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January 5, 2011 Reference No. 050138

Mr. John Swartwout
Division of Remediation
NYSDEC
625 Broadway
Albany, NY 12233-7015

Dear Mr. Swartwout:

Re: Final Operations, Maintenance and Monitoring Plan
HWD Site, Farmingdale, NY
Site #1-52-113

On behalf of HWD Group, we are submitting the enclosed hard copy and 1 CD of the final Operations, Maintenance and Monitoring Plan (O, M&M Plan) for the HWD Site in Farmingdale, NY. The draft O, M&M Plan was included in Appendix J of the 100% Design Report submitted to NYSDEC in October 2009. Revisions included in the final O, M&M Plan were primarily made to reflect as-built conditions for the Soil Vapor Extraction and In-Situ Chemical Oxidation injection systems.

In accordance with the AOC, copies of the final O, M&M Plan are being submitted to:

Gary Litwin – NYSDOH
Bob Corcoran – NYSDEC
Alali M. Tamuno, Esq. - NYSDEC

Should you have any questions, please do not hesitate to contact us.

Yours truly,

CONESTOGA-ROVERS & ASSOCIATES

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OPERATIONS, MAINTENANCE AND MONITORING PLAN

HWD SITE
FARMINGDALE, NEW YORK

Prepared For:

New York State Department of Environmental Conservation on behalf of HWD Site Group

JANUARY 2011
REF. NO. 050138 (6)
This report is printed on recycled paper.

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1.0 INTRODUCTION

The Hazardous Waste Disposal (HWD) Site is located at 11A Picone Boulevard in the Village of Farmingdale, Suffolk County, New York. In December 2004, New York State Department of Environmental Conservation (NYSDEC) issued a Record of Decision (ROD) that selected a remedy for the Site that included soil treatment using either in situ chemical oxidation (ISCO) or soil vapor extraction (SVE) and groundwater treatment using either ISCO or air sparging. In June 2007, the HWD Group and NYSDEC entered into a Consent Order to conduct and implement a Remedial Design/Remedial Action (RD/RA) for the Site. CRA prepared a RD Report for the HWD Group in accordance with the RD/RA Work Plan approved by NYSDEC. The objective of the RD Report was to provide for the development and implementation of final plans and specifications for implementing the remedial alternative set forth in the NYSDEC December 2004 ROD. The Operations, Maintenance, and Monitoring Plan is a support plan for the RD Report and the implementation of the selected remedy. Construction of the remedial alternative consisting of ISCO wells, SVE wells, and an SVE system commenced in November 2009 and was completed in December 2009. The SVE system began operating in March 2010.

This Operations, Maintenance, and Monitoring (OM&M) Plan was prepared to fulfill the HWD Group's requirement for a RD Report under the Consent Order. The requirements for the OM&M Plan are set forth in the Consent Order.

The OM&M Plan is organized as follows:

- Section 1.0 – Introduction
- Section 2.0 – Background Information
- Section 3.0 – Operations Overview
- Section 4.0 - General Remedial Requirements
- Section 5.0 – Operations of ASD and SVE Systems
- Section 6.0 – ISCO Procedures
- Section 7.0 – Monitoring and Verification Sampling
- Section 8.0 – Inspections and Maintenance of ASD and SVE Systems
- Section 9.0 – Contingency Plan
- Section 10.0 – Determination That Remedial Action Objectives are Achieved
- Section 11.0 – Operations Management

2.0 BACKGROUND INFORMATION

The Site is located at 11A Picone Boulevard in the Village of Farmingdale, Suffolk County, New York and is identified as part of Tax Lot 31.004 in the Suffolk County, New York tax maps. A Site location map is presented on Figure 2.1. The Site is approximately 0.5 acres in size and includes an approximately 10,000-square-foot area where hazardous waste storage, transfer, and recycling operations were historically conducted. The Site is currently owned by JPD United Inc., successor to Little Joseph Realty, Inc. Guaranteed Overnight Delivery, Inc., an overnight delivery service, currently leases the property from JPD United Inc. for use as a truck/tractor-trailer parking lot. The Site is covered by a concrete slab that is approximately 6 to 8 inches thick. Select areas of the slab have been repaired/replaced with bituminous asphalt pavement.

Access to the Site is limited by a chain-link fence to the north, east, and south of the Site, and a concrete wall associated with a storage yard west of the Site. The Site is accessible from Picone Boulevard through a gate along the southern Site boundary, and from a paved driveway that enters the northwestern portion of the Site.

Land use in the vicinity of the Site is predominantly commercial/industrial. South of the Site, across Picone Boulevard (20 Picone Boulevard), is a one-story commercial building occupied by a specialty bath tub distributor and Ryder Truck (this was formerly known as the R&D Carpet and Tile Building). The east side of the building includes a garage area and an office area/showroom. Ryder Truck operations make up the west side of the former R&D Carpet and Tile Building. The Ryder Truck portion of the building is primarily used as a service garage for medium- and heavy-duty trucks. A one-story building occupied by Ford Brand Service is located west of the Site, immediately west of the storage yard. The Fort Brand Service building is primarily used as a service garage for heavy equipment used in connection with the aviation industry. A furniture warehouse is located west of the Fort Brand Service building. Parking lots for trucking companies/commercial facilities border the Site to the north, east, and southeast.

HWD, Inc. operated as a hazardous waste storage, transfer, and recycling facility at the Site from approximately 1979 to 1982. Hazardous wastes (primarily spent solvents and acidic wastes) were collected from off-Site generators, transported to the Site by HWD, Inc. and stored on Site prior to off-Site transport and disposal. Spent solvents were also recycled for resale. Hazardous wastes stored on the Site were managed in 55-gallon drums, one or more aboveground storage tanks and a "sludge pit". This operation area

of the Site is now covered by a concrete slab or asphalt paving and is currently used as a truck/ tractor-trailer parking lot.

In November 1982, HWD entered into a Consent Order with NYSDEC that required HWD to cease hazardous waste management operations at the Site. All remaining wastes and waste management tanks were reportedly removed from the Site during 1984.

In October 1999, the Potentially Responsible Parties (PRPs) entered into a Consent Order with NYSDEC to conduct a Remedial Investigation (RI) and Feasibility Study (FS). The RI identified elevated concentrations of tetrachloroethene (PCE) and its breakdown products in the soils and groundwater at the Site. Elevated concentrations of PCE were also identified in samples collected from the indoor air of the former R&D Carpet and Tile Building located southwest and downgradient of the Site. The FS evaluated potential remedial alternatives for the Site and recommended an alternative consisting of ISCO for treatment of the soils and groundwater, sub-slab depressurization for the former R&D Carpet and Tile Building, and Site controls and monitoring. The active sub-slab depressurization (ASD) system was installed at the former R&D Carpet and Tile Building as an Interim Remedial Measure (IRM) in September 2004 and it is operational.

NYSDEC issued a ROD in December 2004. In the ROD, NYSDEC selected a remedy that included soil treatment using either ISCO or soil vapor extraction (SVE) and groundwater treatment using either ISCO or air sparging. The components of the remedy as specified in the ROD are as follows:

- *A remedial design program to provide the details necessary to implement the remedial program*
- *Treatment of source area soils to SCGs (defined in Section 5.1 of the ROD) to protect groundwater and reduce migration of volatile organic compounds (VOCs) through the soil gas using one of the following methods: in situ chemical oxidation using potassium permanganate, or similar oxidant; or SVE with off-gas treatment to meet applicable discharge requirements*
- *Treatment of on-Site and off-Site groundwater to reduce total VOC concentrations to upgradient concentrations by either of the following methods: in situ chemical oxidation; using potassium permanganate, or similar oxidant; or air sparging with off-gas treatment to meet applicable discharge requirements*

- *A pre-design investigation to determine the extent of the downgradient groundwater plume and the optimum location for the injection/air sparging wells and performance monitoring wells*
- *Verification sampling of treated soil and groundwater to confirm the effectiveness of the remedial actions*
- *Continued operation, maintenance, and monitoring of the ASD system IRM to reduce PCE concentrations in indoor air at the former R&D Carpet and Tile Building to ambient background levels*
- *Development of a Site management plan to address residual VOCs and any use restrictions*
- *Imposition of an environmental easement*
- *Annual certification of the institutional and engineering controls*

In June 2007, the HWD Group and NYSDEC entered into a Consent Order to conduct and implement a RD/RA. A RD/RA Work Plan (January 2008, revised March 2008) was prepared to fulfill the HWD Group's requirements for a RD/RA Work Plan under the Consent Order. NYSDEC approved the RD/RA Work Plan on April 29, 2008.

A 30% Preliminary Design (September 2008) was prepared in accordance with the approved RD/RA Work Plan based on SVE treatment of soils and in situ chemical oxidation to treat the groundwater. The 30% Preliminary Design (30% RD) was submitted to NYSDEC on September 29, 2008. NYSDEC provided comments on 30% RD in a letter dated November 26, 2008. The HWD Group provided responses to the NYSDEC comments in a letter dated January 30, 2009. In the January 30, 2009 letter, the HWD Group proposed to install additional monitoring wells at the Site and conduct a round of groundwater sampling prior to completion of the 95% Remedial Design in order to finalize the extent of the groundwater treatment area prior to submittal of the 95% Remedial Design. NYSDEC concurred with this change to the RD/RA Work Plan.

The 95% Remedial Design was submitted to the NYSDEC on June 30, 2009. NYSDEC approved the 95% RD with comments on July 28, 2009.

The 100% Design Report (100% RD) was submitted to the NYSDEC on September 25, 2009. NYSDEC provided verbal comments on October 1, 2009. Based on the comments, revised pages were submitted to the NYSDEC on October 6, 2009. The 100% RD was approved on October 13, 2009.

The remedial system was installed in November-December 2009. Power was connected in February 2010. The SVE system was started on March 3, 2010. ISCO injections were conducted in March and June 2010.

3.0 OPERATIONS OVERVIEW

This OM&M Plan will support the ongoing operations of the existing ASD system for the former R&D Carpet and Tile Building and the operations of the SVE system and ISCO implementation. The general requirements for the various remedial components are presented in Section 4.

3.1 OPERATIONS PLAN

The ASD system operates continuously without an operator control.

The design of the SVE control system is based on the criteria listed below:

- The SVE will be operated at all times to meet permitted air discharge standards.
- The SVE is designed for automatic, unattended operation. Status of operating equipment will be monitored to detect equipment failures, and automatic shutdowns.
- Regular preventative maintenance is required.
- Regular monitoring will be performed to ensure compliance with NYSDEC Air Guide 1 emissions criteria.

The ISCO injection procedures were implemented by trained remedial personnel in March and June 2010. There are no ongoing operational requirements for the ISCO program other than groundwater monitoring (Section 7.3).

3.2 SUPPORTING PLANS AND PROCEDURES

The following plans and procedure documents are included in the RD Report and are referenced where applicable in the OM&M Plan:

- **Site Health and Safety Plan** - summarizes health and safety procedures for construction and OM&M activities and job safety analysis for expected monitoring and maintenance activities.
- **Quality Assurance Project Plan** - presents the policies, organization, objectives, functional activities, and quality assurance (QA) and quality control (QC) activities designed to achieve the specific data quality goals for the OM&M.

- **Field Sampling Plan** - presents the protocols that will be implemented during OM&M activities such as hydraulic measurements, groundwater sampling, SVE air sampling, equipment handling, and waste handling.

3.3 SAFETY AND COMMUNICATIONS

3.3.1 HEALTH AND SAFETY

A Site Health and Safety Plan (HASP) detailing the Site Health and Safety Program for operations of the constructed remedy is included in the 100% RD.

Energy control procedures have been developed for the operation of the SVE system and ISCO equipment. These procedures are included in this OM&M Plan.

3.3.2 COMMUNICATIONS

All communications with regulatory agencies concerning the operation of the SVE system and the ISCO program will be coordinated directly through the HWD Group or other representatives of the HWD Group.

Progress reports will be sent to NYSDEC monthly.

