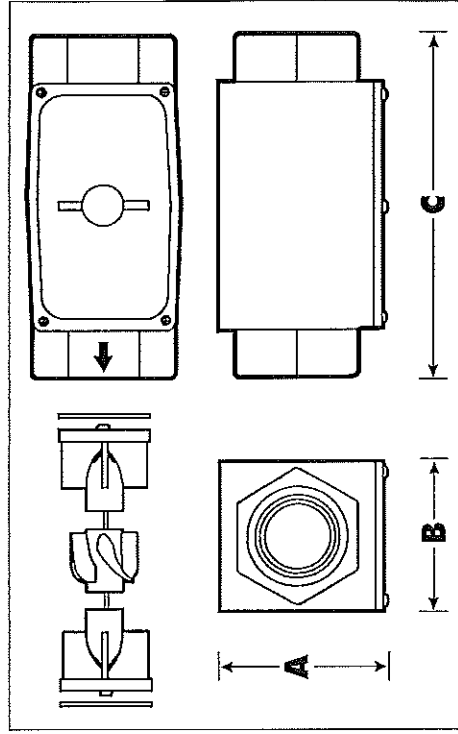
Temperature Range

-40° to +250°F (-40° to +121°C)
 These temperatures apply to operations and storage. They are only for the turbine without computer electronics. Final operational temperature range is determined by computer electronics or accessory modules.

Dimensions

Model Size	1/2 in.	3/4 in.	1 in.	1-1/2 in.	2 in.
A = Height:					
Inches	1.8 in.	2.0 in.	2.2 in.	2.8 in.	3.2 in.
Centimeters	4.6cm	5.1cm	5.6cm	7.1cm	8.2cm
B = Width:					
Inches	2.0 in.	2.0 in.	2.0 in.	2.7 in.	3.3 in.
Centimeters	5.1cm	5.1cm	5.1cm	6.9cm	8.4cm
C = Length:					
Inches	4.2 in.	4.3 in.	4.5 in.	5.3 in.	6.3 in.
Centimeters	10.7cm	10.9cm	11.4cm	13.5cm	16.0cm

Computer electronics add 0.7 in. (1.8cm) to height of turbine.



SPECIFICATIONS - Flange Fittings

All data on Model 1" determined with 1 centipoise solvent test fluid at 70°F (21°C). Data on Models 1-1/2" and 2" is determined with water at 70°F (21°C).

Model Size	1 in.	1-1/2 in.	2 in.
Linear Flow Range			
Gallons/minute (GPM)	5-50	10-100	20-200
Litres/minute (LPM)	18.9-190	38-380	76-760
Maximum Flow ¹			
Gallons/minute (GPM)	75	150	300
Litres/minute (LPM)	284	568	1,136
Maximum Pressure Drop			
in 10:1 Range			
PSIG	5	4	4
bar	0.34	0.28	0.28
Frequency Range in			
Linear Flow Range	45-475 Hz	35-350 Hz	33-330 Hz
Connections			
ANSI 150 lb. Flange	Yes	Yes	Yes
Bolt Size	1/2 in.	1/2 in.	5/8 in.
Weight*			
Pounds	6.5 lbs.	10.6 lbs.	17.9 lbs.
Kilograms	2.9kg	4.8kg	8.1kg

* Computer electronics add 0.2 lbs. (0.1kg) to total weight.

¹ The meter can operate up to this flowrate without damage. Continuous operation will severely degrade meter life and performance.

Performance

Linear Range for 1 in.: 10:1 @ ±1.5% of reading
 Linear Range for 1-1/2 in. and 2 in.: 10:1 @ ±1.0% of reading
 Repeatability: ±0.1%

Pressure Rating

285 PSI (From -20° to 100°F)

Wetted Components

Housing: 316 Stainless Steel
 Journal Bearings: Ceramic (96% Alumina)
 Shaft: Tungsten Carbide
 Rotor and Supports: PVDF
 Retaining Rings: 316 Stainless Steel

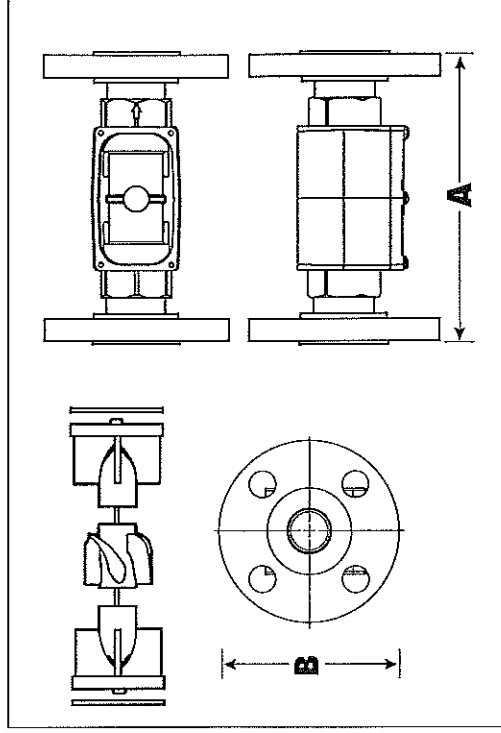
Temperature Range

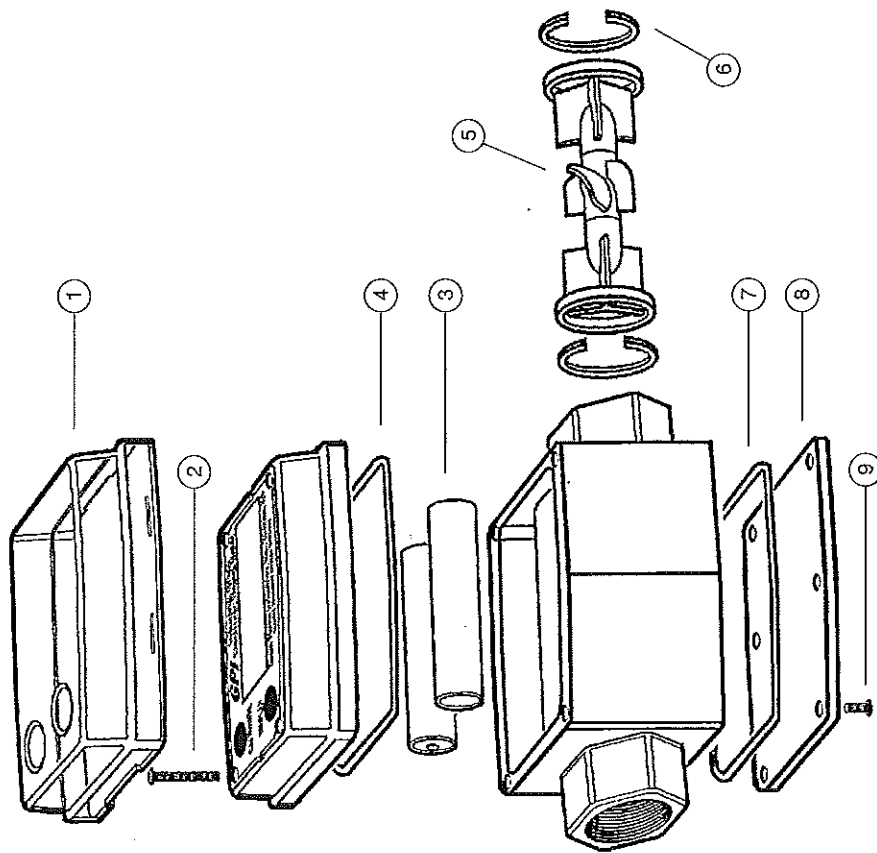
-40° to +250°F (-40° to +121°C)
 These temperatures apply to operations and storage. They are only for the turbine without computer electronics. Final operational temperature range is determined by computer electronics or accessory modules.

Dimensions

Model Size	1 in.	1-1/2 in.	2 in.
A = Length:			
Inches	6.75 in.	8.00 in.	9.50 in.
Centimeters	17.14cm	20.32cm	24.13cm
B = Width:			
Inches	4.25 in.	5.00 in.	6.00 in.
Centimeters	10.80cm	12.71cm	15.24cm

Computer electronics add 0.7 in. (1.8cm) to height of turbine.





Item No.	Part No.	Description	No. Req'd.
1	906004-85	EDM Cover Single Access Port (optional) - Fits 1/2", 3/4" and 1" Only	1
	906004-86	EDM Cover Dual Access Port (optional) - Fits 1/2", 3/4" and 1" Only	1
2	904004-12	Screw	4
3	113520-1	Battery Kit (2 batteries included)	1
4	901002-52	O-Ring, Computer	1
5	125500-1	"05" 1/2-inch Rotor/Support Replacement Kit (includes rotor assembly, support assembly & retaining rings)	1
	125500-2	"07" 3/4-inch Rotor/Support Replacement Kit (includes rotor assembly, support assembly & retaining rings)	1
	125500-3	"10" 1-inch Rotor/Support Replacement Kit (includes rotor assembly, support assembly & retaining rings)	1
	125500-4	"15" 1-1/2-inch Rotor/Support Replacement Kit (includes rotor assembly, support assembly & retaining rings)	1
	125500-5	"20" 2-inch Rotor/Support Replacement Kit (includes rotor assembly, support assembly & retaining rings)	1
6	904005-20	One 05 - 1/2-inch Retaining Ring	2
	904005-21	One 07 - 3/4-inch Retaining Ring	2
	904005-22	One 10 - 1-inch Retaining Ring	2
	904005-23	One 15 - 1-1/2-inch Retaining Ring	2
	904005-24	One 20 - 2-inch Retaining Ring	2
	125505-01	Flange Gasket Kit with 2 Gaskets (1 in. Neoprene) (not shown)	1
	125504-01	Flange Gasket Kit with 2 Gaskets (1 in. Viton) (not shown)	1
	125505-02	Flange Gasket Kit with 2 Gaskets (1-1/2 in. Neoprene) (not shown) ..	1
	125504-02	Flange Gasket Kit with 2 Gaskets (1-1/2 in. Viton) (not shown)	1
	125505-03	Flange Gasket Kit with 2 Gaskets (2 in. Neoprene) (not shown)	1
	125504-03	Flange Gasket Kit with 2 Gaskets (2 in. Viton)(not shown)	1
7	901003-1	Back Coverplate O-Ring	1
8	125015-2	Back Coverplate	1
9	904005-13	Back Coverplate Screws	6

SERVICE

For warranty consideration, parts, or other service information, please contact your local distributor. If you need further assistance, call the GPI Customer Service Department in Wichita, Kansas, during normal business hours.

1-888-996-3837

To obtain prompt, efficient service, always be prepared with the following information:

1. The model number of your turbine.
2. The serial number or manufacturing date code of your turbine.
3. Specific information about part numbers and descriptions.

For warranty work always be prepared with your original sales slip or other evidence of purchase date.

Returning Parts

Please contact the factory before returning any parts. It may be possible to diagnose the trouble and identify needed parts in a telephone call. GPI can also inform you of any special handling requirements you will need to follow covering the transportation and handling of equipment which has been used to transfer hazardous or flammable liquids.

CAUTION: Do not return turbines without specific authority from the GPI Customer Service Department. Due to strict regulations governing transportation, handling, and disposal of hazardous or flammable liquids, GPI will not accept turbines for rework unless they are completely free of liquid residue.

CAUTION: Turbines not flushed before shipment can be refused and returned to the sender.

Limited Warranty Policy

Great Plains Industries, Inc. 5252 E. 36th Street North, Wichita, KS USA 67220-3205, hereby provides a limited warranty against defects in material and workmanship. This product includes a 1-year warranty. The warranty shall extend to the purchaser of this product and to any person to whom such product is transferred during the warranty period.

The warranty period shall begin on the date of the original new equipment purchase. Warrantor's obligation hereunder shall be limited to repairing defective workmanship or replacing or repairing any defective part or parts. This warranty shall not apply if:

- A. the product has been altered or modified outside the warrantor's duly appointed representative;
- B. the product has been subjected to neglect, misuse, abuse or damage or has been installed or operated other than in accordance with the manufacturer's operating instructions.

To make a claim against this warranty, notice of claim must be given in writing to the company at its above address no later than 30 days after the expiration of the warranty period. Such notice shall identify the defect in the product. The company shall, within 14 days of receipt of such notice, notify the customer to either send the product, transportation prepaid, to the company at its office in Wichita, Kansas, or to duly authorized service center. The company shall perform all obligations imposed on it by the terms of this warranty within 60 days of receipt of the defective product.

GREAT PLAINS INDUSTRIES, INC. EXCLUDES LIABILITY UNDER THIS WARRANTY FOR DIRECT, INDIRECT, INCIDENTAL AND CONSEQUENTIAL DAMAGES INCURRED IN THE USE OR LOSS OF USE OF THE PRODUCT WARRANTED HEREUNDER.

The company herewith expressly disclaims any warranty of merchantability or fitness for any particular purpose other than for which it was designed.

This warranty gives you specific rights and you may also have other rights which vary from U.S. state to U.S. state.

Note: In compliance with MAGNUSON MOSS CONSUMER WARRANTY ACT – Part 702 (governs the resale availability of the warranty terms).



Factory Mutual Approved
Intrinsically Safe for Class I, II, III, Division 1, All Groups.



5252 East 36th Street North
Wichita, KS USA 67220-3205
TEL: 316-686-7361
FAX: 316-686-6746

GREAT PLAINS INDUSTRIES, INC.

"A Great Plains Ventures Subsidiary"

www.gpi.net

1-888-996-3837

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09/04



5252 East 36th Street North
Wichita, KS USA 67220-3205
TEL: 316-686-7361
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GREAT PLAINS INDUSTRIES, INC.

"A Great Plains Ventures Subsidiary"

CALIBRATION REPORT

Shop Order/Report No.: 167854

Model No.: G2S05N09GMA

Meter Type: 1/2" NPT

Serial No.: 110262

Calib. Date: 1/6/2010

Fluid Type: Mil-C-7024

Pickup Type*:

	Flow Rate GPM	Frequency Hz	K-Factor Pul/Gal	Viscosity Cstk	Temp Degrees F	Density g/cc	
1	0.978132	41.85219	2567.2717	2.6489	72.6	0.792	
2	0.978444	42.00983	2576.1205	2.6489	72.5	0.792	
3	1.235938	53.30336	2587.6716	2.6489	72.5	0.792	
4	1.236399	53.32681	2587.8446	2.6489	72.5	0.792	
5	1.485363	64.13206	2590.5603	2.6489	72.5	0.792	
6	1.485878	64.12055	2589.1980	2.6489	72.6	0.792	
7	1.747029	75.22729	2583.6079	2.6489	72.6	0.792	
8	1.747682	75.26639	2583.9845	2.6489	72.5	0.792	
9	1.993034	85.83430	2584.0292	2.6489	72.5	0.792	
10	1.994424	85.84033	2582.4094	2.6489	72.5	0.792	
11	2.493953	107.16974	2578.3103	2.6489	72.4	0.792	
12	2.493863	107.21446	2579.4788	2.6489	72.4	0.792	
13	3.511544	150.00992	2563.1444	2.6489	72.5	0.792	
14	3.509082	149.86058	2562.3897	2.6489	72.5	0.792	
15	5.018779	212.58558	2541.4817	2.6489	72.5	0.792	

Calibration data is raw pulse data from the turbine assembly. This data, or its average, is programmed into the integral readout, or it can be programmed into another readout device, to provide an output that will meet or exceed advertised product accuracy over the recommended flow range.

*Use of a different type of pickup can affect turbine performance.

ANY REPRODUCTION OR REPRESENTATION OF THIS DATA, EXCEPT IN FULL, IS NOT AUTHORIZED WITHOUT WRITTEN APPROVAL OF GREAT PLAINS INDUSTRIES, INC.

Meter Calibrated by:

Brent D. Dett

Equipment No.: A163

Calibrated: 10/30/2009

Recal Due: 10/30/2010

GPI
7
CALIBRATION

99001000a



5252 East 36th Street North
Wichita, KS USA 67220-3205
TEL: 316-686-7361
FAX: 316-686-6746

GREAT PLAINS INDUSTRIES, INC.
"A Great Plains Ventures Subsidiary"

CALIBRATION REPORT

Shop Order/Report No.: 167854

Model No.: G2S05N09GMA

Meter Type: 1/2" NPT

Serial No.: 110262

Calib. Date: 1/6/2010

Fluid Type: Mil-C-7024

Pickup Type*:

	Flow Rate GPM	Frequency Hz	K-Factor Pul/Gal	Viscosity Cstk	Temp Degrees F	Density g/cc	
16	5.004371	212.13915	2543.4465	2.6489	72.5	0.792	
17	7.534701	316.17623	2517.7606	2.6489	72.6	0.792	
18	7.501190	314.77294	2517.7839	2.6489	72.6	0.792	
19	9.918785	413.37306	2500.5464	2.6489	72.7	0.792	
20	9.908686	413.27042	2502.4735	2.6489	72.7	0.792	

Calibration data is raw pulse data from the turbine assembly. This data, or its average, is programmed into the integral readout, or it can be programmed into another readout device, to provide an output that will meet or exceed advertised product accuracy over the recommended flow range.

*Use of a different type of pickup can affect turbine performance.

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Meter Calibrated by: _____

Equipment No.: A163

Calibrated: 10/30/2009

Recal Due: 10/30/2010

99001000a

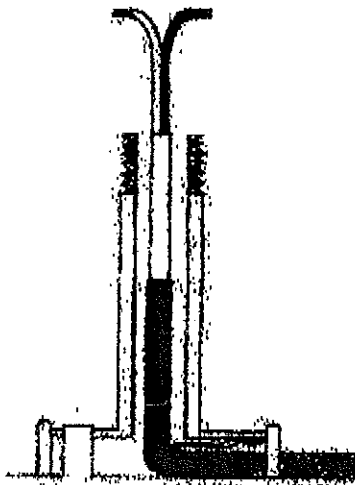


PT-1 POWER TERMINATION KIT

KIT CONTENTS: 1 STANDOFF

STEP 1:

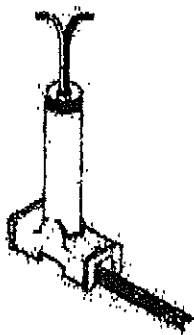
PREPARE CABLE - LOCATE START OF HEATING SECTION; SEPARATE BRAID BACK TO SEVERAL INCHES BEFORE THAT POINT; RATAIL THE BRAID FOR GROUNDING; CAREFULLY REMOVE OUTER (COLORED) JACKET; REMOVE ALL EXPOSED NICHROME WIRE; REMOVE SECOND LAYER OF INSULATION; DO NOT CUT INTO BUS WIRE INSULATION; STRIP ENDS OF BUS WIRES FOR CONNECTION.



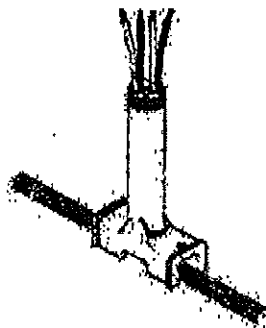
STEP 2:

PULL PREPARED CABLE(S) UP THROUGH STAND-OFF AND SECURE BRAID RATAIL TO SCREW CONNECTOR INSIDE THE BASE; POSITION BASE ON PIPE AND SECURE IN PLACE USING THE PIPE CLAMPS.

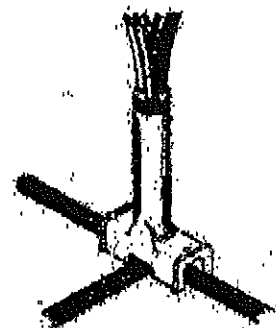
NOTE: DO NOT ALLOW ANY HEATED PART OF THE CABLE TO BE INSIDE THE BASE.



SINGLE CABLE



TWO CABLES



THREE CABLES

THIS BASE CAN BE USED FOR CONNECTION TO POWER. SECURE JUNCTION BOX (OF YOUR CHOICE) AND CONNECT CABLE(S) TO POWER. THIS SAME BASE CAN BE USED TO MOUNT A MONITOR LIGHT (OF YOUR CHOICE) AT END OF CIRCUIT. BASE CAN ALSO BE USED FOR ABOVE INSULATION SPLICE (2 CABLE ENDS) OR TEE SPLICE (3 CABLE ENDS).





ETK - 1 END TERMINATION KIT

KIT CONTENTS: 2 END CAP & 1 PACK RTV SEALANT

STEP 1:



REMOVE METAL BRAID FROM 2" OF THE CABLE. CAREFULLY REMOVE 1" OF THE OUTER (COLORED) JACKET INSULATION. DO NOT CUT INTO BUS WIRE INSULATION.

STEP 2:

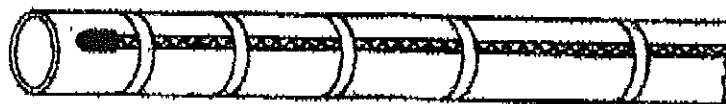


CUT ONE BUS WIRE 1/4" SHORTER THAN THE OTHER AND THOROUGHLY REMOVE ALL EXCESS NICHROME HEATING ELEMENT WIRE.

STEP 3:



APPLY RTV SILICONE SEALANT OVER EXPOSED AREA AND INTO THE END CAP. SLIDE END CAP OVER THE CABLE END. WIPE OFF EXCESS RTV SEALANT.



TERMINATION IS NOW COMPLETE



Model FWT-3 Floorstat

Part Number 18534

Installation and Operation Manual

Important Safety Notice

Both the National Electrical Code (NEC) and local codes require using a ground fault circuit interrupter (GFCI) breaker on the branch circuit supplying power to the heating system. This is an essential requirement for shock safety and fire protection. For safe and reliable operation install this control and the heaters in accordance with the suppliers' instructions and in accordance with applicable sections of the NEC and local codes.

Installation Instructions

Before disposing of the packing material, verify the inclusion of the following items:

- (1) 18580 FWT-3 Installation and Operation Manual.
- (1) 18550 FWT-3 Floorstat Electronics Assembly.
- (1) 19272 Temperature Sensor.

Immediately notify CUSTOMER SERVICE of any discrepancy or shipping damage.

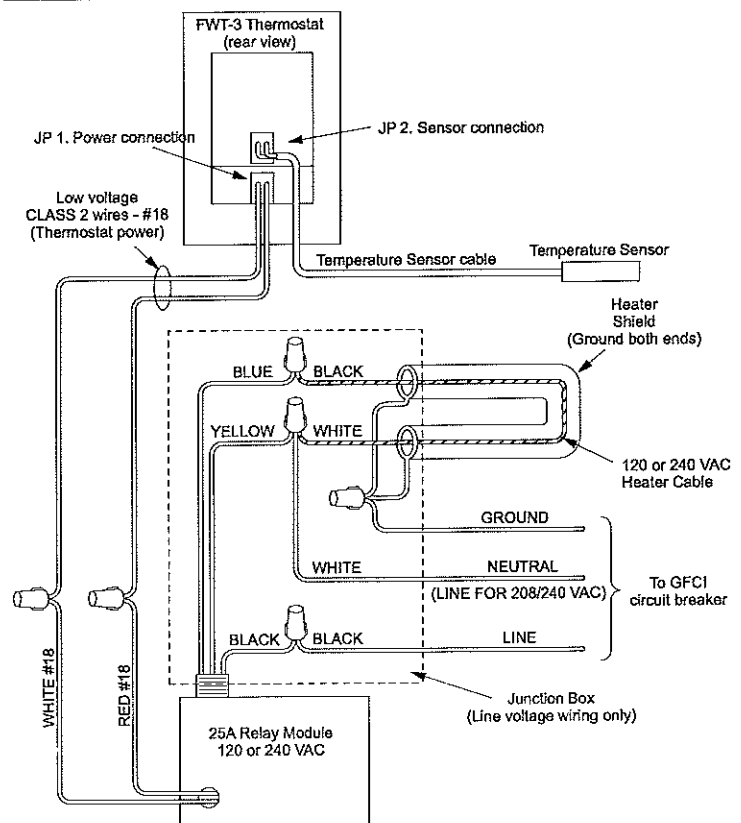
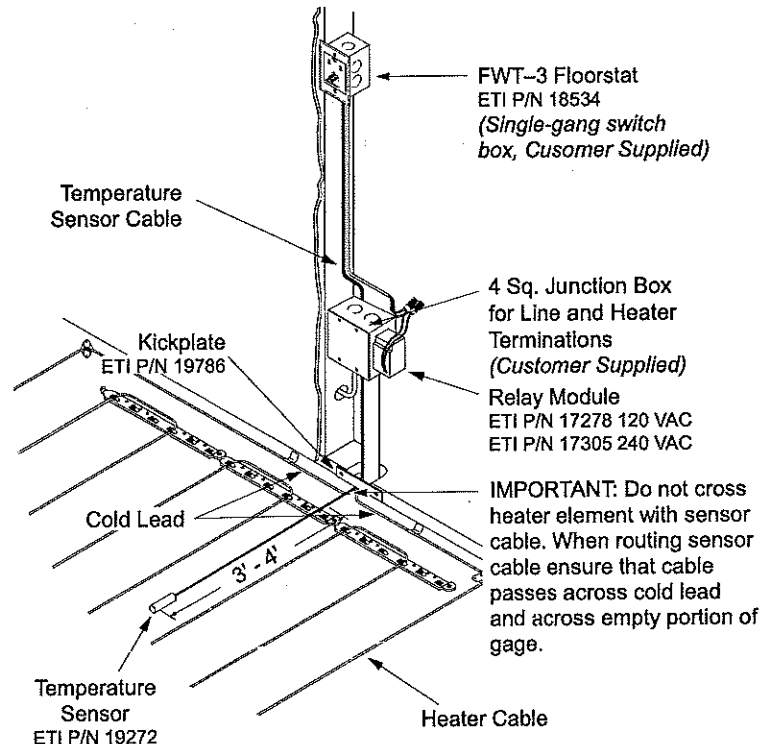
The FWT-3 Floorstat mounts in a single-gang switch box (customer supplied). Choose a location that is convenient for the customer. The Temperature Sensor Cable is 25' long and may be extended using #22 (minimum) wire for distances of up to 100'.

Relay Modules are available for 120 or 240 volt 25 amp supply voltages. The heater and Relay Module operate from the same supply voltage. USING A RELAY MODULE HAVING THE WRONG VOLTAGE RATING MAY PERMANENTLY DAMAGE CONTROL COMPONENTS.

Mount a customer supplied 4 square, 2 1/8" deep, junction box near the floor and close to the heater cold leads. Attach the Relay Module to it. All of the line voltage wiring is enclosed in this junction box. NEC requires heater cold leads to be run in conduit from floor to 4 square junction box.

Connect the heater cold lead, line voltage and Relay Module wires together as is shown in the FWT-3 Wiring Diagram. Secure the connections using customer supplied wire nuts. After completing the wiring, install a cover on the junction box.

Connect the Relay Module to JP 1 using two #18 AWG stranded wires. The connection may be made in any order. Secure connections with customer supplied wire nuts.



FWT-3 Wiring Diagram



Model FWT-3 Floorstat

Part Number 18534

Installation and Operation Manual

Important Safety Notice

Both the National Electrical Code (NEC) and local codes require using a ground fault circuit interrupter (GFCI) breaker on the branch circuit supplying power to the heating system. This is an essential requirement for shock safety and fire protection. For safe and reliable operation install this control and the heaters in accordance with the suppliers' instructions and in accordance with applicable sections of the NEC and local codes.

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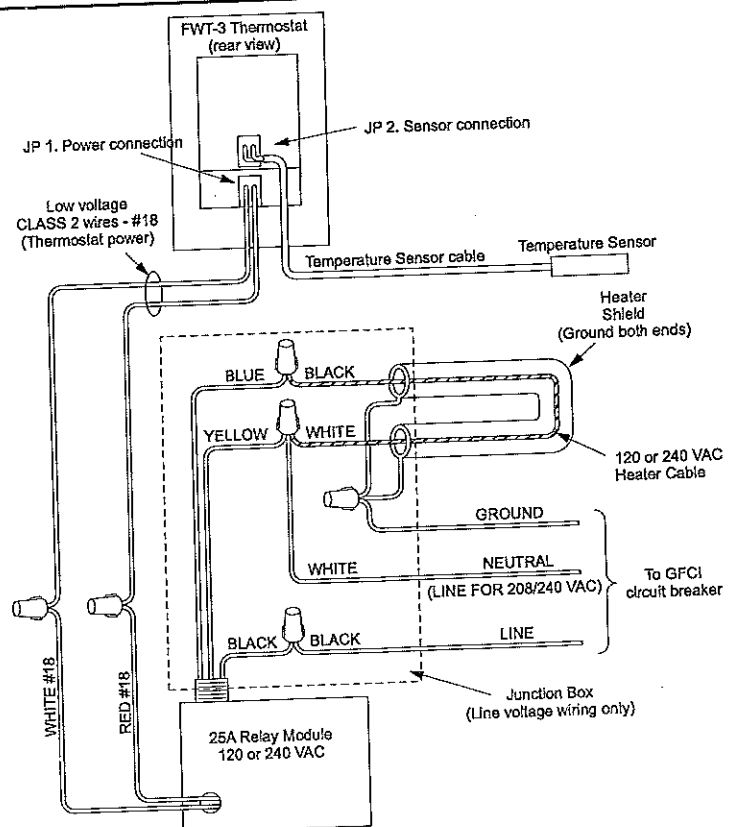
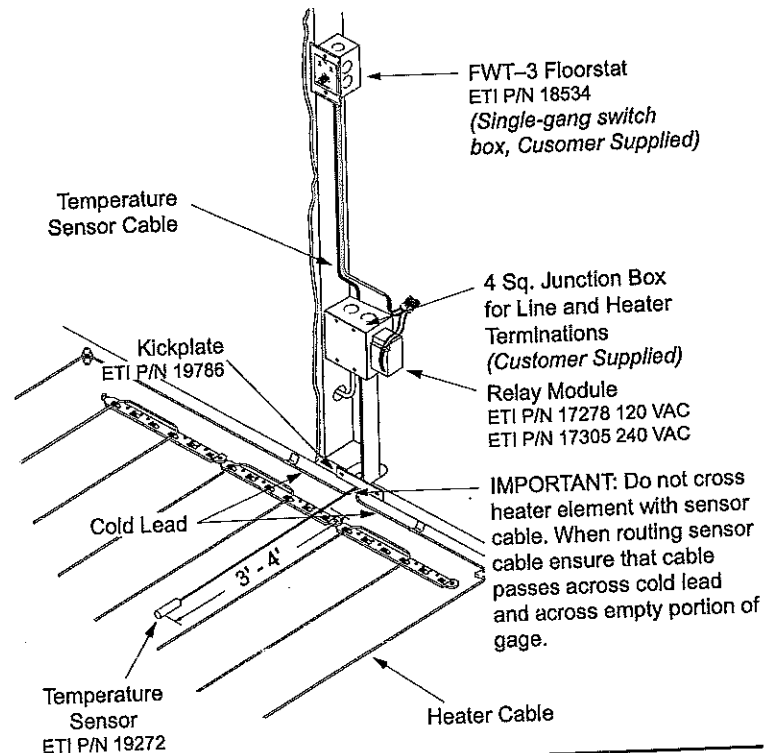
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Relay Modules are available for 120 or 240 volt 25 amp supply voltages. The heater and Relay Module operate from the same supply voltage. USING A RELAY MODULE HAVING THE WRONG VOLTAGE RATING MAY PERMANENTLY DAMAGE CONTROL COMPONENTS.

Mount a customer supplied 4 square, 2 1/8" deep, junction box near the floor and close to the heater cold leads. Attach the Relay Module to it. All of the line voltage wiring is enclosed in this junction box. NEC requires heater cold leads to be run in conduit from floor to 4 square junction box.

Connect the heater cold lead, line voltage and Relay Module wires together as is shown in the FWT-3 Wiring Diagram. Secure the connections using customer supplied wire nuts. After completing the wiring, install a cover on the junction box.

Connect the Relay Module to JP 1 using two #18 AWG stranded wires. The connection may be made in any order. Secure connections with customer supplied wire nuts.



FWT-3 Wiring Diagram

Place the temperature sensor between heater elements one to two feet from the wall. The sensor extension wire and the heater element must not cross. Connect the Temperature Sensor Cable to JP 2 on the back of the FWT-3. The connection may be made in any order. Secure connections with customer supplied wire nuts.

Operating Instructions

The green SUPPLY indicator operates to show that power is available. The yellow HEATER indicator operates during heating. The knob sets the operating temperature. Clockwise rotation increases the temperature.

Full counterclockwise rotation puts the system in its standby mode which prevents heating. This feature saves energy by not heating unoccupied areas. The SUPPLY indicator blinks continuously to indicate selection of the standby mode.

During normal operation the FWT-3 Floorstat does not require any user intervention. The Digital Anticipation feature provides automatic temperature regulation to minimize temperature swings from solar gain and eliminates any need for a timed set back. When first energized the FWT-3 begins monitoring heater cycles, learning the heating characteristics of the floor, and adjusts subsequent heater cycles to provide the smallest possible fluctuation in floor temperature. The Digital Anticipation takes about two hours to reach an optimal heater cycle. If the FWT-3 loses power it will begin this learning process all over again.

Troubleshooting

Neither indicator operates and there is no heat:

Check the circuit breaker. If tripped, there is either a ground fault or short circuit. If not tripped, either or both the FWT-3 Electronic Assembly or Relay Module are probably defective.

Both indicators operate continuously and there is no heat:

Most likely, either the heater or Relay Module or both are defective. A defective FWT-3 Electronic Assembly is possible but unlikely.

Both indicators blink continuously and there is no heat:

The Temperature Sensor is defective.

There is continuous heat and the HEAT indicator is off:

Either the Relay Module (most likely) or FWT-3 Electronic Module or both are defective.

Contacting Customer Service

For technical help, questions or comments concerning this product or any of Environmental Technology, Inc. products contact Customer Service between 8:00 a.m. and 5:00 p.m. EST (UTC minus five hours).

Voice: (800)234-4239 in the USA and Canada or (574)233-1202 everywhere

Fax: (888)234-4238 in the USA and Canada or (574)233-2152 everywhere

Email: helpdesk@networketi.com

Web: <http://www.networketi.com>

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1850 N Sheridan Street, South Bend, Indiana 46628

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PN18580D 10/2006

**WHITE-RODGERS**

TYPE 24A01 / 24A05
"SLIMLINE" LEVEL-TEMP
SILENT OPERATOR
(Normally Open)
INSTALLATION INSTRUCTIONS

Operator: Save these instructions for future use!

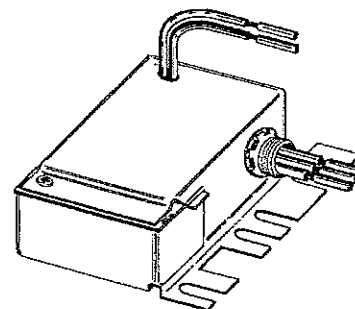
**FAILURE TO READ AND FOLLOW ALL INSTRUCTIONS CAREFULLY BEFORE
INSTALLING OR OPERATING THIS CONTROL COULD CAUSE PERSONAL
INJURY AND/OR PROPERTY DAMAGE.**

DESCRIPTION

These "Level-Temp" controls have been designed to operate with a White-Rodgers low-voltage electric heat thermostat to provide a system for controlling electric warm air heaters and electric radiant heating devices such as duct heaters, wall heaters, baseboards, floor and ceiling cable heaters.

When required, two or more Level-Temp Silent Operators can be operated by one two-wire low voltage thermostat.

The operator has been carefully adjusted. No attempt should be made to adjust it after it leaves the factory.



PRECAUTIONS

If in doubt about whether your wiring is millivolt, line, or low voltage, have it inspected by a qualified heating and air conditioning contractor, electrician, or someone familiar with basic electricity and wiring.

Do not exceed the specification ratings.

All wiring must conform to local and national electrical codes and ordinances.

This control is a precision instrument, and should be handled carefully. Rough handling or distorting components could cause the control to malfunction.

⚠ CAUTION

To prevent electrical shock and/or equipment damage, disconnect electric power to system, at main fuse or circuit breaker box, until installation is complete.

⚠ WARNING

Do not use on circuits exceeding specified voltages. Higher voltages will damage control and could cause shock or fire hazard.

SPECIFICATIONS

ELECTRICAL DATA

Switch Action: Single-Pole, Single-Throw, normally open

Thermal: Average time delay - 45 seconds

Ambient Temp.: -20° to 140°F (-24° to 60°C)

Room Thermostat:

Set adjustable heat anticipator at 0.2 Amps. For fixed anticipation thermostats, use 0.15 to 0.25 Amp. heater.

TYPE NUMBER	INPUT VOLTAGE /FREQUENCY	THERMOSTAT CURRENT	A.C. RESISTIVE NON-INDUCTIVE	A.C. MOTOR INDUCTIVE	
				FULL LOAD	LOCKED ROTOR
24A01G-3	240VAC, 60 Hz	0.2A	25A, 6000W, 240V	12A, 240V	72A, 240V
24A01Z-10	347VAC, 60 Hz	0.2A	17A, 5900W, 347V	—	—
24A01Z-11	600VAC, 60 Hz	0.2A	12A, 7200W, 600V	—	—
24A05A-1	120VAC, 60 Hz	0.2A	25A, 3000W, 120V	16A, 120V	96A, 120V
24A05E-1	208VAC, 60 Hz	0.2A	25A, 5200W, 208V	12A, 208V	72A, 208V
24A05Z-1	277VAC, 60 Hz	0.2A	22A, 6000W, 277V	—	—

Mounting: 1/2" conduit hub or mounting tabs with several break-offs for 2, 3 or 4 hole mounting



WHITE-RODGERS DIVISION
EMERSON ELECTRIC CO.
9797 REAVIS RD., ST. LOUIS, MO. 63123
(314) 577-1300, FAX (314) 577-1517
9999 HWY. 48, MARKHAM, ONT. L3P 3J3
(905) 475-4653, FAX (905) 475-4625

Printed in U.S.A.

PART NO. 37-4701C

Replaces 37-4701B

0023

OPERATION

Basic Silent Operator components are a line-to-low voltage transformer, a low voltage bimetal heater, an ambient compensating bimetal, and a normally open SPST line voltage snap-action switch.

In operation, a circuit is completed through the bimetal heater as the low voltage room thermostat closes its contacts. In approximately 45 seconds, the warping action of the heater closes the line voltage snap-switch to energize the heating load. When the thermostat opens its contacts, the bimetal heater cools for approximately 45 seconds before the line voltage switch opens to de-energize the heating load.

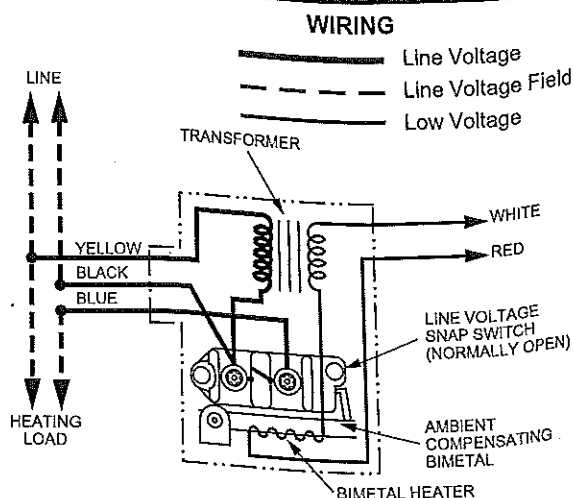


Fig. 1. Internal wiring of Type 24A01/05

INSTALLATION

The "Level-Temp" can be mounted in any position without affecting the performance.

1. Mounting with the 1/2" male conduit hub: Relay may be mounted to any standard junction box or wiring compartment. See drawings under WIRING DIAGRAMS for a variety of possible mountings. Depending on the position of the relay on the junction box or wiring compartment it may be necessary to remove the break-off mounting tabs.
2. Mounting with the universal mounting tabs:
 - a. Relay can be mounted to various metal enclosures, ducts, or mounting plates. The universal mounting tab has several break-offs for 2, 3 or 4 mounting holes.
 - b. Location of the mounting holes may be simplified by holding the control against the mounting surface and marking the proper position for drilling the holes (No. 8 size screws are recommended).