4.0 GENERAL REMEDIAL REQUIREMENTS

4.1 DESCRIPTION OF ACTIVE SUB-SLAB DEPRESSURIZATION SYSTEM

The former R&D Carpet and Tile Building is a one-story commercial building that includes a garage area formerly used to store new carpet and various adhesives, coatings/sealers, base fillers, cleaners, paints/stains, etc., and an office area/showroom. The layout of the building is shown on BBLES Figure 1 (Appendix A). PCE was previously identified in indoor air samples collected from the building. As an Interim Remedial Measure (IRM), the ASD system was installed in September 2004.

The active sub-slab depressurization system consists of a 3-inch PVC suction pipe imbedded approximately 6 inches in the fill material below the floor slab. The riser extends up through the lavatory to the roof were it connects to a roof-mounted RadonAway Model HS5000 fan (originally Model HS3000). A direct reading vacuum gage attached to the riser between the floor slab and the fan measures the vacuum induced by the fan. A pressure sensor emits and audible alarm if the vacuum falls below a predetermined set point. The sensor is attached to the suction pipe. The objective of the ASD is to maintain a pressure differential between the sub-slab air and the office air in accordance with ASTM E2121 in order to prevent migration of PCE vapors from the soil into the office. The New York State SCG for PCE is 100 micrograms per cubic meter ($\mu g/m^3$). To measure the differential pressure, a HM28 Digital Manometer is located on the floor in the closet of the office at the northwestern side of the building. The location of the manometer is labeled TH-2 on BBLES Figure 1. Air sampling results taken after the installation and startup of the ASD indicated that PCE levels in the office space are below the 100 $\mu g/m^3$ standard.

On February 27, 2009, the original HS3000 roof-mounted fan was replaced with a HS5000 fan to provide additional flow and vacuum capacity. Subsequent testing was completed on March 12, 2009 to document the performance of the ASD system. A letter summarizing the fan replacement/enhancement and the testing was submitted to the NYSDEC on March 24, 2009. The testing indicated the ASD is operating satisfactorily.

4.2 DESCRIPTION OF SVE AND ISCO SYSTEMS

The selected treatment systems for soil and groundwater are a Soil Vapor Extraction (SVE) and an In-Situ Chemical Oxidation (ISCO), respectively. The design airflow through the SVE system is 300 scfm. The actual flow varies depending on subsurface conditions and operational considerations.

The SVE system is intended to extract contaminant vapors from the vadose zone. Contaminated soil vapors are drawn out of the ground through ten vertical wells and three horizontal wells piped to a manifold in a SVE equipment trailer. Each SVE well has a variable area flowmeter and shut off valve prior to entering the manifold. Extracted vapors are then conveyed to the SVE skid system.

The SVE skid includes an adjustable dilution valve, which introduces fresh air into the system if desired. Vapors then enter the knockout pot, which removes any entrained water droplets. The knockout pot has a manual drain valve used to remove accumulated water. A level sensor measures the water level in the knockout pot and will shut down the blower if the water level gets too high. Following the knockout pot, vapors pass through an inline filter before entering the blower. Silencers are installed on the blower inlet and outlet.

Following the SVE skid, vapors enter the two carbon vessels piped in series, where carbon adsorbs contaminants in the air. Clean air is then exhausted to the environment. A sample port between the two vessels is available to take air samples to determine the saturation of the first carbon vessel.

The ISCO system is intended to remediate contaminated groundwater to upgradient conditions. Potassium permanganate ($KMnO_4$) solution is injected into each of the 40 individual injection wells. A solution of $KMnO_4$ (approximately 3 percent) is prepared in a mixing tank and transferred to a distribution tank. The $KMnO_4$ is pumped to the injection wells at a pressure sufficient to overcome the hydraulic head and force the oxidant through the well screen and into the surficial aquifer. Each well receives 1,800 gallons of full strength $KMnO_4$ solution (approximately 3 percent) per injection.

SVE and ISCO injection wells were installed in November and December 2009. Table 4.1 presents a well completion summary. The two $KMnO_4$ injection events were conducted in March and June 2010. Tables 4.2 and 4.3 summarize these $KMnO_4$ injection events.

4.2.1 SVE SYSTEM COMPONENTS

A. Wells

- Ten soil vapor vertical extraction wells penetrate approximately 7.5 to 8 ft bgs. The wells are constructed of 2-inch HDPE pipe with a 4 foot PVC well screen at the bottom.

- Three soil vapor horizontal extraction wells were installed in the trenches that were constructed for the piping to the 10 vertical wells. Each horizontal well is constructed of 3-inch perforated HDPE pipe.

B. Header

- Thirteen SVE lines tie into a 4-inch PVC header in the SVE blower equipment trailer.

C. SVE Skid

1. SVE Blower:

   Description: Rotary lobe blower, manufactured by Gardner Denver (Sutorbilt Legend Model 5M, P-version)

   Motor model L3712T as manufactured by Baldor

   10 hp/230V/1 ph/1725 RPM

   Purpose: Creates vacuum to extract volatile contaminants from vadose zone. Forces contaminated vapors through activated carbon vessels for treatment.

2. Knockout Pot:

   Description: 40 gallon water capacity air/mist separator with manual drain valve at bottom.

   Purpose: The knockout pot removes entrained water droplets from the airstream. A high level alarm will shut down the SVE blower if the tank becomes full of water.

3. Dilution Valve:

   Purpose: Allows clean air to be drawn into system to dilute contaminant concentrations.

4. Inline Filter:

   Purpose: Prevent damage to the blower by capturing particulates in the airstream.

5. Inlet and Discharge Silencers:

   Purpose: Reduce noise associated with the blower on the inlet and discharge sides.

6. Vacuum Relief Valve:

Purpose: Prevent damage to SVE system components from excessive vacuum levels. Can be adjusted to actuate at different vacuum levels.

D. Granular Activated Carbon Vessels

Description: Flat bottom, carbon steel drums as manufactured by Carbonair.

500-lb standard fill capacity.

Carbon type: Vapor Phase

Air flows through the two beds in series and the lead and lag drum can be alternated so that the cleanest carbon is always in the lag or second position.

Purpose: The carbon in the vessels adsorbs contaminants from extracted soil vapors.

E. Autodialer

Description: GUARD-IT autodialer.

Purpose: Notify operator of SVE system failure.

4.2.2 ISCO SYSTEM COMPONENTS

A. Wells

Description: 40 wells penetrate up to 30 ft bgs. The wells are constructed of 1 inch SCH40 PVC. The bottom 15 foot of piping is PVC screen in order to distribute the chemical injection within the saturated zone.

B. Mixing and Distribution Tanks

Description: Horizontal freestanding PVC tanks

C. Pumps

Description: Slurry pump

Transfer $KMnO_4$ slurry from a drum to the mixing tank

Mix pump
Circulate $KMnO_4$ solution in the mixing tank

Capacity: 50 GPM at 20 foot TDH
1/2 hp, 230 V, 1750 rpm

Distribution pump(s)
Distribute $KMnO_4$ solution to the injection wells
Capacity: 50 GPM at 20 foot TDH
1/2 hp, 230 V, 1750 rpm

5.0 OPERATIONS OF ASD AND SVE SYSTEMS

5.1 ASD

The ASD operates continuously. The fan is connected to a electrical panel that is located in the same closet as the manometer described in Section 4.1. With the upgraded fan installed in February 2009, the air flow was measured at 54.5 cfm at a vacuum of 25.6 inches WC.

The pressure sensor will alarm if the fan is turned off or is the vacuum levels decreases below the set point. The occupants of the building will notify the landlord's representative if the alarm goes off. The representative will notify CRA who will take action necessary to fix the fan.

Specification sheets for the ASD fan and monometer are provided in Appendix A.

5.2 SVE SYSTEM

The SVE blower is controlled from a control panel mounted on the SVE skid assembly. The vacuum in the well heads is controlled with the valves on the SVE header.

The SVE operates continuously. The volumetric extraction rate is dependant on the number of extraction wells that are in use and the percent bleed air open. The system will shutoff if the knockout pot is full of water. If a shutdown occurs due to the water level in the knockout pot, an alarm notification is sent to CRA by the Guard-it Autodialer. CRA will then go to the Site to inspect and fix the problem. When the groundwater table is high the SVE vacuum is reduced to reduce or eliminate the amount of groundwater entrained with the extracted vapors to prevent an unwanted SVE shutdown.

Startup and shutdown procedures are summarized in the following sections.

5.2.1 PRE-STARTUP

- Verify desired SVE header valves are open
- Verify knockout pot is drained of water
- Verify the following valves are closed
  - Sample ports
  - Carbon vessel drain ports
  - Knockout pot drain
  - Manual dilution valve
- Verify proper belt tension on blower
- Verify proper blower motor rotation
- Adjust vacuum relief valve to maximum permitted level of vacuum

5.2.2 SVE SYSTEM STARTUP

- Provide power to the unit by first turning the circuit breaker and then the disconnect switch to the 'ON' position
- Enable blower by selecting "Auto" on the Hand-Off-Auto switch on the panel
- Start blower by pressing the start button on the front panel
- Adjust flows from individual wells as needed
- Adjust manual dilution valve as necessary to maximum allowable vacuum level

5.2.3 SVE SYSTEM SHUTDOWN

- Stop the blower by pressing the 'Stop' button on the panel
- Turn off SVE system using disconnect switch on front panel
- Close valves to SVE system

Specification sheets for the SVE components are provided in Appendix B.

6.0 ISCO PROCEDURES

Equipment and oxidant for each injection event is mobilized as required. $KMnO_4$ is delivered to the Site in bulk (35 gallon drums) or as a premixed solution. Approximately 3 percent $KMnO_4$ (full strength) solution is mixed at the Site by creating a slurry in a drum of $KMnO_4$ and combining with water in the mixing tank. To prepare a solution of approximately 3 percent $KMnO_4$ for 40 injection wells sufficient to inject 1,800 gallons to each well requires 18,200 lbs of bulk $KMnO_4$. The $KMnO_4$ solution is injected into the 40 ISCO wells described in the RD Report at a volume of 1,800 gallons. Once the full strength $KMnO_4$ solution has been injected, all equipment is cleaned and demobilized. During the cleaning process, undissolved $KMnO_4$ residual is mixed into solution and is injected into selected injection wells. Detailed procedures for each ISCO event are summarized in the following sections.

6.1 PRE-STARTUP

- Connect hose to hydrant
- Set up mixing, distribution tanks and piping
- Provide electrical power to pumps
- Add water to a drum of $KMnO_4$ to make a slurry
- Pump the slurry to the mixing tank
- Add water to the mixing tank to dissolve the slurry
- Continue to add slurry to the mixing tank at a rate sufficient that the $KMnO_4$ mixture is saturated (approximately 3 percent $KMnO_4$) and undissolved $KMnO_4$ is evident in the bottom of the mixing tank
- Saturated $KMnO_4$ solution from the mixing tank overflows by pipe to fill the distribution tank(s)

6.2 ISCO INJECTION

- Unlock and open ISCO injection well. Remove well cap
- Connect ISCO pump to injection well
- Open valves leading to injection well
- Turn on pump that is piped into the distribution tank to begin injection into well

- Turn off pump and close valves when tank has emptied, or after 1800 gallon of full strength solution (approximately 3 percent) has been applied to well(s)
- Install well cap and close well vault
- Repeat procedure at subsequent ISCO injection wells until all wells have been treated
- Clean and demobilize oxidant, mixing, and distribution tanks, recirculation, and injection pumps

6.3 PERMITS

6.3.1 USEPA UNDERGROUND INJECTION CONTROL

An Underground Injection Control Permit (UIC) is required from the United States Environmental Protection Agency (USEPA) prior to undertaking injection of an oxidant into groundwater. CRA submitted a letter application in February 2010 for the two rounds of $KMnO_4$ injection that have been completed. USEPA approved the injection program on February 25, 2010 (Appendix C). USEPA must be notified prior to completing supplemental injections, if necessary. USEPA must also be notified after ISCO wells are abandoned.

6.3.2 U.S. DEPARTMENT OF HOMELAND SECURITY

In accordance with Chemical Facility Anti-Terrorism Standards (CFATS) regulations, $KMnO_4$ is considered to be a chemical of concern if stored at a facility above the threshold quantity of 400 lbs. Quantities in excess of the threshold quantity must be reported to the U.S. Department of Homeland Security (DHS) within 60 days of the date that delivery and storage commences. CRA completed an on-line "TOP SCREEN" filling for each of the two ISCO rounds in accordance with the DHS requirements. This filing would have to be completed again for any future supplemental injections at HWD within 60 days of delivery of $KMnO_4$ to the HWD Site.

7.0 MONITORING AND VERIFICATION SAMPLING

7.1 SVE SYSTEM

At startup of the SVE system the influent VOC concentrations were monitored with a PID to optimize the flow from the thirteen SVE wells. This was performed daily for the first week and then weekly for the first month and monthly thereafter. An air sample was collected once the SVE system was initially optimized. The air sample results were used to model worst-case emission dispersion assuming that carbon is not used to treat the extraction vapors. A letter was sent to the NYSDEC on May 18, 2010 indicating that carbon treatment was not required to be compliant with the NYSDEC Air Guide 1 SGC and AGC limits, but noting that the carbon would remain in use. The post-carbon vapors are monitored on a monthly basis with a PID and if the PID reading exceeds 5 ppm, then an air sample will be collected to determine the VOC concentrations and the Screen3 dispersion model will be updated to ensure continued compliance with the NYSDEC Air Guide 1 limits.

At the conclusion of the soil remediation activities, a soil sampling program will be implemented to determine the effectiveness of the treatment and ultimately verify that the soil treatment criteria have been met. Scheduling of verification soil sampling activities will be determined based on the achievement of asymptotic levels of influent VOCs concentrations in the SVE system or after 2 years of SVE operation, whichever comes first.

Confirmatory soil borings will be advanced in the soil treatment area based on a grid approach with one borehole per 20 foot by 20 foot area resulting in approximately 12 boreholes. During confirmatory soil sampling, direct push soil borings will be completed using Geoprobe® drilling techniques. The borings will be advanced to depths of approximately 8 to 10 ft bgs based on the water table elevation at the time of the event.

A total of 15 samples will be collected, including one from each boring and three QA/QC samples based on a 20 percent QA/QC sample collection frequency.

Each sample will be selected for laboratory analysis based on field screening using a PID with an 11.7 eV lamp. The sample will be chosen based on the observed highest PID reading, or if an elevated reading is not observed, the sample will be collected from the 0- to 2-foot depth interval (typically the shallow soil interval had the highest PCE concentrations during the RI).

Collected soil samples will be submitted to the analytical laboratory under chain-of-custody for analyses of VOCs using EPA Method 8260. All proper sampling and labeling methods will be followed to ensure sample integrity. Analytical results will be evaluated to verify the success of the remedial approach, or to determine the need for additional remedial activities.

Samples will be collected and analyzed in accordance with the QAPP and FSP presented in Appendices H and I, respectively of the 100% RD.

7.2 ASD SYSTEM

A soil gas sample will be collected at the completion of the soil and groundwater treatment to determine if the ASD system can be shut down. The sample will be collected and analyzed in accordance with the QAPP and FSP presented in Appendices H and I, respectively of the 100% RD.

7.3 ISCO SYSTEM

Groundwater monitoring will be conducted to assess the overall groundwater quality during the remedial action and also to specifically evaluate the progress of the ISCO treatment system. During the groundwater treatment period, Remedial Monitoring Wells MW-2, MW-2D, MW-7, MW-8, MW-10, and MW-11 will be sampled quarterly and Groundwater Monitoring Wells MW-1, MW-1D, MW-3, MW-3D, MW-4, MW-5, MW-6, MW-9, and MW-12S and MW-12D will be sampled semi-annually. Samples will be submitted for analysis of VOCs using EPA Method 8260. Prior to commencing the post-ISCO injection groundwater sampling program, the color of the groundwater will be checked to determine if injected $KMnO_4$ has reacted (absence of color or light pink) or has not reacted (dark pink or purple). The groundwater sampling will not be performed until the majority of the $KMnO_4$ has reacted in order to oxidize the target VOCs.

In accordance with the ROD, the groundwater remediation goal is to treat the groundwater to the upgradient concentrations. Since VOC contamination has been identified to be entering the Site from upgradient sources, it is important to characterize and monitor the upgradient groundwater as this will form the basis for determining when the Site remediation is complete. A new upgradient monitoring well MW-9 was installed prior to the construction phase. Existing wells MW-4, MW-9, MW-5, MW-1, MW-1D, MW-2, MW-3 and MW-3D will also be used to monitor groundwater quality upgradient of the treatment area. Monitoring well locations are presented on Figure 7.1.

Prior to implementation of the remedy, a complete round of groundwater samples was collected from the Remedial Monitoring Wells and the Groundwater Monitoring Wells to establish groundwater conditions before the remediation. The "baseline" sampling was conducted March 4 to 9, 2010 and the analytical results were submitted to the NYSDEC on April 8, 2010 with the March 2010 Progress Report. The Remedial Monitoring Wells will then be sampled quarterly for four rounds during the first year during the groundwater treatment (i.e., starting after the two ISCO injection events conducted in March and June 2010). Quarterly monitoring will continue at the Remedial Monitoring Wells for a 1-year period following the remediation to verify that groundwater concentrations remain below the remediation goals. The Groundwater Monitoring Wells will be sampled semi-annually for a 3-year period. The groundwater sampling schedule is presented in Table 7.1.

Samples will be collected and analyzed in accordance with the QAPP and FSP.

8.0 INSPECTIONS AND MAINTENANCE OF ASD AND SVE SYSTEMS

An inspection and operations schedule for the remedial components is presented in Table 8.1.

8.1 ASD.SYSTEM

The ASD system is inspected quarterly to confirm that it is operating as designed. The inspection includes the following:

- Checking the fan operation and noting the vacuum pressure in the suction pipe
- Checking the manometer and recording the differential pressure

To test the pressure sensor alarm the fan is turned off briefly. Once it is determined that the alarm is triggered, the fan is turned back on and the sensor reset.

Maintenance of the ASD equipment will be performed, if needed, to effect repairs.

Inspections are recorded on inspection logs (Figure 8.1) and maintenance activities will be recorded on maintenance logs (Figure 8.2).

The occupants of the building have been provided with the HWD Group and CRA contact information so they can call if the pressure sensor alarm activates.

8.2 SVE.SYSTEM

8.2.1 ROUTINE INSPECTION AND MAINTENANCE

8.2.1.1 SVE.BLOWER

The blower will require the following scheduled maintenance:

- Lubricate bearings on drive end of blower every month of operation, via grease fittings, as directed by manufacturer
- Drain, flush, and replace oil in blower every six months of operation, as directed by manufacturer

8.2.2 UNSCHEDULED MAINTENANCE

Both the SVE and ASD systems may require periodic maintenance to correct operational problems.

8.2.2.1 SVE.SYSTEM

Unscheduled maintenance would be required in the following situations:

- Repair or replacement of damaged equipment was required
- Draining the knockout tank
- Replacing carbon in the carbon vessels

8.2.2.2 ASD.SYSTEM

Unscheduled maintenance would be required in the following situations:

- Failure of the fan or a low pressure alarm indicating the fan is not performing at it's desired level
- Complaints from occupants about noise or odors

8.2.3 DISPOSAL OF USED MATERIAL AND WASTE

- **SVE Condensate**: Condensate to be stored in approved canister for treatment in the ISCO mixing tanks or for disposal off site. Alternatively, based on characterization analysis, the HWD Group with NYSDEC concurrence would dispose of the condensate water to the ground surface.
- **Vapor Phase Carbon**: Spent carbon generated by the vapor phase granular activated carbon (GAC) adsorbers of the SVE system will be sent off-Site to an approved vendor for regeneration
- **Personal Protective Equipment (PPE)**: Disposable PPE used during carbon changeouts will be stored in drums for disposal off site
- **$KMnO_4$ Drums**: Empty drums will be sent off-site to a local recycler

8.3 ENERGY CONTROL PROCEDURES

Energy control procedures are presented in Appendix D. These procedures are to be used anytime maintenance is perform on the SVE blower/motor, ASD fan and the ISCO pumps.

8.4 AS-RECORDED DRAWINGS

As-recorded drawings are included in Appendix E. Well locations are based on a post-construction well survey performed April 21, 2010 and reported in May 2010 (Appendix F).

9.0 CONTINGENCY PLAN

9.1 EMERGENCIES

9.1.1 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 presented in Table 9.1. For emergencies, appropriate emergency response personnel should be contacted. These emergency contact lists must be maintained in an easily accessible location at the Site.

9.1.2 MAP AND DIRECTIONS TO NEAREST HEALTH FACILITY

Site Location:	11a Picone Blvd., Farmingdale, NY
Nearest Hospital Name:	New Island Hospital
Hospital Location:	4295 Hempstead Turnpike
Hospital Telephone:	516-579-6000

Directions to the Hospital: Start out heading West on Picone Blvd. toward NY-110 N/Broadhollow Road. Turn left onto NY-110 S/Broadhollow Road. Turn Right onto Conklin Street/NY-24. Continue to follow NY-24 W. End at New Island Hospital: 4295 Hempstead Turnpike, Bethpage, NY 11714.

The route to the hospital is presented on Figure 9.1

9.1.3 RESPONSE PROCEDURES

As appropriate, the fire department and other emergency response group will be notified immediately by telephone of the emergency. Emergency telephone numbers are listed in Table 9.1. The list is also posted prominently at the Site and made readily available to all personnel at all times.

9.2 ASD

If the ASD System is damaged due to a storm or due to vandalism, repairs will be completed by CRA and/or a mechanical contractor. In the case of a prolonged power

outage, no contingency measures are required if the building is unoccupied. During periods of building occupancy when the power is out, the doors and windows should be opened to provide ventilation.

The occupants of the building have been instructed to contact the landlord's representative (who will notify CRA) if the pressure sensor alarms is activated indicating a problem with the fan. CRA will notify the HWD Group and initiate corrective action. The HWD Group Site representative will provide information to the building tenants so that ventilation is increased until the ASD system is operational. This could include leaving doors and windows open.

9.3 SVE

If the SVE system is damaged due to a storm or to vandalism, repairs will be completed by CRA and/or a subcontractor and the utility company as required. If the SVE system is not operating, CRA will be notified by autodialer so that the problem can be diagnosed and the SVE system restarted.

9.4 ISCO

If there is a spill or accidental release of the chemical oxidant during an injection event, emergency response procedures will be implemented in accordance with the Health and Safety Plan.

10.0 DETERMINATION THAT REMEDIAL OBJECTIVES ACHIEVED

Soil and groundwater confirmatory samples will be collected to verify that the remedial objectives have been achieved as described in the 100% RD report. Once the remediation of the source is completed, it is anticipated that the ASD system will no longer be required. A soil gas sample will be collected as described in the 100% RD to determine if the ASD system is no longer required but the soil gas results will not be used to confirm that the SVE and ISCO remedial objectives have been achieved.

11.0 OPERATIONS MANAGEMENT

11.1 PROJECT MANAGER

The Project Manager reports to HWD Group, and is responsible for the overall management of the remediation system activities at the Site. The Project Manager has the overall responsibility to ensure that the Site operation, maintenance, monitoring, and inspection requirements are met.

The Project Manager's duties include, but are not necessarily limited to, the following:

i) The overall management of the day-to-day operation, maintenance, monitoring, and inspection requirements

ii) Preparation of monthly progress reports

iii) Attendance at meetings regarding the Site operation, maintenance, and monitoring activities

iv) Providing assistance to the Operations Coordinator with maintenance and repair of Site components

v) Evaluating collected data for meeting operational goals and attainment of cleanup goals

11.2 OPERATIONS COORDINATOR

The Operations Coordinator reports to the Project Manager and is primarily responsible for the day-to-day operation and maintenance of the remedial systems. The Operation Coordinator's duties include, but are not necessarily limited to, the following:

i) Operating and maintaining all the Site equipment in an efficient manner

ii) Maintaining a spare parts inventory for equipment and operating supplies, and is responsible for ordering of materials

iii) Scheduling delivery and pick up of equipment and supplies

iv) Scheduling the required inspections, sampling and monitoring, adjustments, and data compilation, all in accordance with the Site operation requirements

v) Performing the required non-scheduled maintenance, scheduled maintenance, and equipment servicing, all in accordance with the Site maintenance requirements

vi) Recording process readings, and completing all operation logs for the Site

vii) Maintaining a clean site

viii) Being available on a scheduled basis to report to the Site in order to respond to emergency conditions

ix) Participating in and conducting safety meetings

11.3 TRAINING REQUIREMENTS

All on-Site personnel associated with this project shall be trained in accordance with the site's Health and Safety Plan (HASP).