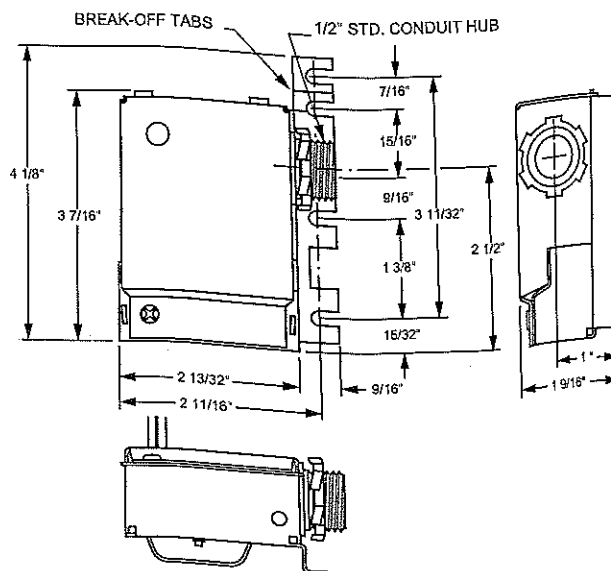


Fig. 2. Dimensions of Type 24A01/05 Level Temp

WIRING

All wiring should be done in accordance with local and national electrical codes and ordinances.

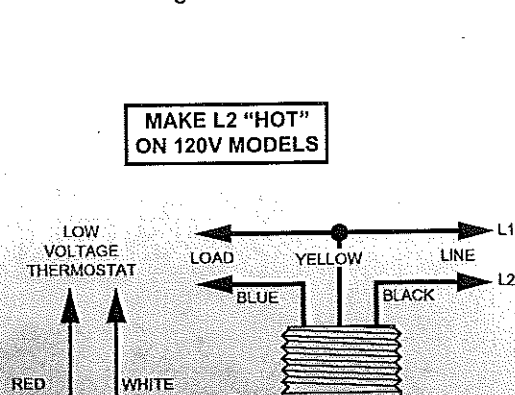


Fig. 3. Diagram of "LEVEL TEMP" Wiring

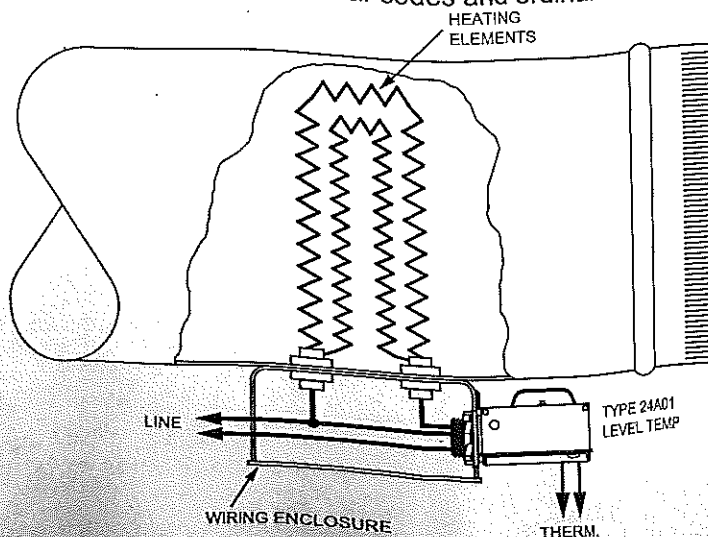


Fig. 4. Electric Duct Heaters

All wiring should be done in accordance with local and national electrical codes and ordinances.

If the manufacturer of the heating equipment has included a wiring diagram, follow such recommendations. If none is available, these diagrams show suggested methods of attaching and wiring the "Level-Temp" Silent Operator control.

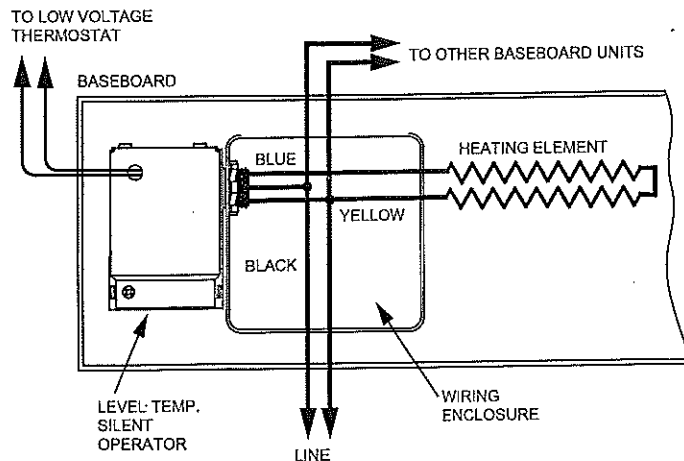


Fig. 5. Baseboard Heaters

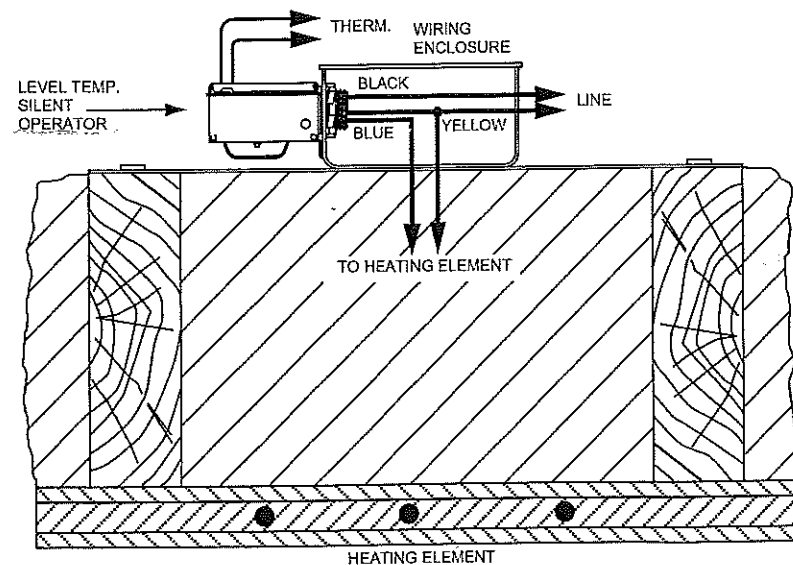


Fig. 8. Ceiling Cable Heaters

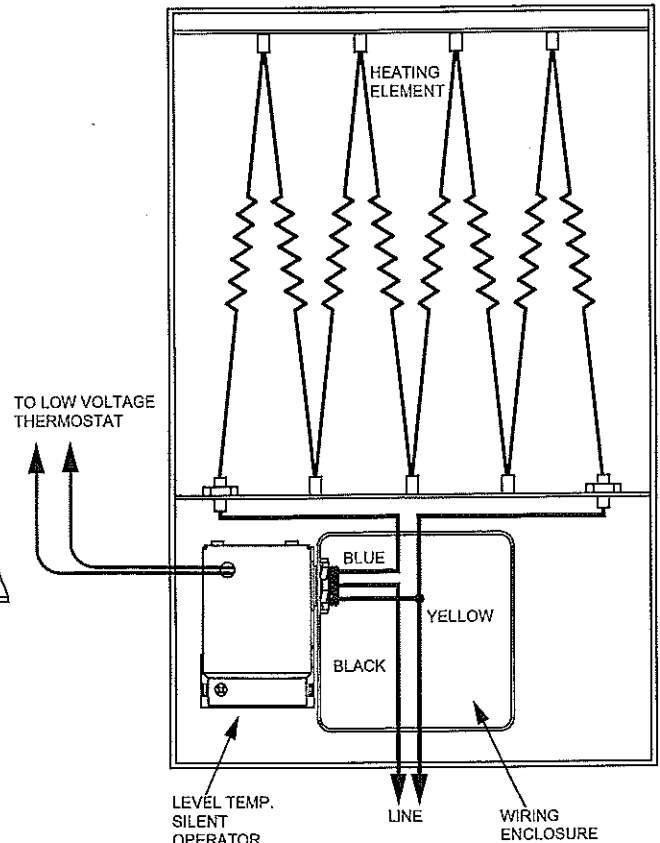


Fig. 7. Wall or Ceiling Heaters

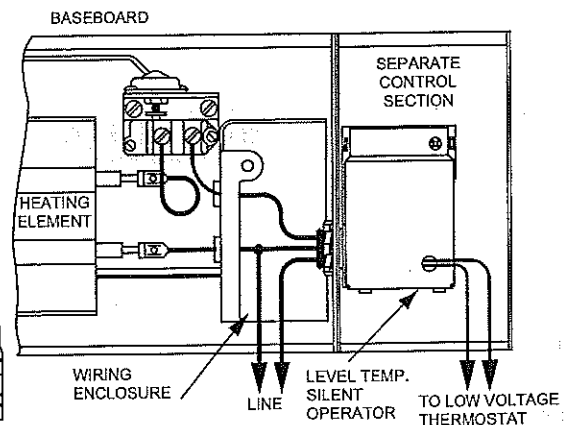


Fig. 6. Baseboard Heaters With Limit

USING ONE THERMOSTAT AND TWO OR MORE SILENT OPERATORS TO "SEQUENCE" LOADS

Figure 9 shows how several Level-Temp Silent Operators can be used to "sequence on" separate heating loads. This may be accomplished by "jumping" the thermostat leads of the additional Silent Operators, and wiring them in careful conformance to the recommended wiring diagram. Note that only one Silent Operator is in the thermostat circuit. Therefore, set the adjustable heater in thermostat at .2A, or use a thermostat with a .2A fixed heater.

SEQUENCE OF OPERATIONS: A circuit is completed through the bimetal heater of the first Silent Operator as the contacts of the low voltage thermostat close. In approximately 45 seconds the line voltage snap-switch of

this Operator closes, energizing heating load #1 and the transformer primary of Silent Operator #2. Since the thermostat leads of this Operator are "jumped", its bimetal heater immediately begins its warping action. In approximately 45 seconds the line voltage switch of Operator #2 closes to energize heating load #2 and the transformer primary of Silent Operator #3. This "sequence on" pattern continues until all successive Silent Operators and heating loads have been energized. When the single Level-Temp room thermostat opens its contacts, each separate heating load will be "sequenced off" in intervals of approximately 45 seconds.

WIRING CONT.

All wiring should be done in accordance with local and national electrical codes and ordinances.

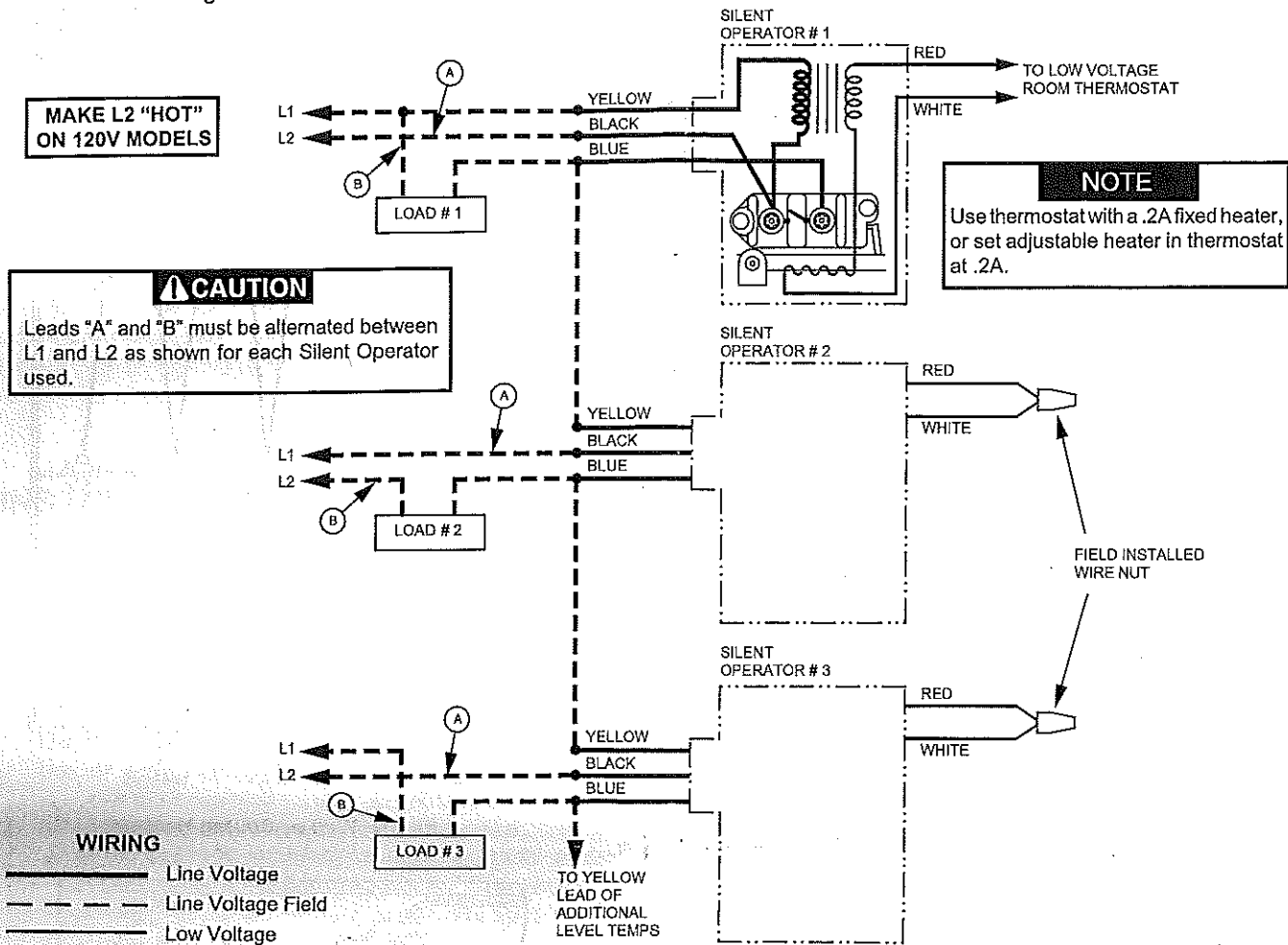


Fig. 9. Typical Wiring Diagram to "Sequence" two or more loads

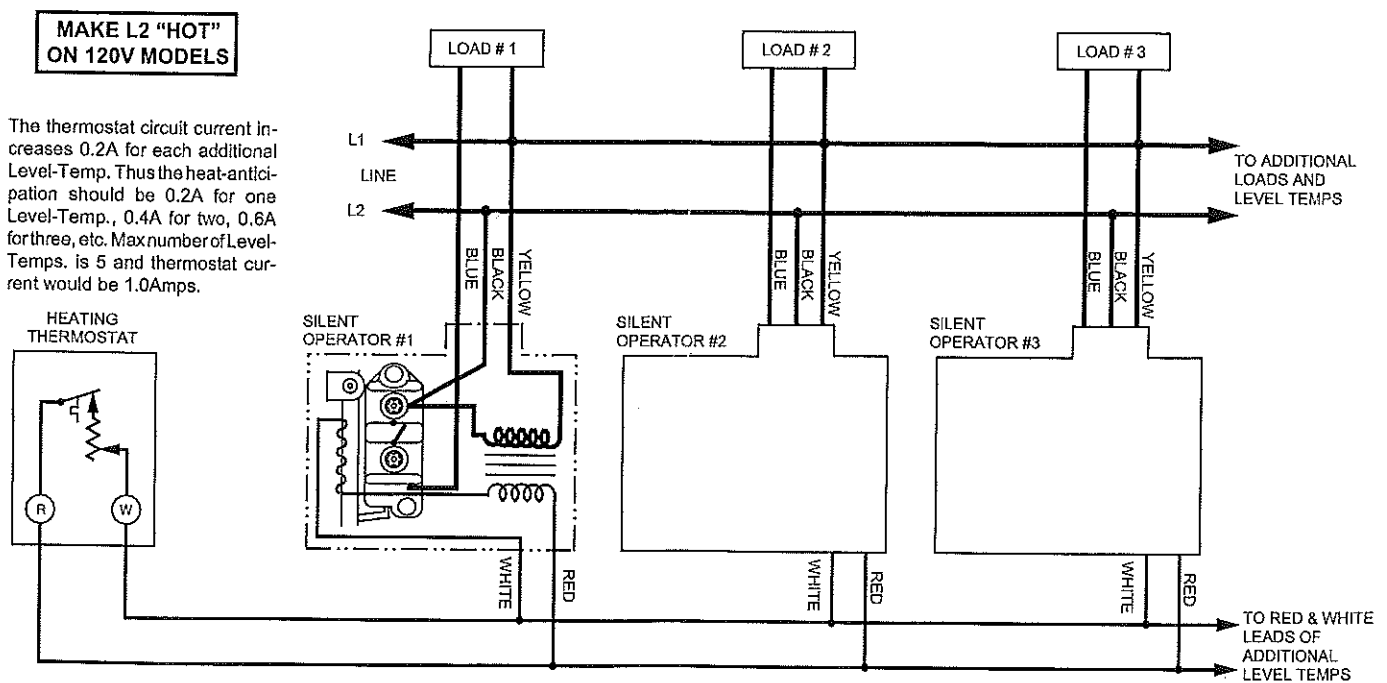


Fig. 10. Typical Wiring Diagram to Operate two or more loads simultaneously



SS3F2-GM

**Owner's Manual
With Parts List**

More Than Air. Answers.

Online answers: <http://www.alr.lrco.com>
PHONE: 1-800-526-3615

CCN: 22204861

REV. A

OCTOBER 2002

INGERSOLL-RAND. AIR COMPRESSORS

Ingersoll-Rand Company
800, B. Bally Street
P. O. Box 1803
Davidson, NC 28036
1-800-AIR SERV
(1-800-247-7378)
www.air.ingersoll-rand.com

CONSUMER INFORMATION SHEET

Thank you for purchasing an Ingersoll-Rand product. We trust that it will offer you many years of trouble-free service. If you encounter any problems or need assistance, please refer to the information provided in this sheet.

INSTALLATION, OPERATION, MAINTENANCE & TROUBLESHOOTING ISSUES

Read the owner's manual first. Often this will clarify your understanding. If you still have problems, please call the toll-free hotline.

MISSING PARTS

If parts are missing call the toll free hotline. Have the serial number, part number, model number and parts list (with missing parts circled) handy when you call. Your parts will be shipped immediately.

SHIPPING DAMAGE OR DEFECTIVE PARTS

Each new product is inspected and in good condition prior to shipment from the factory. If your product was received in a condition that was less than satisfactory, or if you discover a defect that requires service or adjustment by qualified personnel, please contact your nearest authorized service representative.

DO NOT RETURN THE PRODUCT TO YOUR RETAILER!

NOTE REGARDING
EXTENSION CORDS
To avoid power loss and
overheating, use additional air
hoses instead of an extension
cord.

PARTS & SERVICE HOTLINE:
1-800-AIR SERV
(1-800-247-7378)

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Form SCD-946A
July 1999.



Owner's Manual Installation, Operation and Maintenance Instructions for Model SS3F2-GM

IMPORTANT INFORMATION! READ AND FOLLOW THESE INSTRUCTIONS. RETAIN FOR REFERENCE.

SAFETY

DEFINITIONS

▲ DANGER WILL cause DEATH, SEVERE INJURY or substantial property damage.

▲ WARNING CAN cause DEATH, SEVERE INJURY or substantial property damage.

▲ CAUTION WILL or CAN cause MINOR INJURY or property damage.

GENERAL SAFETY PRECAUTIONS

▲ DANGER

INTAKE AIR. Can contain carbon monoxide or other contaminants. Will cause serious injury or death. Ingersoll-Rand air compressors are not designed, intended or approved for breathing air. Compressed air should not be used for breathing air applications unless treated in accordance with all applicable codes and regulations.

▲ WARNING

HAZARDOUS VOLTAGE. Can cause serious injury or death. Disconnect power and bleed pressure from tank before servicing. Lockout/Tagout machine. Compressor must be connected to properly grounded circuit. See grounding instructions in manual. Do not operate compressor in wet conditions. Store indoors.

MOVING PARTS. Can cause serious injury. Do not operate with guards removed. Machine may start automatically. Disconnect power before servicing. Lockout/Tagout machine.

HOT SURFACES. Can cause serious injury. Do not touch. Allow to cool before servicing. Do not touch hot compressor or tubing.

HIGH PRESSURE AIR. Bypassing, modifying or removing safety/relief valves can cause serious injury or death. Do not bypass, modify or remove safety/relief valves. Do not direct air stream at body. Rusted tanks can cause explosion and severe injury or death. Drain tank daily or after each use. Drain valve located at bottom of tank.

▲ CAUTION

RISK OF BURSTING. Use only suitable air handling parts acceptable for pressure of not less than the maximum allowable working pressure of the machine.

GENERAL INFORMATION

Your air compressor unit is suitable for operating air tools, caulking guns, grease guns, sandblasters, etc. Depending on your application, the following accessories may be required:

- An air pressure regulator to adjust the air pressure entering the tool or accessory.
- An air line filter for removal of moisture and oil vapor in compressed air.
- An in-line lubricator to prolong the life of air tools.
- Separate air transformers which combine the functions of air regulation and/or moisture and dirt removal.

Contact your nearest authorized dealer or call 1-800-AIR-SERV for more information on air tools and accessories for your application.

PREPARATION FOR USE

TRANSPORTING THE UNIT

▲ CAUTION The wheels and handle do not provide adequate clearance, stability or support for pulling the unit up and down stairs or steps. The unit must be lifted or pushed up a ramp. Do not use the handle to lift the unit.

SELECTING A LOCATION

GENERAL. Select a clean, dry, well-lit area with plenty of space for proper cooling air flow and accessibility. Locate the unit on a solid level surface at least 12 inches (30 cm) from walls. Ensure unit is as level as possible.

TEMPERATURE. Ideal operating temperatures are between 32°F and 100°F (0°C and 37.8°C). In lower temperatures, you must protect safety/relief valves and drain valves from freezing.

▲ CAUTION Never operate in temperatures below 20°F (-6.5°C) or above 125°F (51.0°C).

HUMID AREAS. In frequently humid areas, moisture may form in the bare pump and produce sludge in the lubricant, causing running parts to wear out prematurely. Excessive moisture is especially likely to occur if the unit is located in an unheated area that is subject to large temperature changes. Two signs of excessive humidity are external condensation on the bare pump when it cools down and a "milky" appearance in petroleum compressor lubricant. You may be able to prevent moisture from forming in the bare pump by increasing ventilation or operating for longer intervals.

NOISE CONSIDERATIONS. Consult local officials for information regarding acceptable noise levels in your area. To reduce excessive noise, use vibration mounts or intake silencers, relocate the unit or construct total enclosures or baffle walls. Contact your dealer for assistance.

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Form SCD-991
March 2000

INSTALLING THE AIR INLET FILTER

CAUTION Do not operate without air inlet filter.

Install the air inlet filter at the inlet connection at the bare pump. If heavy duty filtration is required, contact your dealer for information.

INSTALLING DISCHARGE PIPING

If it is necessary to install air discharge piping or condensate discharge piping, adhere to the following general guidelines. Contact your dealer for more information.

WARNING If an aftercooler, check valve, block valve, or any other restriction is added to the compressor discharge, install a properly-sized ASME approved safety/relief valve between the compressor discharge and the restriction.

CAUTION If you will be using Ingersoll-Rand synthetic compressor lubricant, all downstream piping material and system components must be compatible. Refer to the following material compatibility list. If there are incompatible materials present in your system, or if there are materials not included in the list, contact your dealer.

Substrate:

Aluminum, Teflon, Epoxy (Gloss Filled), Oil Resistant Alloy, Fluorocarbon, Polyurethane, 2-Component Urethane, Nylon, Delrin, Colanese, High Nitrile Rubber (Buna N, NBR more than 36% Acrylonitrile), Polyurethane, Polyethylene, Ethylene Glycol, Polyethylene Glycol, Polypropylene, Bakelite Phenolics, Epoxy, Isocyanate, Melamine, (© Ingersoll-Rand Inc. or Ingersoll-Rand Corporation)

Not Recommended:

Polysulfone, Natural Rubber, SBR Rubber, Acrylic Paint, Lacquer, Varnish, Polyurethane, Polyurethane, Cellulose Acetate, Low Nitrile Rubber, Buna N, NBR, 36% Acrylonitrile, EPDM, Chlorinated Polyethylene, Acrylic, EPR, Acrylic, Phenolic, Polyurethane, Styrene Acrylonitrile (Styri, Bury)

GENERAL REQUIREMENTS. The piping, fittings, receiver tank, etc. must be certified safe for at least the maximum working pressure of the unit. Use hard-welded or threaded steel or copper pipe, cast iron fittings and hoses that are certified safe for the unit's discharge pressure and temperature. DO NOT USE PVC PLASTIC. Use pipe thread sealant on all threads, and make up joints tightly to prevent air leaks.

CONDENSATE DISCHARGE PIPING. If installing a condensate discharge line, the piping must be at least one size larger than the connection, as short and direct as possible, secured tightly and routed to a suitable drain point. Condensate must be disposed of in accordance with local, state, and federal laws and regulations.

NOTE: All compressed air systems generate condensate which accumulates in any drain point (e.g., tanks, filters, drip legs, aftercoolers, dryers). This condensate contains lubricating oil and/or substances which may be regulated and must be disposed of in accordance with local, state, and federal laws and regulations.

ELECTRICAL WIRING & GROUNDING

WARNING Any electrical installation and service required should be performed by a qualified electrician who is familiar with all applicable local, state and federal laws and regulations.

NOTE This product should be connected to a grounded, reliable, permanent wiring system, or an equipment-grounding terminal or lead on the product.

GENERAL. The motor rating, as shown on the motor nameplate, and the power supply must have compatible voltage, phase and hertz characteristics.

WIRE SIZE. The electrical wiring between the power supply and electric motor varies according to motor horsepower. Power leads must be adequately sized to protect against excessive voltage drop

during start-up. Information for selecting the proper wire size and securing connections should be provided with the motor. If not, refer to the National Electric Code (NEC) or applicable local, state and federal laws and regulations. If other electrical equipment is connected to the same circuit, the total electrical load must be considered in selecting the proper wire size. DO NOT USE UNDERSIZE WIRE.

FUSES. Refer to the National Electric Code to determine the proper fuse or circuit breaker rating required. When selecting fuses, remember the momentary starting current of an electric motor is greater than its full load current. Time-delay or "slow-blow" fuses are recommended.

GROUNDING. The unit is equipped with a power cord having a grounding wire, an appropriate grounding plug. The plug must be used with an outlet that has been installed and grounded in accordance with all local codes and ordinances. The outlet must have the same configuration as the plug. DO NOT USE AN ADAPTER.

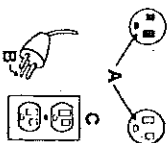
WARNING In the event of a short circuit, grounding reduces the risk of shock by providing an escape for the electric current. The unit must be properly grounded.

WARNING

Improper installation of the grounding plug can result in a risk of electric shock. If repair or replacement of the cord or plug is necessary, do not connect the grounding wire to other flat blade terminals. The wire with insulation having an outer surface that is green with or without yellow stripes is the grounding wire.

Check with a qualified electrician or serviceman if the grounding instructions are not completely understood, or if in doubt as to whether the product is properly grounded. Do not modify the plug provided. If it will not fit the outlet, have the proper outlet installed by a qualified electrician.

This product is for use on a nominal 120-volt circuit and has a grounding pin for look like the plug illustrated below. Make sure the product is connected to an outlet having the same configuration as the plug. No adapter should be used with this product.



A=Ground
B=Grounding Pin
C=Outlet

EXTENSION CORDS. It is preferable to use extra air hose instead of an extension cord to avoid voltage drop and power loss to the motor, and to prevent overheating. If an extension cord must be used, ensure it meets the following criteria:

- Three wire cord with a three blade grounding plug, and a three slot receptacle that will accept the plug on the unit.
- Good condition
- No longer than 50 feet.
- 12 gauge or larger.

NOTE

Wire size increases as gauge number decreases. For example, 10 AWG and 8 AWG wire is acceptable, whereas 14 or 16 AWG are NOT acceptable.

COMPRESSOR LUBRICATION

CAUTION Do not operate without lubricant or with inadequate lubricant. Ingersoll-Rand is not responsible for compressor failure caused by inadequate lubrication.

SYNTHETIC LUBRICANT. We recommend Ingersoll-Rand synthetic compressor lubricant from start-up. See the WARRANTY section for extended warranty information.

ALTERNATE LUBRICANTS. You may use a petroleum-based lubricant that is premium quality, does not contain detergents, contains only anti-rust, anti-oxidation, and anti-foam agents as additives, has a flashpoint of 440°F (227°C) or higher, and has an auto-ignition point of 650°F (343°C) or higher.

See the petroleum lubricant viscosity table below. The table is intended as a general guide only. Heavy duty operating conditions require heavier viscosities. Refer specific operating conditions to your dealer for recommendations.

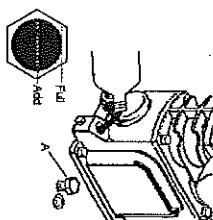
Temperature Around Unit		Viscosity @ 100°F (37.8°C)		Viscosity Grade	
°F	°C	SUS	Centistokes	ISO	SAE
40 & below	4.4 & below	150	32	32	10
40 - 80	4.4 - 26.7	500	110	100	30
80 - 125	26.7 - 51.0	750	185	150	40

If you use a petroleum-based compressor lubricant at start-up and decide to convert to Ingersoll-Rand synthetic compressor lubricant later on, the compressor valves must be thoroughly decontaminated and the crankcase must be flushed before conversion.

COMPRESSOR PUMP FILLING PROCEDURES:

1. Unscrew and remove the oil fill plug (A).
2. Slowly fill the crankcase with lubricant until the lubricant reaches the top thread of the oil fill opening and the top of the sight glass. Crankcase capacity is one (1) pint (0.5 liter).
3. Replace the oil fill plug HAND TIGHT ONLY.

Filling Procedures



OPERATION

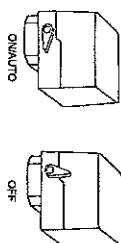
GENERAL

Your air compressor was designed for 100% continuous duty operation with the use of Ingersoll-Rand synthetic compressor lubricant and 60% continuous duty operation with the use of petroleum lubricant. In other words, synthetic lubricant allows the compressor to pump continuously without cycling. Petroleum lubricant limits the compressor to a maximum of 36 minutes of pumping time per hour. The compressor should not cycle more than 10 times per hour.

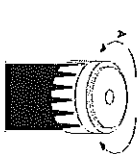
NORMAL START-UP

1. Set the pressure switch lever to "OFF".

Pressure Switch Lever



2. Close the regulator by pulling the adjustment dial out and turning it fully counterclockwise (A). Push the dial in when the knob will no longer turn.



3. Attach hose and accessory.
4. Move the pressure switch lever to "ON/AUTO". The unit will start.
5. Allow tank pressure to build. The motor will stop when tank pressure reaches cut-out pressure.
6. Adjust the regulator to the desired secondary pressure by pulling the adjustment dial out and turning it clockwise (B) to increase the pressure or counterclockwise (A) to decrease the pressure. Push the dial in when the desired pressure is reached.

NOTE: When the receiver tank pressure drops below the factory pre-set minimum, the pressure switch resets and restarts the unit.

SHUTDOWN

1. Set the pressure switch lever to "OFF".
2. Close the service valve fully.
3. Remove the air tool or accessory.
4. Slowly open the service valve to bleed air pressure down to 20 psig.
5. Slowly open the manual drain valve at the bottom of the tank to drain all condensate (water).
6. Close the drain valve and the service valve for the next use.
7. Wrap the power cord securely around the handle.
8. Store the unit indoors.

PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
Abnormal piston, ring or cylinder wear	<ol style="list-style-type: none"> 1. Lubricant viscosity too low. 2. Lubricant level too low. 3. Incorrect type lubricant being used. 4. Cylinder(s) scratched, worn or scored. 5. Excessively dirty crankshaft. 6. Worn cylinder finish. 	<ol style="list-style-type: none"> 1. Drain existing lubricant and refill with proper lubricant. 2. Add lubricant to crankcase to proper level. 3. Drain existing lubricant and refill with proper lubricant. 4. Repair or replace as required. 5. Install remote oil filter piping and route to source of cleaner oil. 6. Dress cylinder with 160 grit finish.
Air delivery drops off	<ol style="list-style-type: none"> 1. Clogged or dirty inlet and/or discharge line filter. 2. Air leaks in air discharge piping. 3. Lubricant viscosity too high. 4. Compressor valves leaky, broken, carbonized or loose. 5. Piston rings damaged or worn (broken, rough or scratched). 6. Piston rings not seated, are stuck in grooves or are gapped not. 7. Cylinder(s) or piston(s) scratched, worn or scored. 8. Defective safety relief valve. 	<ol style="list-style-type: none"> 1. Clean or replace. 2. Check tubing and connections. 3. Drain existing lubricant and refill with proper lubricant. 4. Inspect valves. Clean or replace as required. Install valve kit. 5. Install ring kit. 6. Adjust piston rings. 7. Repair or replace as required. 8. Replace.
Unit does not come up to speed	<ol style="list-style-type: none"> 1. Loose belt/hook or motor pulley, excessive and play in motor shaft or loose drive belt. 2. Lubricant viscosity too high. 3. Lubricant level too low. 4. Compressor valves leaky, broken, carbonized or loose. 5. Defective ball bearings on crankshaft or motor shaft. 	<ol style="list-style-type: none"> 1. Check belt/hook, motor pulley, crankshaft, drive belt tension and alignment. Repair or replace as required. 2. Drain existing lubricant and refill with proper lubricant. 3. Check line voltage and upgrade lines as required. Contact electrician. 4. Inspect valves. Clean or replace as required. 5. Inspect bearings and replace crankshaft assembly if required.
Unit is slow to come up to speed	<ol style="list-style-type: none"> 1. Lubricant viscosity too high. 2. Leaking check valve or check valve seat blown out. 3. Ambient temperature too low. 4. Bad motor. 	<ol style="list-style-type: none"> 1. Drain existing lubricant and refill with proper lubricant. 2. Replace check valve. 3. Relocate unit to warmer environment. 4. Replace.
Unit runs excessively hot	<ol style="list-style-type: none"> 1. Inadequate ventilation around belt/hook. 2. Drive belts too tight or misaligned. 3. Compressor valves leaky, broken, carbonized or loose. 4. Wrong belt/hook direction of rotation. 	<ol style="list-style-type: none"> 1. Relocate unit far from air flow. 2. Adjust belts to proper tension and alignment. 3. Inspect valves. Clean or replace as required. Install valve kit. 4. Check motor wiring for proper connections. Reverse two leads on three-phase motors.
Excessive noise during operation	<ol style="list-style-type: none"> 1. Loose belt/hook or motor pulley, excessive and play in motor shaft or loose drive belt. 2. Lubricant viscosity too high. 3. Lubricant level too low. 4. Compressor valves leaky, broken, carbonized or loose. 5. Defective ball bearings on crankshaft or motor shaft. 6. Defective ball bearings on crankshaft or motor shaft. 7. Leaking check valve or check valve seat blown out. 	<ol style="list-style-type: none"> 1. Check belt/hook, motor pulley, crankshaft, drive belt tension and alignment. Repair or replace as required. 2. Drain existing lubricant and refill with proper lubricant. 3. Add lubricant to crankcase to proper level. 4. Inspect valves. Clean or replace as required. 5. Inspect ball bearings and replace crankshaft assembly if required. 6. Inspect bearings and replace crankshaft assembly if required. 7. Replace check valve.
Excessive starting and stopping	<ol style="list-style-type: none"> 1. Air leaks in air discharge piping. 2. Pressure switch differential too narrow. 3. Leaking check valve or check valve seat blown out. 4. Excessive condensate in receiver tank. 	<ol style="list-style-type: none"> 1. Check tubing and connections. 2. Adjust pressure switch to increase differential, if differential is not properly adjusted. Install pressure switch with differential adjustment feature if differential adjustment is desired. 3. Replace check valve. 4. Drain receiver tank with manual drain valve.
High oil consumption	<ol style="list-style-type: none"> 1. Clogged or dirty inlet and/or discharge line filter. 2. Lubricant viscosity too low. 3. Defective type lubricant being used. 4. Piston rings damaged or worn (broken, rough or scratched). 5. Piston rings not seated, are stuck in grooves or are gapped not. 6. Cylinder(s) or piston(s) scratched, worn or scored. 7. Connecting rod, piston pin or crankpin bearings worn or scored. 8. Crankshaft seal worn or crankshaft scored. 9. Worn cylinder finish. 	<ol style="list-style-type: none"> 1. Clean or replace. 2. Drain existing lubricant and refill with proper lubricant. 3. Drain existing lubricant and refill with proper lubricant. 4. Install ring kit. 5. Adjust piston rings. 6. Repair or replace as required. 7. Inspect all. Repair or replace as required. 8. Replace seal or crankshaft assembly. 9. Dress cylinder with 160 grit finish.
Kneeling or rattling	<ol style="list-style-type: none"> 1. Loose belt/hook or motor pulley, excessive and play in motor shaft or loose drive belt. 2. Compressor valves leaky, broken, carbonized or loose. 3. Carbon build-up on top of piston(s). 4. Cylinder(s) or piston(s) scratched, worn or scored. 5. Connecting rod, piston pin or crankpin bearings worn or scored. 6. Defective ball bearings on crankshaft or motor shaft. 	<ol style="list-style-type: none"> 1. Check belt/hook, motor pulley, crankshaft, drive belt tension and alignment. Repair or replace as required. 2. Inspect valves. Clean or replace as required. 3. Clean piston(s). Repair or replace as required. 4. Repair or replace as required. 5. Inspect bearings and replace crankshaft assembly if required. 6. Replace.

PROBLEM	POSSIBLE CAUSE	POSSIBLE SOLUTION
Light flicker or dim when running	<ol style="list-style-type: none"> 1. Improper line voltage. 2. Wiring or electric service panel too small. 3. Poor contact on motor terminals or starter connections. 4. Improper starter overload heaters. 5. Poor power regulation (unbalanced line). 	<ol style="list-style-type: none"> 1. Check line voltage and upgrade lines as required. Contact electrician. 2. Install properly sized wire or service box. Contact electrician. 3. Ensure good contact on motor terminals or starter connections. 4. Install proper starter overload heaters. Contact electrician. 5. Contact power company.
Motor overloads or trips	<ol style="list-style-type: none"> 1. Defective type lubricant being used. 2. Excessively light duty cycles. 3. Unit located in damp or humid location. 	<ol style="list-style-type: none"> 1. Drain existing lubricant and refill with proper lubricant. 2. Check line voltage and upgrade lines as required. Contact electrician. 3. Run unit for longer duty cycles. 3. Relocate unit.
Motor overload trips or draws excessive current	<ol style="list-style-type: none"> 1. Lubricant viscosity too high. 2. Improper line voltage. 3. Poor contact on motor terminals or starter connections. 4. Poor power regulation (unbalanced line). 5. Improper starter overload heaters. 6. Drive belts too tight or misaligned. 7. Compressor valves leaky, broken, carbonized or loose. 8. Cylinder(s) or piston(s) scratched, worn or scored. 9. Connecting rod, piston pin or crankpin bearings worn or scored. 10. Defective ball bearings on crankshaft or motor shaft. 11. Leaking check valve or check valve seat blown out. 12. Ambient temperature too low. 13. Bad motor. 	<ol style="list-style-type: none"> 1. Drain existing lubricant and refill with proper lubricant. 2. Check line voltage and upgrade lines as required. Contact electrician. 3. Ensure good contact on motor terminals or starter connections. 4. Install proper starter overload heaters. Contact electrician. 5. Contact power company. 6. Adjust belts to proper tension and alignment. 7. Inspect valves. Clean or replace as required. 8. Replace or replace as required. 9. Inspect all. Repair or replace as required. 10. Inspect bearings and replace crankshaft assembly if required. 11. Inspect bearings and replace crankshaft assembly if required. 12. Relocate unit to warmer environment. 13. Replace. 14. Replace.
Motor will not start	<ol style="list-style-type: none"> 1. Improper line voltage. 2. Wiring or electric service panel too small. 3. Poor contact on motor terminals or starter connections. 4. Improper starter overload heaters. 5. Bad motor. 	<ol style="list-style-type: none"> 1. Check line voltage and upgrade lines as required. Contact electrician. 2. Install properly sized wire or service box. Contact electrician. 3. Ensure good contact on motor terminals or starter connections. 4. Install proper starter overload heaters. Contact electrician. 5. Replace.
Oil in discharge air (oil pump)	<ol style="list-style-type: none"> 1. Lubricant viscosity too low. 2. Defective type lubricant being used. 3. Piston rings worn (broken, rough or scratched). 4. Piston rings not seated, are stuck in grooves or are gapped not. 5. Cylinder(s) or piston(s) scratched, worn or scored. 6. Worn cylinder finish. 7. Excessive condensate in receiver tank. 	<ol style="list-style-type: none"> 1. Drain existing lubricant and refill with proper lubricant. 2. Drain existing lubricant and refill with proper lubricant. 3. Install ring kit. 4. Adjust piston rings. 5. Repair or replace as required. 6. Dress cylinder with 160 grit finish. 7. Drain receiver tank with manual drain valve.
Oil leaking from shaft seal	<ol style="list-style-type: none"> 1. Clogged or dirty inlet and/or discharge line filter. 2. Compressor valves leaky, broken, carbonized or loose. 3. Defective safety/relief valve. 	<ol style="list-style-type: none"> 1. Clean or replace. 2. Inspect valves. Clean or replace as required. 3. Replace.