11.4 PERSONNEL REQUIREMENTS

OM&M activities will be performed by CRA. Subcontracted trades will be used for drilling/geoprobe work, surveying, and SVE system carbon replacement. Chemical injection (ISCO) requires two individuals. Expected personnel requirements are presented in Table 11.1.

TABLE 4.1

ISCO INJECTION WELL AND SOIL VAPOR EXTRACTION WELL COMPLETION SUMMARY
HDW SITE
FARMINGDALE, NY
RN 050138

ISCO Injection Well	*Date Installed*	*Feet of Screen*	*Feet of Riser*	*Total Depth*
IW-1	11/20/09	15	15	30
IW-2	11/20/09	15	15	30
IW-3	11/25/09	15	15	30
IW-4	11/24/09	15	15	30
IW-5	11/23/90	15	15	30
IW-6	11/16/09	15	15	30
IW-7	11/17/09	15	12.5	27.5
IW-8	11/18/09	15	15	30
IW-9	11/17/09	15	15	30
IW-10	11/16/09	15	15	30
IW-11	11/20/09	15	15	30
IW-12	11/20/09	15	15	30
IW-13	11/24/09	15	15	30
IW-14	11/23/90	15	15	30
IW-15	11/23/90	15	15	30
IW-16	11/16/09	15	15	30
IW-17	11/17/09	15	15	30
IW-18	11/18/09	15	15	30
IW-19	11/19/09	15	15	30
IW-20	11/16/09	15	15	30
IW-21	11/20/09	15	15	30
IW-22	11/24/09	15	15	30
IW-23	11/25/09	15	15	30
IW-24	11/24/09	15	15	30
IW-25	11/23/90	15	15	30
IW-26	11/23/09	15	15	30
IW-27	11/17/09	15	15	30
IW-28	11/19/09	15	15	30
IW-29	11/18/09	15	15	30
IW-30	11/18/09	15	15	30
IW-31	11/20/09	15	15	30
IW-32	11/24/09	15	15	30
IW-33	11/24/09	15	15	30
IW-34	11/25/09	15	15	30
IW-35	11/23/90	15	15	30
IW-36	11/19/09	15	15	30
IW-37	11/19/09	15	15	30
IW-38	11/19/09	15	15	30
IW-39	11/23/90	15	15	30
IW-40	11/18/09	15	15	30

SVE Well	*Date Installed*	*Feet of Screen*	*Feet of Riser*	*Total Depth*
SVE-101	12/01/09	4	3	7.5
SVE-102	12/01/09	4	3	7.5
SVE-103	12/01/09	4	3	7.5
SVE-104	11/30/09	4	3.5	8
SVE-105	12/01/09	4	3.5	8
SVE-106	11/30/09	4	3.5	8
SVE-107	11/30/09	4	3.5	8
SVE-108	11/30/09	4	3.5	8
SVE-109	12/01/09	4	3	7.5
SVE-110	12/01/09	4	3	7.5

Notes:

The 8 foot SVE wells are topographically on the high side of the Site and the 7.5 foot wells are on the low part of the Site.
All wells are flush mounted.

TABLE 4.2

ISCO SUMMARY - ROUND 1
HDW SITE
FARMINGDALE, NY

Injection Well No.	*03/27/10 gals*	*03/28/10 gals*	*03/29/10 gals*	*03/30/10 gals*	*03/31/10 gals*	*4/1/2010 gals*	*4/2/2010 gals*	*Total gals*
1						1,840		
2						1,910		
3						2,080		
4					1840			
5					1,830			
6			1,803					
7			1,804					
8		1,837						
9		1,827						
10	1,801							
11							1,800	
12						1,800		
13						1,800		
14						1,800		
15					1,810			
16			1,820					
17			1,800					
18			1,800					
19		1,820						
20	1,802							
21						1,800		
22							1,800	
23					1,870			
24					1,940			
25			1,800					
26			1,800					
27			1,810					
28		1,800						
29		1,886						
30	1,855							
31						1,800		
32					1,815			
33				1,810				
34				2,140				
35			1,860					
36			1,922					
37		1,798						
38	1,806							
39	1,803							

TABLE 4.2

ISCO SUMMARY - ROUND 1
HDW SITE
FARMINGDALE, NY

Injection Well No.	*03/27/10 gals*	*03/28/10 gals*	*03/29/10 gals*	*03/30/10 gals*	*03/31/10 gals*	*4/1/2010 gals*	*4/2/2010 gals*	*Total gals*
40						1,876		
TOTAL	**9,067**	**10,968**	**18,219**	**3,950**	**11,105**	**16,706**	**3,600**	**73,615**

Notes:

1 The ISCO program was performed between March 25, 2010 and April 6, 2010.
2 The total amount of KMnO4 used was approximately 19, 200 lbs.
3 A total of 73,615 gallons of full strength solution (approx. 2.9% KMnO4) was applied to the 40 injection wells
4 An additional 34,271 gallons of diluted KMnO4 solution was pumped to 31 of the 40 injection wells to clean out the mixing and distribution tanks.
5 The total volume of KMnO4 solution applied to the 40 injection wells was 107,866 gallons.

TABLE 4.3

ISCO SUMMARY - ROUND 2
HDW SITE
FARMINGDALE, NY

Injection Well No.	*6/23/2010 gals*	*6/24/2010 gals*	*6/25/2010 gals*	*6/26/2010 gals*	*Total gals*
1		1,000		830	1,830
2		1,000		800	1,800
3		1,000		820	1,820
4			1,360	440	1,800
5			1,140	660	1,800
6	1,800				1,800
7	1,800				1,800
8	1,840				1,840
9		1,800			1,800
10				1,800	1,800
11		1,010		800	1,810
12		850	151	800	1,801
13		960	90	810	1,860
14			1,156	644	1,800
15		1,800			1,800
16		1,800			1,800
17		1,810			1,810
18		1,800			1,800
19				1,800	1,800
20	1,800				1,800
21		880	123	800	1,803
22		840	200	810	1,850
23		650	350	900	1,900
24			1533	287	1,820
25		1,840			1,840
26		1,800			1,800
27		1800			1,800
28		1,800			1,800
29	1800				1,800
30	1,800				1,800
31			1,140	810	1,950
32		640	360	810	1,810
33			1,617	183	1,800
34			1,599	211	1,810
35		1,800			1,800
36			1,050	760	1,810
37	1,800				1,800
38	1,800				1,800
39	1,800				1,800
40	1,800				1,800
TOTAL	**18,040**	**26,880**	**11,869**	**15,775**	**72,564**

TABLE 4.3

ISCO SUMMARY - ROUND 2
HDW SITE
FARMINGDALE, NY

SVE Well No	*6/23/2010 gals*	*6/24/2010 gals*	*6/25/2010 gals*	*6/26/2010 gals*	*Total gals*
101			800		800
102			800		800
103			800		800
104			804		804
105			800		800
106			800		800
107			820		820
108			800		800
109			800		800
110			800		800
SVE TOTAL	**0**	**0**	**8,024**	**0**	**8,024**
TOTAL ALL WELLS					**80,588**

Notes:

1 The ISCO program was performed between June 22, 2010 and June 27, 2010.
2 The total amount of KMnO4 used was approximately 18, 200 lbs.
3 A total of 72,564 gallons of full strength solution (approx. 2.7% KMnO4) was applied to the 40 injection wells and 10 SVE wells.
4 An additional 18,930 gallons of diluted KMnO4 solution was pumped to 19 of the 40 injection wells to clean out the mixing and distribution tanks.
5 The total volume of $KMnO_4$ solution applied to the 40 injection wells and 10 SVE wells was 99,518 gallons.

TABLE 7.1

GROUNDWATER MONITORING SCHEDULE
HWD SITE
11 A PICONE BOULEVARD
FARMINGDALE, NEW YORK

	Year 1				*Year 2*				*Year 3*			
	1st Quarter [1][2]	*2nd Quarter*	*3rd Quarter*	*4th Quarter*	*1st Quarter*	*2nd Quarter*	*3rd Quarter*	*4th Quarter*	*1st Quarter*	*2nd Quarter*	*3rd Quarter*	*4th Quarter*
Remedial Monitoring Wells [3]												
MW-2	√	√	√	√	√	√	√	√	√		√	
MW-2D	√	√	√	√	√	√	√	√	√		√	
MW-7	√	√	√	√	√	√	√	√	√		√	
MW-8	√	√	√	√	√	√	√	√	√		√	
MW-10	√	√	√	√	√	√	√	√	√		√	
MW-11	√	√	√	√	√	√	√	√	√		√	
Groundwater Monitoring Wells [3]												
MW-1	√		√		√		√		√		√	
MW-1D	√		√		√		√		√		√	
MW-3	√		√		√		√		√		√	
MW-3D	√		√		√		√		√		√	
MW-4	√		√		√		√		√		√	
MW-5	√		√		√		√		√		√	
MW-6	√		√		√		√		√		√	
MW-9	√		√		√		√		√		√	
MW-12S	√		√		√		√		√		√	
MW-12D	√		√		√		√		√		√	

Notes:

(1) Schedule based on a 1-year groundwater treatment period and a 2-year soil treatment period.
(2) To be performed after the second ISCO injection event, subject to confirmation that $KMnO_4$ in the groundwater has had time to react with VOCs based on monitoring of the groundwater for a light pink color which would indicate low residual concentrations of KMnO4.
(3) A baseline sampling event was performed in March 2010 prior to the first ISCO injection event.

TABLE 8.1

MAINTENANCE SCHEDULE
OPERATION, MAINTENANCE, AND MONITORING PLAN
HWD SITE, FARMINGDALE

Item	*Inspect For*	*Before Use*	*Monthly*	*Quarterly*	*Semi-Annually*
1. Groundwater Treatment and Monitoring					
Injection Wells	- Cover in place		*		
	- Condition of cover and lock		*		
	- Condition of inside of well		*		
	- Flow unrestricted, well free of obstructions and sediment	*			
Mixing Tank	- Check containment	*			
	- Condition of inside of tank	*			
	- Check pipe fittings	*			
Flow Meters	- Operating properly, check manufacturer's inspection requirements	*			
Pumps	- Operating properly, check manufacturer's inspection requirements	*			
Piping	- Check condition, replace damaged pipe	*			
Monitor Wells	- Covers in place and no damage to station pipe			*	
	- Sample wells per Table 7.1			*	*
Storage Trailer	- Ensure that $KMnO_4$ can be stored in a secure location	*			
	- Ensure that the storage container can be locked				

TABLE 8.1

MAINTENANCE SCHEDULE
OPERATION, MAINTENANCE, AND MONITORING PLAN
HWD SITE, FARMINGDALE

	Item	*Inspect For*	*Before Use*	*Monthly*	*Quarterly*	*Semi-Annually*
2.	**SVE Treatment System**					
	SVE Wells	- Cover in place		*		
		- Condition of cover and lock		*		
		- Condition of inside of well		*		
		- Flow unrestricted, well free of obstructions and sediment		*		
		- Check VOCs in wells/adjust flows		*		
	Knockout Pot	- Check for the presence of water		*		
		- Drain water to storage drums		*		
		- Check for leaks		*		
	Filters	- Clean filter		*		
	Vacuum Blower	- Record SVE well vacuum pressures		*		
		- Record blower flow/vacuum pressure and speed		*		
		- Perform recommended maintenance		*	*	*
	SVE Trailer	- Check for damage		*		
		- Clear/remove garbage		*		
	Flowmeters	- Check/record influent flow rates from each well		*		
	Carbon	- Monitor for VOC breakthrough, replace GAC as required		*		
	Autodialer	- Test		*		
3.	**ASD System**					
	Fan	- Check fan vacuum pressure			*	
		- Check sub slab pressure			*	