WARRANTY

Ingersoll-Rand Company warrants that the Equipment manufactured by it and delivered hereunder shall be free of defects in material and workmanship for a period of twelve (12) months from the date of placing the Equipment in operation or eighteen (18) months from the date of shipment, whichever shall occur first. The foregoing warranty period shall apply to all Equipment, except for the following: (A) Compressors that are operated solely on Ingersoll-Rand synthetic compressor lubricant will have their bare compressor warranted for the earlier of twenty-four (24) months from the date of Initial operation or thirty (30) months from the date of shipment. (B) Replacement parts will be warranted for six (6) months from the date of shipment. Should any failure to conform to this Warranty be reported in writing to the Company within said period, the Company shall, at its option, correct such nonconformity by suitable repair to such Equipment, or furnish a replacement part F.O.B. point of shipment, provided the purchaser has installed, maintained and operated such equipment in accordance with good industry practices and has complied with specific recommendations of the Company. Accessories or equipment furnished by the Company, but manufactured by others, shall carry whatever warranty the manufacturer conveyed to Ingersoll-Rand Company and which can be passed on to the Purchaser. The Company shall not be liable for any repairs, replacements, or adjustments to the Equipment or any costs of labor performed by the Purchaser without the Company's prior written approval.

The Company makes no performance warranty unless specifically stated within its proposal and the effects of corrosion, erosion and normal wear and tear are specifically excluded from the Company's Warranty. In the event performance warranties are expressly included, the Company's obligation shall be to correct in the manner and for the period of time provided above.

THE COMPANY MAKES NO OTHER WARRANTY OF REPRESENTATION OF ANY KIND WHATSOEVER, EXPRESSED OR IMPLIED, EXCEPT THAT OF TITLE, AND ALL IMPLIED WARRANTIES OF MERCHANTABILITY AND FITNESS FOR A PARTICULAR PURPOSE, ARE HEREBY DISCLAIMED.

Correction by the Company of nonconformities, whether patent or latent, in the manner and for the period of time provided above, shall constitute fulfillment of all liabilities of the Company and its Distributors for such nonconformities with respect to or arising out of such Equipment.

LIMITATION OF LIABILITY

THE REMEDIES OF THE PURCHASER SET FORTH HEREIN ARE EXCLUSIVE, AND THE TOTAL LIABILITY OF THE COMPANY, ITS DISTRIBUTORS AND SUPPLIERS WITH RESPECT TO CONTRACT OR THE EQUIPMENT AND SERVICES FURNISHED, IN CONNECTION WITH THE PERFORMANCE OR BREACH THEREOF, OR FROM THE MANUFACTURE, SALE, DELIVERY, INSTALLATION, REPAIR OR TECHNICAL DIRECTION COVERED BY OR FURNISHED UNDER CONTRACT, WHETHER BASED ON CONTRACT, WARRANTY, NEGLIGENCE, INDEMNITY, STRICT LIABILITY OR OTHERWISE SHALL NOT EXCEED THE PURCHASE PRICE OF THE UNIT OF EQUIPMENT UPON WHICH SUCH LIABILITY IS BASED.

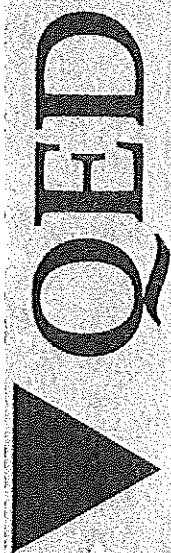
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OPERATIONS MANUAL

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The equipment in this manual is protected under U.S. and foreign patents issued and pending:

U.S. Patents:	4,497,370
Selective Oil Skimmer (SOS)	4,663,037
Specific Gravity Skimmer (SPG)	5,004,405
AutoPump (AP)	5,474,685
Specific Gravity Skimmer (SPG) Product Sensing	4,761,225
Vacuum/Pressure Hydrocarbon Recovery System	5,474,685
SPG PSR technology	5,641,272
AP-2	5,704,772
Genie System	
Canada Patent:	1,239,868
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Introduction

Welcome to QED Environmental Systems' AutoPump® (AP-2) manual.

To ensure the best operator safety and system performance, it is strongly recommended that the operators read this entire manual before using the system.

This manual reflects our many years of experience and includes comments and suggestions from our sales and service personnel and most importantly from our customers. The chapters, their contents and sequence were designed with you, the user and installer, in mind. We wrote this manual so it can be easily understood by users who may not be familiar with systems of this type or are using a QED system for the first time.

Safety

Safety has been a cornerstone of our design which has been proven out in building and shipping systems throughout the world. Our high level of performance is achieved by using quality components, building in redundancies or backup systems, and not compromising our commitment to quality manufacturing. The net result is the highest quality and safest pneumatic pump recovery system on the market. We feel so strongly about safety, based on years of working with the hydrocarbon industry, that it is the first section in all of our manuals.

ATEX Certification

Equipment with an ATEX label similar to the example on Figure 1, page 2 is ATEX certified. Equipment without the label is not ATEX certified.

Figures 1 and 2 explain the ATEX label, the label location and appearance.

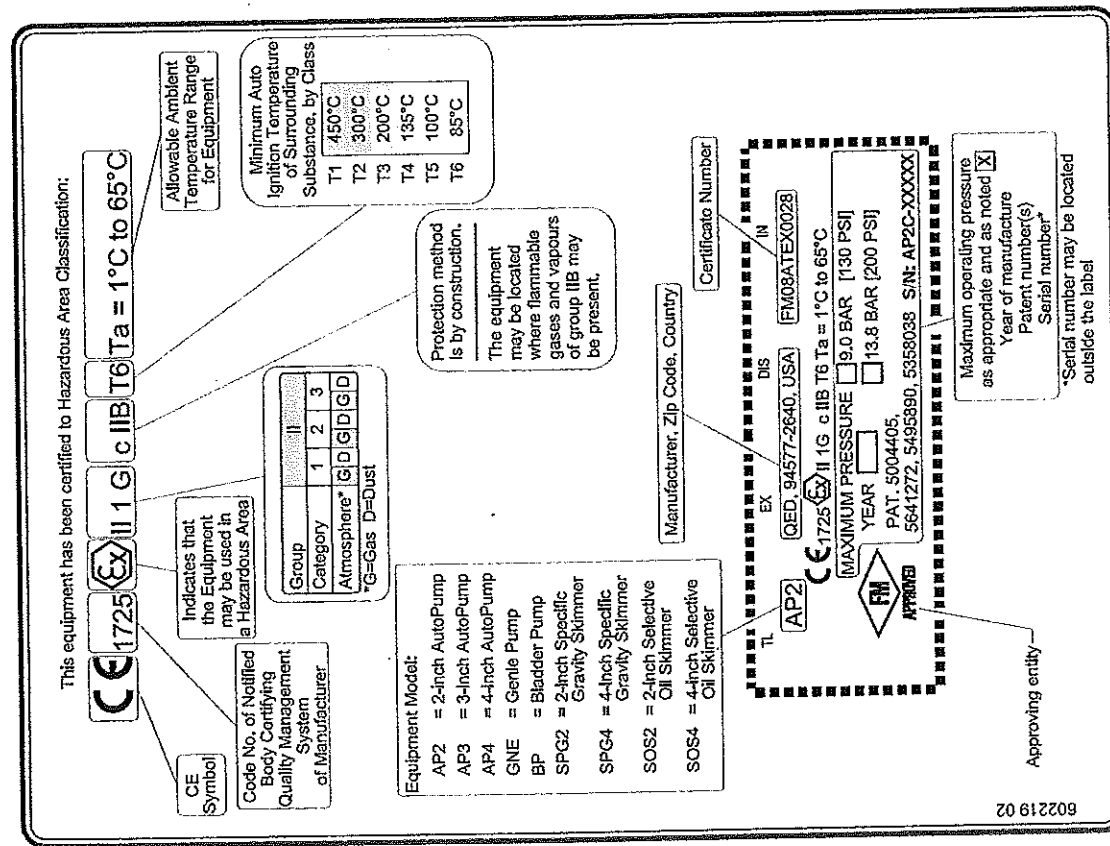


Figure 1 - ATEX Label Detail, Example and Explanation

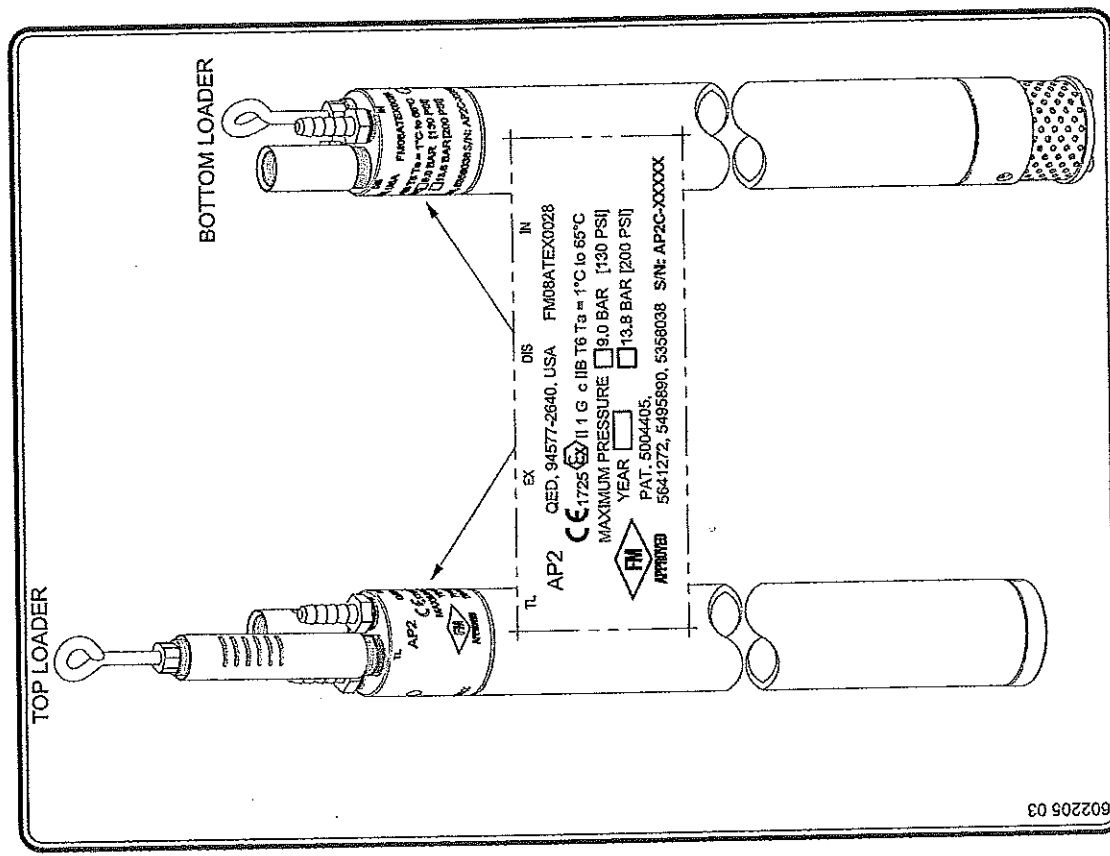


Figure 2 - ATEX Label Location and Appearance

How to Contact QED

If for any reason you are unable to find what you need in this manual please feel free to contact the QED Service Department at any time. We encourage you to use following communication methods to reach us at any time:

Service Department
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www.qedenv.com

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 (734) 995-1170 — Fax
info@qedenv.com — E-mail

QED can be reached 24 hours a day

We welcome your comments and encourage your feedback regarding anything in this manual and the equipment you have on-site.

Thank you again for specifying QED remediation equipment.

Chapter 1: Safety

Safety has been a prime consideration when designing the AutoPump System. Safety guidelines are provided in this manual, and the AutoPump System safety features are listed below. Please do not attempt to circumvent the safety features of this system.

We have also listed some possible hazards involved when applying this system to site remediation. Nothing will protect you as much as understanding the system, the site at which it is being used, and the careful handling of all the equipment and fluids. If you have any questions, please contact the QED Service Department for guidance.

As you read through this manual, you will encounter three kinds of warnings. The following examples indicate how they appear and lists their respective purposes.

Note: Highlights information of interest.
Caution: Highlights ways to avoid damaging equipment.
WARNING: Highlights personal safety issues.

A Partial List of Safety Procedures

WARNING:

The air compressor and any other electrical equipment used with this pneumatic system must be positioned outside of any area considered hazardous because of possible combustible materials.

These safety procedures should be followed at all times when operating QED equipment on or off site, and should be considered as warnings:

- Wear safety goggles when working with the AutoPump System to protect eyes from any splashing or pressure release.
- Wear chemically resistant rubber gloves, boots, and coveralls when handling the AutoPump and fluid discharge hose to avoid skin contact with the fluid being recovered.

- Point all hoses away from personnel and equipment when connecting or disconnecting.
- Always ensure that the fluid discharge hose is connected before the air hose to prevent accidental discharge.

The AutoPump System minimizes the potential for accidents with the following safeguards:

Fire and Explosion Protection

Almost all of QED underground fluid extraction systems are pneumatic. This offers many inherent fire and explosion protection features:

- Compressed air lines eliminates electrical wiring in hazardous areas.
- Aluminum or fiberglass enclosures prevent sparking.
- Standard systems use brass fittings to eliminate sparking hazard.

Personal Protection

On-site, service and maintenance personnel can safely use QED equipment. Safety-in-use is the primary design feature in all systems. Following are some samples:

- All standard high pressure air hoses have automatic shut off quick-connects on the supply side which prevents injury due to hose whip or air blown particles. Tubing does not usually have quick-connect fittings, but is pushed over barbs or pushed into compression fittings.
- Metal regulators and filter bowls are rated for an inlet pressure of 200 psi. The metal air filter bowl is made of zinc, providing greater pressure and chemical resistance than plastic bowls and it is less prone to damage if dropped.

Spill Protection

On-site spills cannot always be prevented. QED equipment is designed to take into consideration such unpredictable occurrences that may happen despite strict adherence to standardized safety practices.

- The standard air and fluid hoses are rated at over 800 psi burst pressure to prevent accidental hose breakage.
- Down well quick-connects have locking features to prevent accidental disconnections.

Chapter 2: Overview

The AutoPump® fills and empties automatically, and is very easy to install, use, and maintain. The AutoPump is a pneumatic fluid extraction pump that pumps in pulses. It handles any liquid which flows freely into the pump and is compatible with the component materials and with the connecting hoses.

The AutoPump is very versatile and available in a range of lengths and fluid inlet arrangements to meet particular site specifications.

Equipment will vary by application and site specifications. (See Chapter 3)

General Specifications

Pump Diameter		1.75 inch	44.5 mm
Pressure Range		5-130 psi	0.4-9.2 kg/cm ²
Flow Range	Long BL	0 to 2.3 gallons per minute (GPM)	0 to 8.8 liters per minute (LPM)
	Long TL	0 to 1.9 gallons per minute (GPM)	0 to 7.2 liters per minute (LPM)
	Short BL	0 to 2.0 gallons per minute (GPM)	0 to 7.6 liters per minute (LPM)
Short TL		0 to 1.6 gallons per minute (GPM)	0 to 6.1 liters per minute (LPM)

This is How it Works

The AutoPump is a submersible compressed air-driven pump which fills and empties automatically. It also controls the fluid level in a well automatically. The pump fills (see Figure 3) when fluids enter either the top or bottom check valve. Air in the pump chamber exits through the exhaust valve as the fluid fills the pump. The float inside the pump is carried upwards by the fluid rising inside the casing until it pushes against a stop on the control rod, forcing the valve mechanism to switch to the discharge mode.

The switching of the valve causes the exhaust valve to close and the air inlet valve to open. This causes the pump to empty (see Figure 3) by allowing compressed air to enter the pump. This pressure on the fluid closes the inlet check valve and forces the fluid up the discharge tube and out of the pump through the outlet check valve. As the fluid level falls in the pump, the float moves downwards until it pushes against the lower stop on the control rod, forcing the valve mechanism to switch to the fill mode. The outlet check valve closes and prevents discharged fluids from re-entering the pump. The filling and discharging of the pump continues automatically.

Note: The figures shown here are simplified schematics.

Major AutoPump Features

- The AutoPump System is small and lightweight and can be easily moved from site to site, allowing quick response to changing conditions.
- The hoses are color coded and all the fittings are different so only the proper connections can be made.
- Rugged construction ensures long system life, even under harsh conditions.
- The entire system is pneumatically powered with no electrical components, thus avoiding sparks in control power and sensing devices.

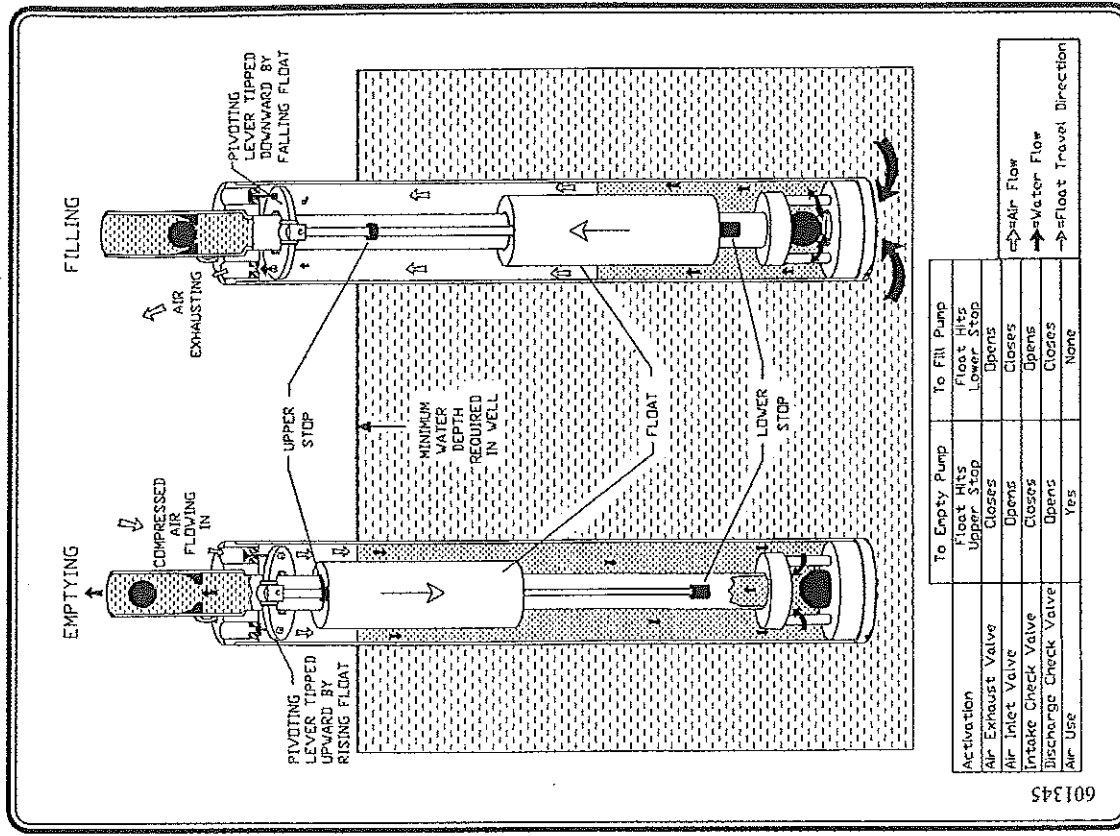


Figure 3 - How it Works

Revision 2- July, 2009

- The AP-2 only uses air while pumping. Unlike systems that rely on bleeding air sensors or timers which pressurize and depressurize the air hoses for each stroke, the air hose for the AP-2 remains pressurized to the pumps at all times. Air compressor power consumption, compressor filter maintenance, and thus operating costs are substantially reduced.
- The AP-2 can be configured to fill from the top or the bottom.

Figure 4 on the next page illustrates an overview of an AutoPump System.

The AP-2 System provides everything required for pumping fluid from a well. QED can also supply the air compressor, if desired.

The system is designed to perform for years and comes with a one year warranty.

Note:

An automatic drain on the compressor is highly recommended since it dramatically decreases air filter maintenance. QED can supply an automatic drain.

Caution:

Alteration of the System: Do not change or modify the equipment without the expressed written approval of QED.

Special Operating Conditions

Conditions may require adjustment or adaptations to the equipment. Below is a list of some of these conditions, their possible effects, and solutions.

Since every site is different, please contact your QED representative for detailed assistance if needed.

Cold Weather

Moisture in the pneumatic lines can freeze causing problems with the system. Such freezing could result in regulators not reducing the air pressure, valves sticking, and hoses clogging.

Actions To Take

- Use water traps and automatic compressor tank drains. These are available at industrial distributing companies (e.g., W.W. Graingers®).

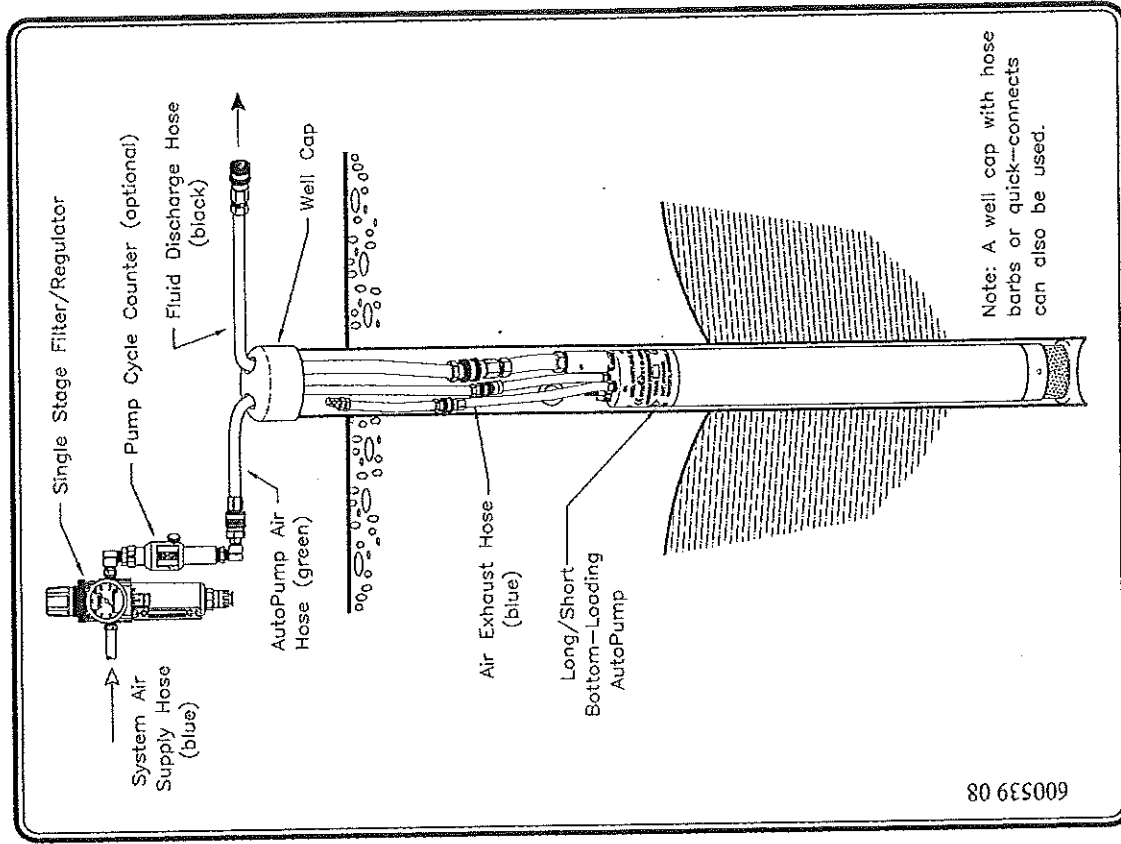


Figure 4 - Overview of the AutoPump System

- Reduce air line freezing by burying air hoses below the frost line, or insulating and heating with heat tape, or running hoses through a PVC pipe with warm air being blown through it.
- Remove all the moisture you can from the air by using drains on the compressor, filter, and low points in the air line. Use an air dryer to lower the dew point of the compressed air below the temperature of exposed lines.
- Protect the air regulator from freezing. During freezing conditions regulators may fail "open", allowing high pressure (e.g. 150 psi from the compressor) to enter components (e.g. gauges, hoses, fluid receptacles) that may be damaged, cause a safety problem, or release contaminating material.
- Locate the air intake to the compressor so the coolest (driest) air is drawn in. Usually it is better to draw air from outside a building than from the inside.

Flow induced freezing

Although it rarely occurs, air flow through an AutoPump may cause freezing internally at water temperatures well above 32°F, slowing down the system. Cold water, moisture in the compressed air, high air pressure, a high pumping rate, and back pressure on the pump are variables that alone, or in combination with each other, may induce freezing. Should it occur, there are system adaptations which can decrease or eliminate the freezing. Please contact QED for advice.

The well is under a vacuum

The pump will work in a well that is under a vacuum, but there several conditions that must be considered.
(See Appendix D)

Abrasive particles in the well

Please contact QED service if you encounter problems with abrasives in the well.

Hard pipe air supply connection to the pump

These can cause debris and scale to travel down to the pump. It can also prevent the pump from cycling smoothly due to a solid connection (non-flexing) to the top of the pump. Blow out all of the hard pipe before connecting the pump. A short (6 feet) length of hose should be used between the hard pipe and the pump to allow the natural movement of the pump to occur without restraint. A small screen filter should be used at the lower end of the metal air pipe to prevent scale from reaching the air valve.

Options and Accessories

The following options and accessories are available from QED. Contact your QED Representative regarding the following:

- **AP Data Module** – This water-resistant enclosure protects and shields surface instrumentation from weather and/or harsh site conditions while providing easy visual access to key system instrumentation readings. The options available for inclusion inside the NEMA 3R enclosure are a filter/regulator, pump cycle counter, level sensor regulator and gauge with air flow meter. Also included are a fluid level indicator with an On/Off switch, an Air Inlet Supply Gauge, and a Vacuum/Pressure reference with Gauge.
- **Pump Cycle Counter (PCC)** – A PCC counts the number of times a pump cycles. The counter provides information for maintenance, service, and statistical purposes with minimal loss in air pressure or performance. A PCC is easily attached on the air inlet hose to the pump.
- **TFSO** – The Tank-Full Shut-Off (TFSO) System is a unique, self-contained pneumatic system that shuts down other pneumatic systems in the event of a liquid level rise or a pressure increase in a container. The TFSO provides dual safety by using two sensors. The system is expandable—the button sensor of the system can be tied to monitor many containers.
- **Inlet Conversions** – AutoPumps can be converted from Top- to Bottom-Loading and vice versa. See Appendix C for more information.
- **Extended Leachate Screens** – (see figure 7)

Tools

The following tools are used to service the AP-2:

- Spanner wrench
- 3/32-inch Hex (Allen) key
- 6-inch Crescent wrench

Parts List

In aggressive sites over millions of cycles, the parts that one may anticipate replacing are:

- Discharge check valve ball

AP-2 AutoPumps

In both the Bottom-Loading and the Top-Loading models, the fluid is pushed out of the pump through a check valve located at the top of the pump. This check valve prevents the fluid from reentering the pump.

Bottom-Loading AP-2/BL

The Bottom-Loading AutoPump fills through a check valve at the bottom of the pump. There are two lengths of AP-2/BL: long and short. The fluid level in the well can be drawn down to 35 inches from the bottom of the long BL, and 20 inches from the bottom of the short BL (See Figure 5)

Top-Loading AP-2/TL

The Top-Loading AutoPump fills through a check valve at the top of the pump, therefore the fluid level in the well will never go below the level of this check valve. There are two lengths of AP-2/TL: long and short (See Figure 6)

Chapter 3: Equipment

Unpacking

During the unpacking procedure, check for the following:

- All parts on the packing list have been included in the box
- All fitting openings are unobstructed
- The equipment has not been damaged in shipment

Equipment List

The equipment list will vary depending on site specifications, but the following list is a typical configuration:

1. Top-Loading or Bottom-Loading AP-2 with support eyebolt
2. Single stage filter/regulator with:
 - 5 micron filter with manual drain (auto drain option)
 - Pressure regulator with gauge
3. Pump Cycle Counter (PCC)
4. Hoses:
 - Fluid discharge hose (black)
 - System air supply hose (blue)
 - AutoPump air hose (green)
 - Air exhaust hose (blue)

Note:

Black nylon tubing can be used in place of hose.

5. Pump support system:
 - Well cap
 - Polypropylene support rope with quick-link assembly or SS wire rope

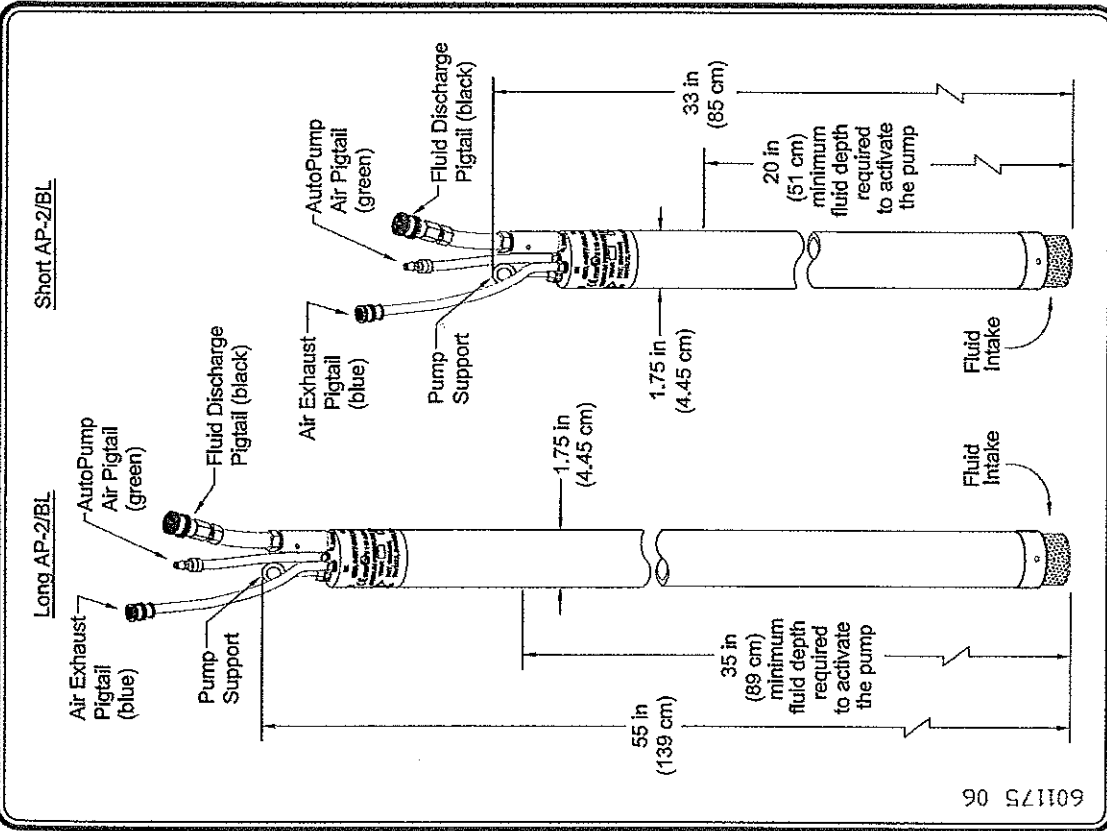


Figure 5 - Long and Short Bottom-Loading (AP-2/BL)

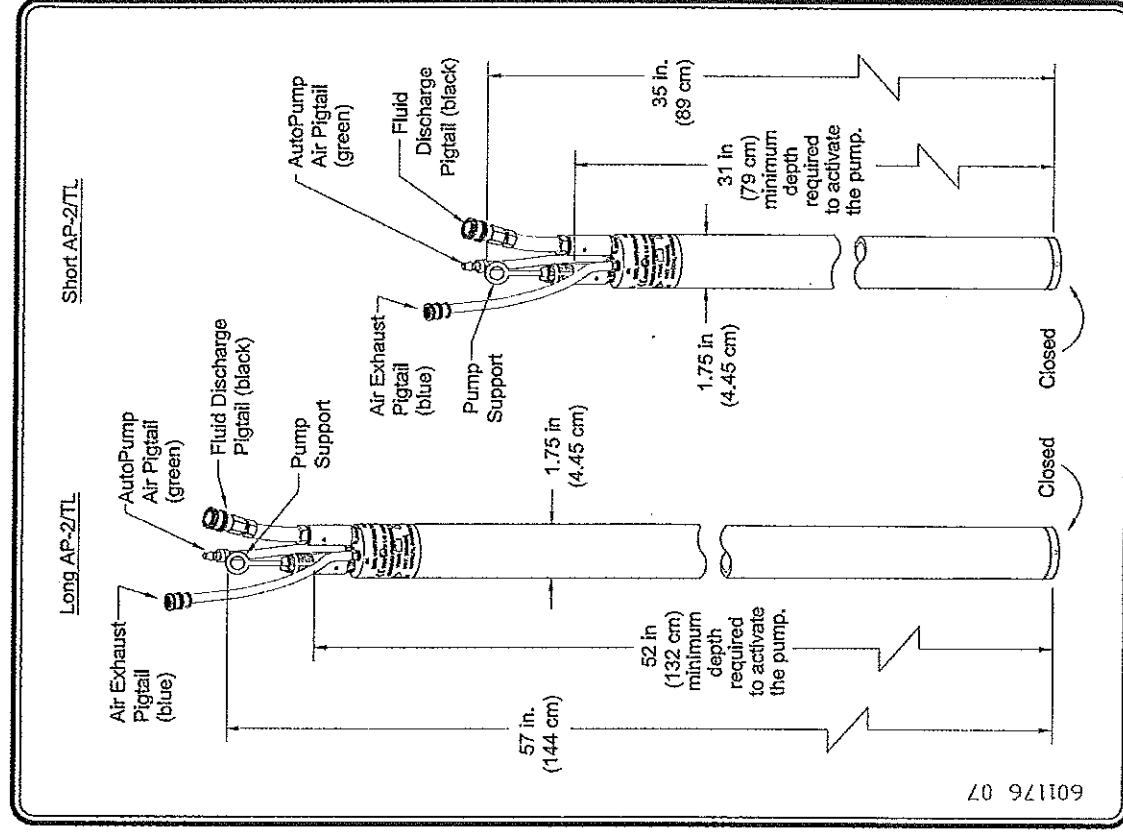


Figure 6 - Long and Short Top-Loading (AP-2/TL)

Specifications

Pump	Length	Vol/Cycle Range	Weight	Outside Diameter
Long AP-2/BL	55-inches 139-cm	0.14 gal - 0.17 gal .53 L - .64 L	7.8 lb 3.6 kg	1.75-in 4.45-cm
Short AP-2/BL	33-inches 85-cm	0.05 gal - 0.08 gal .19 L - .30 L	5.4 lb 2.5 kg	1.75-in 4.45-cm
Long AP-2/TL	57-inches 144-cm	0.14 gal - 0.17 gal .53 L - .64 L	7.8 lb 3.6 kg	1.75-in 4.45-cm
Short AP-2/TL	35-inches 89-cm	0.05 gal - 0.08 gal .19 L - .30 L	5.4 lb 2.5 kg	1.75-in 4.45-cm

Component Materials

Component materials include stainless steel, Viton, nylon, epoxy, PTFE (e.g., Teflon), polyethylene, titanium, PVDF (e.g., Kynar). Hose connections can be brass or stainless steel.

Materials may vary depending on site specific needs.

Performance and Air Use Curves

See Appendices A and B.

Landfill Pump Configurations

All lengths (Long and Short) and intake configurations (Bottom-Loading) are available in models for landfill leachate, condensate pumping and dewatering applications. (See Figure 7)

Landfill Pump Specifications

Pump	Length	Vol/Cycle Range	Weight	Outside Diameter
Long AP-2/BL	57-inches 144-cm	0.14 gal - 0.17 gal .53 L - .64 L	7.9 lb 3.6 kg	1.75-in 4.45-cm
Short AP-2/BL	35-inches 89-cm	0.05 gal - 0.08 gal .19 L - .30 L	5.5 lb 2.5 kg	1.75-in 4.45-cm

Component Materials

Component materials include stainless steel, Viton, nylon, epoxy, PTFE (e.g., Teflon), polyethylene, titanium, PVDF (e.g., Kynar). Hose connections are usually stainless steel. Materials may vary depending on site specific needs.

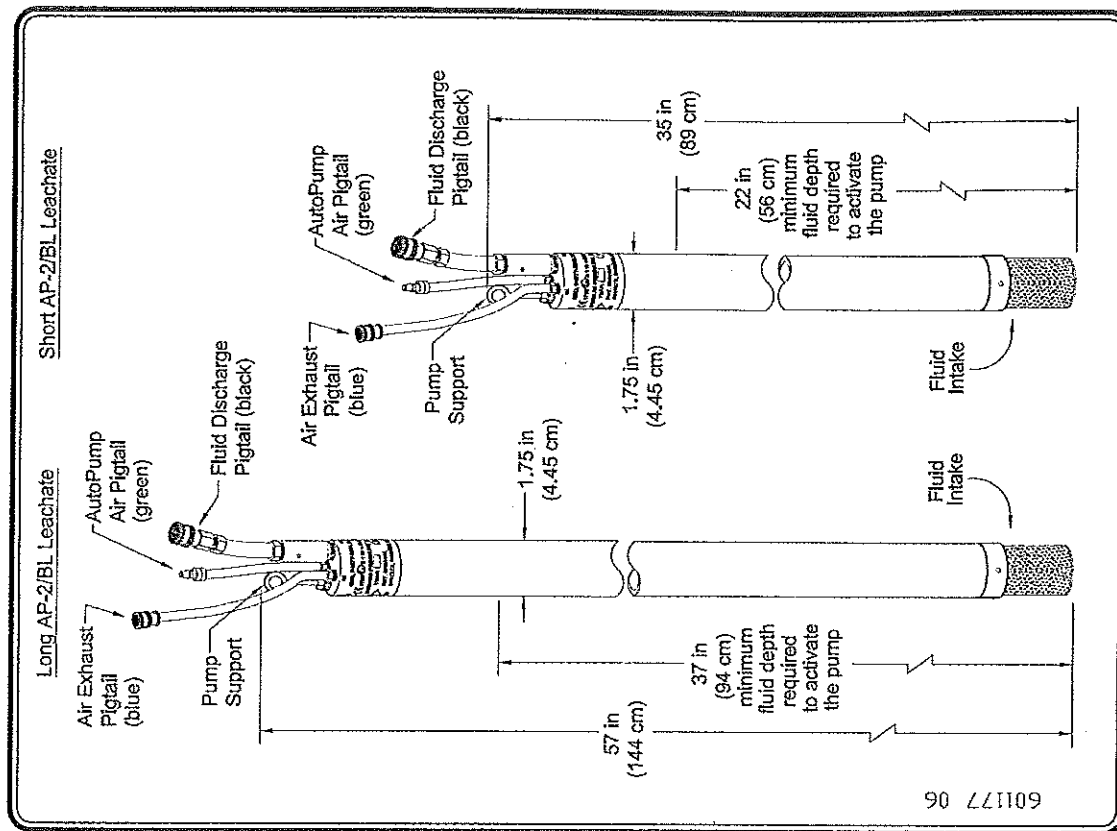


Figure 7 - Long and Short AP-2 Bottom Loading with Leachate Screen

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Single Stage Filter/Regulator

A single stage 5 micron particulate air filter/regulator has an a manual or an optional automatic drain and is installed on the system air supply hose. The filter/regulator removes particles and some oil vapor, and water droplets from the air passing to the AP-2. The regulator should produce at least as much pressure as required to move the fluid from the depth at which the pump is installed. (See Figure 8)

Note:

Too much air pressure can result in low pump efficiency.