TABLE 9.1

EMERGENCY CONTACT NUMBERS
OPERATION, MAINTENANCE, AND MONITORING PLAN
HWD SITE
FARMINGDALE, NEW YORK

Contact	*Telephone No.*
Medical, Fire, and Police:	911
One Call Center:	(800) 272-4480 (3 days notice required for utility markout)
Poison Control Center:	(800) 222-1222
Pollution Toxic Chemical Oil Spills:	(800) 424-8802
NYSDEC Spills Hotline:	(800) 457-7362
Hospital	516-579-6000
HWD (c/o Rod Sutch, de maximis)	865-691-5052 Office or 865-548-6718 Cell
CRA (Jamie Puskas)	519-884-0510 Office or 519-572-9444 Cell
JPD United (Site owner)	631-249-5800

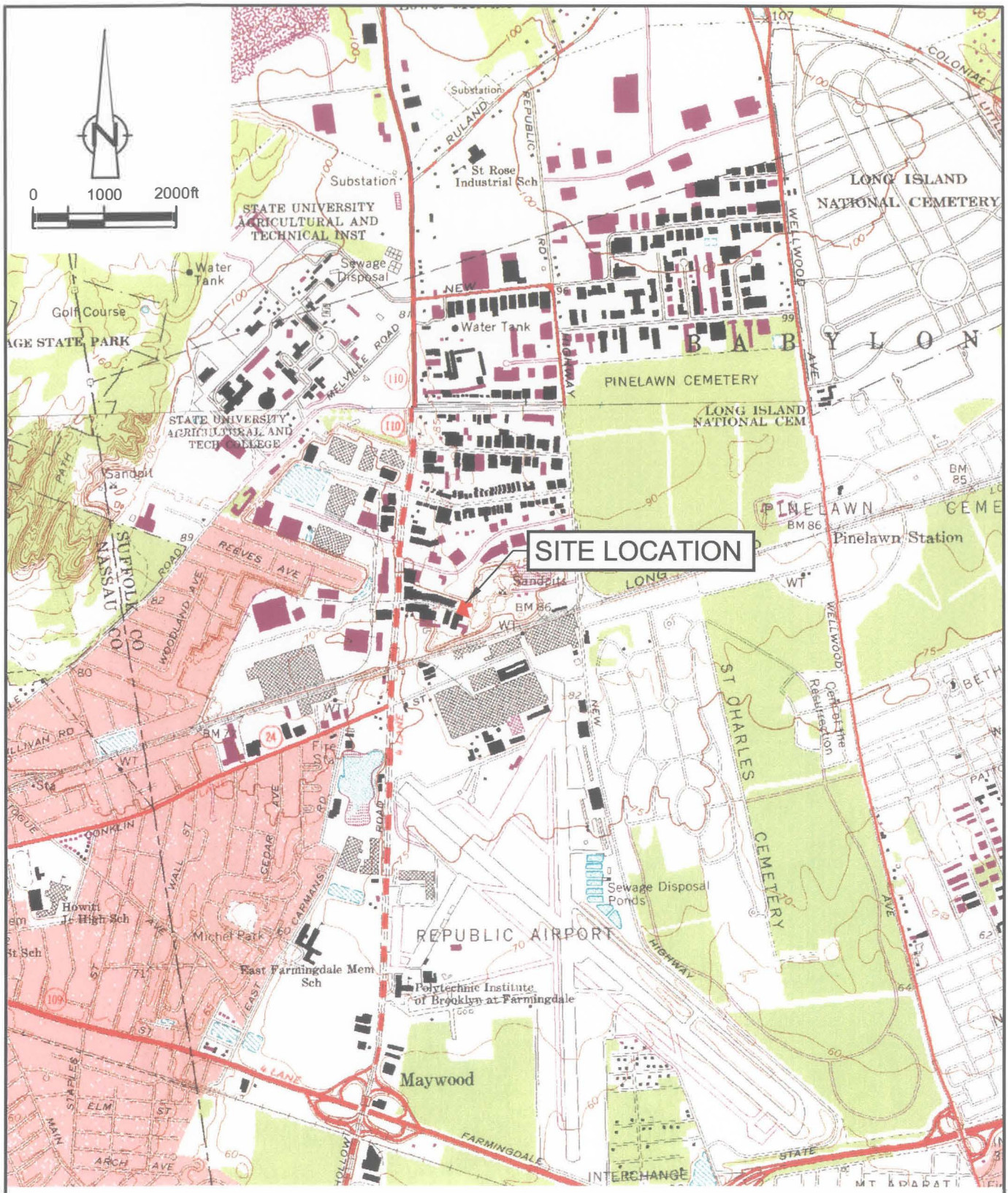
Note:

Contact numbers are subject to change and should be updated as necessary.

TABLE 11.1

PERSONNEL REQUIREMENTS
OPERATION, MAINTENANCE, AND MONITORING PLAN
HWD SITE
FARMINGDALE, NEW YORK

Monitoring and Testing Activities	
Groundwater monitoring/Soil Sampling	One person monitoring/sampling plus drilling contractor if required
Maintenance Activities	
All maintenance activities	One Inspector plus Maintenance Contractor's crew, if required
Operation Activities	
Site inspection	As appropriate
ISCO injection	Two or three persons, as appropriate



SOURCE: AMITYVILLE AND HUNTINGTON U.S.G.S. QUADRANGLE MAPS

figure 2.1

SITE LOCATION
OPERATIONS, MAINTENANCE AND MONITORING PLAN
HWD SITE
Farmingdale, New York

50138-00(006)GN-WA001 JAN 05/2011

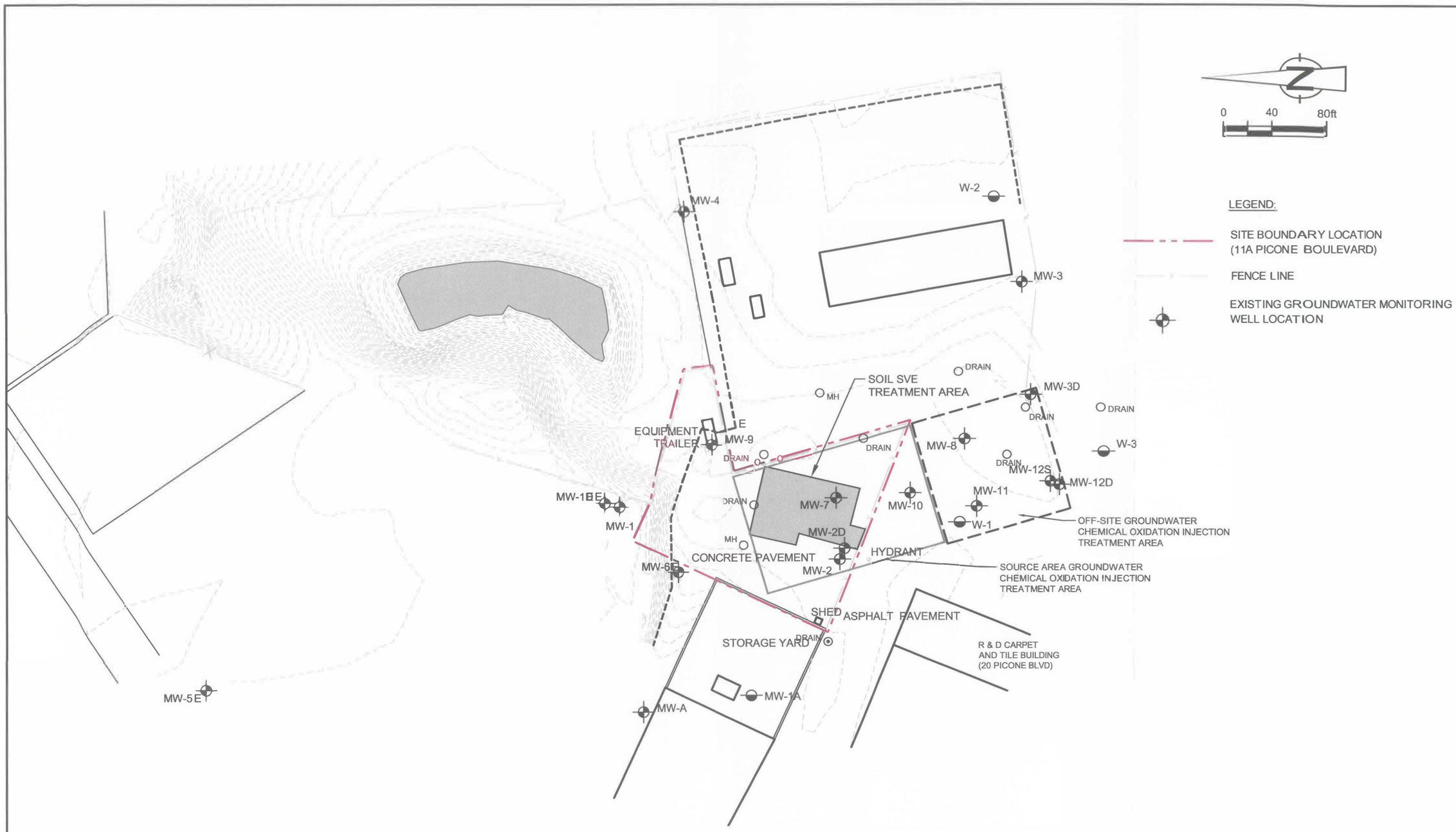


figure 7.1

RA MONITORING WELL LOCATIONS
OPERATIONS, MAINTENANCE AND MONITORING PLAN
HWD SITE
Farmingdale, New York

DATE OF REPAIR	SPARE PARTS USED				DESCRIPTION OF REPAIR
	DESCRIPTION	PART NO.	QTY.	ORDERED	
				YES/NO	
				YES/NO	
				YES/NO	
				YES/NO	
				YES/NO	
				YES/NO	
				YES/NO	
				YES/NO	
				YES/NO	
				YES/NO	
				YES/NO	
				YES/NO	
				YES/NO	
				YES/NO	
				YES/NO	
				YES/NO	
				YES/NO	
				YES/NO	
				YES/NO	
				YES/NO	
				YES/NO	
				YES/NO	
				YES/NO	
				YES/NO	
				YES/NO	

Note:

These records are to be retained for a minimum of 2 years.

figure 8.1
EQUIPMENT MAINTENANCE LOG
HWD SITE
11A PICONE BOULEVARD
FARMINGDALE, NEW YORK

Date: _____ Time: _____ Name: _____

ASD FAN

Belts	Pass	Fail
Noise/Vibration	Pass	Fail
Grease Bearings	Yes	No
Vacuum P-01		

DIFFERENTIAL METER Vacuum ("WC)

1

ODOUR OBSERVATIONS

Any VOC odors outside of building?	Yes	No

MISCELLANEOUS

Inspect Breakers	Pass	Fail
Pressure Alarm	Pass	Fail
Check Supplies	Pass	Fail
Check for Leaks	Pass	Fail

Comments:

_____

_____

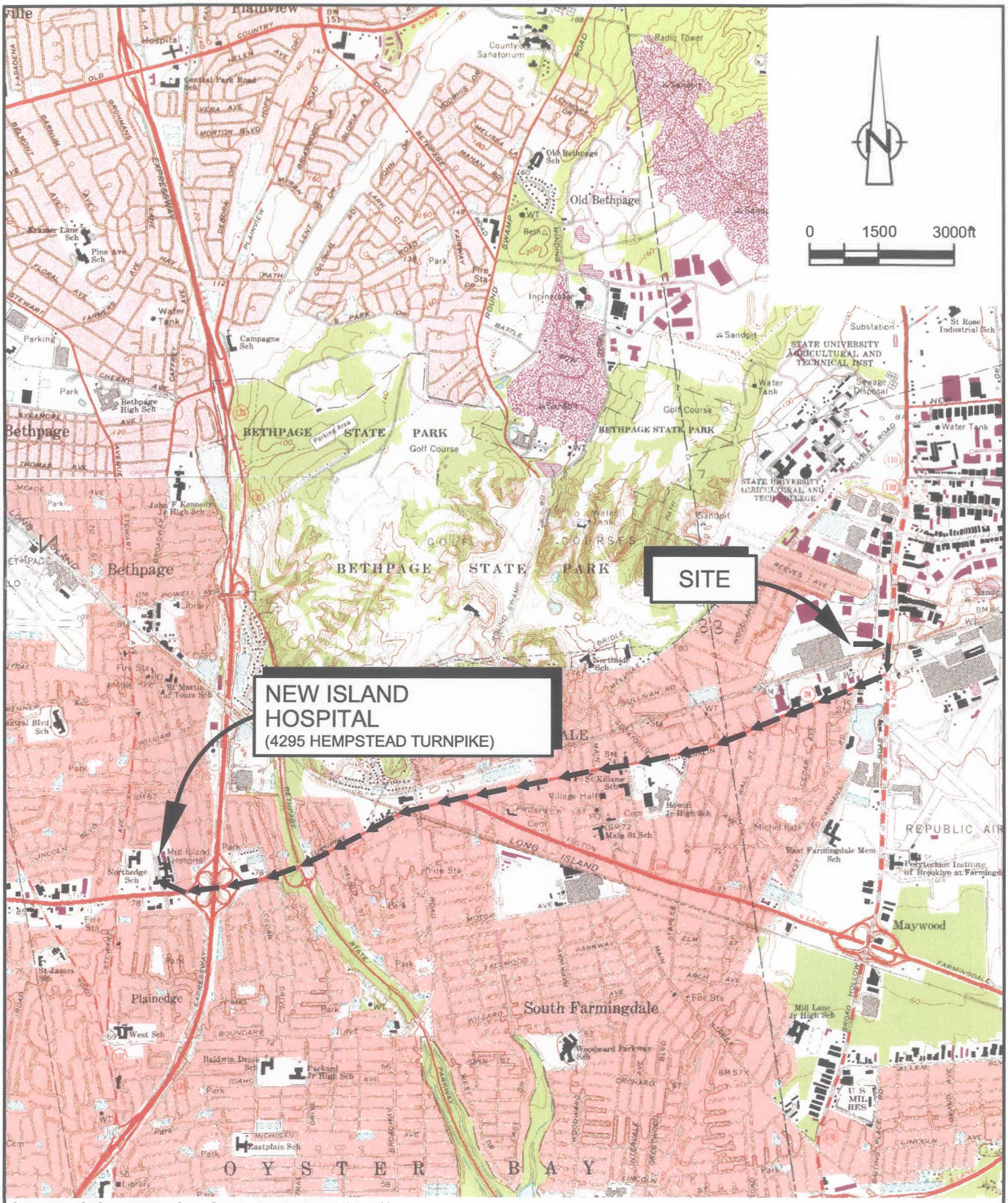
_____

_____

_____

_____

figure 8.2
EQUIPMENT INSPECTION LOG
HWD SITE



SOURCE: USGS 7.5 MINUTE SERIES, TOPO QUAD: AMITYVILLE, NY 1979
USGS 7.5 MINUTE SERIES, TOPO QUAD: HUNTINGTON, NY 1979
CONTOUR INTERVALS: 10'

figure 9.1

EMERGENCY HOSPITAL ROUTE
OPERATIONS, MAINTENANCE AND MONITORING PLAN
Farmingdale, New York

APPENDIX F

WELL SURVEY REPORT

Borbas Surveying & Mapping, LLC

New Jersey Certificate of Authorization No. 24GA28056200 – A New York Foreign Service Corporation – A Pennsylvania Authorized Corporation

• Environmental and Digital Mapping • Aerial Control and GPS Surveys • Remote Sensing • GIS • Topographic and Engineering Surveys •
• ALTA/ACSM Boundary Surveys • Transportation and Right of Ways • Deformation and Structure Surveys •

Well Report
11A Picone Boulevard
Village of Farmingdale, Suffolk County, New York
April 21, 2010

WELL ID	NORTHING NAD83 FEET	EASTING NAD83 FEET	INNER CASING ELEV	INNER CASING 2ND 3"	OUTER CASING ELEV	LATITUDE NORTH	LONGITUDE WEST
IW-1	210283.9	1145201.6	65.07	N/A	65.32	40°44'32.61"	73°25'08.98"
IW-2	210260.0	1145214.3	65.14	N/A	65.40	40°44'32.38"	73°25'08.86"
IW-3	210238.9	1145217.3	64.91	N/A	65.29	40°44'32.17"	73°25'08.78"
IW-4	210215.1	1145229.0	64.91	N/A	65.16	40°44'31.93"	73°25'08.63"
IW-5	210193.1	1145237.6	65.00	N/A	65.26	40°44'31.71"	73°25'08.52"
IW-6	210170.1	1145244.8	64.91	N/A	65.38	40°44'31.49"	73°25'08.43"
IW-7	210147.1	1145256.6	64.77	N/A	65.26	40°44'31.26"	73°25'08.28"
IW-8	210124.4	1145264.2	64.53	N/A	64.82	40°44'31.03"	73°25'08.18"
IW-9	210103.0	1145275.8	64.91	N/A	65.13	40°44'30.82"	73°25'08.04"
IW-10	210083.4	1145286.0	64.56	N/A	64.93	40°44'30.63"	73°25'07.90"
IW-14	210276.1	1145181.5	65.25	N/A	65.54	40°44'32.54"	73°25'09.25"
IW-12	210254.2	1145191.5	65.21	N/A	65.48	40°44'32.32"	73°25'09.12"
IW-13	210232.6	1145199.7	65.17	N/A	65.48	40°44'32.11"	73°25'09.01"
IW-14	210210.2	1145208.6	65.23	N/A	65.52	40°44'31.89"	73°25'08.90"
IW-15	210184.7	1145218.4	65.09	N/A	65.45	40°44'31.63"	73°25'08.77"
IW-16	210162.0	1145228.2	65.14	N/A	65.45	40°44'31.41"	73°25'08.65"
IW-17	210138.9	1145237.5	65.09	N/A	65.45	40°44'31.18"	73°25'08.53"
IW-18	210146.6	1145248.2	64.81	N/A	65.09	40°44'30.96"	73°25'08.39"
IW-19	210093.0	1145257.3	64.54	N/A	64.94	40°44'30.72"	73°25'08.28"
IW-20	210069.9	1145271.3	64.89	N/A	65.24	40°44'30.49"	73°25'08.10"
IW-21	210268.8	1145164.4	65.50	N/A	65.78	40°44'32.47"	73°25'09.47"
IW-22	210246.9	1145172.4	65.20	N/A	65.59	40°44'32.25"	73°25'09.37"
IW-23	210225.4	1145181.8	65.34	N/A	65.66	40°44'32.04"	73°25'09.25"
IW-24	210203.2	1145191.2	65.46	N/A	65.72	40°44'31.82"	73°25'09.13"
IW-25	210176.0	1145194.7	65.12	N/A	65.47	40°44'31.55"	73°25'09.08"
IW-26	210155.5	1145209.0	65.32	N/A	65.58	40°44'31.34"	73°25'08.90"
IW-27	210132.6	1145219.0	65.28	N/A	65.63	40°44'31.12"	73°25'08.77"
IW-28	210141.3	1145227.3	65.20	N/A	65.48	40°44'30.91"	73°25'08.67"
IW-29	210087.6	1145239.5	64.54	N/A	64.89	40°44'30.67"	73°25'08.51"
IW-30	210064.1	1145250.9	64.87	N/A	65.13	40°44'30.44"	73°25'08.36"
IW-31	210263.3	1145141.9	65.65	N/A	65.92	40°44'32.41"	73°25'09.76"
IW-32	210239.8	1145154.9	65.39	N/A	65.70	40°44'32.18"	73°25'09.59"
IW-33	210215.0	1145162.3	65.44*	N/A	65.67*	40°44'31.93"	73°25'09.50"
IW-34	210205.8	1145171.5	65.31	N/A	65.74	40°44'31.84"	73°25'09.38"
IW-35	210170.1	1145180.8	65.24	N/A	65.50	40°44'31.49"	73°25'09.26"
IW-36	210147.4	1145190.4	65.42	N/A	65.73	40°44'31.27"	73°25'09.14"
IW-37	210124.1	1145201.8	65.22	N/A	65.70	40°44'31.03"	73°25'09.00"
IW-38	210101.5	1145214.1	65.16	N/A	65.59	40°44'30.81"	73°25'08.88"
IW-39	210079.2	1145221.2	64.83	N/A	65.23	40°44'30.59"	73°25'08.75"
IW-40	210056.8	1145230.1	64.83	N/A	65.13	40°44'30.37"	73°25'08.63"

WELL ID	NORTHING NAD83 FEET	EASTING NAD83 FEET	INNER CASING ELEV	INNER CASING 2ND"	OUTER CASING ELEV	LATITUDE NORTH	LONGITUDE WEST
SVE-101	210282.7	1145194.8	65.09	N/A	65.43	40°44'32.60"	73°25'09.07"
SVE-102	210281.5	1145170.5	65.56	65.28	65.81	40°44'32.59"	73°25'09.39"
SVE-103	210263.0	1145188.6	65.15	65.13	65.49	40°44'32.41"	73°25'09.16"
SVE-104	210257.0	1145163.7	65.38	65.31	65.68	40°44'32.35"	73°25'09.48"
SVE-105	210239.3	1145181.2	65.32	65.18	65.58	40°44'32.17"	73°25'09.25"
SVE-106	210232.8	1145158.5	65.39	65.43	65.63	40°44'32.11"	73°25'09.55"
SVE-107	210220.0	1145175.3	65.43	65.26	65.72	40°44'31.98"	73°25'09.33"
SVE-108	210219.7	1145203.3	65.24	65.13	65.55	40°44'31.98"	73°25'08.97"
SVE-109	210245.8	1145209.3	65.09	65.04	65.41	40°44'32.24"	73°25'08.89"
SVE-110	210269.3	1145215.3	65.00	64.89	65.32	40°44'32.47"	73°25'08.81"

Notes:
1. Horizontal Datum is the Long Island State Plane Coordinate System, NAD 83, determined by differential GPS on May 22, 2008 and February 24, 2009 via the New York State Department of Transportation Spatial Reference Network COR Station NYCI.
2. Vertical Datum is the existing site datum established from a map provided by Conestoga Rovers & Associates titled "Figure 1: Proposed Monitoring Well Locations" and dated May 13, 2008. Held Railroad Spike at 65.46'.
*3. At the time of field survey, IW-33 was obstructed by a truck, and had limited access to the inner and outer casings due to the truck's fuel tank. Elevations were observed on the outer and inner casings, in a manner inconsistent with Borbas Surveying and Mapping L.L.C. standard field procedures, and should be assumed to be +/- 0.05'.