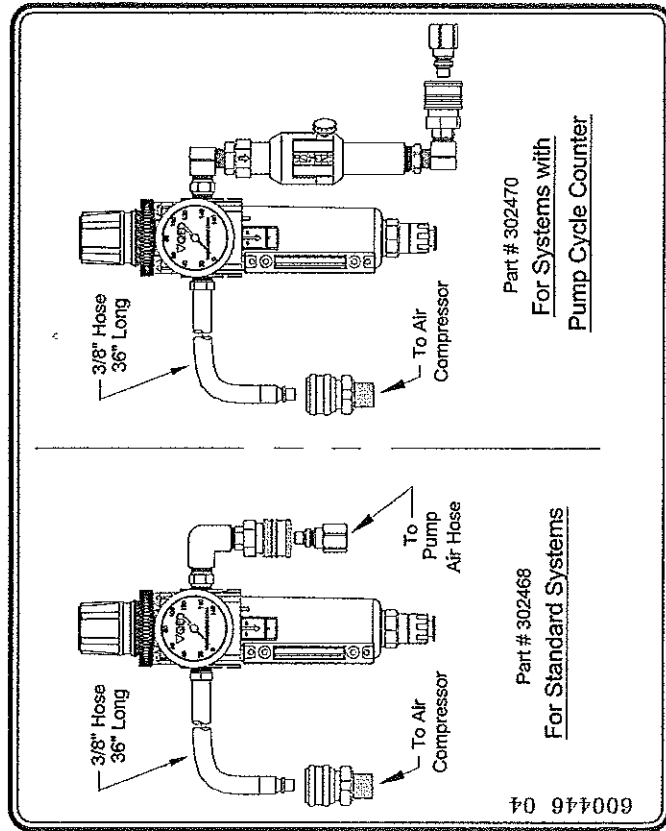


Figure 8 - Single Stage Filter/Regulator with Quick-Connects

Hoses and Fittings

The table below shows the normal hose colors. These may change due to application or need.

Hose and Tubing Color Code Table

	System Air Supply Hose	Fluid Discharge Hose	AutoPump Air Hose	Air Exhaust Hose
Hose Color	Blue	Black	Green	Blue
Hose Material	Nitrile	Nitrile	Nitrile	Nitrile
Hose Size I.D.	1/4-inch to 3/8-inch	1/2-inch to 3/4-inch	1/4-inch to 3/8-inch	3/8-inch to 1/2-inch
Tubing Color	Black	Black	Black	Black
Tubing Material	Nylon or Polyethylene	Nylon or Polyethylene	Nylon or Polyethylene	Nylon or Polyethylene
Tubing Size O.D.	3/8-inch to 1/2-inch	3/4-inch to 1-inch	3/8-inch to 1/2-inch	1/2-inch to 3/4-inch
Function	Transports air from air compressor to filter/regulator	Transports product from AutoPump to discharge point	Transports air from filter/regulator to AutoPump	Exhausts air from AutoPump
Fittings	Hose barb and clamp or one-way quick-connect fitting	Hose barb and clamp or straight through quick-connects	Hose barb and clamp or one-way quick-connect fitting	Hose barb and clamp or straight through quick-connects

* Nylon tubing is available in single tube or jacketed bundles. Contact QED for the sizes and bundle configurations.

If optional quick-connects are used, the flow of air and fluid in the hoses runs *into* the male plug and *out* of the female socket.

The quick-connect fittings on one type of hose will usually not interchange with those of another, so it is very difficult to connect a hose to an incorrect fitting.

Note:

The down well hose fittings normally have locking quick-connects. On sites with water depths over 50 feet, special consideration may be required to support the hoses. Consult with QED regarding such applications.

Pump Cycle Counter

Refer to Appendix F – Pump Cycle Counter

Volumes Pumped Per Cycle

- The volume of fluid pumped per cycle from an AutoPump varies depending upon the inlet air pressure, the fluid inlet head and the force against which the pump must move the fluid. This force is a sum of the static head and dynamic losses incurred during fluid movement, usually referred to as Total Head.
- The Total Head depends upon back pressure in the surface lines, hose size, fittings, vertical and horizontal pumping distance, the number of pumps feeding the hose system, air pressure to the pump, and the type of pump.
- The effects of some of these variables may cause the volume pumped per cycle to vary from pump to pump on a single site.

Pump	Volume per Cycle: Range	Volume per Cycle: Average
Long AP-2/BL	0.14 gal - 0.17 gal 53 L - 64 L	0.155 gal .59 L
Short AP-2/BL	0.05 gal - 0.08 gal .19 L - .30 L	0.065 gal .25 L

All figures above are dependent on site specific conditions under which the pump is operating

Pump Support System

To safely support the AP-2, a pump support system is offered. Included in the system are a well cap, support rope, and quick-link assembly.

(See Figure 14 on page 34, and Figure 15 on page 35)

Well caps with various fitting combinations are available.
(See Figure 13 on page 33)

Caution:

Although it may be possible to support the pump using only tubing, it is not always wise to do so. If a pump becomes jammed in a well, a strong rope or wire rope separate from the tubing may be needed to withstand the force required to free it. Thus a separate support line is recommended.

Compressed Air Supply

The AP-2 System includes a compressor-to-pump air line quick disconnect fitting for the compressor.

There is a distinct air inlet on the AP-2; an "IN" is stamped next to it on the head of the pump. The air inlet quick connect fitting on the pump has a female counterpart on the air inlet hose. The air inlet must be connected for the AP-2 System to function. Do not lubricate the compressed air coming out of the compressor. The AP-2 does not require lubrication and excess oil may foul the filter/regulator.

WARNING:

PVC pipe is generally not recommended for compressed air service.

Cautions

The following suggestions are offered to reduce the complications involved in assembly and installation.

- Cover the hose ends with tape if they are being pulled through trenches. Be sure the ends of the hoses that connect to the air compressor and fluid discharge have the correct fitting leading out of the well. If you are unsure, look at the respective fittings on the pump.
- Blow out all water and particles from compressed air conduits (trunk lines, sensor hoses, air supply hoses etc.) and fluid lines for at least 10 seconds after the water and particles exit before connecting them to the system.
- When running hoses in conduit, include a rope to pull additional hoses in case they are needed at a later date
- If solid metal piping is used for compressed air conduit, it is advised that an air filter or a "Y" strainer with a fine mesh screen (80 mesh or finer) be placed at the downstream end of the piping. Metal flakes, rust, galvanizing material, dirt, etc. can be dislodged from such metal piping and travel to the pump.

Component Assembly

Quick-Connects/Hose Barbs

Follow the instructions on Figure 9 for properly securing the locking quick-connects. See Figure 10 for properly securing hose barbs.

AutoPump Assembly

STEP 1 - Attach Fluid Discharge Hose (black)

Note:

If a well cap with holes is used, insert the hoses through the cap before attaching hose.

- Attach the fluid discharge hose or tubing to the AutoPump.
(See Figure 11 and Figure 12)
- Attach the other end of the discharge hose to the fluid discharge point.

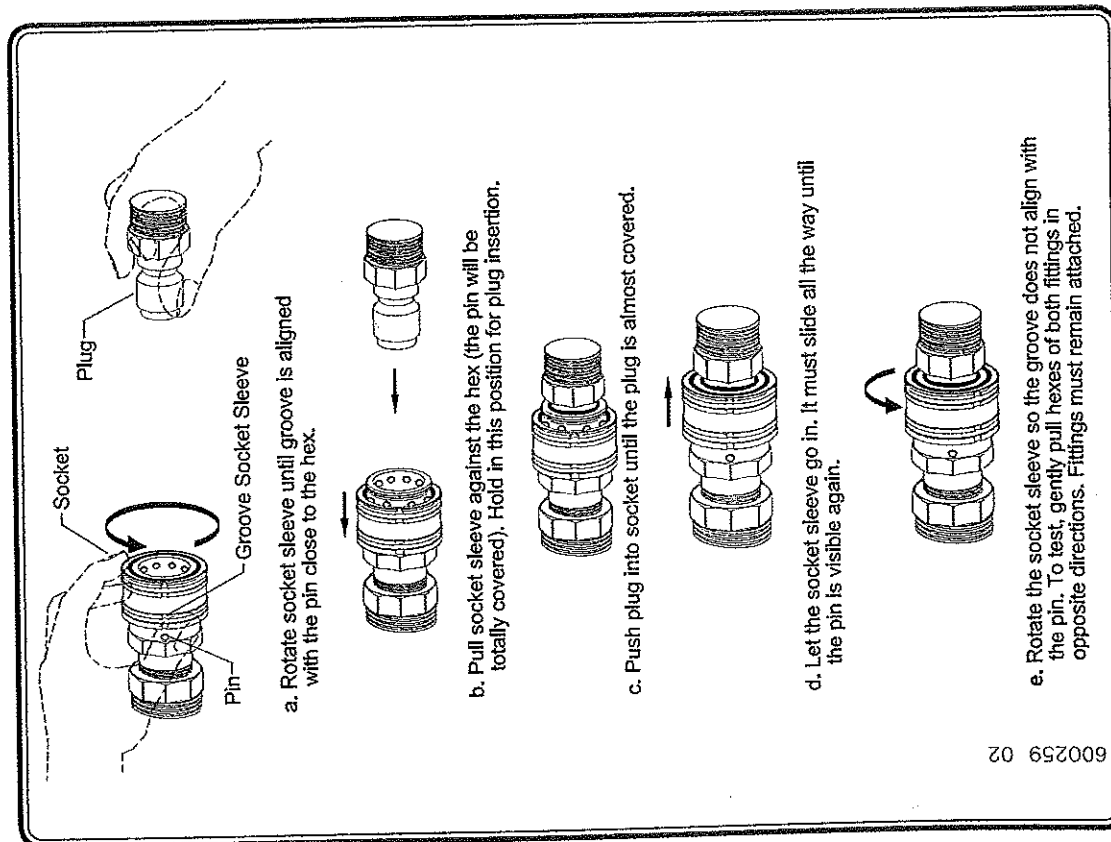


Figure 9 - Locking Quick-Connects

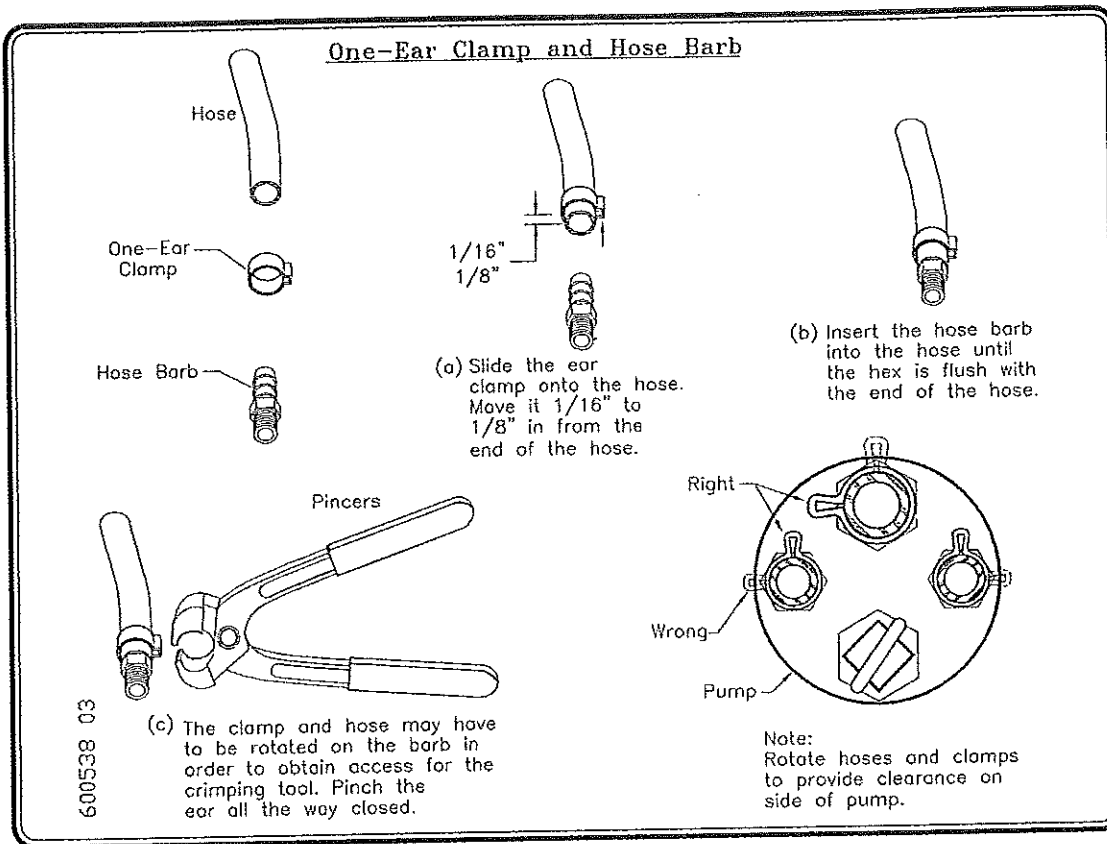
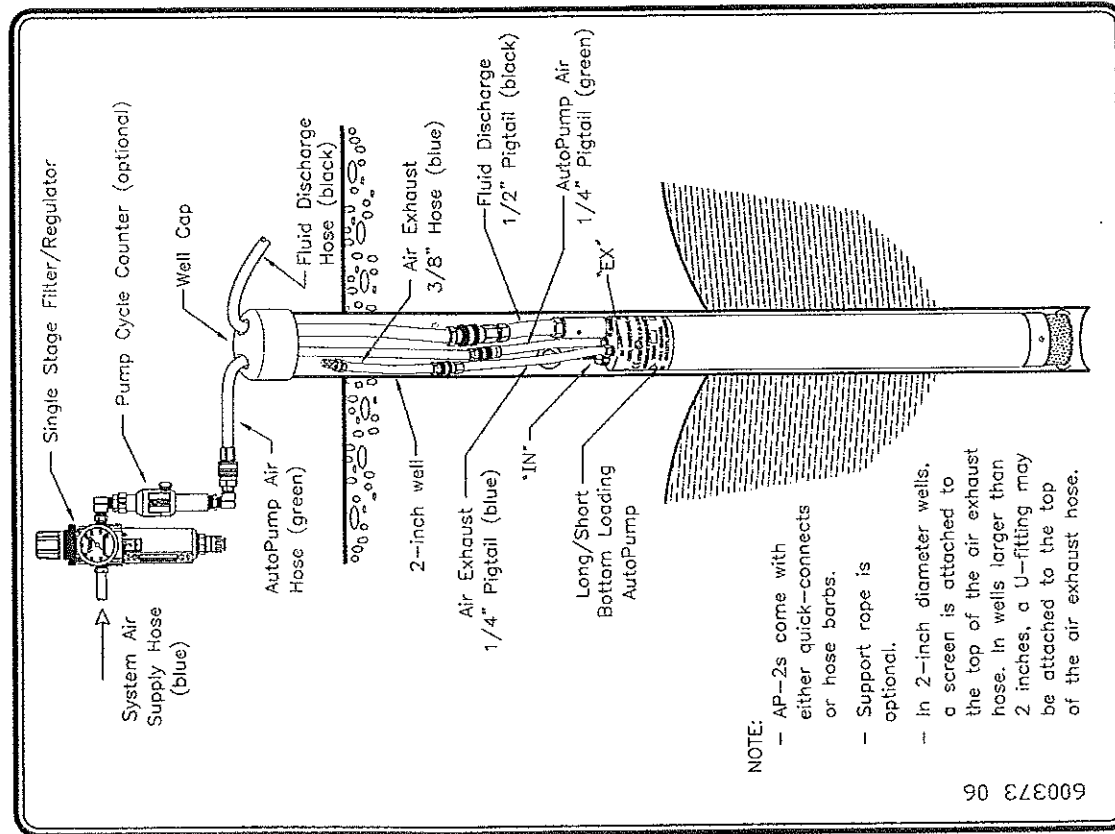


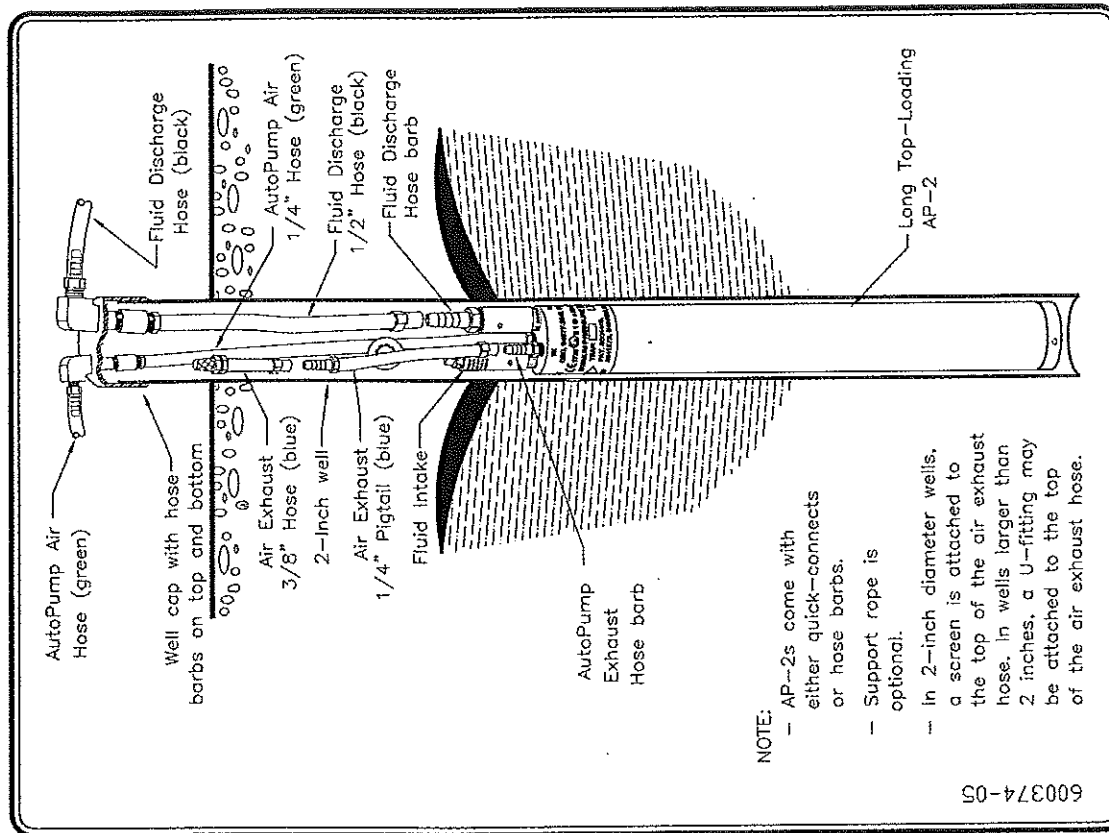
Figure 10 - One-Ear Clamp and Hose Barb Assembly Instructions



- NOTE:
- AP-2s come with either quick-connects or hose barbs.
 - Support rope is optional.
 - In 2-inch diameter wells, a screen is attached to the top of the air exhaust hose. In wells larger than 2 inches, a U-fitting may be attached to the top of the air exhaust hose.

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Figure 11 - AP-2 Assembly: Well Cap with Holes



- NOTE:
- AP-2s come with either quick-connects or hose barbs.
 - Support rope is optional.
 - In 2-inch diameter wells, a screen is attached to the top of the air exhaust hose. In wells larger than 2 inches, a U-fitting may be attached to the top of the air exhaust hose.

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Figure 12 - AP-2 Assembly: Well Cap with Hose Barbs

STEP 2 - Attach AutoPump Air Hose (green)

- a. If a Pump Cycle Counter (PCC) is used, install it downstream of the air filter regulator and as close to the pump as is reasonable.
- b. Attach the AutoPump air hose to the single stage filter/regulator or optional Pump Cycle Counter (See Figure 4 on page 11)
- c. Attach the other end of the AutoPump air hose to the AutoPump.

STEP 3 - Attach Air Exhaust Hose (blue)

- a. Attach the air exhaust hose to the AutoPump.
(See Figure 11 and Figure 12)

STEP 4 - Attach System Air Supply Hose (blue)

- a. Thread the air hose socket with 1/4-inch MPT to the compressor. Use Teflon tape or sealant on the threads.
- b. Attach the air hose plug end of the system air supply hose to the socket now attached to the compressor.
- c. Attach the socket on the discharge end of the hose to the single stage filter/regulator. (See Figure 4 on page 11)

The pump will work in a well that is under vacuum, but there are several conditions that must be considered. (See Appendix D)

Dry Test

Before installing the AutoPump in the recovery well, it is important to test the system for proper operation. Before beginning this test, make sure that all hoses are properly connected as described in the previous section.

To test for float movement and air valve actuation follow these steps:

- STEP 1 -** Drain all fluid from the pump through the bottom inlet check valve (Bottom-loading) or air inlet fitting (Top-loading).

- STEP 2 -** Hold the pump horizontally.

STEP 3 -

Tip the top of the pump downwards to about 45°. The float should slide to the top of the pump and open the air valve. Air should be heard going into the pump. It will exit the inlet fluid check valve (Bottom-loading) or the outlet check valve (Top-loading).

Caution:

If air is not acceptable in the fluid discharge hose, disconnect the hose before performing this test.

STEP 4 -

Tip the head of the pump upwards past horizontal to 45° from the vertical. The float should slide to the bottom of the pump and close the air valve.

STEP 5 -

Repeat this process 3 or 4 times to ensure the float moves freely and the air-valve opens and closes. If the pump must be tilted nearly vertical before the float slide or the air valve moves, open the pump and inspect for interference.

Pump Support System and Hose Bundling Assembly

A pump support system can be created to support the pump and hoses. The pump support system uses well caps with various fitting combinations. (See Figure 13)

Though it is possible in some instances to support a downwell pump with only the tubing, a separate support line is recommended.

Note:

The walls of some wells deform over time. They may trap a downwell pump. In some of those cases the support line has proven useful when retrieving the pump.

In addition to supporting the down-well equipment with a support rope, it may be important to support down-well hoses (in most cases nylon tubing does not need to be supported by the support line). Since the down-well hoses can weigh more than the pump, particularly in wells over 50 feet deep with fluid inside the discharge hose, hose support can avoid problems such as kinking, jamming, and breaking.

Hose bundling or the use of jacketed tubing reduces equipment entanglement at the well surface, and aids the removal of the pump from the well. Bundling also assists in positioning the pump and down-well hose assembly against one side of the well casing. Maximum space is created for other items, such as probes, to be periodically placed inside the well.

Follow these instructions to create a hose bundle.

- STEP 1 -** Lay the equipment on the ground and make all of the necessary hose connections. (See **Component Assembly on pages 25 through 32**)
- STEP 2 -** If a well cap is supplied, install it on the hoses. (See **Figure 11** for well cap with holes; see **Figure 12** for well cap with hose barbs)
- STEP 3 -** Connect the quick-link assembly on the support rope to the eye on the AP-2 and lay the support rope out along with the hoses. Make sure that none of the hoses or support ropes are crossing over each other. (See **Figure 14**)

Note:

To make the next step easier, pull the support rope and the hoses taut.

- STEP 4 -** Starting at the AutoPump end of the hose, put a tie-wrap through the center of the braided support rope just above the uppermost quick-connect or barb on the AutoPump. (See **Figure 14** and **Figure 15**)

- STEP 5 -** Pulling the rope taut, put the tie-wrap around the fluid discharge hose with the rough surface outwards. Cross the ends and complete the figure-8 pattern by securing the ends around the exhaust hose. When you connect the tie-wrap make sure it is straight and is not kinking the hoses. (See **Figure 14** and **Figure 15**)

Note:

After completing this step, the fluid discharge hose will be attached to the support rope and the exhaust hose. At this point the air supply hose is still lying free.

- STEP 6 -** Place the next tie-wrap two feet towards the well cap from the first. Secure the air supply hose rather than the exhaust hose.

Note:

It is important to put the tie-wraps approximately two feet apart to keep a proper discharge hose/support rope bundle. Experience has shown that spreading the tie-wraps further apart than two feet increases the probability for hose kinking.

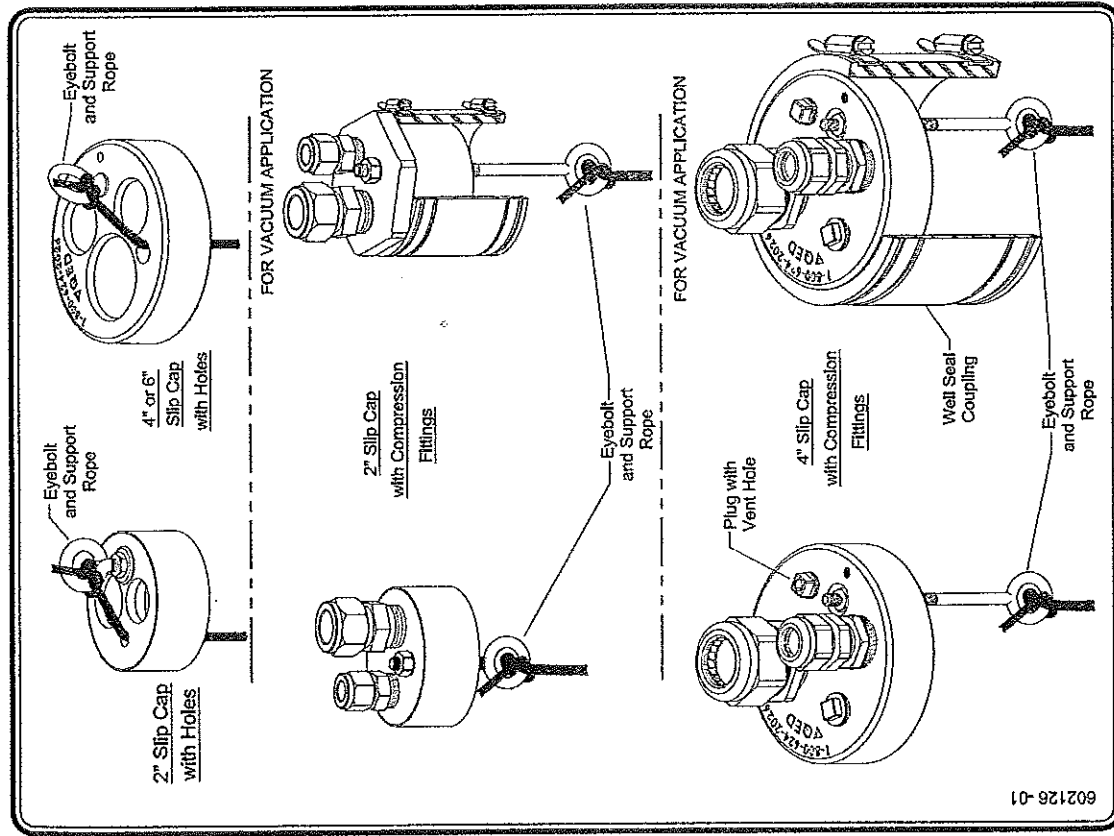


Figure 13 - Examples of Well Caps

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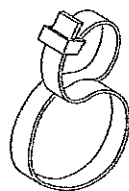
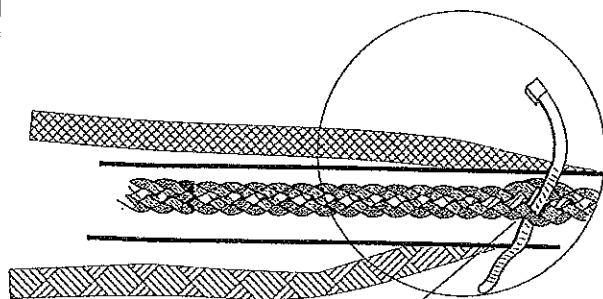
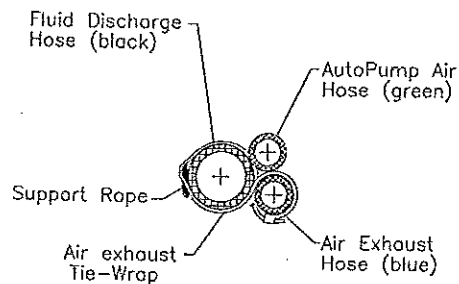


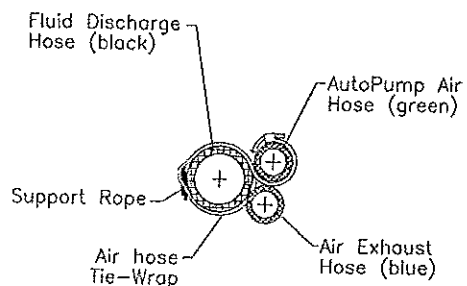
figure Eight tie-wrap layout



Thread tie-wraps through support line



Air exhaust tie-wrap

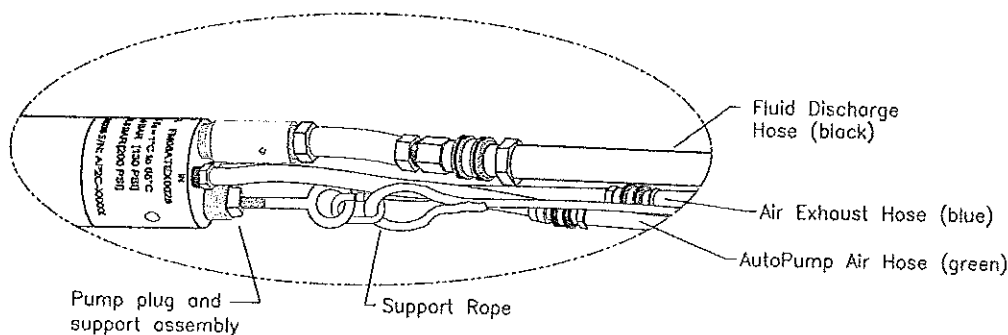


Air hose tie-wrap

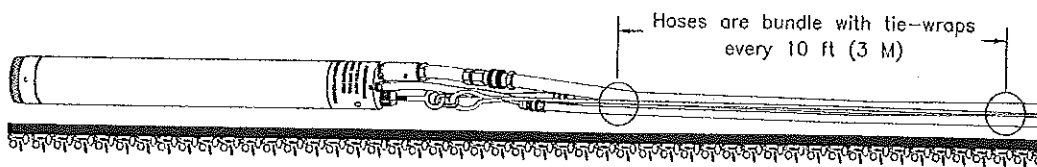
Figure 15 - Hose Bundling: Part 2 of 2

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Pump plug and support assembly



Hoses are bundle with tie-wraps every 10 ft (3 M)

Figure 14 - Hose Bundling: Part 1 of 2

STEP 7- Continue to alternate the air exhaust and the air supply tie-wraps every two feet, stopping about five feet from the wellhead.

STEP 8- Being careful not to leave any sharp edges, cut the excess from the tie-wraps.

You now have a down-well bundled hose assembly that supports both the hoses and the down-well equipment.

AutoPump Installation

Once the installation of the pump support system is completed, you may install the AutoPump in the recovery well.

Note:

Submerging the pump before supplying it with air will result in fluids entering the exhaust hose. Those fluids will be discharged from the exhaust hose during the first few cycles of the pump. If such discharge will not be confined to the well, the operator may wish to install the pump with a low air pressure supplied to the pump. To obtain the value of that low pressure in psi, multiply the number of feet that the pump is to be submerged by one-half (0.5).

WARNING:

Be sure that the fluid discharge has a closed valve during such process because the pump may have enough pressure to begin pumping fluid from the well.

STEP 1 - Lower the pump until it is at the desired level.

STEP 2 - Secure the pump by tying off (securing) the support line or by placing the well cap on the well.

STEP 3 - Increase the air pressure to the pump until the pump is pushing the fluid out at the desired rate. With sufficient air pressure (at least 10 to 15 psi over the vertical static head), the AutoPump will gradually draw down the fluid level in the well to the level of the pump. The time required for this draw down varies with the yield of the well as compared to the flow rate of the pump. The maximum recommended continuous operating pressure is 130 psi.

The pump rate can be increased slightly by increasing the air pressure to the pump. However, under conditions with high inlet pressures and little discharge resistance, some air may exit with the fluid. That would be due to a brief residual pressure in the pump which discharges fluid (and air) even after the exhaust valve is opened.

Under normal operating conditions, no air should exit the pump with the fluid.

If the pump is moving air out the fluid discharge and this is undesirable, a needle valve in the air line can be used. This reduces the air flow rate to the pump and thus the pressure buildup in the pump. Alternately, reduce the pressure going to the pump through the pressure regulator.

Adjusting the Pump Cycle Counter

Refer to Appendix F -- Pump Cycle Counter

Chapter 5: Start Up and Operation

Start Up Checklist

In normal operation, the AutoPump System requires little attention.

Before regulating the air pressure to the desired operating pressure, ensure that the following conditions exist:

1. Personal Protective Equipment (PPE) is being used by all personnel.
2. The pump is submerged below the fluid level.
3. All hoses are connected.
4. The exterior air filter is mounted vertically to allow the filter and its bowl drain to operate properly.
5. All out-of-well air and fluid valves are in their correct positions.
6. A method of rapid disconnect and exhaust (or at least a shut off) of compressed air to the pump is available in case of an unexpected occurrence.
7. When pumping is to begin, either gradually raise the air pressure to the pump or gradually open the air valve to the pump to allow the pump and hoses to slowly pressurize. Check for leaks as you do this.
8. As the air pressure overcomes the static and dynamic resistant forces, the pump will begin to cycle. Listen for the periodic exhaust of air from the pump to determine that the pump is working. The pump should push fluid out and then exhaust sharply to fill before pressurizing and pushing the fluid out again.
Cycling can also be monitored by placing an air pressure gauge at the well head and by observing a pulse counter, if one is present.

Observation of System Operation

Observe the system operation for at least 10 pump cycles to ensure everything is working. If the well influx is low so the pump seldom cycles, pour clean water into the well to check on the pump. If allowed, the pump discharge can be directed into the well so the pump will cycle within an acceptable period to allow for observance of operation. Check your local regulations to determine if these practices are permissible.

Note:

The Pump Cycle Counter may have to be readjusted if it is set when the water is recirculating to the well.

After the entire site is operating, return to each well to ensure that the pump and PCCs are functioning properly. The addition of other pumps and possible system back pressure can necessitate air pressure and counter readjustment.

Downwell Testing of the AutoPump

While the AutoPump is in the well, it can be tested by putting compressed air into the exhaust hose of the pump.

Note:

The air supply hose must be shut off or pressurized when this is done.

The compressed air will enter the pump through the exhaust valve and push any fluids in the pump up the discharge tube. If sufficient compressed air is continually supplied, it will also exit the discharge tube and cause the fluid in the discharge hose to be airfited to the surface. This method can be used to lighten the pump and hoses before removing the pump from the well. This process can also show whether the fluid inlet check valve is sealing and if the pump is capable of discharging fluid.

AutoPump Shutdown while Submerged

The AutoPump can be submerged for long periods of time at most sites. If the well environment is such that deposition occurs on stainless steel parts, the operator may wish to raise the pump above the water level during a shutdown of the system.

AutoPump Removal Technique (optional)

By pressurizing the exhaust hose as noted above and airlifting the fluids out of the well, the fluid in an AutoPump and discharge hose can be reduced significantly. This can be used to lighten the system before removing it from the well.

Maintenance Table

A visual check and/or maintenance is recommended at least once every two weeks, but some site environments may demand more frequent service. The following table outlines the recommended minimum schedule for the AP-2 System.

Equipment	Biweekly	Monthly*	As Required
Air Quality Check • Single Stage Filter/Regulator	X		
AutoPump Service			X
Check Pump Cycle Counter	X		
Check Volume Pumped Per Cycle		X	

* Site conditions may require maintenance more often.

The following sections describe each maintenance activity in detail.

Air Quality Check

Single Stage Filter/Regulator Maintenance

Even using air which has some oil and water in it, the AutoPump System should operate trouble-free for years. The air filter is normally a 5 micron filter with a replaceable element.

To replace the element in the air filter on the single stage filter/regulator use the following procedure:

STEP 1 - Disconnect Air Source

- Valve off the air supply and drain the downstream air to the air filter. Or disconnect the blue system air supply hose from the single stage filter/regulator. The air filters will depressurize, allowing them to be safely serviced.

WARNING:

Do not remove a filter bowl that is pressurized.

Chapter 6: Maintenance

General Maintenance

The AutoPump should be relatively free of maintenance. The frequency of maintenance depends upon the nature of the fluids being pumped. Follow these general maintenance checks.

- Periodically inspect all hoses and connections for damage. Make sure that the hoses are not split or cracked, and listen for leaks in the system.
- Even if significant amounts of water enters the air hose, the AP-2 System should perform reliably for years. Check the air filters and filter bowl drains on the filters/regulator for saturation and operation every few weeks.
- Periodically drain the air filters on the air hose to the pumps of collected particles, water and oil. Draining prevents the filter from clogging up or being otherwise damaged. Check the regulator to ensure the pressure setting has not drifted appreciably.
- An automatic drain on the compressor is highly recommended, since such an addition can dramatically increase air filter life and decrease maintenance. Automatic drains are available from QED.
- The pump can be opened up in the field if the area is clean and dry.

STEP 2 - Remove Filter Bowl

- Different styles of air filters are available. The following instructions are given for the most typical filter used, one with 1/4" pipe thread.
- Remove the bowl of the air filter by sliding the button downward and twisting the bowl about 1/8 of a turn. The bowl should slide downward from the upper portion of the filter revealing the filter element. Unscrew the element as you would unscrew a light bulb. Hand tighten the element after replacing it.

Make sure to replace the correct filter element.

- Blue or black filter bowl:
QED Filter element Part No. 205071
- Silver filter bowl:
QED Filter element Part No. 205800

STEP 3 - Bowl Drain**Optional Float Drain**

- Wash out any deposits and oil buildup from the filter bowl with warm water and soap. To make sure the float drain is operating freely, shake it; the drain should rattle. Test the float drain by filling the bowl with water, assembling the bowl to the filter and reconnecting it to the air supply. The water should drain from the bowl. When under pressure, the drain should not leak.

Standard Manual Drain

- With water in the bowl, open the drain and ensure the liquid drains easily. When under pressure and closed, the drain should not leak.

AutoPump Service**AutoPump Shutdown and Removal from Well**

To shut down and remove the AutoPump, follow these directions:

- STEP 1 -** Wait until the pump is in its discharge cycle and then raise it above the water level in the well. This will empty most of the fluid from the pump making it lighter to lift. There will also be less fluid to drain from the pump.

Note:

See Start Up and Operation for optional pump removal technique.

- STEP 2 -** Pull the pump and hoses to the surface.

- STEP 3 -** Shut off the air to the pump and disconnect the air hose from the pump.

- STEP 4 -** Ensure that there is a safe place to drain any fluid from the pump and discharge hose.

- STEP 5 -** Disconnect the fluid discharge hose from the pump.

- STEP 6 -** Drain the fluid by turning the pump upside-down and allowing fluid to flow from the air inlet fitting.

Caution:

Wear gloves and catch the draining fluid in a sump or bucket.

Removing Pump Casing

Follow these instructions for removing the pump casing:

Caution:

When assembling or disassembling the pump, do not rotate the casing. If the casing is turned and if any resistance is felt, stop. This action may cause the float and control rod to rotate with the casing. Instead of rotating the casing, spin the bottom check valve (or plug on a Top-Loading pump) and hold the casing stationary.

Caution:

After troubleshooting is completed and before assembling the pump, slowly move the float through its range to ensure that the lever trips, even if the pump fills and empties slowly.

- STEP 1 -** Insert and hold a spanner wrench on the circumference of the lower head. Rotate a spanner wrench counterclockwise on the lower head assembly. Hold the casing with a handle or a strap wrench. (See Figure 16)

Caution:

Do not leverage any tool against the air inlet or air exhaust fittings. This could damage the fittings.

- STEP 2 -** Once the lower head is unscrewed and removed from the discharge tube, pull the lower head assembly out of the casing.

- STEP 3 -** If the lower head remains in the casing, turn it and remove it from the pump casing.

Note:

The O-rings at the top and bottom of the pump may have swollen due to solvents in the fluid being pumped and therefore make turning the lower head difficult. Prevent the outer casing from turning while removing the lower head.

Cleaning Pump Interior

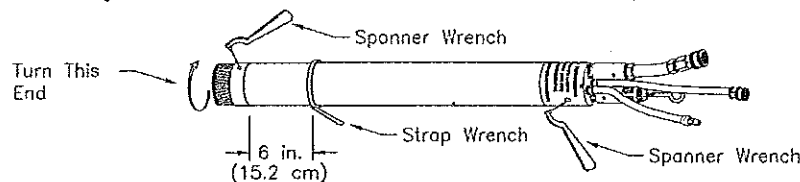
The inner workings of the pump should now be exposed for inspection and cleaning. (See Figure 17, Figure 18, Figure 19, Figure 20, and Figure 21)

Note:

A Scotch Brite® abrasive pad is useful for cleaning debris from the pump components.

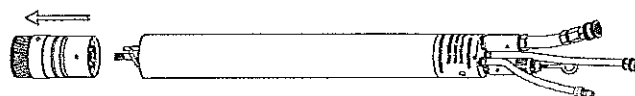
- STEP 1 -** Gently brush off built-up solids from the float, the discharge tube, the pump casing, and the control rod guide.
- STEP 2 -** The pump can be steam cleaned without damage.
- STEP 3 -** Remove thick deposits of hardened scale on the discharge tube by using a handbrush.

- a) Tilt the hose end of the pump down into a container for a few minutes to drain any fluids from the pump. (Remember to wear protective gear: safety glasses, long gloves, aprons, and boots).
- b) Insert and hold a spanner wrench on the circumference of the upper head. The upper head could also be gently held in a pipe vise. Secure the casing with a strap wrench 6 in. (15.2 cm) from the bottom of the pump. Hold the casing and pump head still while rotating the bottom head counterclockwise with the second spanner wrench.



Note: The O-ring at the top and bottom of the pump may have swollen due to solvents in the fluid being pumped and therefore make turning the lower head difficult. Prevent the outer casing from turning while removing the lower head.

- c) Once the lower head is unscrewed from the discharge tube, pull the upper head assembly out of the casing.



- d) Pull the casing from the pump.

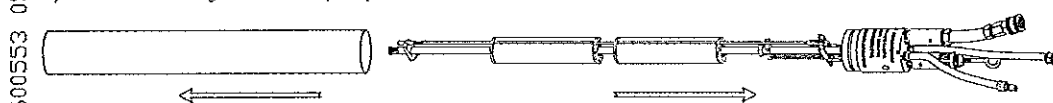


Figure 16 - Removing AP-2 Pump Casing

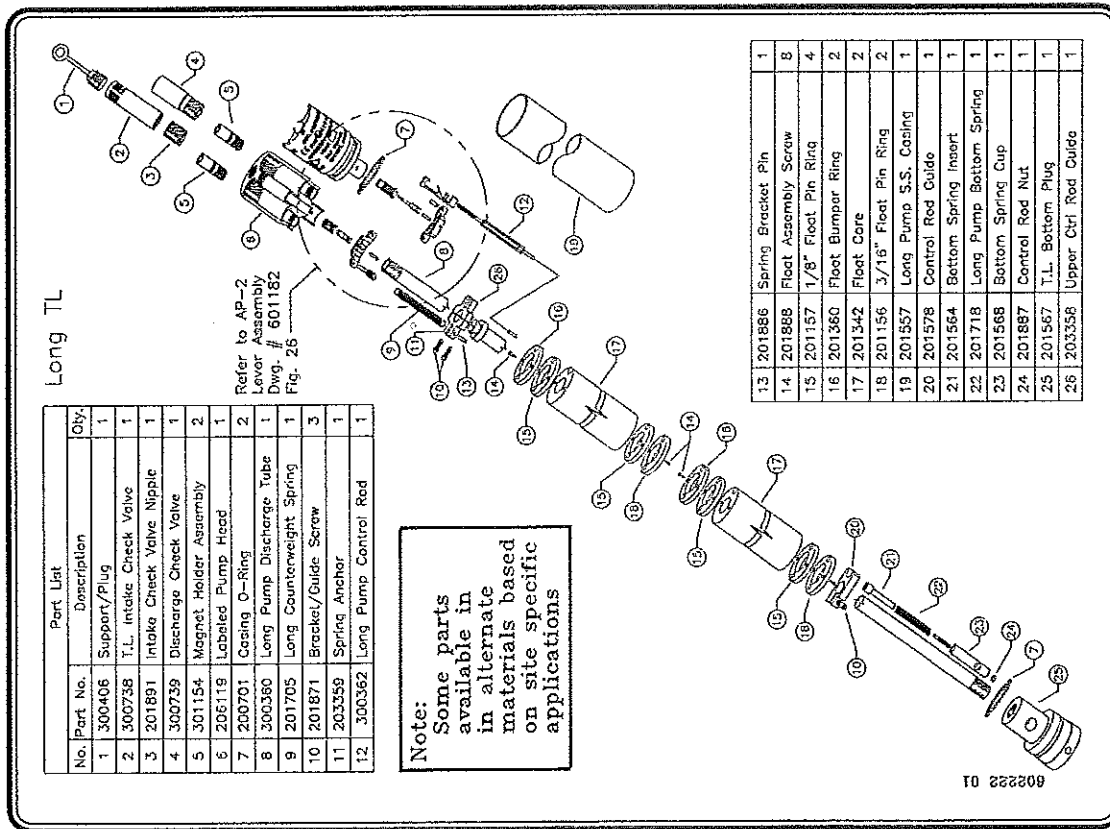


Figure 17 - Exploded view of a Long Top-Loading AutoPump AP-2

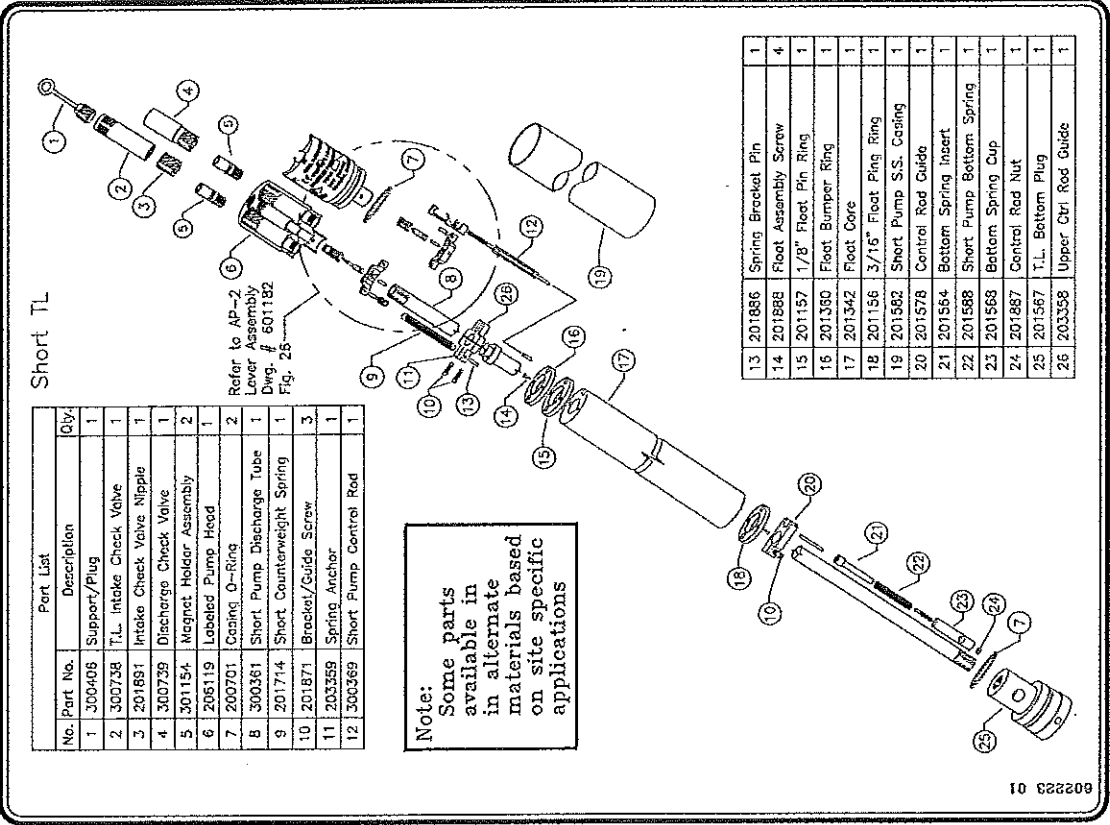


Figure 18 - Exploded View of a Short Top-Loading AutoPump AP-2

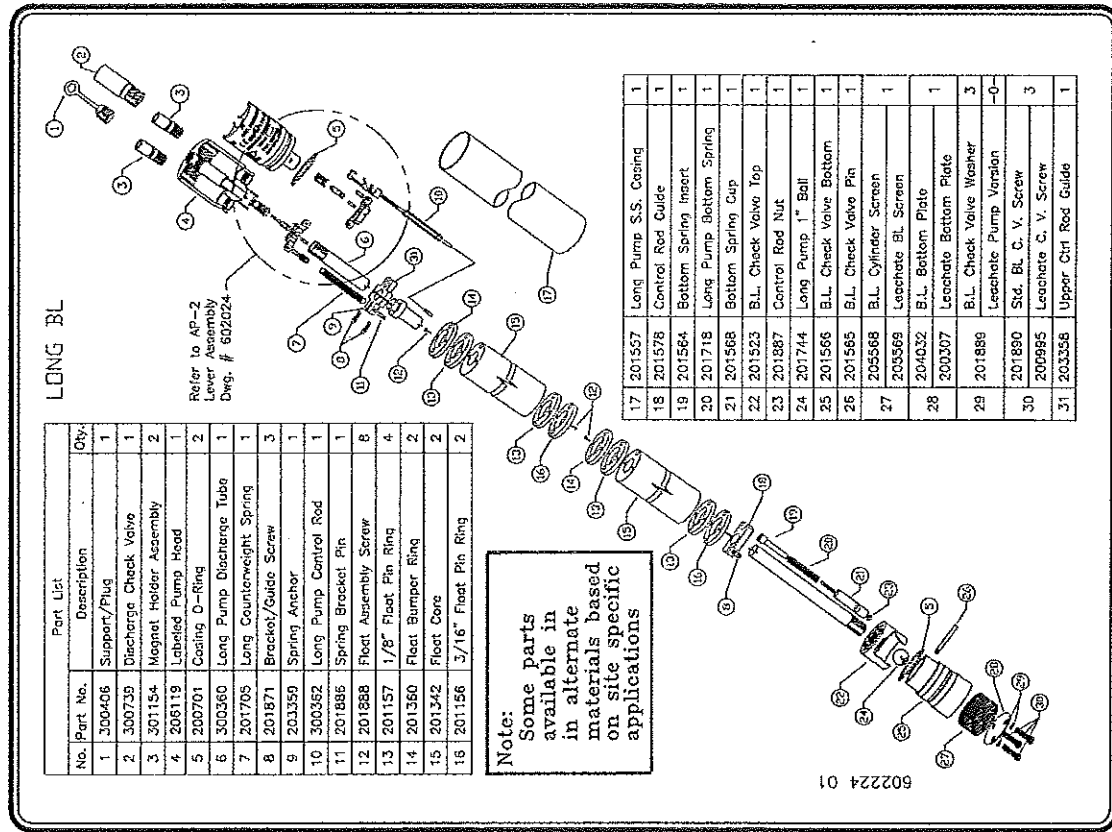


Figure 19 - Exploded View of a Long Bottom-Loading Autopump AP-2

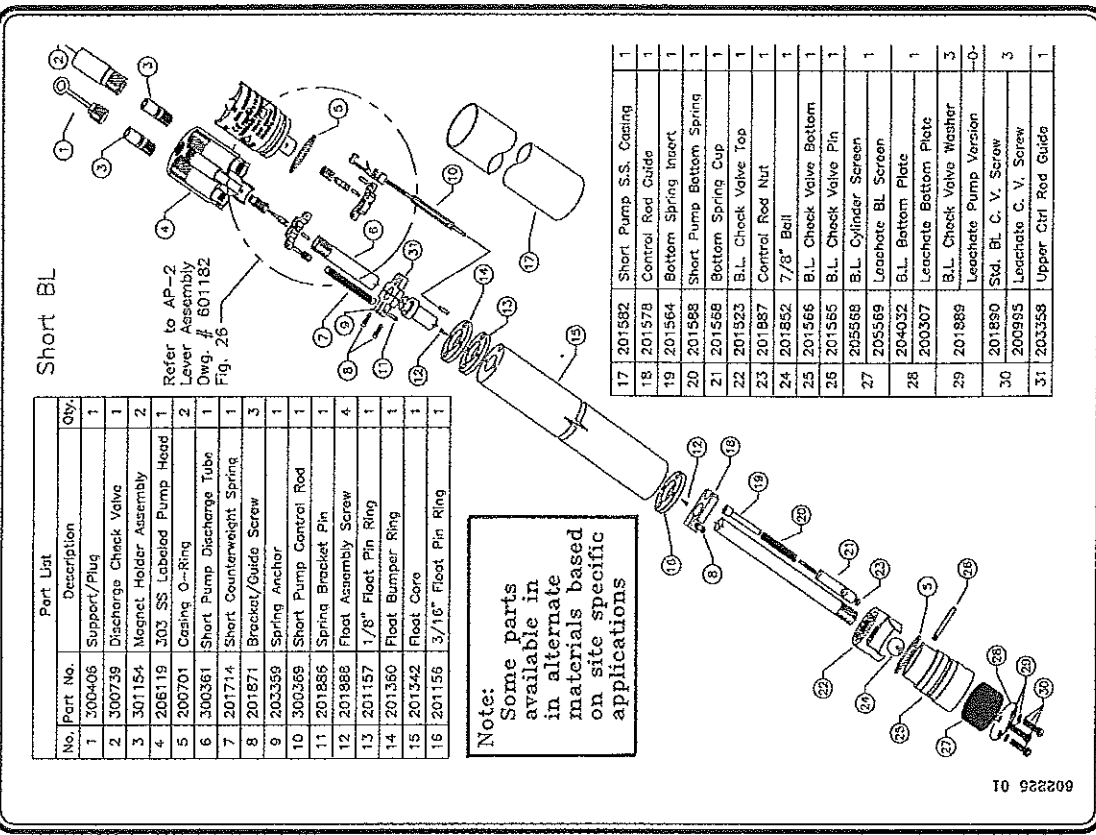


Figure 20 - Exploded View of a Short Bottom-Loading Autopump AP-2

Iron Build-up Cleaning Procedure

After the casing has been removed from the AutoPump please follow the procedure below:

Note:

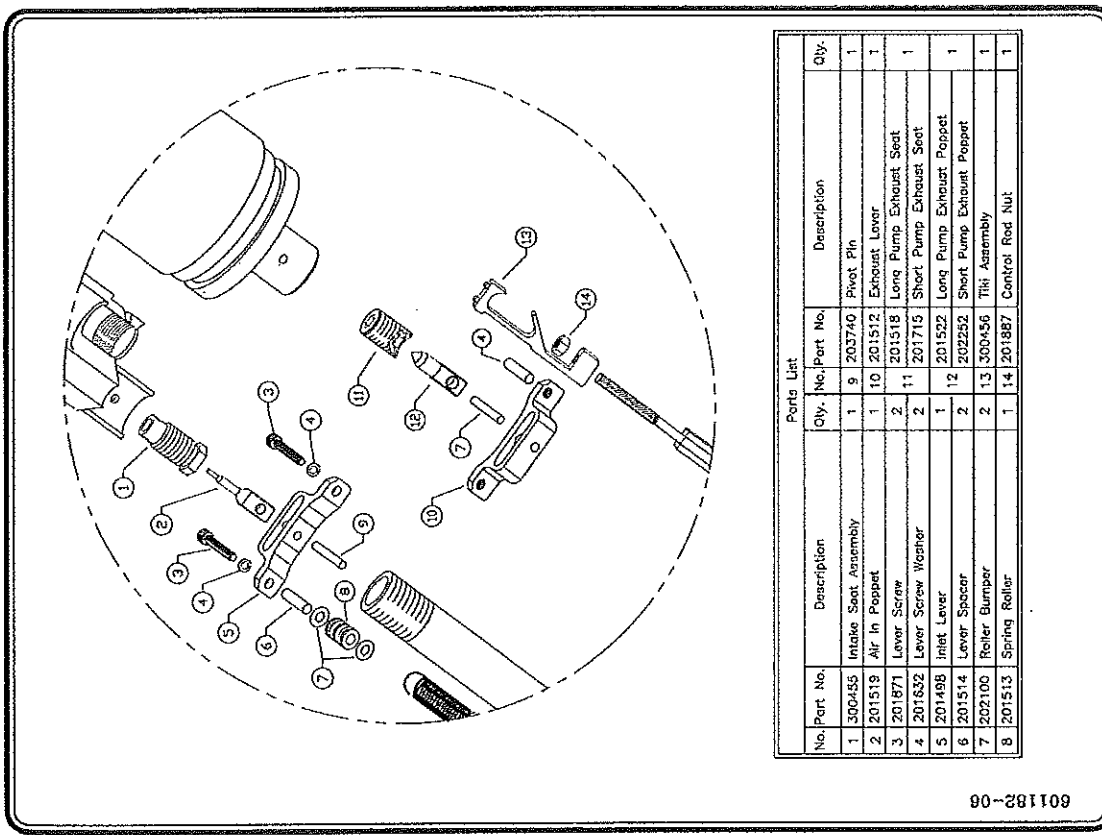
The procedure described below can be seen in the Maintenance Video Tape. This will aid the technicians understanding and ease of properly disassembling the AutoPump, effectively cleaning components and then re-assembling the AutoPump.

- STEP 1 -** The bottom intake check valve assembly should be removed from the casing. (See pages 46 and 47, and Figure 16 on page 48)
- STEP 2 -** Visually inspect both stainless steel fluid discharge pipe for iron build-up or debris. Also, do the same with the float that rides up and down on the SS discharge pipe.
- STEP 3 -** Should there be iron deposits on either or both the discharge pipe or float, then remove the float from the SS fluid discharge pipe as follows:
- Remove the control rod guide. (See Figures 17 through 20)
 - Remove the small SS nut from the bottom spring cup (See Figures 17 through 20) The nut and cup removal will allow you to remove the spring and float from the SS discharge pipe.
- STEP 4 -** The stainless steel fluid discharge pipe can now be cleaned using either a Scotch Brite pad, a wire brush or finally a wire wheel on either a drill or a grinding machine. After removing the iron debris, it is recommended the pipe be water rinsed.
- STEP 5 -** Both the internal and external surfaces of the float will generally require cleaning. The material choices include a Scotch Brite pad, and a light grade 150 sandpaper and a razor or Exacto Knife. The internal surface of the float can be cleaned by attaching some Scotch Brite to the end of a long pipe or screw driver to scrape the inside hole of the float.

Note:

This float should not be soaked in any acids.

Figure 21 - Exploded View of AP-2 Lever Assembly



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- STEP 6 -** The Control rod (See Figures 17 through 20) is the next component to be cleaned. Only use a Scotch Brite pad for removing any iron or debris on this metal alloy control rod.
- STEP 7 -** The final component to be cleaned is the outer AutoPump casing. The fastest and most effective way to clean out the inside surface of the pump casing is to use a three-stone honing tool. The technique is to move the hone in-and-out a half dozen times or so through each end of the casing. The time for the casing cleaning should take no longer than 5 minutes.

The AutoPump is now ready for re-assembly by following the steps above in reverse order.

Installing Pump Casing

- STEP 1 -** Inspect the O-rings to ensure they are capable of sealing (no discernible cuts or abrasions).
- STEP 2 -** Lubricate both inside ends of the casing to a depth of 1/2" with a thin layer of food-grade grease. Ensure that the film reaches the edges of the casing.
- STEP 3 -** Place the bottom check valve (Bottom Loading Pump) or bottom plug (Top Loading Pump) upright on a clean level surface.
- STEP 4 -** Pull the casing down over the check valve or plug.

Warning:

The pump casing has beveled ends that allow it to slide over the O-rings easily. Keep fingers, hands and other body parts away from these edges as they approach the heads. These edges can pinch when the pump casing is slid over the lower and upper heads.

- STEP 5 -** Turn the pump upside down and spin the casing assembly on the discharge tube by hand until the edge of the casing contacts the O-ring on the pump head.

Caution:

Be careful to swing the counterweight inside the pump.

- STEP 6 -** Using a spanner wrench on the bottom fitting, or, a strap wrench on the bottom end of the casing (pump bottom), turn the parts together until the casing just contacts the pump head.

- STEP 7 -** Turn the bottom check valve or the plug in the reverse direction (counter clockwise) so it is looser by 1/4 turn.

Cleaning the Pump Cycle Counter

Refer to Appendix F -- Pump Cycle Counter

Checking Volumes Pumped Per Cycle

See page 23 for information on the AutoPump volumes pumped per cycle. Ensure that volumes correspond with the previous experience on-site, and with the ranges indicated on page 23. If it doesn't correspond, then one of the following may exist:

1. The AutoPump is malfunctioning. (See Chapter 7: Troubleshooting & Repair)
2. The Pump Cycle Counter may not be counting correctly. See Appendix F -- Pump Cycle Counter for troubleshooting procedures.
3. Site conditions (e.g. air pressure, discharge head) may have changed substantially.

Chapter 7: Troubleshooting & Repairs

Problems may occur and usually can be easily resolved by following these instructions. If, after careful reading and service, you cannot resolve the problem, please contact the *QED Environmental Systems (QED)* Service Department at (800) 537-1767.

Caution:

Wear goggles, gloves, and coveralls when servicing this system. After troubleshooting is completed and before assembling the pump, slowly move the float through its range to ensure that the lever will trip even if the pump fills and empties slowly.

Note:

See **Chapter 6: Maintenance** for disassembly and cleaning instructions.

Possible Causes	Symptoms		
Detailed Instructions Follow this Chart	Pump not cycling	Pump Cycles, but volume is reduced or there is no discharge	Air in fluid discharge
1. Air supply	X		X
2. Fluid level	X		
3. Air exhaust restricted	X		X
4. Fluid Inlet clogged	X		
5. Debris, scale or very viscous fluid	X	X	X
6. Float pins	X		X
7. Debris in air inlet valve	X		
8. Fluid check valve		X	
9. Valve lining	X		

Troubleshooting

1. Air Supply:

- If the air pressure is too low, or if the flow is severely restricted, the pump will not cycle. Check the flow by inserting the pump air fitting part way into the air line socket. A healthy discharge of air should result.
- If the air pressure exceeds the design limitations of the pump, the pump may fail to cycle, or the exhaust valve may have locked up and cause air to enter the fluid discharge.

2. Fluid Level:

- The fluid level must be above the fluid inlet on a Top-Loading pump. On a Bottom-Loading pump, the fluid must be no lower than 10 inches (Short pump) or 17 inches (Long pump) below the head of the pump.

3. Air Exhaust Restricted:

- The exhaust line must not be kinked, plugged, or too small in diameter.
- The air exhaust outlet must be above the fluid level.
- If the air exhausts in the well, the well must be vented to the atmosphere or a functioning vapor recovery line.
- If the air exhausts to the atmosphere (outside the well) and a vacuum is drawn on the well, the pump may fail to fill. In order for the pump to fill under these adverse conditions, the pump must be submerged to make up for the pressure difference between the atmosphere and the partial vacuum in the well.

The pressure difference, expressed as feet of water column (FT. W. C.), is how far the fluid must be above the pump before it can fill.

- See **Appendix D** if there is a vacuum on the well.
- Ice may be forming on the exhaust valve seat due to the temperature drop that accompanies expansion of compressed air. Restrict the exhaust to lower the expansion rate of the exhaust. Restrict the air inlet hose or lower the pressure to reduce the rate of incoming compressed air. The previous three suggestions may reduce the flow rate from the pump. Submerge the head of the pump, if it is not already submerged. Protect the air lines from low temperatures and freezing by burial or insulation.

4. Fluid Inlet Clogged:

- If the fluid inlet screen is clogged with debris, or if a Bottom-Loading pump is on the bottom of the well, water cannot enter the pump.

5. Debris, Scale, or very Viscous Fluid:

- If debris, scale or a very viscous fluid has accumulated inside the pump, the float may not move freely up and down, or the control rod may not slide easily through the float.
- Clean the float, control rod, and the casing. See **Chapter 6** for cleaning instructions.

6. Float Pins:

- Determine if any part of the float foam itself can contact the discharge pipe. Move each end of the float back and forth, sideways, to ensure that the pins on the plate of the float prevent float foam contact with the pipe. Call **QED** for repair options.

Note:

- If viscous materials cause continual problems, contact QED for possible solutions.

7. Debris in Air Inlet Valve:

- Open the pump. Connect the air supply. Adjust the air pressure to 40 psi. Pull the control rod down. Listen to determine if significant volume of air leaks through. A leak rate of 5 SCFH or less is within specification (this is a small leak that produces bubbles in a soapy water solution). If so, clean the valve by blowing air or water through it from both ends.
- If air still leaks through the valve with the control rod down, the air-hose must be removed to access the valve inlet to check for debris in the valve or in the hose pigtail.
- Push the rod upwards. If little or no air passes through, remove the air-in hose to access the valve inlet. Blow air through the valve from the poppet side to clear debris from the ball and seat.

8. Fluid Check Valves:

- Open the pump. Hold the pump vertically and pour water into the discharge check valve. If water flows through, clean the valve.
- The valve assembly may be soaked in a solvent. Be careful not to damage the teflon ball with the tools used for cleaning.
- Inspect the ball for wear. If it is too small to seal on the seat, or if it is obviously out of round, replace the check valve.
- If the pump is a Bottom-Loading design, inspect the seat of the bottom check valve for debris and wear. Clean or replace if necessary.
- If the pump is a Top-Loading design, remove the fluid inlet check valve, turn it upside down, and pour water into it. If water flows through, clean it.

9. Air Inlet Valve Timing:

- Remove the pump casing. Connect the air supply. Push the control rod end of the lever up to the head. Lower the rod slowly and stop at the point where the sound of air drops dramatically.
- The levers should be nearly ± 10 degrees parallel to the lower surface of the head at this point.
- Check if the lever is jamming due to an improper adjustment.

Returning Equipment for Service

If the equipment needs to be returned to QED for servicing, please follow these steps:

- | | |
|-----------------|--|
| STEP 1 - | Call the QED Service Department and obtain a Return Material Authorization (RMA) number. Please have available the customers contact person's name, company name and address, phone number, fax number, reason for the return, and the names of the chemicals to which the equipment has been exposed. |
| STEP 2 - | Clean all equipment before shipping. See Equipment Cleaning Requirements at the end of this section. |
| STEP 3 - | If the equipment must be cleaned after it arrives at QED, the customer will be charged for the cleaning and disposal of material, if necessary. (Cost can be \$200.00 per piece of equipment cleaned.) Drain and dry all equipment after cleaning. |
| STEP 4 - | Package the equipment so that it will not be damaged in shipment. Use bubble pack rather than styrofoam flakes as packing material. |
| STEP 5 - | Ship the equipment via a carrier and service level (i.e., one-day, two-day shipping) in consideration of probable service time and return shipment time. |
| STEP 6 - | It is recommended that such shipments be insured so if the shipment is badly damaged or lost, the customer can replace the equipment at little or no cost. |
| STEP 7 - | Include the contact's name, company, phone number and RMA number given by QED. |
| STEP 8 - | Write the RMA number on the outside of the packaging so it will be directed immediately to the QED Service Department. |

Equipment Cleaning Requirements

If the equipment is to be shipped to another site or to the factory for service, it needs to be thoroughly cleaned before leaving the site. Cleaning the equipment protects the user (sender), the shipper, and the receiver from dirt and/or contaminants. If the equipment is not cleaned prior to shipping for servicing, it may be severely delayed, refused or the shipper may be charged a cleaning fee. Before packing and shipping, ensure that the equipment is dry inside and out.

The following is a list of equipment and how it should be cleaned prior to shipment.

Hoses and Fittings

- | | |
|-----------------|--|
| STEP 1 - | Pump clean water or water with a gentle soap solution (e.g. Dove Dish Soap) through the pump to remove free product and particles. |
| STEP 2 - | Rinse all soap off of the equipment. |
| STEP 3 - | Soak and rinse the outside of the unit with water to remove loose debris and dirt. |
| STEP 4 - | Steam clean inside and out to remove difficult dirt and contaminants. |

Caution:

Use low pressure (less than 40 psi) when steam cleaning.

AutoPumps

- | | |
|-----------------|--|
| STEP 1 - | Pump clean water or water with a gentle soap (e.g. Dove Dish Soap) solution through the pump to remove free product and particles. |
| STEP 2 - | Rinse all soap off of the equipment. |
| STEP 3 - | Soak and rinse the outside of the unit with water to remove loose debris and dirt. |
| STEP 4 - | Steam clean inside and out to remove difficult dirt and contaminants. |

Caution:

Use low pressure (less than 40 psi) when steam cleaning.

With the previous information, obtain the flow rate by using the following steps:

- On the horizontal scale, find the depth in the well at which the pump will be located.
- Trace that depth upwards to the line for the air inlet pressure you selected.
- Travel horizontally over to the vertical scale and read the flow rate.

Example: A long Bottom-Loading AP-2 with a 1/2-inch discharge hose and 70 psi supply pressure positioned 100 feet below ground and submerged 6 inches below the fluid will produce about .77 gallons per minute (GPM).

The same pump submerged 10 feet below the fluid produces 1.0 GPM.

Note:

These flow rates are only applicable for the designated well head conditions. Any additional resistance from out-of-well equipment (e.g. surface hoses, valves, etc.) will affect the values shown on these curves.

Appendix A: Performance Curves

These curves were derived from in-house tests using a pump with average air flow capacity. Flow rates in the field may vary slightly due to temperature, air quality, flow restrictions and minor differences in pump adjustments. Flow rates can be affected due to the natural cooling effect of compressed air expansion. If this cooling effect is lowering the flow rate, decreasing the air pressure to the pump can actually increase the flow rate in some cases. Another way to reduce freezing of water vapor in compressed air is to use an air dryer on the compressed air line.

The following charts show the performance flow rate curves for the Long and Short pumps.

Long Bottom and Top-Loading AP-2 AutoPumps

- See Figures 22 and 23.

Short Bottom and Top-Loading AP-2 AutoPumps

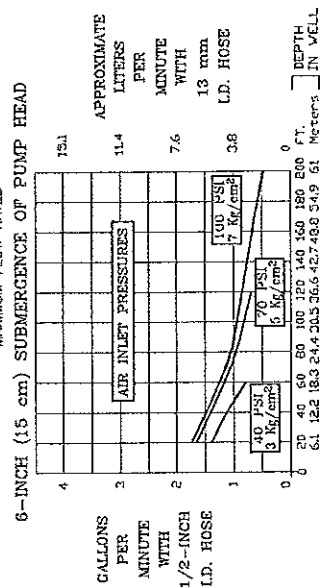
- See Figures 24 and 25.

The curves are categorized by pump type, hose size, depth of submergence and air supply pressure. To determine the flow rate a pump will produce, the following information must be known:

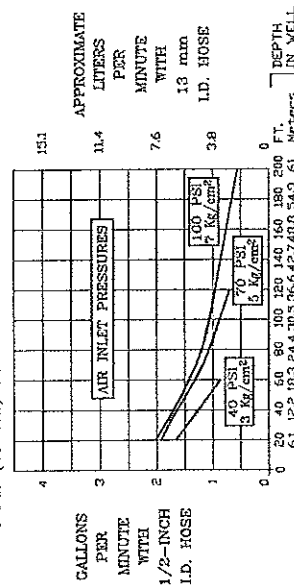
1. **Pump** – Long or Short; Top- or Bottom-Loading.
2. **Discharge hose size** – 1/2 inch is standard. A larger inside diameter may yield a higher flow rate. This depends on site conditions.
3. **Fluid Inlet Submergence** – Select the submergence depth of the pump below the fluid under normal operating conditions.
4. **Air pressure.**

1/2-INCH (13 mm) INSIDE DIAMETER DISCHARGE HOSE

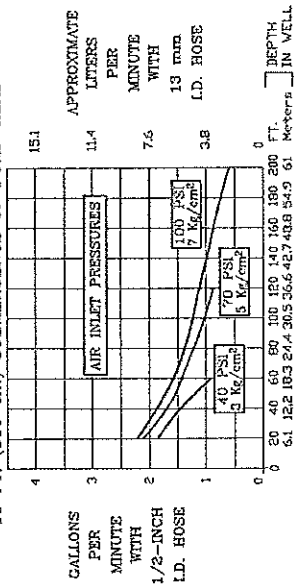
MAXIMUM FLOW RATES *



2 FT. (60 cm) SUBMERGENCE OF PUMP HEAD



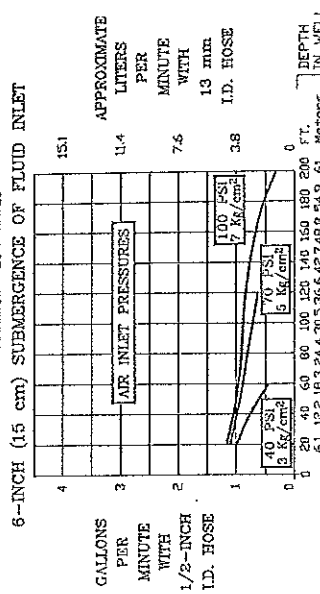
10 FT. (300 cm) SUBMERGENCE OF PUMP HEAD



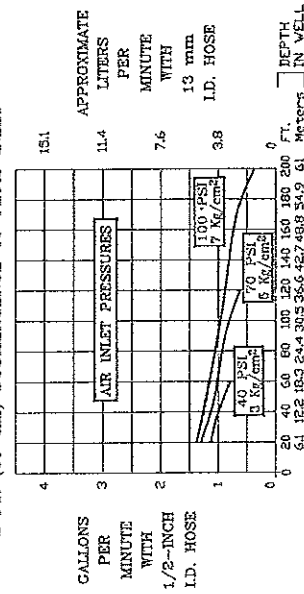
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1/2-INCH (13 mm) INSIDE DIAMETER DISCHARGE HOSE

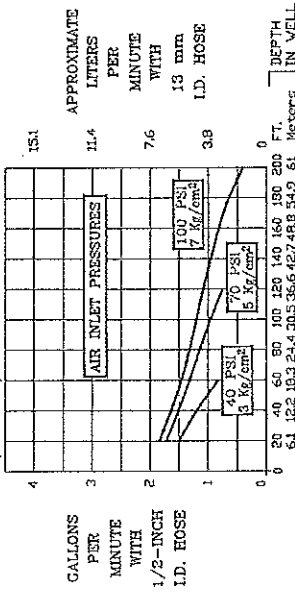
MAXIMUM FLOW RATES *



2 FT. (60 cm) SUBMERGENCE OF FLUID INLET



10 FT. (300 cm) SUBMERGENCE OF FLUID INLET



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Figure 22 - Long AP-2/BL Performance Curves:

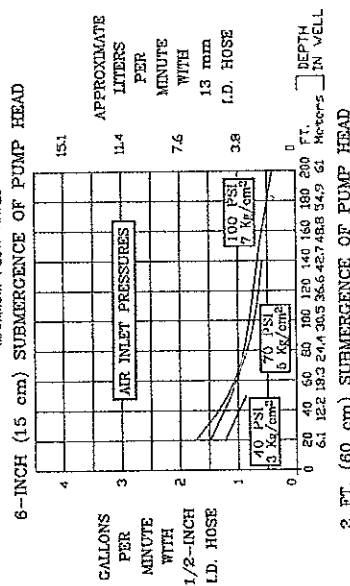
1/2-inch (13 mm) I.D. Discharge US and METRIC UNITS

Figure 23 - Long AP-2/TL Performance Curves:

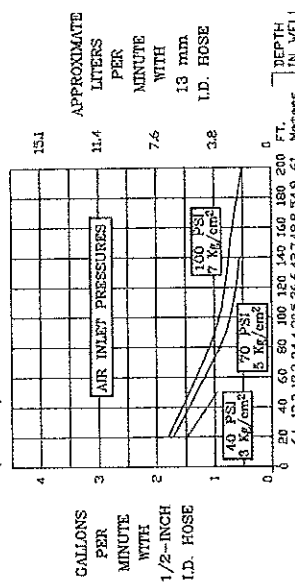
1/2-inch (13 mm) I.D. Discharge US and METRIC UNITS

1/2-INCH (13 mm) INSIDE DIAMETER DISCHARGE HOSE

MAXIMUM FLOW RATES *



2 FT. (60 cm) SUBMERGENCE OF PUMP HEAD



10 FT. (300 cm) SUBMERGENCE OF PUMP HEAD

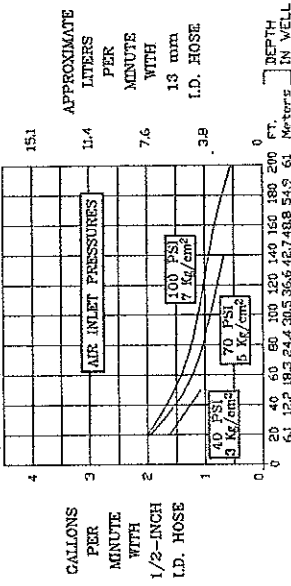
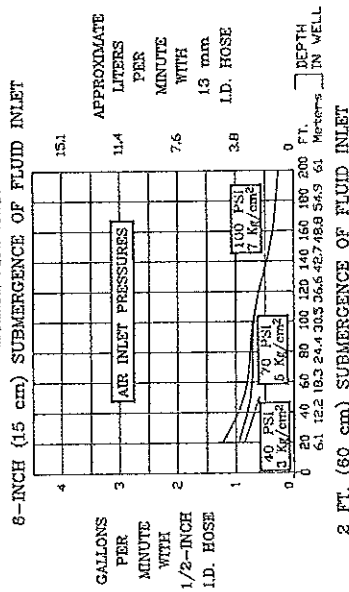


Figure 24 - Short AP-2/BL Performance Curves:

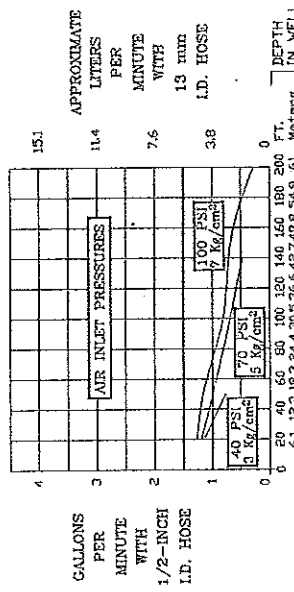
1/2-inch (13 mm) I.D. Discharge US and METRIC UNITS

1/2-INCH (13 mm) INSIDE DIAMETER DISCHARGE HOSE

MAXIMUM FLOW RATES *



2 FT. (60 cm) SUBMERGENCE OF FLUID INLET



10 FT. (300 cm) SUBMERGENCE OF FLUID INLET

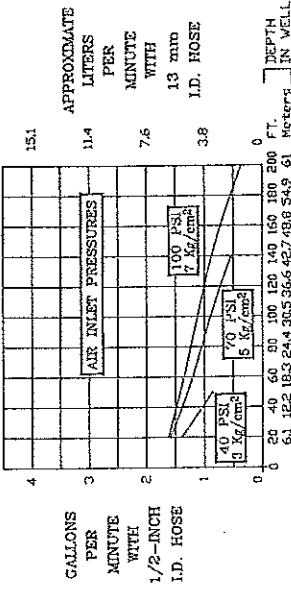


Figure 25 - Short AP-2/TL Performance Curves:

1/2-inch (13 mm) I.D. Discharge US and METRIC UNITS

If the yield of the well is less than the maximum pump rate predicted by the appropriate flow rate graph, multiply the actual fluid recovery rate times the air use factor. This air use can be diminished if the regulator pressure is reduced. The maximum pump rate for the lower air pressure can be predicted using the performance curves.