5/18/2010

J. Peter Borbas, P.L.S. Date
NY License No. 050566-1

APPENDIX E

AS-RECORDED DRAWINGS

DRAWING INDEX

DWG. No.	TITLE
CIVIL DRAWINGS	
CI-01	SITE MAP / ISCO AND SVE WELL LOCATIONS
CI-02	SVE TRENCH LOCATION HORIZONTAL SVE SYSTEM
CI-03	SVE PIPING LAYOUT
CI-04	EQUIPMENT LAYOUT / MISC. NOTES
CI-05	WELL AND TRENCH DETAILS
FLOW SHEETS	
EF-00	ENGINEERING FLOW SHEET LEGEND
EF-01	PROCESS FLOW SHEET SVE WELLS
EF-02	PROCESS FLOW SHEET SVE WELLS
EF-03	PROCESS FLOW SHEET SVE SYSTEM
EF-04	PROCESS FLOW SHEET ISCO SYSTEM
MECHANICAL	
ME-01	SVE MANIFOLD LAYOUT
ELECTRICAL	
EL-01	GROUNDING / POWER PLAN AND DETAILS

HWD SITE
FARMINGDALE, NEW YORK

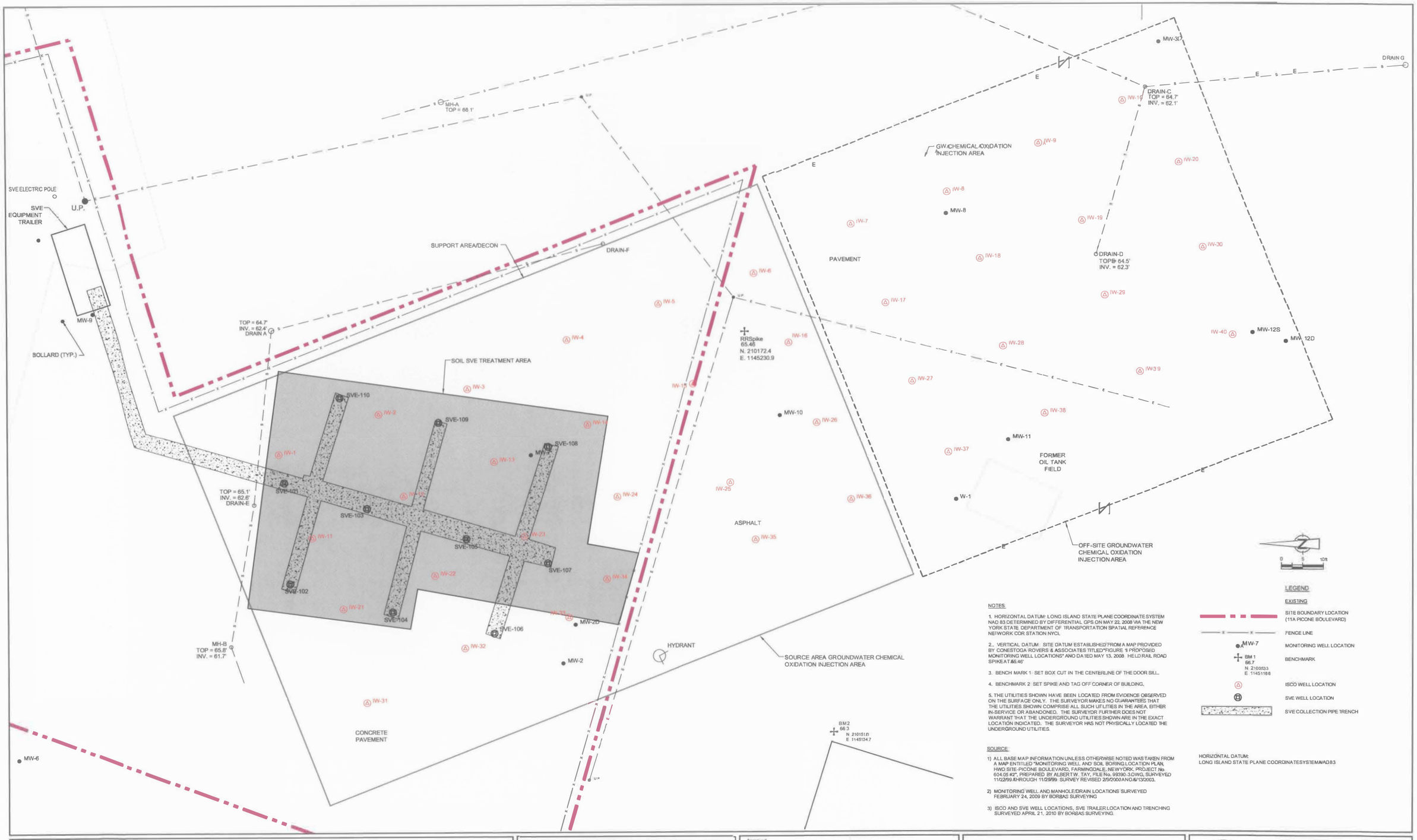
ISCO / SVE TREATMENT
AS-BUILT DRAWINGS

JANUARY 2011

OPERATIONS, MAINTENANCE AND MONITORING PLAN

50138-00(006)

CRA Infrastructure & Engineering, Inc.



NOTES:

1. HORIZONTAL DATUM: LONG ISLAND STATE PLANE COORDINATE SYSTEM NAD 83 DETERMINED BY DIFFERENTIAL GPS ON MAY 22, 2008 VIA THE NEW YORK STATE DEPARTMENT OF TRANSPORTATION SPATIAL REFERENCE NETWORK CORS STATION NYCL.
2. VERTICAL DATUM: SITE DATUM ESTABLISHED FROM A MAP PROVIDED BY CONESTOGA ROVERS & ASSOCIATES TITLED "FIGURE 5 PROPOSED MONITORING WELL LOCATIONS" AND DATED MAY 13, 2008. HELD RAIL ROAD SPIKE AT 65.46'
3. BENCH MARK 1: SET BOX CUT IN THE CENTERLINE OF THE DOOR SILL.
4. BENCHMARK 2: SET SPIKE AND TAG OFF CORNER OF BUILDING.
5. THE UTILITIES SHOWN HAVE BEEN LOCATED FROM EVIDENCE OBSERVED ON THE SURFACE ONLY. THE SURVEYOR MAKES NO GUARANTEES THAT THE UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN-SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED. THE SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES.

SOURCE:

1) ALL BASE MAP INFORMATION UNLESS OTHERWISE NOTED WAS TAKEN FROM A MAP ENTITLED "MONITORING WELL AND SOIL BORING LOCATION PLAN, HWD SITE-PICONE BOULEVARD, FARMINGDALE, NEW YORK, PROJECT No. 604.05 #2", PREPARED BY ALBERT W. TAY, FILE No. 99390-3.DWG, SURVEYED 11/22/99 & THROUGH 11/29/99. SURVEY REVISED 2/9/2000 AND 6/13/2003.
2) MONITORING WELL AND MANHOLE/DRAIN LOCATIONS SURVEYED FEBRUARY 24, 2009 BY BORBAS SURVEYING
3) ISCO AND SVE WELL LOCATIONS, SVE TRAILER LOCATION AND TRENCHING SURVEYED APRIL 21, 2010 BY BORBAS SURVEYING.

LEGEND

EXISTING

- SITE BOUNDARY LOCATION (11A PICONE BOULEVARD)
- FENCE LINE
- MW-7 — MONITORING WELL LOCATION
- BM 1 66.7 N. 210033 E. 11451188 — BENCHMARK
- ISCO WELL LOCATION
- SVE WELL LOCATION
- SVE COLLECTION PIPE TRENCH

HORIZONTAL DATUM:
LONG ISLAND STATE PLANE COORDINATE SYSTEM NAD 83

AS-BUILT DRAWINGS

THIS AS-BUILT DRAWING HAS BEEN PREPARED, IN PART, BASED ON INFORMATION FURNISHED BY OTHERS. WHILE THIS INFORMATION IS BELIEVED TO BE RELIABLE, CRA CAN NOT AND DOES NOT WARRANT ITS ACCURACY AND/OR COMPLETENESS, AND THUS SHALL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH MAY HAVE BEEN INCORPORATED HEREIN AS A RESULT. THOSE RELYING ON THIS AS-BUILT DRAWING ARE ADVISED TO OBTAIN VERIFICATION OF ITS ACCURACY AND/OR COMPLETENESS BEFORE USING IT FOR ANY PURPOSE.

SCALE VERIFICATION: THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY

No	Revision	Date	Initial

Approved

HWD SITE
FARMINGDALE, NEW YORK

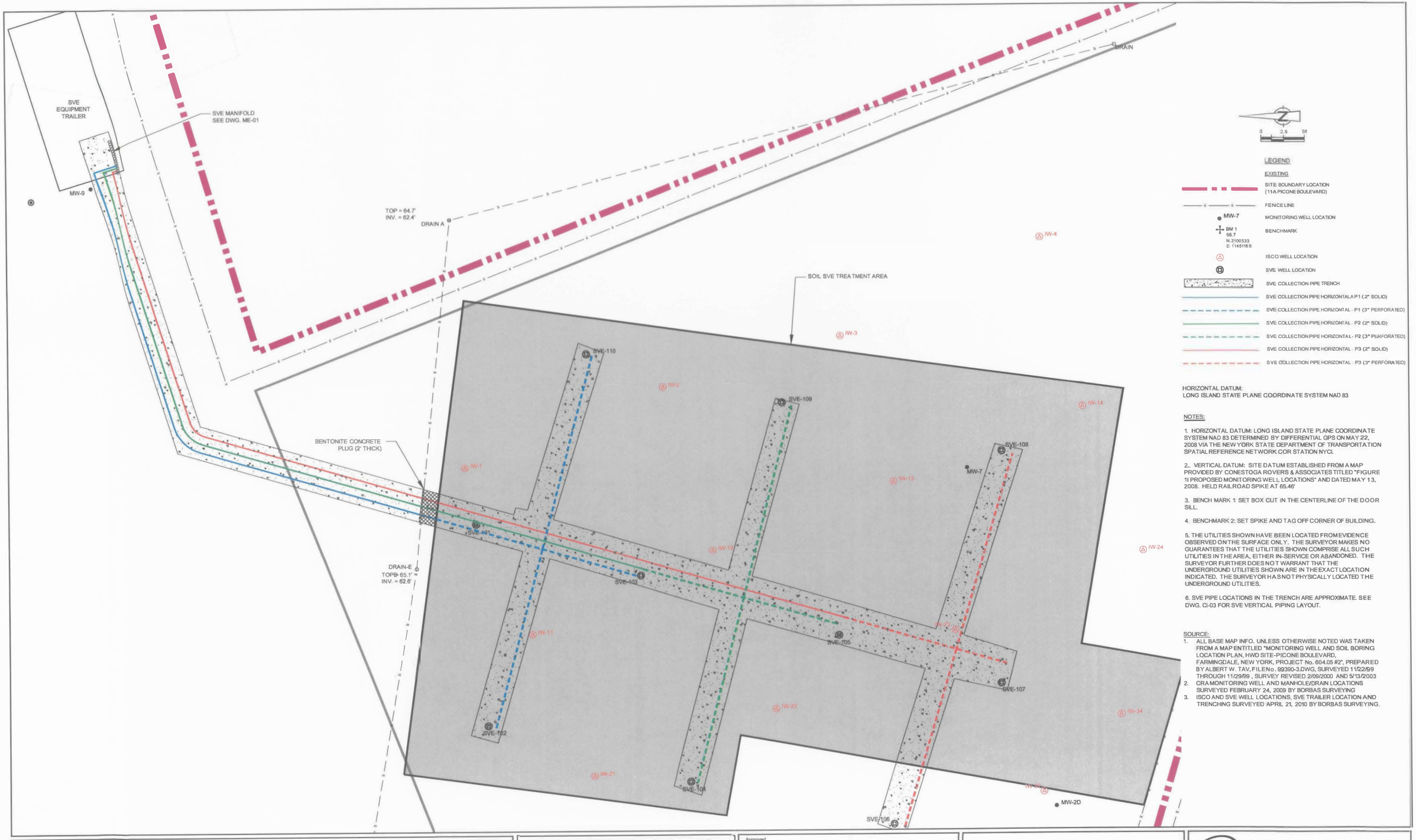
AS-BUILT ISCO / SVE TREATMENT

SITE MAP/
ISCO AND SVE WELL LOCATIONS

CRA Infrastructure & Engineering, Inc.

SourceReferences:			Date: SEPTEMBER 2010
ProjectManager: J. PUSKAS	Reviewed By: R. MEDSGER	Designed By: K. LYNCH	Drawn By: M. WOLFER
Scale: 1"=10'	Project No: 50138-00	ReportNo: 006	Drawing No: CI-01

50138-00(006)CI-WA001 JAN 05/2011



LEGEND

EXISTING

- SITE BOUNDARY LOCATION (11A PICONE BOULEVARD)
- FENCE LINE
- MW-7 MONITORING WELL LOCATION
- BM 1 66.7 N.2100533 E.1145116.6 BENCHMARK
- ISCO WELL LOCATION
- SVE WELL LOCATION
- SVE COLLECTION PIPE TRENCH
- SVE COLLECTION PIPE HORIZONTALA P1 (2" SOLID)
- SVE COLLECTION PIPE HORIZONTAL - P1 (3" PERFORATED)
- SVE COLLECTION PIPE HORIZONTAL - P2 (2" SOLID)
- SVE COLLECTION PIPE HORIZONTAL - P2 (3" PERFORATED)
- SVE COLLECTION PIPE HORIZONTAL - P3 (2" SOLID)
- SVE COLLECTION PIPE HORIZONTAL - P3 (3" PERFORATED)

HORIZONTAL DATUM:
LONG ISLAND STATE PLANE COORDINATE SYSTEM NAD 83

NOTES:

1. HORIZONTAL DATUM: LONG ISLAND STATE PLANE COORDINATE SYSTEM NAD 83 DETERMINED BY DIFFERENTIAL GPS ON MAY 22, 2008 VIA THE NEW YORK STATE DEPARTMENT OF TRANSPORTATION SPATIAL REFERENCE NETWORK COR STATION NYCI.