Note:

These air use factors are only applicable for the designated well head conditions. Any additional resistance from out-of-well equipment (e.g. surface hoses, valves, etc.) will affect the factors shown on these curves.

Appendix B: Air Consumption Curves

The following charts show the air consumption curves for the Long and Short length AP-2 AutoPumps. These curves can be used to estimate air use and compressor sizing. A compressor with reserve capacity is recommended.

The following charts show the air consumption curves for the Long and Short pumps.

Long Bottom and Top-Loading AP-2 AutoPumps

- See Figures 26 and 27
- See Figures 28 and 29.

The curves are categorized by pump length, hose size, depth of submergence and air supply pressure. To determine the amount of air used for each gallon of fluid pumped, the following information must be known:

1. **Pump** – Long or Short.
2. **Discharge hose size** – 1/2-inch I.D. A larger diameter may yield significantly lower air use rates, depending upon site conditions.
3. **Air pressure.**

With the above information, obtain the probable flow rate by using the following steps:

- On the horizontal scale, find the depth in the well at which the pump will be located.
- Trace that depth upwards to the line for the air inlet pressure you selected.
- Travel horizontally over to the vertical scale and read the air use factor.

Example: A long Bottom-Loading pump with a 1/2-inch discharge hose and 70 psi supply pressure positioned 50 feet below ground will use about 0.60 SCF of air for each gallon of fluid pumped.

The maximum flow rate for the pump, taken from the flow rate curves, when there is 10 feet of fluid over the pump and it is positioned 50 feet below ground is about 1.5 GPM.

Multiply the 1.50 GPM flow rate times the 0.60 SCF air use factor to generate a .90 SCFM (Standard Cubic Feet per Minute) air use result.

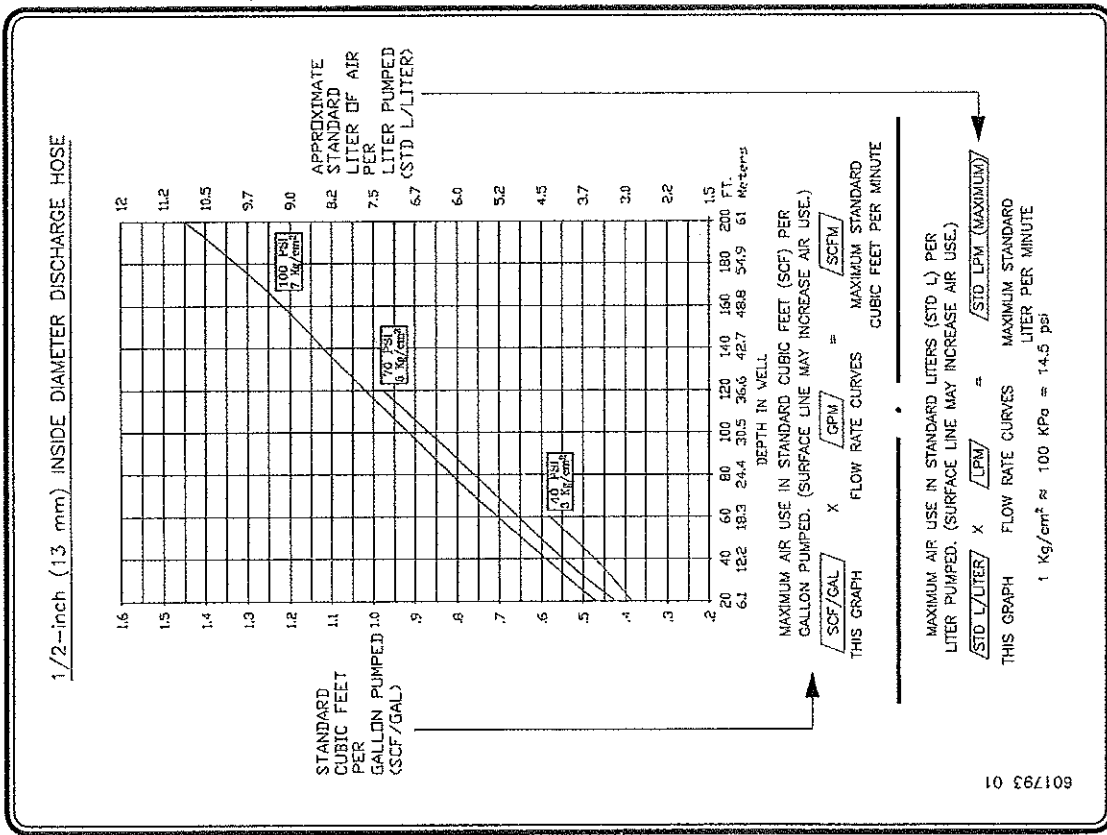


Figure 26 - Long AP-2/BL Air Consumption Curves:

1/2-inch (13 mm) I.D. Discharge US and METRIC UNITS

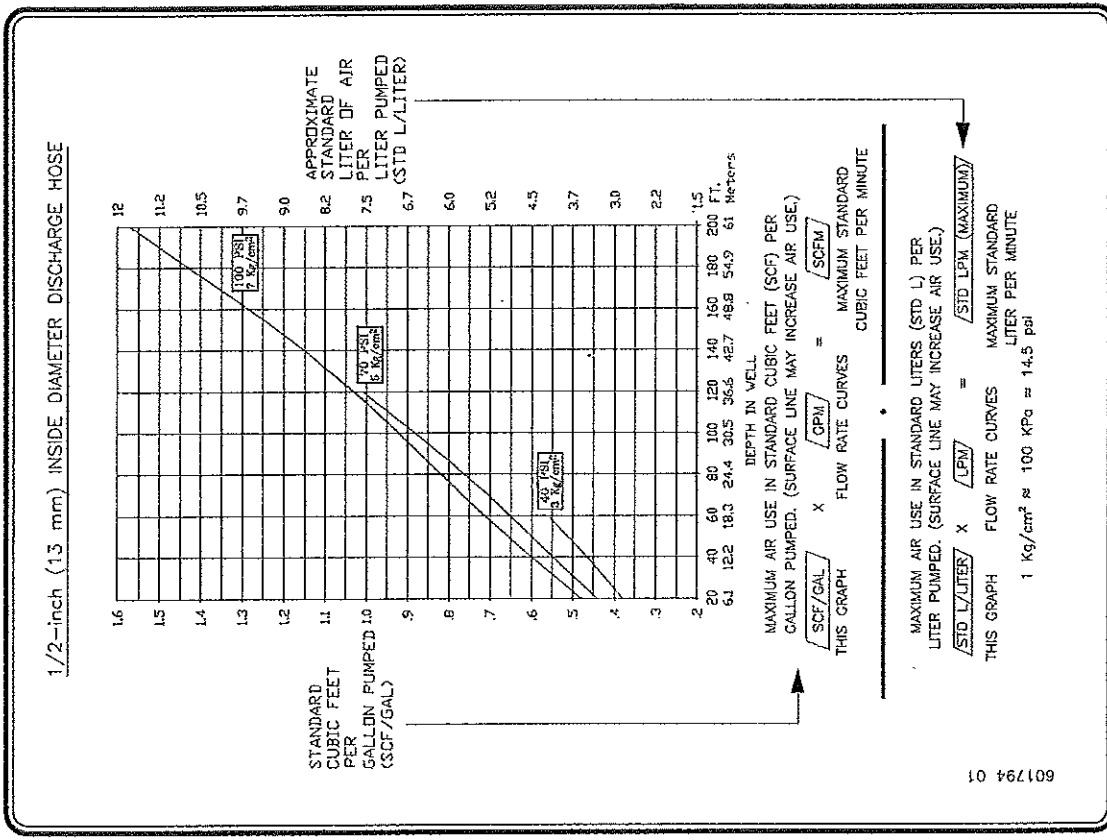


Figure 27 - Long AP-2/TL Air Consumption Curves:

1/2-inch (13 mm) I.D. Discharge US and METRIC UNITS

1/2-inch (13 mm) INSIDE DIAMETER DISCHARGE HOSE

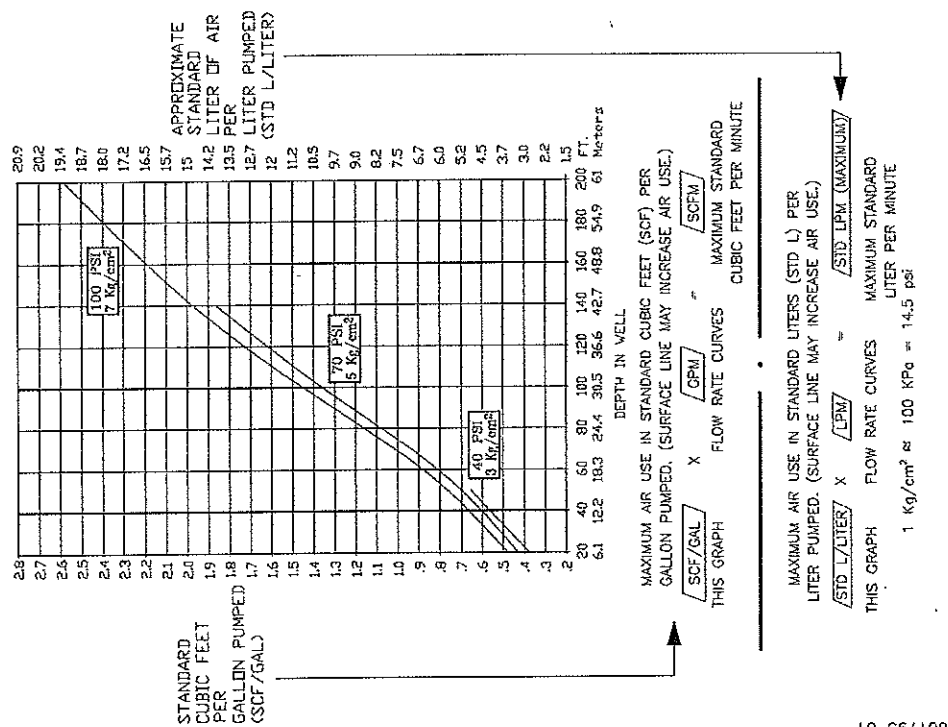


Figure 28 - Short AP-2/BL Air Consumption Curves:
1/2-inch (13 mm) I.D. Discharge US and METRIC UNITS

1/2-inch (13 mm) INSIDE DIAMETER DISCHARGE HOSE

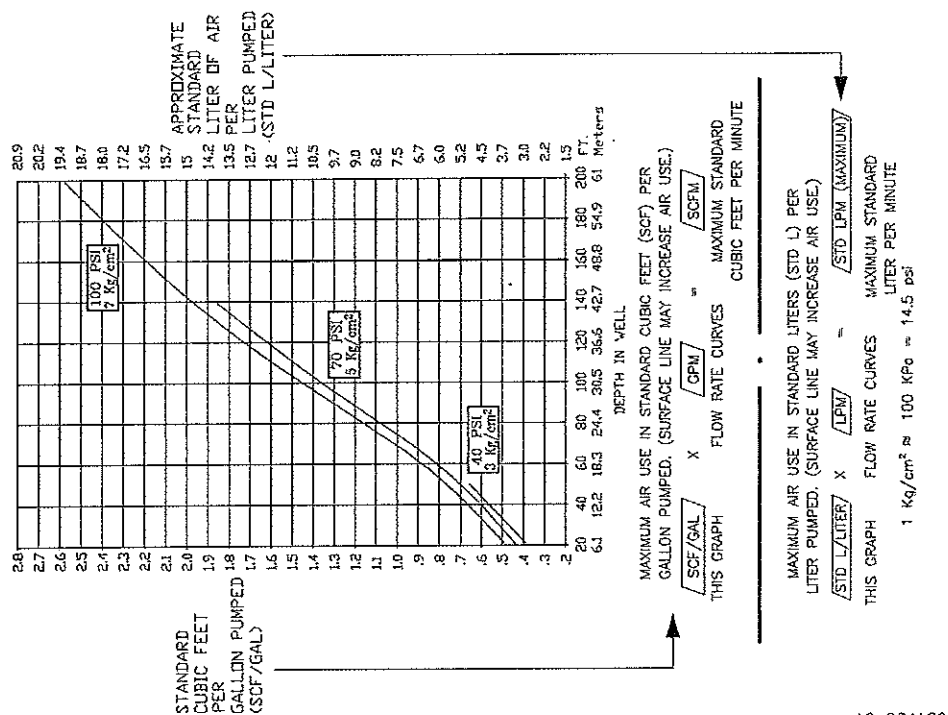


Figure 29 - Short AP-2/TL Air Consumption Curves:
1/2-inch (13 mm) I.D. Discharge US and METRIC UNITS

Appendix C: AP-2 Conversions

The AP-2 can be converted the from Top- to Bottom-Loading or Bottom- to Top-Loading by rearranging the check valves.

For Bottom-Loading to a Top-Loading conversion, see Figure 30 on the next page.

For Top-Loading to Bottom-Loading conversion, see Figure 31 on page 76.

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INSTRUCTIONS

- 1- Remove the pump support/plug (a).
- 2- Remove the old teflon tape from both the threaded hole (z) and the threaded plug (a).
- 3- Thread (a) into the intake/check valve assembly (b).
- 4- Put teflon tape on (x).
- 5- Thread (a)(b) into (z).
- 6- Hold the pump by inserting one of the spanner wrenches (c) into the blind hole on the side of the upper head.
- 7- Unscrew the lower head intake assembly (d) with the other spanner wrench (c), holding the outer casing from rotating.
- 8- Remove the O-Ring from the lower head intake (d) and place it on the supplied lower head plug (e).
- 9- Thread the supplied plug (e) to the fluid discharge tube by turning the spanner wrench (c).
- 10- Do not use sealant or tape on (d) or (e).

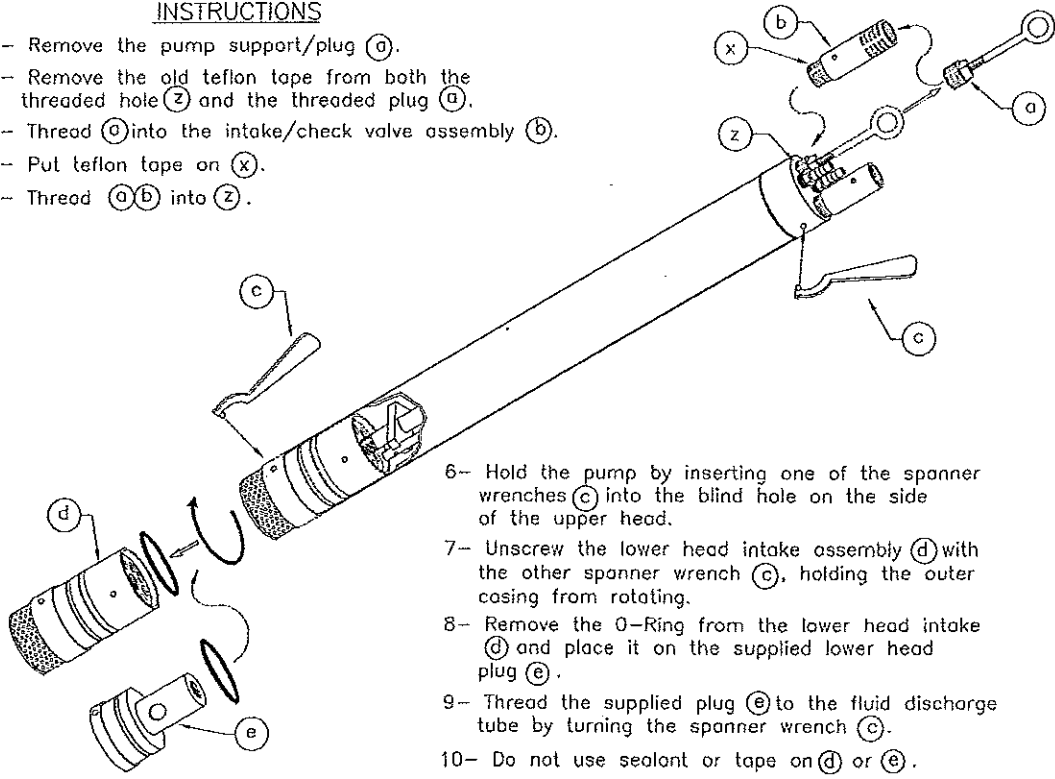


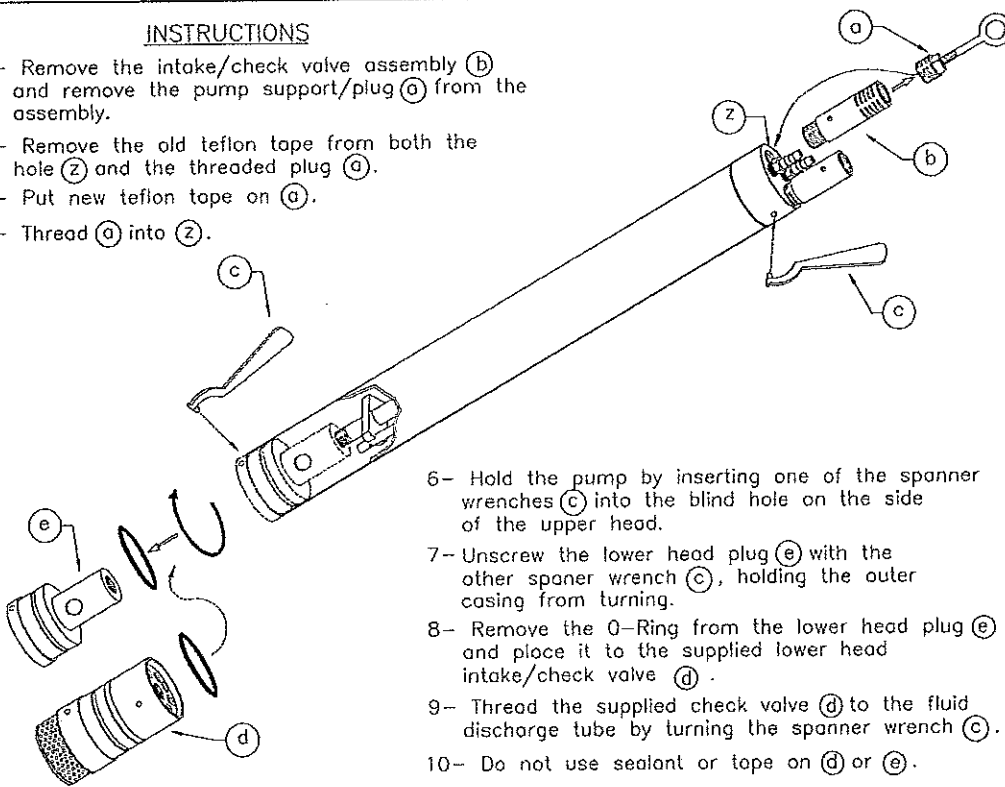
Figure 30 - Conversion From Bottom-Loading to Top-Loading AutoPump

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INSTRUCTIONS

- 1- Remove the intake/check valve assembly (b) and remove the pump support/plug (a) from the assembly.
- 2- Remove the old teflon tape from both the hole (z) and the threaded plug (a).
- 3- Put new teflon tape on (a).
- 4- Thread (a) into (z).



- 6- Hold the pump by inserting one of the spanner wrenches (c) into the blind hole on the side of the upper head.
- 7- Unscrew the lower head plug (e) with the other spanner wrench (c), holding the outer casing from turning.
- 8- Remove the O-Ring from the lower head plug (e) and place it to the supplied lower head intake/check valve (d).
- 9- Thread the supplied check valve (d) to the fluid discharge tube by turning the spanner wrench (c).
- 10- Do not use sealant or tape on (d) or (e).

Appendix D: Vacuum on Well

The AP-2 will work in a well that is under vacuum, but there are several conditions that must be considered. These conditions are described in Figure 32, Figure 33, Figure 34, and Figure 35 on the following pages.

Figure 31 - Conversion From Top-Loading to Bottom-Loading AutoPump

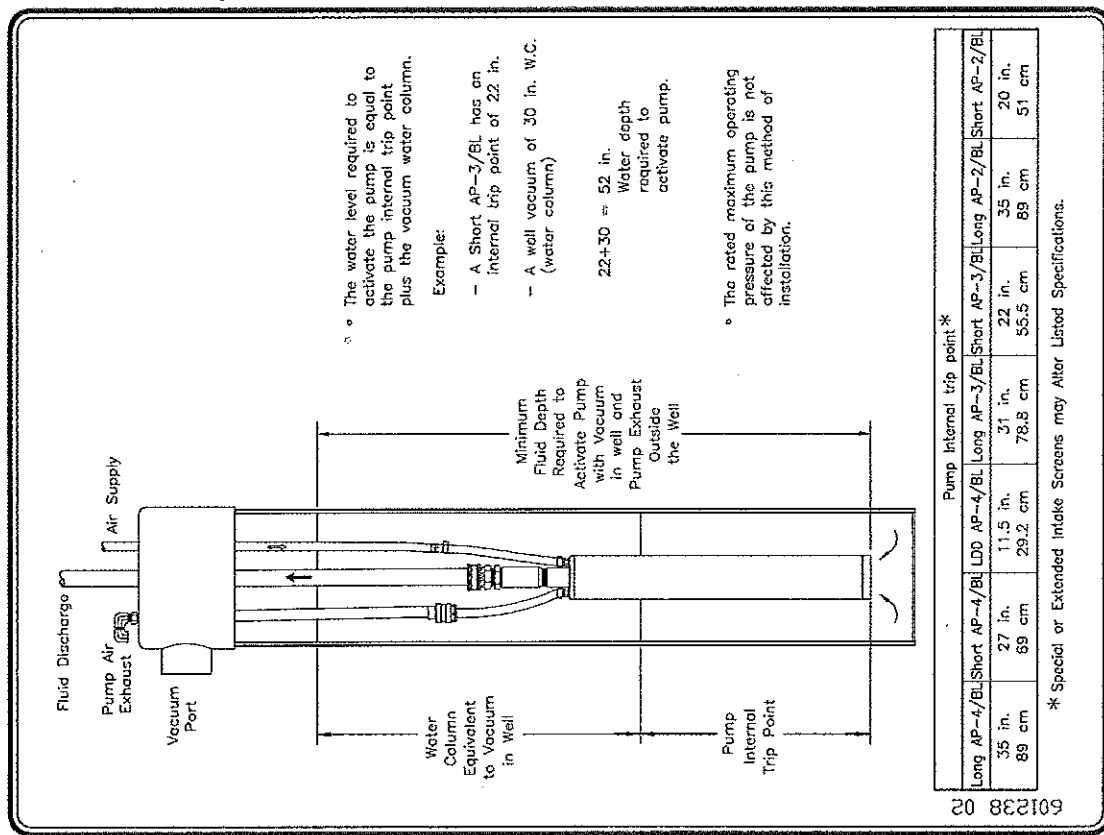


Figure 32 - AP-2/BL with Vacuum In the Well and Pump Exhaust Outside the Well

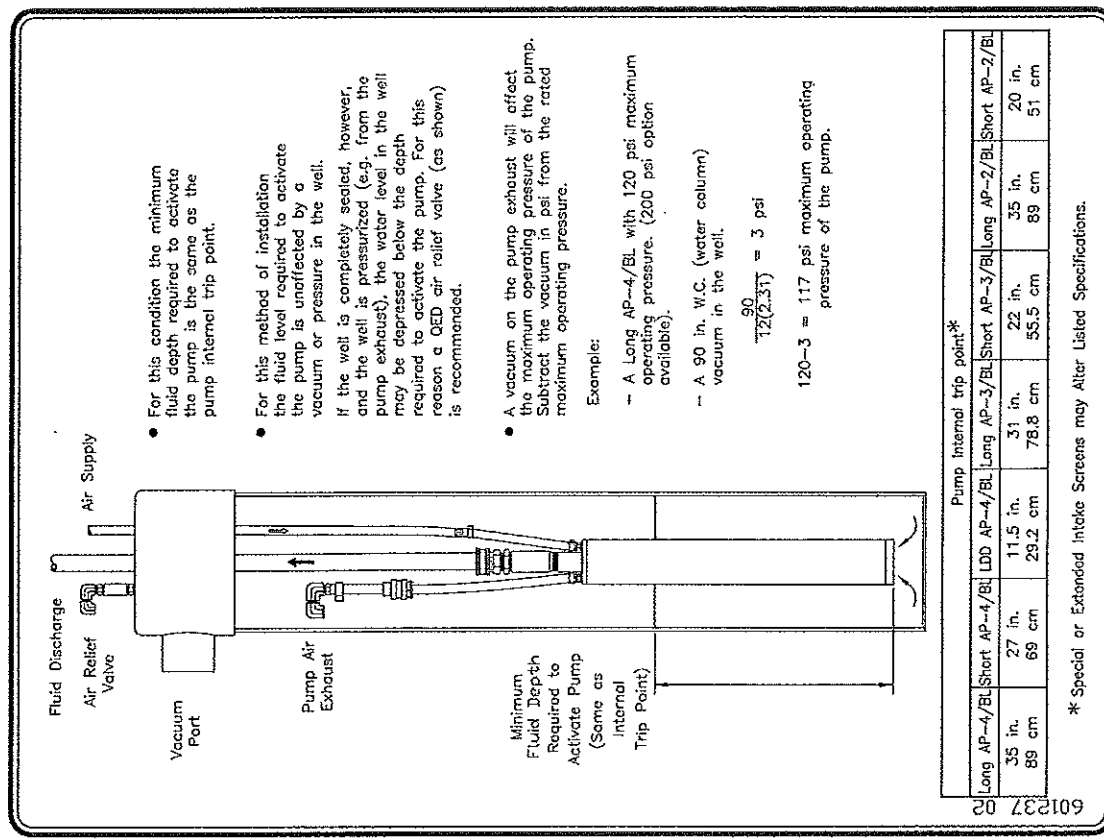


Figure 33 - AP-2/BL with Vacuum In the Well and Pump Exhaust In the Well

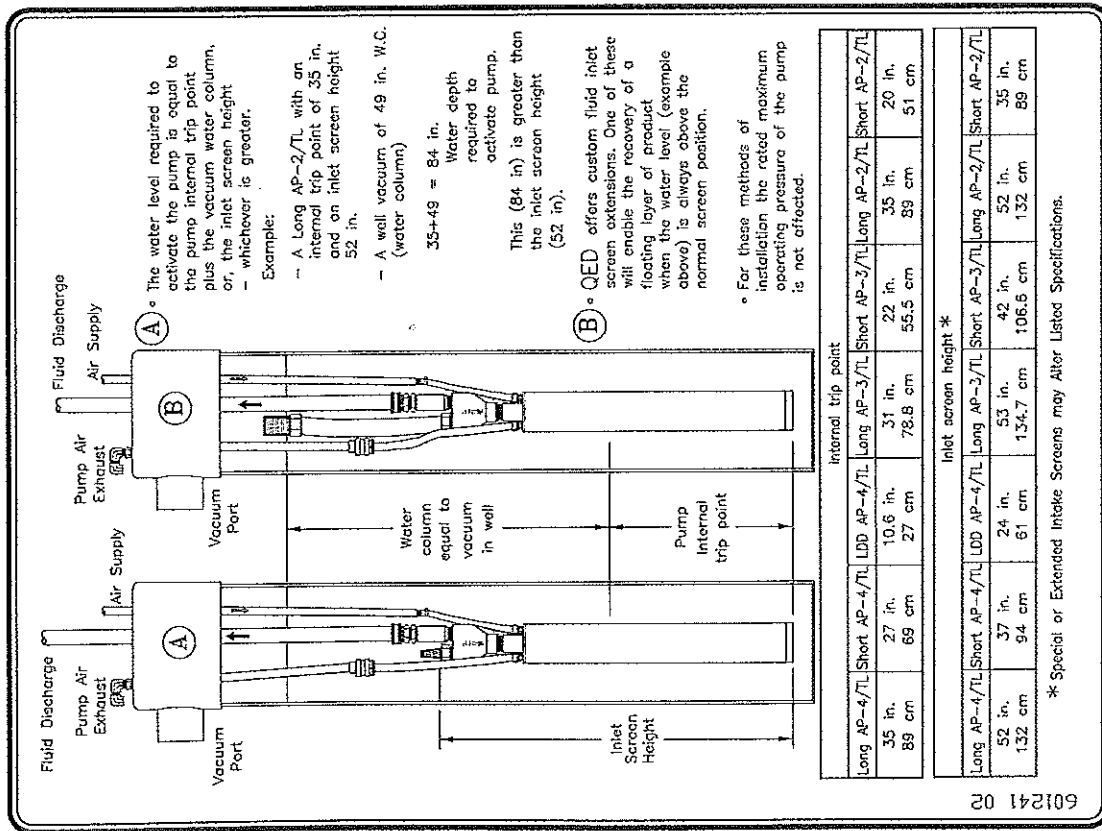


Figure 34 - AP-2/TL with Vacuum In the Well and Pump Exhaust Outside the Well

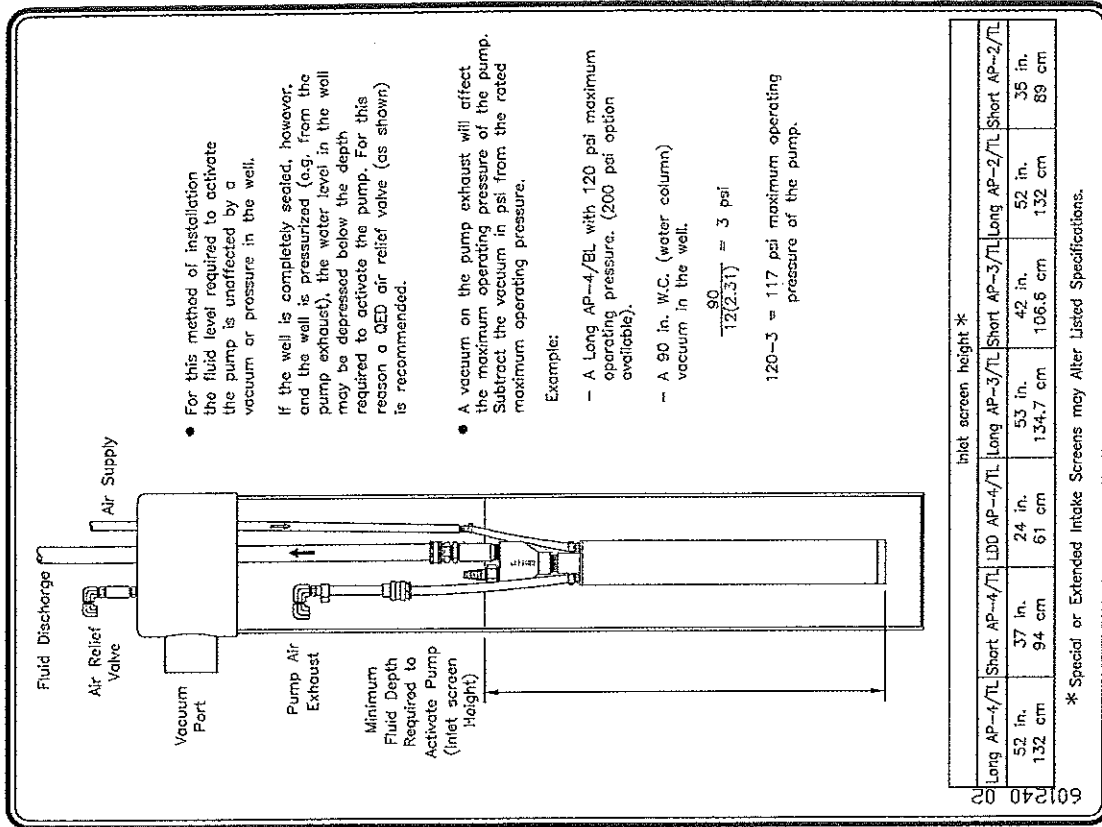


Figure 35 - AP-2/TL with Vacuum In the Well and Pump Exhaust In the Well

Appendix E: Air Compressor

Installation

The air compressor provides the air necessary to drive the system. The compressed air normally passes through a single stage filter/regulator and then into the AutoPump System.

WARNING:

The air compressor and any other electrical equipment used with this pneumatic system must be positioned outside of any area considered hazardous because of the possibility of the presence of combustible materials.

Compressors start and stop automatically. Do not place hands or objects on or near any part of the compressor.

QED Environmental Systems (QED) does not usually supply the air compressor. It is best to buy the compressor from a local supplier who provides service. Follow the instructions that accompany the compressor. This appendix is only a general guide, not an in-depth manual for the compressor.

WARNING:

When compressing air, parts of a compressor can get very hot. Do not touch the motor, compressor or piping until it has cooled down.

Caution:

The air compressor should be located outside and away from any area which may contain flammable fumes.

Note:

An automatic drain on the compressor receiver tank significantly reduces the load on the air filters, extends the life of the filter elements, and reduces system maintenance. If your air compressor is not equipped with an automatic drain, you can obtain one from QED.

Note:

The information on compressors is for reciprocating piston compressors. A centrifugal compressor produces about twice the air of a piston compressor for the same horsepower.

- As a general rule, a piston-type compressor should not start more than six times per hour. Also, a piston compressor should not operate more than 50% of the time.
- At a minimum, the air compressor should be in the 1 to 1-1/2 HP range with a 20 gallon holding tank.
- At sea level a 1 HP air compressor provides approximately 3.5 cubic feet per minute (SCFM) of free air.
- For compressor sizing, all down well and surface hosing and other resistance must be known.
- The 2 and 3 HP compressors should have 60 to 80 gallon tanks.
- A 5 HP compressor should have at least an 80 gallon tank, and the 7-1/2 HP and 10 HP compressors should have at least a 120 gallon tank.
- Storage tanks and automatic pressure shut-off switches provide a buffer so the compressor motor can cool between each time the tank is pressurized.
- Compressors are generally equipped with a pressure activated start/stop switch. This switch senses the pressure of the air in the holding tank (reservoir) of the compressor. The pressure difference between when the compressor starts and when it stops may need to be adjusted to maintain compressor starts to six times per hour. Refer to the compressor manufacturer for guidance.

Electrical Wiring for the Compressor

- All electrical connections should be made by a licensed electrician and in accordance with the electrical code for particular areas. The wiring should provide full motor nameplate voltage and current at the motor terminals during start-up.
- Wiring hookup must be made so that the compressor flywheel turns in the proper direction. There is usually an arrow on the flywheel to indicate the proper rotation direction.

Motor Overload Protection

- To prevent motor damage, provide all compressor motors with overload protection. Some motors are furnished with built-in thermal overload protection.
- To prevent motor damage due to low voltage or undue load imposed on the motor, use larger motors in conjunction with starters that include thermal overload units.
- To determine the proper thermal protection (thermal element), consider the load to be carried, the starting current, the running current, and the ambient temperature. Recheck electric current characteristics against nameplate characteristics before connecting wiring.

Caution:

Fuses are for circuit protection only and are not to be considered motor protection devices. Consult your local power company regarding proper fuse size.

Air Quality and Pressure

- In compressors requiring lubricating oil, do not use synthetic oil. Synthetic oil can adversely affect some materials. Non-detergent 30 Weight oil is recommended for compressor lubrication.
- Install an automatic drain on the compressor holding tank to periodically drain the water and oil which collects in the tank. This will help to extend air filter cartridge life.
- Do not lubricate the compressed air coming out of the compressor. QED equipment is designed to run without the aid of lubricated air. The air filters are designed to remove oil from the compressed air.
- The compressor should provide between 70 and 250 pounds per square inch (psi) of air pressure to the system. The filter (with metal bowl) and regulator will accept a maximum of 250 psi air pressure. Air filters with plastic bowls will accept a maximum of 150 psi. Maximum output air pressure setting on the regulator is 120 psi.

Maintenance

Although QED usually does not supply the compressor, this section is provided to help the operator. If the system receives clean, oil-free air from the compressor, maintenance will be significantly reduced.

Inspection - Check for possible damage in transit. Almost all compressors are shipped with the flywheel unmounted. Do not force the flywheel on the crankshaft. Use a wedge-in "slot" provided for easy assembly. Checked belt alignment and tension carefully.

Placement - A compressor is a source of sparking. Place it out of what is considered a hazardous area by local and national fire and electric codes.

Mounting - Install in a clean, dry, well-ventilated location away from any source of heat such as a boiler or radiator. If the unit is to be fastened to a foundation, support and shim all four feet firmly to remove all stress from the unit. The compressor flywheel should be mounted towards a wall with a minimum clearance of 18 inches to allow for circulation of air and additional clearance if required for servicing.

Lubrication - Fill the crankcase to the level mark on the oil gauge. Use the type of industrial compressor oil that is recommended by the manufacturer for the ambient temperature. Do not use synthetic oil, as these can damage the pumps.

Pressure and Speed - Never operate the compressor at pressures or speeds in excess of those recommended by the factory. Every compressor assembly must have a safety valve installed and should be set at either the maximum tank working pressure or 25 psi over the actual pressure of the pump, whichever is less.

Daily - Check for unusual noise, failure to compress, overheating, oil leaks, and vibration. Correct before serious damage can develop. Drain all condensate from receiver and traps.

Weekly - Examine intake filter elements and if they are dirty, remove and clean or replace them. Check oil level and add oil if necessary. Do not fill over level mark on sight glass. Keep compressor clean for efficient operation and appearance.

Monthly - Check and tighten all bolts and nuts as required. Check air connections for air leaks and tighten as required. Check belt tension.

Note:

These are standard maintenance procedures which the QED Environmental Systems "warranty" does not cover. QED does not manufacture compressors. Always use the manufacturer's instructions and recommendations when installing, using and servicing the compressor. These notes are included as a general guide only.

Troubleshooting

Although QED usually does not supply the compressor, this section is provided to help the operator. If the system receives clean, oil-free air from the compressor, maintenance will be significantly reduced.

I. Problem: Slow Pumping or Insufficient Pressure**Solutions:**

- A. Clogged filter element: clean or replace.
- B. Leaks in air lines: retighten or replace.
- C. Insufficient air capacity: add compressor capacity, consult dealer.
- D. Head valves: clean or replace.
- E. Slipping belts: adjust or replace.
- F. Power cord is too long for the power needed, causing a voltage drop: use a short cord with large wires. Do not coil the power cord.

II. Problem: Excessive Oil Consumption**Solutions:**

- A. Too much oil: drain out excess to level mark on sight glass.
- B. Worn rings: replace rings.
- C. Clogged air intake filters: clean or replace.
- D. Improper Oil: check the manufacturer's recommendation.

- E. Oil leaks: check and tighten all bolts and nuts to manufacturer's specifications. Replace gaskets if necessary.

- F. See "Overheating."

III. Problem: Overheating**Solutions:**

- A. Pump running backwards: reverse rotation.
- B. Inadequate ventilation or high ambient temperature: move intakes to outside and install filters to protect against weather and foreign objects. Force air through enclosure if necessary.
- C. Restricted air intakes: clean or replace.
- D. Loose or restricted valves: retighten, clean, or replace.
- E. Incorrect installation: allow 18 inches minimum between wall and flywheel.
- F. Insufficient air capacity: consult dealer. Seal all air leaks.
- G. Insufficient oil: check level and consult dealer.

IV. Problem: Oil or Water in Air**Solutions:**

- A. Drain tank more often: use an automatic drain.
- B. Reposition intake to take in cooler, drier air.
- C. Install water dropouts with automatic drains in the air lines.
- D. Install an after cooler prior to the air storage tanks.

Appendix F: Pump Cycle Counter

Introduction

QED Environmental Systems (QED) Pump Cycle Counters (PCC) are air pulse detecting units that are placed in-line between a pump and its air supply. They require no external power source. A digital readout displays the number of times a pump cycles. PCCs consist of a magnet housing, an internally located magnet shuttle, and a digital display.

The position of the digital display is adjustable, allowing the counter to be used on many different kinds of pumps and at various distances from the well. (See Figure 36)

The PCC can be used on at least 75 feet (23 m) of 3/8 inch (9.5mm) or 1/4 inch (6.4mm) air hose with air pressure supply 30% higher than the total developed head.

Performance of the PCC is dependent upon the air hose size and the length, the type of pump and the system pressure. Air flow control valves can affect counter performance. Please contact QED for application assistance.

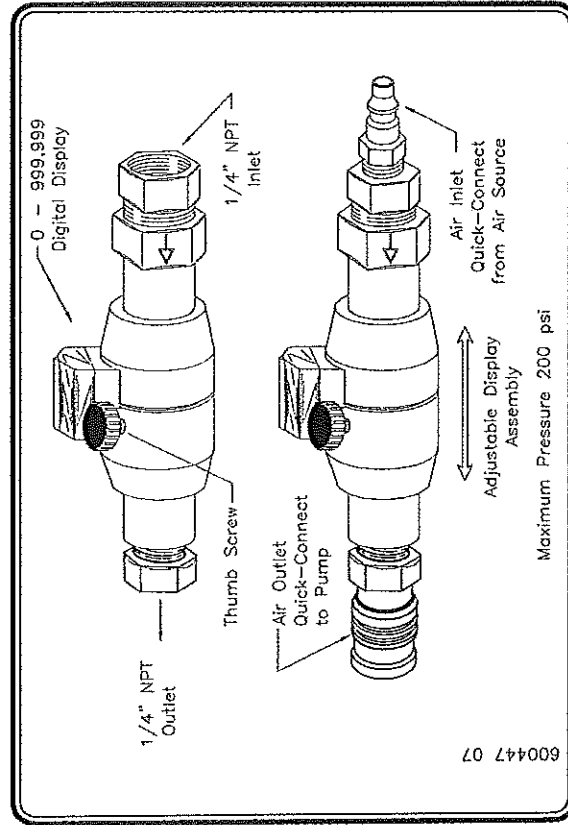


Figure 36 - Pump Cycle Counter

Pump Cycle Counter Operation/Installation

When a pneumatically operated pump such as the QED AutoPump® has filled, it triggers itself "On". This allows air to flow to the pump until a certain volume of fluid has discharged. The air stops; the pump fills; then the cycle continues to repeat.

A PCC mounted between a filter/regulator and a pump senses air flow to the pump. In a piston-like action, the internally located magnet shuttle moves forward (in the direction of air flow) during the "On" pulse and returns to a seated position in the "Off" period. (See Figure 37)

The digital display senses the completion of this "to-and-from" movement and records the cycle, increasing the number one digit that is shown in the clear plastic display.

This process repeats itself for each pump cycle.

Note:

The PCC will not function properly beyond certain distance limits from the pump, or above or below optimum air line diameters. Safe limits are as follows:

AP-4: 250 ft. maximum with 1/4 inch or 3/8 inch ID air hose.

AP-3: 150 ft. maximum with 1/4 inch or 3/8 inch ID air hose.

AP-2: 75 ft. maximum with 1/4 inch or 3/8 inch ID air hose.

Contact QED for advice.

Digital Display

The digital display has the following features:

- A six digit counter that counts from 0 - 999,999 before resetting itself.
- A clear viewing lens that is water-and-impact resistant.
- **Optional:** Switch for remote electronic readout available upon request. (See Figure 39)

Magnet Housing

The magnet housing has the following features:

- A clear mark on the outside that indicates the correct direction of air flow.
- It is made of anodized aluminum.
- It has a 1/4-inch FNPT inlet and a 3/8-inch or 1/4-inch FNPT outlet.
- It handles air pressures from 40 - 200 psi.

Hardware Options

Inlet and outlet openings can be fit with no-mix quick-connects or barb connections depending on site requirements.

Materials of Construction

QED PCCs are made of the following:

- Anodized Aluminum
- Stainless Steel
- Engineering Plastics
- Brass
- Viton

Pump Cycle Counter Weight - 0.4 lbs (0.2 kg)

Adjusting the Pump Cycle Counter

Note:

To get the most reliable performance, adjust the counter after it is installed and the pump is running. Typically, the Display Assembly that holds the digital readout is set 1/2-inch (13mm) from the upstream hex. Before adjusting the PCC be sure there is no air leak downstream of the counter. A leak could influence the travel of the magnet shuttle when the pump cycles.

- STEP 1 -** Loosen, but do not remove, the thumb screw (item #3) that locks the Display Assembly. (See Figure 38)
- STEP 2 -** Slide the Display Assembly on the magnet housing (item #6) (back and forth or up and down as the case may be) while the pump is cycling until the digital display (item #4) advances once per pump cycle.
- STEP 3 -** Slowly slide the Display Assembly upstream towards the air source until the digital display (item #4) stops counting. Using a pencil, mark this point on the magnet housing (item #6).
- STEP 4 -** Slowly slide the Display Assembly in the opposite direction, towards the pump, past where the counting occurs until the digital display (item #4) stops counting. Using a pencil, mark this point on the magnet housing (item #6).
- STEP 5 -** Position the Display Assembly between the two extremes where counting did not occur. Lock the Display Assembly in place with the thumb screw. (item #3)

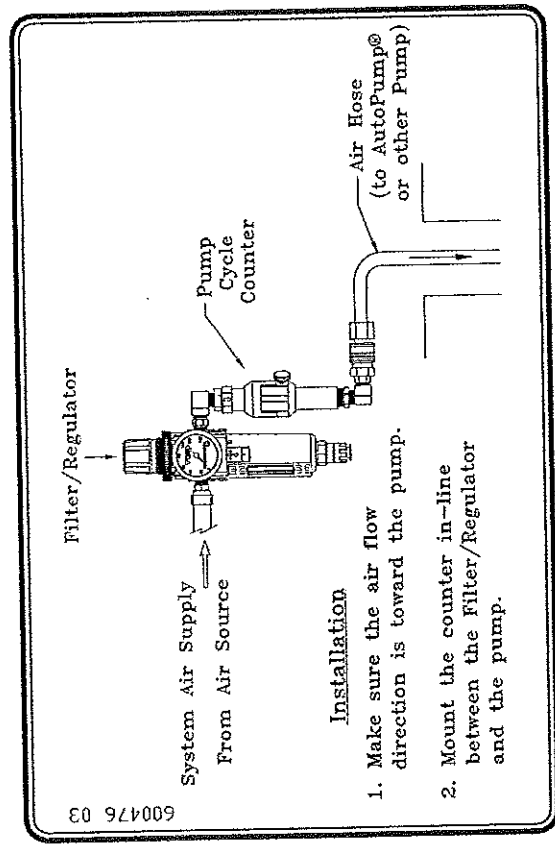


Figure 37 - Pump Cycle Counter Installation

Cleaning the Pump Cycle Counter

Sometimes the PCC does not count due to either the magnet shuttle or the spring hanging up inside the magnet housing. The counter components can be cleaned by *gently* washing the unit in warm water. A soft brush may be used to remove debris. To clean the inside, follow these instructions: (See Figure 38)

Note:

As a precaution, mark and/or measure with a pencil, the set distance (See Figure 38) so that it can be reset in the same position should movement occur. Do not loosen the thumb screw (item #3) since movement of the Display Assembly is unnecessary for cleaning.

- STEP 1 - Remove the inlet fitting (item #11), not the thumb screw (item #3) as noted above.
- STEP 2 - Remove the magnet shuttle assembly (item #9) and the spring (item #8) from inside the magnet housing (item #6).
- STEP 3 - Inspect the magnet shuttle assembly (item #9), the spring (item #8), and the inside of the magnet housing (item #6) for burrs which may restrict the magnet shuttle assembly (item #9) movement.
- STEP 4 - If burrs are present, remove the burrs and smooth the part. Replace the PCC if necessary.
- STEP 5 - Use a soft bottle brush and warm water to clean the inside of the magnet housing.

Caution:

Be careful not to scratch the pieces.

- STEP 6 - Let the parts dry.
- STEP 7 - Reassemble the PCC.

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- NOTE:**
- 1 - All threaded joints are Teflon sealed.
 - 2 - Loosen Thumb screw (3) to adjust position of display assembly.

Display Assembly

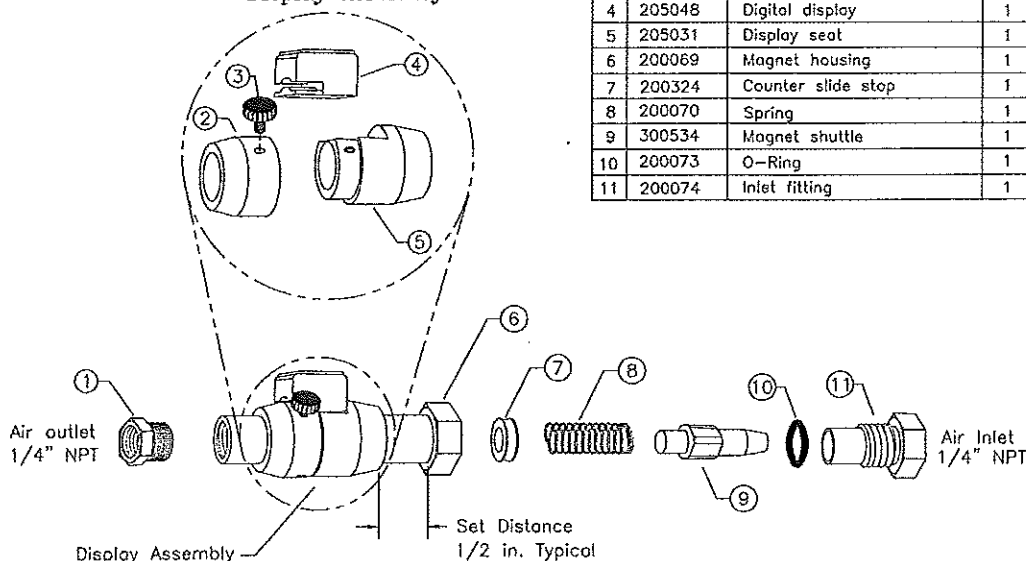


Figure 38 - Pump Cycle Counter Exploded View

Assembly of the Digital Display (Figure 38)

Should the digital display be removed and disassembled for any reason, the procedure for assembling is as follows:

- STEP 1 -** Seat the digital display (item #4) on the flat of the display seat (item #5). (See Figure 38)
- STEP 2 -** Slide the cycle counter sleeve (item #2) over the display seat (item #5) and the bottom lip portion of the digital display (item #4). Both pieces (the display seat #5 and the digital display #4) should be held in place by the cycle counter sleeve (item #2).
- STEP 3 -** Align the thumb screw holes.
- STEP 4 -** Screw in the thumb screw (item #3) to hold the Display Assembly together.

AP-2 Volumes Pumped Per Cycle

The volume of fluid pumped per cycle from an AutoPump® varies depending upon the inlet air pressure and the total developed head (TDH) (static plus dynamic head). The closer the pressures are to each other, (the TDH is almost the same as the inlet air pressure), the closer the volume pumped per cycle will be to the lower end of the gallon range in the table below. The TDH depends upon back pressure in the surface lines, hose size, fittings, vertical and horizontal pumping distance, the number of pumps feeding the hose system, air pressure to the pump, and the type of pump. The effects of some of these variables may cause the volume pumped per cycle to vary from pump to pump on a single site.

AP2 AutoPump Models		
Pump	Volume per Cycle: Range	Volume per Cycle: Typical
Long AP2	0.14 - 0.17 gal (0.53 - .64 L)	0.155 gal (0.59 L)
Short AP2	0.05 - 0.08 gal (0.19 - 0.30 L)	0.065 gal (0.25 L)

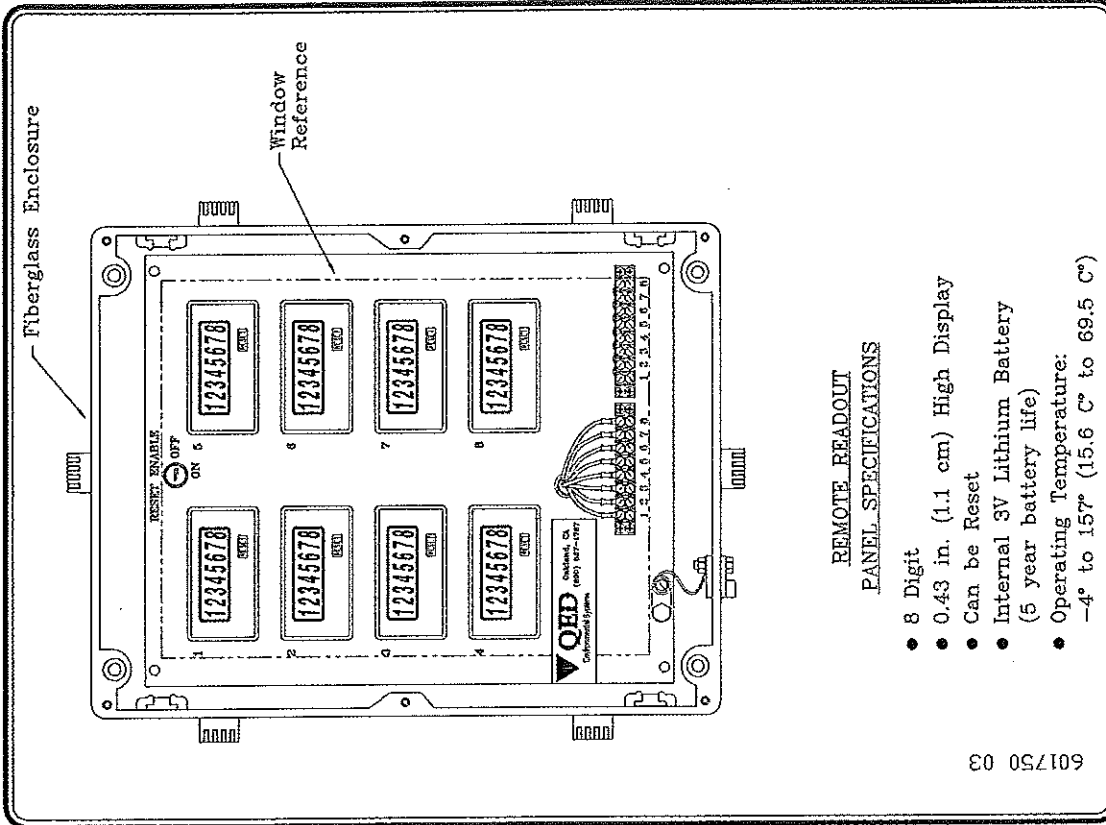


Figure 40 - Pump Cycle Counter Remote Readout Panel

Revision 2 - July, 2009

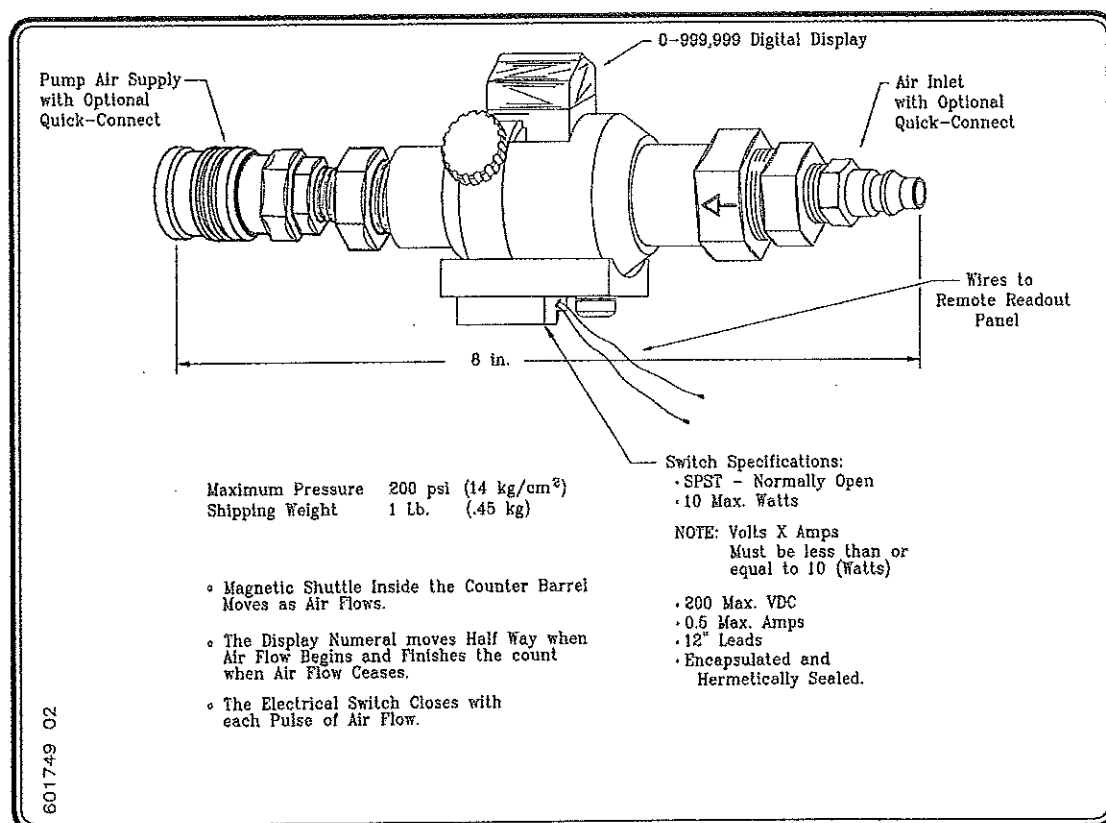


Figure 39 - Pump Cycle Counter with Magnetic Reed Switch

Terms, Conditions, and Warranty

ONE YEAR WARRANTY

This limited warranty is in lieu of and excludes all other representations made by advertisements, distributors, agents, or manufacturers sales representatives, and all other warranties, both express and implied. There are no implied warranties of merchantability or of fitness for a particular purpose for goods covered hereunder.

QED Environmental Systems warrants to the purchaser of its products that, subject to the limitations and conditions provided within the Terms & Conditions of Sale, products, materials and/or workmanship shall reasonably conform to descriptions of the products and shall be free of defects in material and workmanship.

All warranty durations are calculated from the original date of purchase—determined as beginning the date of shipment from QED facilities and the date QED is notified of a warranty claim. This warranty shall be limited to the duration and conditions set forth below.

1. **AP-2 AutoPumps**—warranted for one (1) year: 100% material and 100% workmanship. This limited warranty coverage only applies to AP-2 AutoPumps. There will be no warranty for application or material compatibility. The materials used in pumps vary depending upon application and the customer is responsible for knowing the environment in which the pump will be operating and working with QED to determine what materials of construction will be best for the application.

The warranty is valid when the following conditions exist: when the site has a pH between 4 and 9, has a salinity of 3500 ppm or less, is between 40 and 120 degrees Fahrenheit, is non-corrosive to the construction materials of the pump; and is not abrasive. Typical commercial fuels are acceptable materials in free or dissolved phase. The pumps and accessories must be operated within the specifications and limits given in the manual for the particular piece of equipment.

2. **Pumps, hose, tubing, fittings, heater, condensers and air filtration housings** — warranted for one (1) year: 100% material and 100% workmanship. This does not include AP-2 AutoPumps. There will be no warranty for application or material compatibility. The materials used vary depending upon application and the customer is responsible for knowing the environment in which the equipment will be operating and working with QED to determine what materials of construction will be best for the application.
3. **Pneumatic Data Modules / Logic Control Panels** — warranted for one (1) year: 100% material and 100% workmanship.
4. **Parts and Repairs** — warranted for ninety (90) days: 100% material and 100% workmanship; when repairs are performed by QED or its appointed agent, from date of repair or for the full term of the original warranty, whichever is longer. Separately sold parts are warranted for ninety (90) days: 100% materials and 100% workmanship.

This warranty will be void in the event of unauthorized disassembly of component assemblies. Defects in any equipment that result from abuse, operation in any manner outside the recommended procedures, use and applications other than for intended use or exposure to chemical or physical environments beyond the designated limits of materials and construction, will also void the warranty.

Chemical attack by liquids and/or abrasive substances contacting equipment and accessories shall not be covered by this warranty. A range of materials of construction is available from QED and it is the Buyer's responsibility to select materials of construction to fit the Buyer's application. QED will only warrant that the supplied site liquid contacting materials will conform to published QED specifications and generally accepted standards for that particular material.

QED Environmental Systems shall be released from all obligations under all warranties if any product covered hereby is repaired or modified by persons other than QED service personnel (unless such repair by others is made with the written consent of QED); resold to other parties; and/or moved to or used on a remediation site other than originally specified.

It is understood and agreed that QED Environmental Systems shall in no event be liable for incidental or consequential damages resulting from its breach of any of the terms of this agreement, nor for special damages, nor for improper selection of any product described or referred to for a particular application. Liability under this warranty is limited to repair or replacement F.O.B. QED's factory, or its appointed agent's shop, of any parts which prove to be defective within the duration and conditions set forth herein, or repayment of the purchase price at the option of QED, provided the products have been returned in accordance with the duration and conditions set forth herein.

Subassemblies and Other Equipment Manufactured by Others

The foregoing warranty does not apply to major subassemblies and other equipment, accessories, and other parts manufactured by others, and such other parts, accessories, and equipment are subject only to the warranties, if any, supplied by their respective manufacturers. QED makes no warranty concerning products or accessories not manufactured by QED. In the event of failure of any such product or accessory, QED will give reasonable assistance to Buyer in obtaining from the respective manufacturer whatever adjustment is reasonable in light of the manufacturer's own warranty.

Illustrations and Drawings

Reasonable Effort has been made to have all illustrations and drawings accurately represent the product(s) as it actually was at the time of doing the illustrations and drawings.

However, products may change to meet user requirements and therefore may not be reflected in the literature. In addition, literature may be updated to reflect the most recent equipment revision(s). Changes to either or both equipment and/or literature can be made without notice.

Buyer's Remedies

The buyer's exclusive and sole remedy on account of or in respect to the furnishing of defective material or workmanship shall be to secure replacement thereof as aforesaid. QED shall not in any event be liable for the cost of any labor expended on any such product or material or for any special, direct, indirect or consequential damages to any one by reason of the fact that it shall have been deemed defective or a breach of said warranty.

Changes without Notice

Prices and Specifications are subject to change without notice.

Shipping Dates

Shipping dates are approximate and are subject to delays beyond our control.

F.O.B. Point and Title

All material is sold F.O.B. factory. Title to all merchandise sold shall pass to Buyer upon delivery by Seller to carrier at factory. All freight insurance is the responsibility of the Buyer and shall be charged to the Buyer on the invoice unless directed in writing. All Freight claims are the Buyer's responsibility.

Terms

Payment terms are net 30 days; 1.5% per month past due.

State and Local Taxes

Any taxes, duties or fees which the seller may be required to pay or collect upon or with respect to the sale, purchase, delivery, use or consumption of any of the material covered hereby shall be for the account of the Buyer and shall be added to the purchase price.

Acceptance

All orders shall be subject to the terms and conditions contained or referred to in the Seller's quotation, acknowledgments, and to those listed here and to no others whatsoever. No waiver, alteration or modification of these terms and conditions shall be binding unless in writing and signed by an executive officer of the Seller. All orders subject to written acceptance by QED Environmental Systems, Ann Arbor, MI, U.S.A.

Warranty Claims Procedure (Responsibility of purchaser)

The original purchaser's sole responsibility in the instance of a warranty claim shall be to notify QED or its appointed agent, of the defect, malfunction, or other manner in which the terms of this warranty are believed to be violated. The purchaser may secure performance of obligations hereunder by contacting the Customer Service Department of QED or its appointed agent, and:

1. Identifying the product involved by model or serial number, or other sufficient description, that will allow QED, or its appointed agent, to determine which product is defective.
2. Specifying where, when, and from whom the product was purchased.
3. Describing the nature of the defect or malfunction covered by this warranty.

4. After obtaining authorization from QED, sending the malfunctioning component via a RMA# (Return Material Authorization number) to the address below or to its appointed agent:

QED Environmental Systems
1565 Alvarado Street
San Leandro, CA 94577-2640
USA

(800) 537-1767 Toll-Free in North America
(510) 346-0400 Tele.
(510) 346-0414 Fax

5. Equipment must be cleaned before shipment or it will be cleaned by QED before any work is performed. The customer will be charged for such cleaning.

If any product covered hereby is actually defective within the terms of this warranty, purchaser must contact QED, or its appointed agent, for determination of warranty coverage. If the return of a component is determined to be necessary, QED, or its appointed agent, will authorize the return of the component at Purchaser's expense. If the product proves not to be defective within the terms of this warranty, then all costs and expenses in connection with the processing of the Purchaser's claim and all costs for repair, parts, labor, and shipping and handling, as authorized by owner hereunder, shall be borne by the Purchaser. In no event shall such allegedly defective products be returned to QED, or its appointed agent, without its consent, and QED's, or its appointed agent's, obligations of repair, replacement or refund are conditional upon the buyer's return of the defective product to QED, or its appointed agent. All equipment returned to QED will be appropriately cleaned of contamination before shipping.

EC DECLARATION OF CONFORMITY

AP-4	Air Driven Pneumatic Pump
AP-3	Air Driven Pneumatic Pump
AP-2	Air Driven Pneumatic Pump

PRODUCTS:

QED Environmental Systems Inc. declares that the item(s) described above are in compliance with the following standards

ATEX Directive 94/9/EC

Certification body:

Notified body number:

Address:

Certificate number:

Standard applied:

FM Approvals Ltd.

1725


1 Windsor Dials, Windsor, Berkshire, UK, SL4 1RS

FM08ATEX0028

EN13463-1:2001

EN13463-5:2003

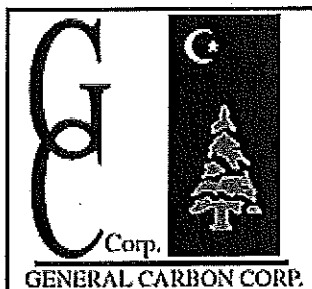
Signed:


Revell Jackson,

Production Manager & Authorized Person

QED Environmental Systems Inc.
1565 Alvarado Street
San Leandro, California 94577-2640
USA

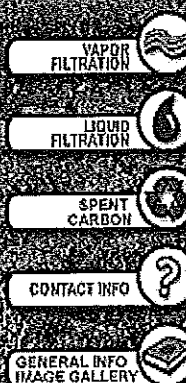
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Paterson, NJ 07501
Tel: 973 523-2223
Fax: 973 523-1494
sales@generalcarbon.com

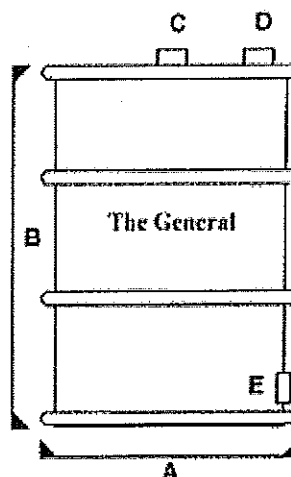
CLEANING
the WORLD
with
ACTIVATED
CARBON

LIQUID
FILTRATION



The General Water Pollution Control Barrels

The General Water Pollution Control Barrels are low cost, self contained water purification adsorbers designed to treat liquid streams of up to 20 GPM. The units are available in four different sizes to better serve your treatment needs.



Specifications

	30 Gallon	55 Gallon	85 Gallon	110 Gallon
A-Diameter, Outside:	19 19/32 "	24"	28"	32"
B-Height, Outside Wall:	29"	35"	39"	43"
Inlet Fitting:	C-1"FPT	C-1"FPT	C-1"FPT	C-2"FPT
Outlet Fitting:	E-1"FPT	E-1"FPT	D-1"FPT	D-2"FPT
Drain Fitting:	E-1"FPT	E-1"FPT	E-1"FPT	E-1"FPT
Carbon Weight, Lbs:	90	165	300	400
Max. Recommended Flow Rate, GPM:	8	10	15	20
Maximum Pressure, psig:	7	10	7	7
Max. Design Temp., Deg F:	140	140	140	140
Flow Direction:	Downflow	Downflow	Downflow	Downflow

Activated Carbon - The General liquid adsorbers are filled with virgin, high activity GC 8x30 carbon. Virgin GC 12x40, reactivated GC 8x30R or other special carbons are also available.

Removable Lid - 16 gauge lid with ring & bolt closure and poly clad cellulose gasket.

Connections - Metal connections with standard pipe threads insure easy, durable and leakproof hookup to your system. Unions or quick connect fittings are advised to make drum exchange easy.

Flow Distributors - Both inlet and outlet have low pressure drop, slotted Schedule 40 PVC distributors. Units work well in either an upflow or downflow manner when the start up procedure is followed. Stainless Steel internals and drums are available for special applications.

Coatings - **The General** water pollution control barrels are coated on the inside with heat cured phenolic epoxy. The outside coating is industrial enamel. A polyethylene liner is available for extra corrosion resistance for the 55 gallon and 85 gallon units.

Installation & Startup - If possible, before the units are used for the first time, they should be filled with clean water for a period of 8 to 12 hours to allow the carbon to degas. A gentle backwash is also recommended to remove carbon fines that can cause excessive pressure drop through the unit. Multiple units are usually connected in series with testing between the units advised to determine when the first unit needs to be changed out.

Maintenance - Once connected, **The General** requires no maintenance other than the monitoring of the influent and effluent liquid streams and the operating pressure of the system. Monitoring the liquid stream into the last Water Pollution Control Barrel in series mode is a recommended safeguard against breakthrough in the final outflow. When the concentration of contaminants in the outflow equals the concentration in the inflow, **The General** has reached its removal capacity and should be removed from service. The working life of each adsorber is dependent upon the type of contaminant in the water as well as its concentration and the liquid flow rate. A pressure relief device is advised to prevent damage to the canister in the event of excessive pressure buildup.

Recharging The General - Once the carbon is saturated by contaminants, the unit should be removed and replaced with a fresh one. To purchase replacement carbon or to arrange for a carbon change out, please contact our office.

Disposal - Dispose of the spent carbon in accordance with Federal, State, and Local regulations.

Warning!

Wet activated carbon readily absorbs free oxygen. ANY entry into carbon vessels requires procedures for confined space entry and oxygen depletion to be followed!

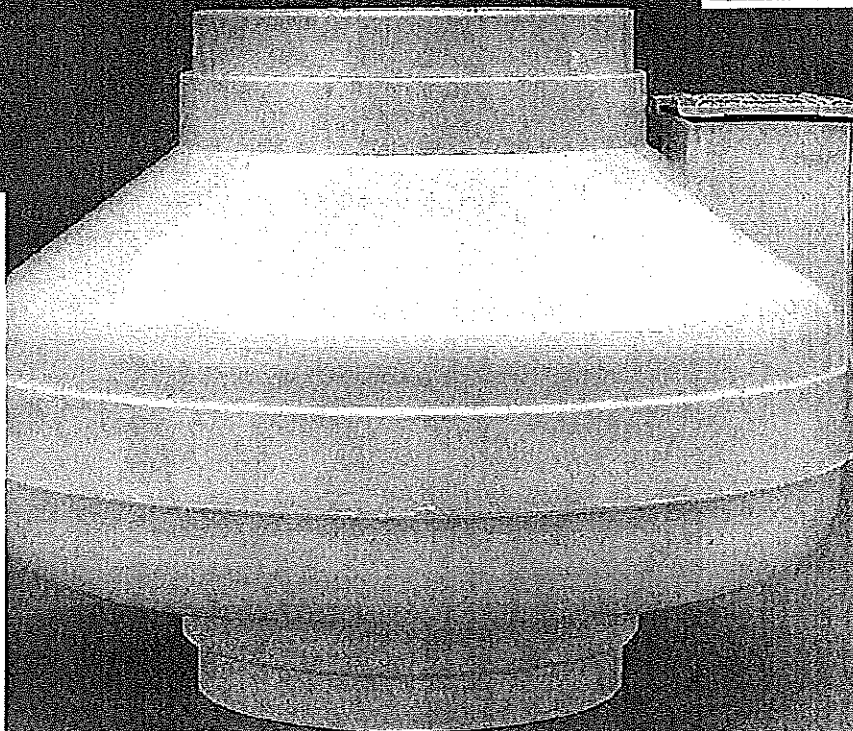
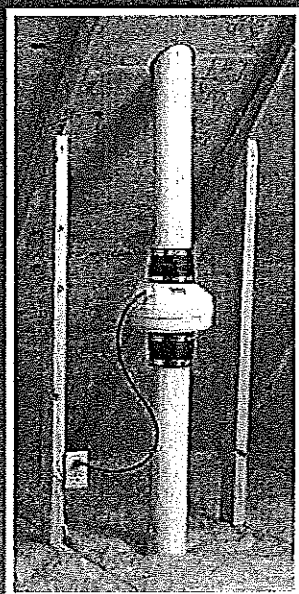
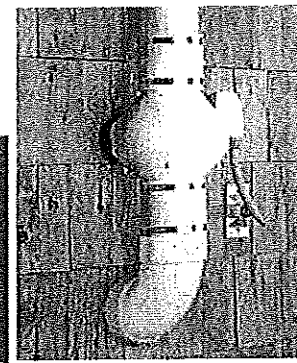
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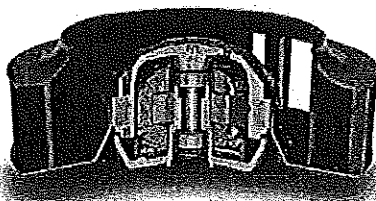
HP SERIES

FANS FOR RADON APPLICATIONS
WITH IMPROVED UV RESISTANCE!



TRUST THE INDUSTRY STANDARD. HERE'S WHY:

Don't put your reputation at stake by installing a fan you know won't perform like a Fantech! For nearly twenty years, Fantech has manufactured quality ventilation equipment for Radon applications. Fantech is the fan Radon contractors have turned to in over 1,000,000 successful Radon installations worldwide.



Fantech external rotor motor

FANTECH HP SERIES FANS MEET THE CHALLENGES OF RADON APPLICATIONS:

HOUSING

- UV resistant, UL Listed durable plastic
- UL Listed for use in commercial applications
- Factory sealed to prevent leakage
- Watertight electrical terminal box
- Approved for mounting in wet locations - i.e. Outdoors

MOTOR

- Totally enclosed for protection
- High efficiency EBM motorized impeller
- Automatic reset thermal overload protection
- Average life expectancy of 7-10 years under continuous load conditions

RELIABILITY

- Five Year Full Factory Warranty
- Over 1,000,000 successful radon installations worldwide

IMPROVING INDOOR AIR QUALITY THROUGH BETTER VENTILATION
www.fantech.net



HP Series Fans are Specially Designed with Higher Pressure Capabilities for Radon Mitigation Applications

MOST RADON MITIGATORS WHO PREVIOUSLY USED THE FANTECH FR SERIES FANS HAVE SWITCHED TO THE NEW HP SERIES.

PERFORMANCE DATA

Fan Model	Volts	Wattage Range	Max. Amps	CFM vs. Static Pressure in Inches W.G.								Max. Ps
				0"	0.5"	0.75"	1.0"	1.25"	1.5"	1.75"	2.0"	
HP2133	115	14 - 20	0.17	134	68	19	-	-	-	-	-	0.84
HP2190	115	60 - 85	0.78	163	126	104	81	58	35	15	-	1.93
HP175	115	44 - 65	0.57	151	112	91	70	40	12	-	-	1.66
HP190	115	60 - 85	0.78	157	123	106	89	67	45	18	1	2.01
HP220	115	85 - 152	1.30	344	260	226	193	166	137	102	58	2.46

HVI
MEMBER

PERFORMANCE CURVES

Fantech provides you with independently tested performance specifications.

The performance curves shown in this brochure are representative of the actual test results recorded at Texas Engineering Experiment Station/Energy Systems Lab, a recognized testing authority for HVI. Testing was done in accordance with AMCA Standard 210-85 and HVI 916 Test Procedures. Performance graphs show air flow vs. static pressure.

Use of HP Series fans in low resistance applications such as bathroom venting will result in elevated sound levels. We suggest FR Series or other Fantech fans for such applications.

HP FEATURES INCLUDE

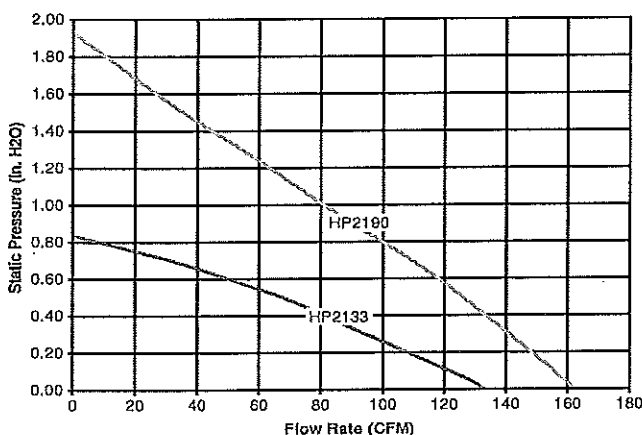
- Improved UV resistant housings approved for commercial applications.
- UL Approved for Wet Locations (Outdoors)
- Sealed housings and wiring boxes to prevent Radon leakage or water penetration
- Energy efficient permanent split capacitor motors
- External wiring box
- Full Five Year Factory Warranty



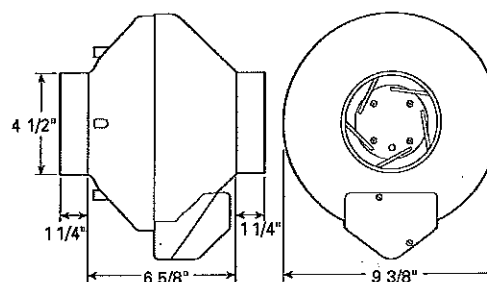
NOTE:

Installations that will result in condensate forming in the outlet ducting should have a condensate bypass installed to route the condensate outside of the fan housing. Conditions that are likely to produce condensate include but are not limited to: outdoor installations in cold climates, long lengths of outlet ducting, high moisture content in soil and thin wall or aluminum outlet ducting. Failure to install a proper condensate bypass may void any warranty claims.

HP2133 & HP2190 RADON MITIGATION FANS



Tested with 4" ID duct and standard couplings.



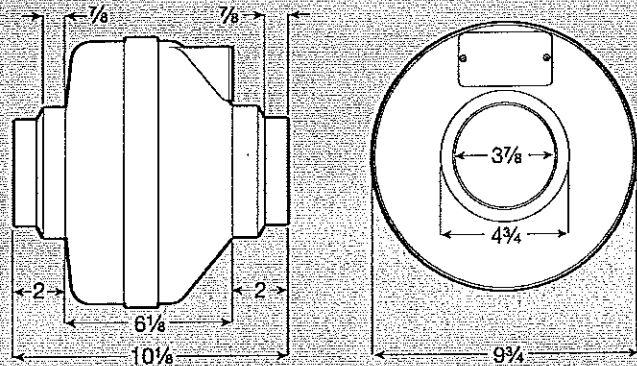
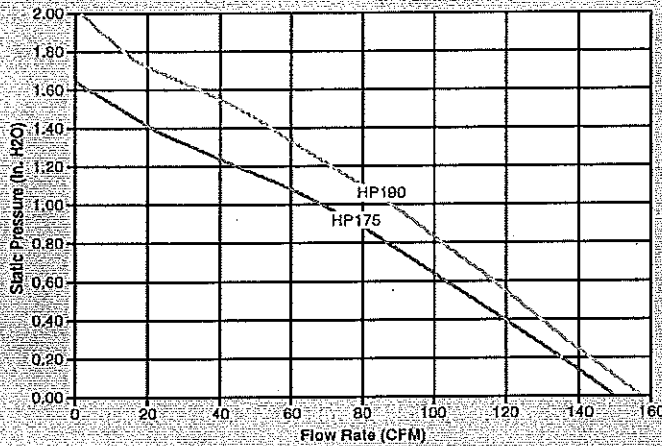
HP2133 -- For applications where lower pressure and flow are needed. Record low power consumption of 14-20 watts! Often used where there is good sub slab communication and lower Radon levels.

HP2190 -- Performance like the HP190 but in a smaller housing. Performance suitable for the majority of installations.

Fans are attached to PVC pipe using flexible couplings.

For 4" PVC pipe use Indiana Seals #156-44, Pipeconx PCX 56-44 or equivalent.
 For 3" PVC pipe use Indiana Seals #156-43, Pipeconx PCX 56-43 or equivalent.

HP175 & HP190 RADON MITIGATION FANS



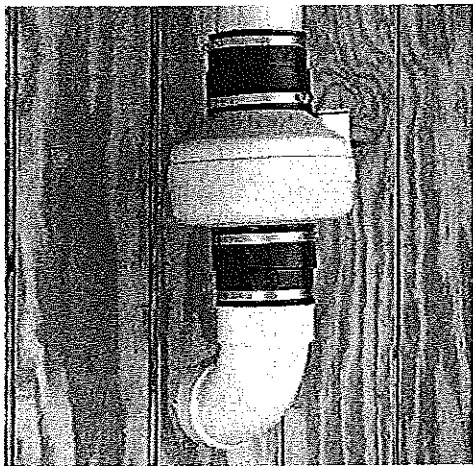
HP175 – The economical choice where slightly less air flow is needed. Often used where there is good sub slab communication and lower Radon levels.

HP190 – The standard for Radon Mitigation. Ideally tailored performance curve for a vast majority of your mitigations.

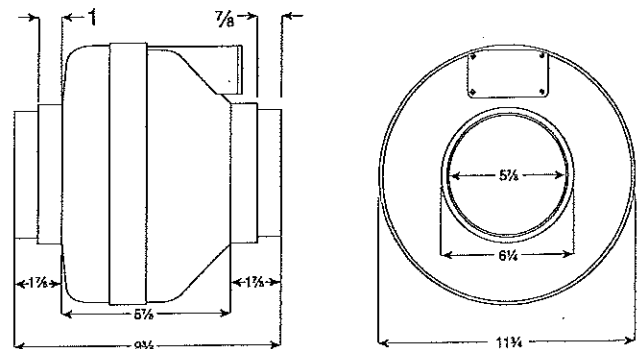
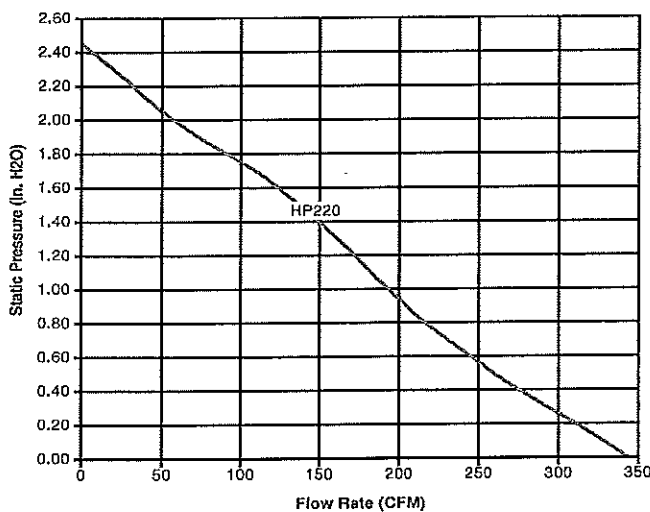
Fans are attached to PVC pipe using flexible couplings.

For 4" PVC pipe use Indiana Seals #151-44, Pipeconx PCX 51-44 or equivalent.

For 3" PVC pipe use Indiana Seals #150-43, Pipeconx PCX 50-43 or equivalent.



HP220 RADON MITIGATION FAN



HP 220 – Excellent choice for systems with elevated radon levels, poor communication, multiple suction points and large subslab footprint. Replaces FR 175.

Fans are attached to PVC pipe using flexible couplings.

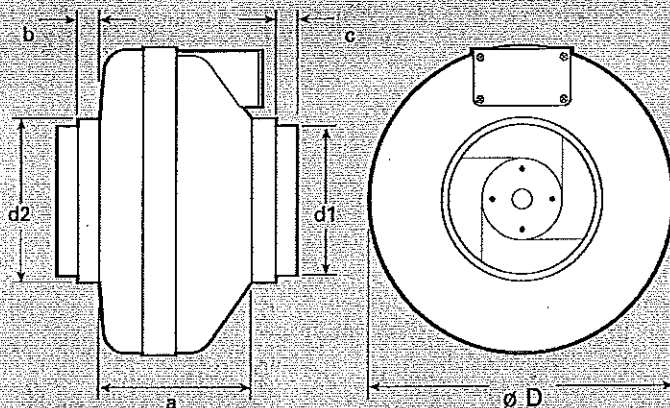
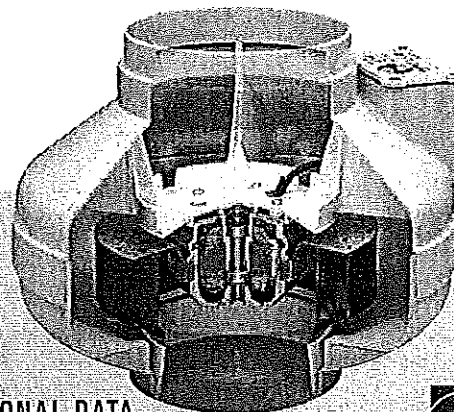
For 4" PVC pipe use Indiana Seals #156-64, Pipeconx PCX 56-64 or equivalent.

For 3" PVC pipe use Indiana Seals #156-63, Pipeconx PCX 56-63 or equivalent.



FR SERIES

THE ORIGINAL MITIGATOR



DIMENSIONAL DATA

model	øD	d1	d2	a	b	c
FR100	9 1/2	3 7/8	4 7/8	6 1/8	7/8	7/8
FR110	9 1/2	3 7/8	4 7/8	6 1/8	7/8	7/8
FR125	9 1/2	-	4 7/8	6 1/8	7/8	-
FR140	11 3/4	5 7/8	6 1/4	5 7/8	1	7/8
FR150	11 3/4	5 7/8	6 1/4	5 7/8	1	7/8
FR160	11 3/4	5 7/8	6 1/4	6 3/8	1	7/8
FR200	13 1/4	7 7/8	9 7/8	6 1/4	1 1/2	1 1/2
FR225	13 1/4	7 7/8	9 7/8	6 1/4	1 1/2	1 1/2
FR250	13 1/4	-	9 7/8	6 1/4	-	1 1/2

All dimensions in inches



PERFORMANCE DATA

Fan Model	Energy Star	RPM	Volts	Rated Watts	Wattage Range	Max. Amps	CFM vs. Static Pressure in Inches W.G.								Max. Ps	Duct Dia.
							0"	.2"	.4"	.6"	.8"	1.0"	1.5"			
FR100	✓	2900	115	19	13 - 19	0.18	122	100	78	55	15	-	-	0.87"	4"	
FR125	✓	2950	115	18	15 - 18	0.18	148	120	88	47	-	-	-	0.79"	5"	
FR150	✓	2750	120	71	54 - 72	0.67	263	230	198	167	136	106	17	1.58"	6"	
FR160	-	2750	115	129	103 - 130	1.14	289	260	233	206	179	154	89	2.32"	6"	
FR200	✓	2750	115	122	106 - 128	1.11	408	360	308	259	213	173	72	2.14"	8"	
FR225	✓	3100	115	137	111 - 152	1.35	429	400	366	332	297	260	168	2.48"	8"	
FR250*	-	2850	115	241	146 - 248	2.40	649	600	553	506	454	403	294	2.58"	10"	

FR Series performance is shown with ducted outlet. Per HVI's Certified Ratings Program, charted air flow performance has been derated by a factor based on actual test results and the certified rate at .2 inches W.G.
*Also available with 8" duct connection. Model FR 250-8. Special Order.

NOTE:

Installations that will result in condensate forming in the outlet ducting should have a condensate bypass installed to route the condensate outside of the fan housing. Conditions that are likely to produce condensate include but are not limited to: outdoor installations in cold climates; long lengths of outlet ducting; high moisture content in soil and thin wall or aluminum outlet ducting. Failure to install a proper condensate bypass may void any warranty claims.

FIVE YEAR WARRANTY

DURING ENTIRE WARRANTY PERIOD:

FANTECH will replace any fan which has a factory defect in workmanship or material. Product may need to be returned to the Fantech factory, together with a copy of the bill of sale and identified with RMA number.

FOR FACTORY RETURN YOU MUST:

- Have a Return Materials Authorization (RMA) number. This may be obtained by calling FANTECH either in the USA at 1.800.747.1762 or in CANADA at 1.800.565.3548. Please have bill of sale available.
- The RMA number must be clearly written on the outside of the carton, or the carton will be refused.
- All parts and/or product will be repaired/replaced and shipped back to buyer; no credit will be issued.

OR

The Distributor may place an order for the warranty fan and is invoiced. The Distributor will receive a credit equal to the invoice only after product is returned prepaid and verified to be defective.

FANTECH WARRANTY TERMS DO NOT PROVIDE FOR REPLACEMENT WITHOUT CHARGE PRIOR TO INSPECTION FOR A DEFECT. REPLACEMENTS ISSUED IN ADVANCE OF DEFECT INSPECTION ARE INVOICED, AND CREDIT IS PENDING INSPECTION OF RETURNED MATERIAL. DEFECTIVE MATERIAL RETURNED BY END USERS SHOULD NOT BE REPLACED BY THE DISTRIBUTOR WITHOUT CHARGE TO THE END USER, AS CREDIT TO DISTRIBUTOR'S ACCOUNT WILL BE PENDING INSPECTION AND VERIFICATION OF ACTUAL DEFECT BY FANTECH.

THE FOLLOWING WARRANTIES DO NOT APPLY:

- Damages from shipping, either concealed or visible. Claim must be filed with freight company.

- Damages resulting from improper wiring or installation.
- Damages or failure caused by acts of God, or resulting from improper consumer procedures, such as:
 - Improper maintenance
 - Misuse, abuse, abnormal use, or accident, and
 - Incorrect electrical voltage or current.
- Removal or any alteration made on the FANTECH label control number or date of manufacture.
- Any other warranty, expressed, implied or written, and to any consequential or incidental damages, loss or property, revenues, or profit, or costs of removal, installation or reinstallation, for any breach of warranty.

WARRANTY VALIDATION

- The user must keep a copy of the bill of sale to verify purchase date.
- These warranties give you specific legal rights, and are subject to an applicable consumer protection legislation. You may have additional rights which vary from state to state.

DISTRIBUTED BY:



United States 1712 Northgate Blvd. • Sarasota, FL 34234 • 1.800.747.1762 • www.fantech.net
Canada 50 Kanallak Way • Bouctouche, NB E4S 3M5 • 1.800.565.3548 • www.fantech.ca

Item #: 411741
Rev Date: 120407

Fantech, reserves the right to modify, at any time and without notice, any or all of its products' features, designs, components and specifications to maintain their technological leadership position.



Fantech

Installation Instructions for Radon Fans Model HP/FR

READ & SAVE THESE INSTRUCTIONS!



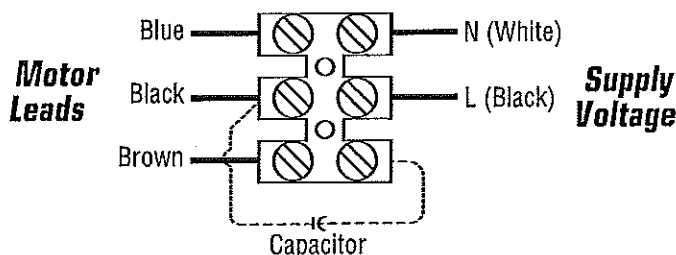
Warnings

DO NOT CONNECT POWER SUPPLY UNTIL FAN IS COMPLETELY INSTALLED, MAKE SURE ELECTRICAL SERVICE TO THE FAN IS LOCKED IN "OFF" POSITION.

1. Suitable for use with solid-state speed control.
2. This unit has rotating parts and safety precautions should be exercised during installation, operation and maintenance.
3. CAUTION: "For General Ventilation Use Only. Do Not Use To Exhaust Hazardous Or Explosives Materials and Vapors."
4. **WARNING: TO REDUCE THE RISK OF FIRE, ELECTRIC SHOCK, OR INJURY TO PERSONS-OBSERVE THE FOLLOWING:**
 - a. Use this unit only in the manner intended by the manufacturer. If you have questions, contact the factory.
 - b. Before servicing or cleaning unit, switch power off at service panel and lock the service disconnecting means to prevent power from being switched on accidentally. When the service disconnecting means cannot be locked, securely fasten a prominent warning device, such as a tag, to the service panel.
 - c. Installation work and electrical wiring must be done by qualified person(s) in accordance with all applicable codes and standards, including fire-rated construction.
 - d. The combustion airflow needed for safe operation of fuel burning equipment may be affected by this unit's operation. Follow the heating equipment manufacturer's guidelines and safety standards such as those published by the National Fire Protection Association (NFPA), the American Society of Heating, Refrigeration, and Air Conditioning Engineers (ASHRAE) and the local code authorities.
 - e. When cutting or drilling into wall or ceiling, do not damage electrical wires or other hidden utilities.
 - f. Ducted fans must always be vented to the outdoors.
 - g. If this unit is to be installed over a tub or shower, it must be marked as appropriate for the application.
 - h. NEVER place a switch where it can be reached from a tub or shower.
5. **WARNING!** Check voltage at the fan to see if it corresponds to the motor nameplate.

GUARDS MUST BE INSTALLED WHEN FAN IS WITHIN REACH OF PERSONNEL OR WITHIN SEVEN (7) FEET OF WORKING LEVEL OR WHEN DEEMED ADVISABLE FOR SAFETY.

Wiring Diagram



Five (5) Year Warranty

This warranty supersedes all prior warranties

Installation that will result in condensate forming in the outlet ducting should have a condensate bypass installed to route the condensate outside of the fan housing. Conditions that are likely to produce condensate include but are not limited to: outdoor installations in cold climates, long lengths of outlet ducting, high moisture content in soil and thin wall or aluminum outlet ducting. Failure to install a proper condensate bypass may void any warranty claims.

DURING ENTIRE WARRANTY PERIOD:

FANTECH will repair or replace any part which has a factory defect in workmanship or material. Product may need to be returned to the fantech factory, together with a copy of the bill of sale and identified with RMA number.

FOR FACTORY RETURN YOU MUST:

- Have a Return Materials Authorization (RMA) number. This may be obtained by calling FANTECH either in the USA at 1.800.747.1762 or in CANADA at 1.800.565.3548. Please have bill of sale available.
- The RMA number must be clearly written on the outside of the carton, or the carton will be refused.
- All parts and/or product will be repaired/replaced and shipped back to buyer; no credit will be issued.

OR

The Distributor may place an order for the warranty part and/or product and is invoiced. The Distributor will receive a credit equal to the invoice only after product is returned prepaid and verified to be defective.

FANTECH WARRANTY TERMS DO NOT PROVIDE FOR REPLACEMENT WITHOUT CHARGE PRIOR TO INSPECTION FOR A DEFECT. REPLACEMENTS ISSUED IN ADVANCE OF DEFECT INSPECTION ARE INVOICED, AND CREDIT IS PENDING INSPECTION OF RETURNED MATERIAL. DEFECTIVE MATERIAL RETURNED BY END USERS SHOULD NOT BE REPLACED BY THE DISTRIBUTOR WITHOUT CHARGE TO THE END USER, AS CREDIT TO DISTRIBUTOR'S ACCOUNT WILL BE PENDING INSPECTION AND VERIFICATION OF ACTUAL DEFECT BY FANTECH.

THE FOLLOWING WARRANTIES DO NOT APPLY:

- Damages from shipping, either concealed or visible. Claim must be filed with freight company.
- Damages resulting from improper wiring or installation.
- Damages or failure caused by acts of God, or resulting from improper consumer procedures, such as:
 1. Improper maintenance
 2. Misuse, abuse, abnormal use, or accident, and
 3. Incorrect electrical voltage or current.
- Removal or any alteration made on the FANTECH label control number or date of manufacture.
- Any other warranty, expressed, implied or written, and to any consequential or incidental damages, loss or property, revenues, or profit, or costs of removal, installation or reinstallation, for any breach of warranty.

WARRANTY VALIDATION

- The user must keep a copy of the bill of sale to verify purchase date.
- These warranties give you specific legal rights, and are subject to an applicable consumer protection legislation. You may have additional rights which vary from state to state.

United States

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Fax: 877.747.8118; 506.743.9600

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Article #: 301077

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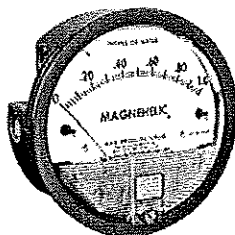
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Series 2000

Magnehelic® Differential Pressure Gauge

Indicate Positive, Negative or Differential, Accurate within 2%

Product Specifications

Service: Air and non-combustible, compatible gases. (Natural Gas option available.)

Wetted Materials: Consult factory.

Housing: Die cast aluminum case and bezel, with acrylic cover, Exterior finish is coated gray to withstand 168 hour salt spray corrosion test.

Accuracy: $\pm 2\%$ of full scale ($\pm 3\%$ on -0, -100PA, -125PA, -10MM and $\pm 4\%$ on -00, -60PA, -6MM ranges), throughout range at 70°F (21.1°C).

Pressure Limits: -20" Hg. to 15 psig.† (-0.677 bar to 1.034 bar); MP option; 35 psig (2.41 bar), HP option; 80 psig (5.52 bar).

Overpressure: Relief plug opens at approximately 25 psig (1.72 bar), standard gages only.

Temperature Limits: 20 to 140°F.* (-6.67 to 60°C).

Mounting Orientation: Diaphragm in vertical position. Consult factory for other position orientations.

Process Connections: 1/8" female NPT duplicate High and low pressure taps - one pair side and one pair back.

Weight: 1 lb 2 oz (510 g); MP & HP 2 lb 2 oz (963 g).

Standard Accessories: Two 1/8" NPT plugs for duplicate pressure taps, two 1/8" pipe thread to rubber tubing adapters and three flush mounting adapters with screws. (Mounting and snap ring retainer substituted for 3 adapters in MP & HP gage accessories.)

†For applications with high cycle rate within gage total pressure rating, next higher rating is recommended. See Options Page.

*Low temperature models available as special option.

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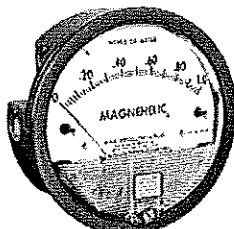
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Series 2000

Magnehelic® Differential Pressure Gauge

Indicate Positive, Negative or Differential, Accurate within 2%

Product Features

- Bezel provides flange for flush mounting in panel.
- Clear plastic face is highly resistant to breakage. Provides undistorted viewing of pointer and scale.
- Precision litho-printed scale is accurate and easy to read.
- Red tipped pointer of heat treated aluminum tubing is easy to see. It is rigidly mounted on the helix shaft.
- Pointer stops of molded rubber prevent pointer over-travel without damage.
- "Wishbone" assembly provides mounting for helix, helix bearings and pointer shaft.
- Jeweled bearings are shock-resistant mounted; provide virtually friction-free motion for helix. Motion damped with high viscosity silicone fluid.
- Zero adjustment screw is conveniently located in the plastic cover, and is accessible without removing the cover.
- O-ring seal provides pressure tightness.
- Helix is precision made from an alloy of high magnetic permeability. Mounted in jeweled bearings, it turns freely, following the magnetic field to move the pointer across the scale.
- Samarium Cobalt magnet mounted at one end of range spring rotates helix without mechanical linkages.
- Calibrated range spring is flat spring steel. Small amplitude of motion assures consistency and long life. It reacts to pressure on diaphragm. Live length adjustable for calibration.
- Silicone rubber diaphragm with integrally molded O-ring is supported by front and rear plates. It is locked and sealed in position with a sealing plate and retaining ring. Diaphragm motion is restricted to prevent damage due to overpressures.
- Die cast aluminum case is precision made and iridite-dipped to withstand 168 hour salt spray corrosion test. Exterior finished in baked dark gray hammerloid. One case size is used for all standard pressure options, and for both surface and flush mounting.
- Blowout plug of silicone rubber protects against overpressure on 15 psig rated models. Opens at approximately 25 psig.
- O-ring seal for cover assures pressure integrity of case.

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APPENDIX J

Operations and Maintenance Checklists

Operation and Maintenance Check List
Groundwater Pump and Treat System
Cornerstone Site B-1
3100 Third Avenue
Bronx, New York
BCP #C203044

Name:	Weather:			
Date:				
Components to be Checked	Comments			
System operating?				
Yes/No (if no please explain)				
Pressure at compressor (psi).				
Is the automatic drain on the compressor operating correctly?				
Yes/No (if no please explain)				
Has the oil been changed?	Date:			
Yes/No (if no please explain)				
Have the compressor filters been changed?	Date:			
Yes/No (if no please explain)				
List condition of the carbon drums.				
Reading from flow meter.				
Effluent sample obtained?	Date:		Time:	
yes/no				
Are there any loose connections or leaks? (please check/tighten all bolts and nuts)				
Yes/No (if yes please explain)				
Temperature from heat trace dial.				
Note condition of vaults.				
Pressure from filter regulator.	MW-2A:	MW-6:	MW-7:	MW-8:
Readings from cycle counter.	MW-2A:	MW-6:	MW-7:	MW-8:
Are all well caps secure?				
Yes/No (if no please explain)				
Pumps operating?				
Yes/No (if no please explain)				
Has the air quality check been performed?				
Yes/No (if no please explain)				
Have all air filters and filter bowl drains been checked?				
Yes/No (if no please explain)				
Has the filter regulator been checked for saturation?				
Yes/No (if no please explain)				
Additional comments:				

Operation and Maintenance Check List
Sub-Slab Depressurization System
Cornerstone Site B-1
3100 Third Avenue
Bronx, New York
BCP #C203044

Name:		Weather:									
Components to be Checked		Date:	Date:	Date:	Date:	Date:	Date:	Date:	Date:	Date:	Date:
Is the system operating? Yes/No (if no please explain)											
Record the pressure from each riser. (Vents A,B,C)		A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:
Record PID reading from each riser. (Vents A,B,C)		A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:
Pressure gauge and exterior case clear? Yes/No (if no please explain) (Vents A,B,C)		A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:	A: B: C:
Additional comments:											

APPENDIX K

Environmental Easement

**ENVIRONMENTAL EASEMENT GRANTED PURSUANT TO ARTICLE 71, TITLE 36
OF THE NEW YORK STATE ENVIRONMENTAL CONSERVATION LAW**

THIS INDENTURE made this _____ day of _____, 2010, between Owner(s), CS Melrose Site B1 Housing Development Fund Corp. (the "Grantor Fee Owner"), a New York Not-for-Profit corporation, having an office at 754 Melrose Avenue, Bronx, County of Bronx, State of New York, 10451 and CS Melrose Site B LLC (the "Grantor Beneficial Owner"), a New York limited liability company, having an office at 1865 Palmer Avenue, Suite 203, Larchmont, County of Westchester, State of New York, 10538 (collectively, the "Grantor"), and The People of the State of New York (the "Grantee"), acting through their Commissioner of the Department of Environmental Conservation (the "Commissioner", or "NYSDEC" or "Department" as the context requires) with its headquarters located at 625 Broadway, Albany, New York 12233,

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to encourage the remediation of abandoned and likely contaminated properties ("sites") that threaten the health and vitality of the communities they burden while at the same time ensuring the protection of public health and the environment; and

WHEREAS, the Legislature of the State of New York has declared that it is in the public interest to establish within the Department a statutory environmental remediation program that includes the use of Environmental Easements as an enforceable means of ensuring the performance of operation, maintenance, and/or monitoring requirements and the restriction of future uses of the land, when an environmental remediation project leaves residual contamination at levels that have been determined to be safe for a specific use, but not all uses, or which includes engineered structures that must be maintained or protected against damage to perform properly and be effective, or which requires groundwater use or soil management restrictions; and

WHEREAS, the Legislature of the State of New York has declared that Environmental Easement shall mean an interest in real property, created under and subject to the provisions of Article 71, Title 36 of the New York State Environmental Conservation Law ("ECL") which contains a use restriction and/or a prohibition on the use of land in a manner inconsistent with engineering controls which are intended to ensure the long term effectiveness of a site remedial program or eliminate potential exposure pathways to hazardous waste or petroleum; and

WHEREAS, Grantor Fee Owner, is the owner of real property located at 481 East 158th Street, in the City of New York, County of Bronx and State of New York, known and designated on the tax map of the County Clerk of Bronx as tax map parcel numbers: Section 9, Block 2364, Lot 45 and 70, being the same as a portion of that property conveyed to Grantor Fee Owner by deed dated June 26, 2009 and recorded in the County Clerk's Office in Instrument No. 2009000209074, comprised of approximately 0.37 acres, and hereinafter more fully described in the Land Title Survey dated May 2010, prepared by Montrose Surveying Co., LLP, which will be attached to the Site Management Plan. The property description (the "Controlled Property") is set forth in and attached hereto as Schedule A; and

WHEREAS, Grantor Beneficial Owner, is the owner of the beneficial interest in the Controlled Property being the same as a portion of that beneficial interest conveyed to Grantor

Beneficial Owner by means of a Declaration of Interest and Nominee Agreement dated June 26, 2009 between Grantor Beneficial Owner and Grantor Fee Owner and recorded on July 9, 2009 in the Land Records of the Office of the City Register of the City of New York, Bronx County as CRFN: 2009000209075; and

WHEREAS, the Department accepts this Environmental Easement in order to ensure the protection of human health and the environment and to achieve the requirements for remediation established for the Controlled Property until such time as this Environmental Easement is extinguished pursuant to ECL Article 71, Title 36; and

NOW THEREFORE, in consideration of the mutual covenants contained herein and the terms and conditions of Brownfield Cleanup Agreement Index Number: W2-1126-08-10, Grantor conveys to Grantee a permanent Environmental Easement pursuant to ECL Article 71, Title 36 in, on, over, under, and upon the Controlled Property as more fully described herein ("Environmental Easement")

1. Purposes. Grantor and Grantee acknowledge that the Purposes of this Environmental Easement are: to convey to Grantee real property rights and interests that will run with the land in perpetuity in order to provide an effective and enforceable means of encouraging the reuse and redevelopment of this Controlled Property at a level that has been determined to be safe for a specific use while ensuring the performance of operation, maintenance, and/or monitoring requirements; and to ensure the restriction of future uses of the land that are inconsistent with the above-stated purpose.

2. Institutional and Engineering Controls. The controls and requirements listed in the Department approved Site Management Plan ("SMP") including any and all Department approved amendments to the SMP are incorporated into and made part of this Environmental Easement. These controls and requirements apply to the use of the Controlled Property, run with the land, are binding on the Grantor and the Grantor's successors and assigns, and are enforceable in law or equity against any owner of the Controlled Property, any lessees and any person using the Controlled Property.

A. (1) The Controlled Property may be used for: **Restricted Residential as described in 6 NYCRR Part 373-1.8(g)(2)(ii), Commercial as described in 6 NYCRR Part 375-1.8(g)(2)(iii) and Industrial as described in 6 NYCRR Part 375-1.8(g)(2)(iv).**

(2) All Engineering Controls must be operated and maintained as specified in the Site Management Plan (SMP);

(3) All Engineering Controls must be inspected at a frequency and in a manner defined in the SMP.

(4) Groundwater and other environmental or public health monitoring must be performed as defined in the SMP;

(5) Data and information pertinent to Site Management of the Controlled Property must be reported at the frequency and in a manner defined in the SMP;

(6) All future activities on the property that will disturb remaining contaminated material must be conducted in accordance with the SMP;

(7) Monitoring to assess the performance and effectiveness of the remedy must be performed as defined in the SMP.

(8) Operation, maintenance, monitoring, inspection, and reporting of any mechanical or physical components of the remedy shall be performed as defined in the SMP.

(9) Access to the site must be provided to agents, employees or other representatives of the State of New York with reasonable prior notice to the property owner to assure compliance with the restrictions identified by this Environmental Easement.

B. The Controlled Property shall not be used for, Unrestricted Residential purposes and the above-stated engineering controls may not be discontinued without an amendment or extinguishment of this Environmental Easement.

C. The SMP describes obligations that the Grantor assumes on behalf of Grantor, its successors and assigns. The Grantor's assumption of the obligations contained in the SMP which may include sampling, monitoring, and/or operating a treatment system, and providing certified reports to the NYSDEC, is and remains a fundamental element of the Department's determination that the Controlled Property is safe for a specific use, but not all uses. The SMP may be modified in accordance with the Department's statutory and regulatory authority. The Grantor and all successors and assigns, assume the burden of complying with the SMP and obtaining an up-to-date version of the SMP from:

Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, New York 12233
Phone: (518) 402-9553

D. Grantor must provide all persons who acquire any interest in the Controlled Property a true and complete copy of the SMP that the Department approves for the Controlled Property and all Department-approved amendments to that SMP.

E. Grantor covenants and agrees that until such time as the Environmental Easement is extinguished in accordance with the requirements of ECL Article 71, Title 36 of the ECL, the property deed and all subsequent instruments of conveyance relating to the Controlled Property shall state in at least fifteen-point bold-faced type:

This property is subject to an Environmental Easement

held by the New York State Department of Environmental Conservation pursuant to Title 36 of Article 71 of the Environmental Conservation Law.

F. Grantor covenants and agrees that this Environmental Easement shall be incorporated in full or by reference in any leases, licenses, or other instruments granting a right to use the Controlled Property.

G. Grantor covenants and agrees that it shall annually, or such time as NYSDEC may allow, submit to NYSDEC a written statement by an expert the NYSDEC may find acceptable certifying under penalty of perjury, in such form and manner as the Department may require, that:

(1) the inspection of the site to confirm the effectiveness of the institutional and engineering controls required by the remedial program was performed under the direction of the individual set forth at 6 NYCRR Part 375-1.8(h)(3).

(2) the institutional controls and/or engineering controls employed at such site:

(i) are in-place;

(ii) are unchanged from the previous certification, or that any identified changes to the controls employed were approved by the NYSDEC and that all controls are in the Department-approved format; and

(iii) that nothing has occurred that would impair the ability of such control to protect the public health and environment;

(3) the owner will continue to allow access to such real property to evaluate the continued maintenance of such controls;

(4) nothing has occurred that would constitute a violation or failure to comply with any site management plan for such controls;

(5) the report and all attachments were prepared under the direction of, and reviewed by, the party making the certification;

(6) to the best of his/her knowledge and belief, the work and conclusions described in this certification are in accordance with the requirements of the site remedial program, and generally accepted engineering practices; and

(7) the information presented is accurate and complete.

3. Right to Enter and Inspect. Grantee, its agents, employees, or other representatives of the State may enter and inspect the Controlled Property in a reasonable manner and at reasonable times to assure compliance with the above-stated restrictions.

4. Reserved Grantor's Rights. Grantor reserves for itself, its assigns, representatives, and successors in interest with respect to the Property, all rights as fee and beneficial owner of the Property, including:

A. Use of the Controlled Property for all purposes not inconsistent with, or limited by the terms of this Environmental Easement;

B. The right to give, sell, assign, or otherwise transfer part or all of the underlying fee interest to the Controlled Property, subject and subordinate to this Environmental Easement;

5. Enforcement

A. This Environmental Easement is enforceable in law or equity in perpetuity by Grantor, Grantee, or any affected local government, as defined in ECL Section 71-3603, against the owner of the Property, any lessees, and any person using the land. Enforcement shall not be defeated because of any subsequent adverse possession, laches, estoppel, or waiver. It is not a defense in any action to enforce this Environmental Easement that: it is not appurtenant to an interest in real property; it is not of a character that has been recognized traditionally at common law; it imposes a negative burden; it imposes affirmative obligations upon the owner of any interest in the burdened property; the benefit does not touch or concern real property; there is no privity of estate or of contract; or it imposes an unreasonable restraint on alienation.

B. If any person violates this Environmental Easement, the Grantee may revoke the Certificate of Completion with respect to the Controlled Property.

C. Grantee shall notify Grantor of a breach or suspected breach of any of the terms of this Environmental Easement. Such notice shall set forth how Grantor can cure such breach or suspected breach and give Grantor a reasonable amount of time from the date of receipt of notice in which to cure. At the expiration of such period of time to cure, or any extensions granted by Grantee, the Grantee shall notify Grantor of any failure to adequately cure the breach or suspected breach, and Grantee may take any other appropriate action reasonably necessary to remedy any breach of this Environmental Easement, including the commencement of any proceedings in accordance with applicable law.

D. The failure of Grantee to enforce any of the terms contained herein shall not be deemed a waiver of any such term nor bar any enforcement rights.

6. Notice. Whenever notice to the Grantee (other than the annual certification) or approval from the Grantee is required, the Party providing such notice or seeking such approval shall identify the Controlled Property by referencing the following information:

County, NYSDEC Site Number, NYSDEC Brownfield Cleanup Agreement, State Assistance Contract or Order Number, and the County tax map number or the Liber and Page or computerized system identification number.

Parties shall address correspondence to: Site Number: C203044
Office of General Counsel
NYSDEC
625 Broadway
Albany New York 12233-5500

With a copy to: Site Control Section
Division of Environmental Remediation
NYSDEC
625 Broadway
Albany, NY 12233

County: Site No: C203044:

All notices and correspondence shall be delivered by hand, by registered mail or by Certified mail and return receipt requested. The Parties may provide for other means of receiving and communicating notices and responses to requests for approval.

7. Recordation. Grantor shall record this instrument, within thirty (30) days of execution of this instrument by the Commissioner or her/his authorized representative in the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

8. Amendment. Any amendment to this Environmental Easement may only be executed by the Commissioner of the New York State Department of Environmental Conservation or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

9. Extinguishment. This Environmental Easement may be extinguished only by a release by the Commissioner of the New York State Department of Environmental Conservation, or the Commissioner's Designee, and filed with the office of the recording officer for the county or counties where the Property is situated in the manner prescribed by Article 9 of the Real Property Law.

10. Joint Obligation. If there are two or more parties identified as Grantor herein, the obligations imposed by this instrument upon them shall be joint and several.

SIGNATURE PAGES TO FOLLOW

County: Site No: C203044:

IN WITNESS WHEREOF, Grantor Fee Owner has caused this instrument to be signed in its name.

CS Melrose Site B / Housing Development Fund Corp.:

By:  _____

Title: Vice President Date: May 28 2010

County:

Site No: C203044:

IN WITNESS WHEREOF, Grantor Beneficial Owner has caused this instrument to be signed in its name.

CS Melrose Site B LLC

By: _____

Title: Vice President Date: May 28 2010

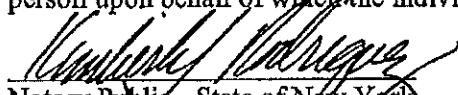
Grantor Fee Owner's Acknowledgment

STATE OF NEW YORK)

) ss:

COUNTY OF Westchester

On the 28th day of May, in the year 20 10, before me, the undersigned, personally appeared Ronald Mbelis, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.


Notary Public - State of New York

Kimberly Rodriguez
Notary Public, State of New York
No. 01RO6218332
Commission Expires March 01, 2014

Grantor Beneficial Owner's Acknowledgment

STATE OF NEW YORK)

COUNTY OF Westchester) ss:

On the 28th day of May, in the year 20 10, before me, the undersigned, personally appeared Ronald M. Heits, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/they executed the same in his/her/their capacity(ies), and that by his/her/their signature(s) on the instrument, the individual(s), or the person upon behalf of which the individual(s) acted, executed the instrument.

Kimberly Rodriguez
Notary Public - State of New York

Kimberly Rodriguez
Notary Public, State of New York
No. 01RO6218332
Commission Expires March 01, 2014

THIS ENVIRONMENTAL EASEMENT IS HEREBY ACCEPTED BY THE PEOPLE OF THE STATE OF NEW YORK, Acting By and Through the Department of Environmental Conservation as Designee of the Commissioner,

By: _____
Dale A. Desnoyers, Director
Division of Remediation

Grantee's Acknowledgment

STATE OF NEW YORK)
) ss:
COUNTY OF)

On the _____ day of _____, in the year 20__, before me, the undersigned, personally appeared _____, personally known to me or proved to me on the basis of satisfactory evidence to be the individual(s) whose name is (are) subscribed to the within instrument and acknowledged to me that he/she/ executed the same in his/her/ capacity as Designee of the Commissioner of the State of New York Department of Environmental Conservation, and that by his/her/ signature on the instrument, the individual, or the person upon behalf of which the individual acted, executed the instrument.

Notary Public - State of New York

SCHEDULE "A" PROPERTY DESCRIPTION

Legal Description
Tax Block 2364 Tax Lots 45 & 70

ALL that certain plot or piece or parcel of land, situate lying and being in the Borough and County of the Bronx, City and State of New York bounded and described as follows:

BEGINNING at the corner formed by the intersection of the northerly side of East 158th Street (50 feet wide) with the easterly side of 3rd Avenue (80 feet wide);

RUNNING THENCE northerly, along the easterly side of 3rd Avenue, 99.53 feet to the southerly boundary of former Tax Lot 49;

RUNNING THENCE easterly, along the southerly boundary of former Tax Lot 49 and along a line forming an angle of 97 degrees 44 minutes 38 seconds on the southeast with the easterly side of 3rd Avenue, 154.46 feet to the westerly boundary of the Land now or formerly of the Port Morris Branch of The New York & Harlem Railroad Company;

RUNNING THENCE southerly, along the westerly boundary of the Land now or formerly of the Port Morris Branch of The New York & Harlem Railroad Company, the following three courses and distances;

1. THENCE southerly along a line forming an angle of 90 degrees 39 minutes 57 seconds on the southwest with the last mentioned course, 11.74 feet to a point;
2. THENCE southerly along a line forming an exterior angle of 178 degrees 42 minutes 0 seconds on the east with the last mentioned course, 30.58 feet to a point;
3. THENCE southerly, along a line forming an exterior angle of 181 degrees 20 minutes 54 seconds in the east with the last mentioned course, 56.17 feet to the northerly side of East 158th Street;

RUNNING THENCE westerly, along the northerly side of East 158th Street, 169.65 feet to the corner, the point or place of BEGINNING.



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