2.. VERTICAL DATUM: SITE DATUM ESTABLISHED FROM A MAP PROVIDED BY CONESTOGA ROVERS & ASSOCIATES TITLED "FIGURE 1I PROPOSED MONITORING WELL LOCATIONS" AND DATED MAY 13, 2008. HELD RAILROAD SPIKE AT 65.46'

3. BENCH MARK 1: SET BOX CUT IN THE CENTERLINE OF THE DOOR SILL.

4. BENCHMARK 2: SET SPIKE AND TAG OFF CORNER OF BUILDING.

5. THE UTILITIES SHOWN HAVE BEEN LOCATED FROM EVIDENCE OBSERVED ON THE SURFACE ONLY. THE SURVEYOR MAKES NO GUARANTEES THAT THE UTILITIES SHOWN COMPRISE ALL SUCH UTILITIES IN THE AREA, EITHER IN-SERVICE OR ABANDONED. THE SURVEYOR FURTHER DOES NOT WARRANT THAT THE UNDERGROUND UTILITIES SHOWN ARE IN THE EXACT LOCATION INDICATED. THE SURVEYOR HAS NOT PHYSICALLY LOCATED THE UNDERGROUND UTILITIES.

6. SVE PIPE LOCATIONS IN THE TRENCH ARE APPROXIMATE. SEE DWG. CI-03 FOR SVE VERTICAL PIPING LAYOUT.

SOURCE:

1. ALL BASE MAP INFO. UNLESS OTHERWISE NOTED WAS TAKEN FROM A MAP ENTITLED "MONITORING WELL AND SOIL BORING LOCATION PLAN, HWD SITE-PICONE BOULEVARD, FARMINGDALE, NEW YORK, PROJECT No. 604.05 #2", PREPARED BY ALBERT W. TAV, FILENo. 99390-3.DWG, SURVEYED 11/22/99 THROUGH 11/29/99 , SURVEY REVISED 2/09/2000 AND 5/13/2003
2. CRA MONITORING WELL AND MANHOLE/DRAIN LOCATIONS SURVEYED FEBRUARY 24, 2009 BY BORBAS SURVEYING
3. ISCO AND SVE WELL LOCATIONS, SVE TRAILER LOCATION AND TRENCHING SURVEYED APRIL 21, 2010 BY BORBAS SURVEYING.

AS-BUILT DRAWINGS

THIS AS-BUILT DRAWING HAS BEEN PREPARED, IN PART, BASED ON INFORMATION FURNISHED BY OTHERS. WHILE THIS INFORMATION IS BELIEVED TO BE RELIABLE, CRA CAN NOT AND DOES NOT WARRANT ITS ACCURACY AND/OR COMPLETENESS, AND THUS SHALL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH MAY HAVE BEEN INCORPORATED HEREIN AS A RESULT. THOSE RELYING ON THIS AS-BUILT DRAWING ARE ADVISED TO OBTAIN VERIFICATION OF ITS ACCURACY AND/OR COMPLETENESS BEFORE USING IT FOR ANY PURPOSE.

SCALE VERIFICATION: THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

No	Revision	Date	Initial

Approved

HWD SITE
FARMINGDALE, NEW YORK

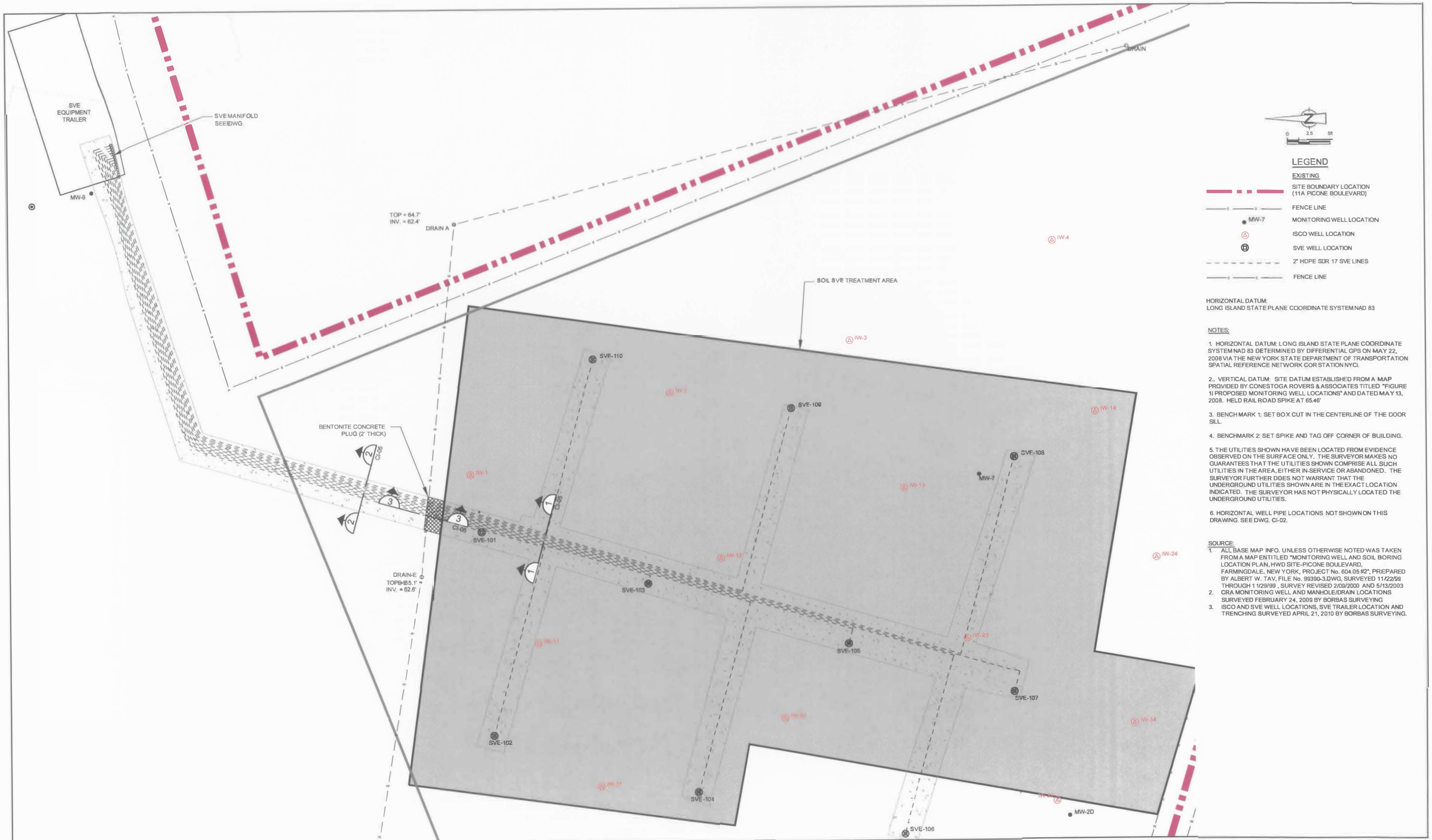
AS-BUILT ISCO / SVE TREATMENT

SVE TRENCH LOCATION
HORIZONTAL SVE SYSTEM

CRA Infrastructure & Engineering, Inc.

Source Reference:			Date: SEPTEMBER 2010
Project Manager: J. PUSKAS	Reviewed By: R. MEDSGER	Designed By: K. LYNCH	Drawn By: M.JWOLFER
Scale: 1"=0'	Project No: 50138-00	Report No: 006	Drawing No: CI-02

50138-00(006)CIW A004 JAN 05/2011



LEGEND

EXISTING

- SITE BOUNDARY LOCATION (11A PICONE BOULEVARD)
- FENCE LINE
- MW-7 MONITORING WELL LOCATION
- ISCO WELL LOCATION
- SVE WELL LOCATION
- 2" HDPE SDR 17 SVE LINES
- FENCE LINE

HORIZONTAL DATUM:
LONG ISLAND STATE PLANE COORDINATE SYSTEM NAD 83

NOTES:

1. HORIZONTAL DATUM: LONG ISLAND STATE PLANE COORDINATE SYSTEM NAD 83 DETERMINED BY DIFFERENTIAL GPS ON MAY 22, 2008 VIA THE NEW YORK STATE DEPARTMENT OF TRANSPORTATION SPATIAL REFERENCE NETWORK COR STATION NYCI.

2.. VERTICAL DATUM: SITE DATUM ESTABLISHED FROM A MAP PROVIDED BY CONESTOGA ROVERS & ASSOCIATES TITLED "FIGURE 1I PROPOSED MONITORING WELL LOCATIONS" AND DATED MAY 13, 2008. HELD RAIL ROAD SPIKE AT 65.46'

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6. HORIZONTAL WELL PIPE LOCATIONS NOT SHOWN ON THIS DRAWING. SEE DWG. CI-02.

SOURCE:

1. ALL BASE MAP INFO. UNLESS OTHERWISE NOTED WAS TAKEN FROM A MAP ENTITLED "MONITORING WELL AND SOIL BORING LOCATION PLAN, HWD SITE-PICONE BOULEVARD, FARMINGDALE, NEW YORK, PROJECT No. 604.05.#2", PREPARED BY ALBERT W. TAV, FILE No. 99390-3.DWG, SURVEYED 11/22/99 THROUGH 1 1/29/99 , SURVEY REVISED 2/09/2000 AND 5/13/2003
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AS-BUILT DRAWINGS

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SCALE VERIFICATION: THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY

No	Revision	Date	Initial

Approved

HWD SITE
FARMINGDALE, NEW YORK

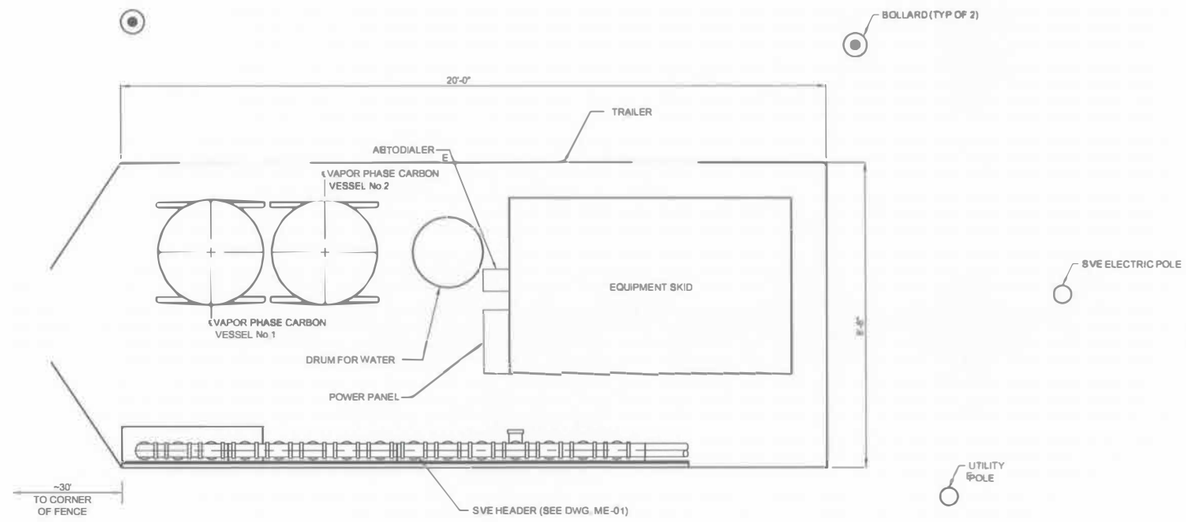
AS-BUILT ISCO / SVE TREATMENT

SVE WELL PIPING LAYOUT

CRA Infrastructure & Engineering, Inc.

Source Reference:			Date: SEPTEMBER 2010
Project Manager: J. PUSKAS	Reviewed By: R. MEDSGER	Designed By: K. LYNCH	Drawn By: M. WOLFER
Scale: 1"=5'	Project No: 50138-00	Report No: 006	Drawing No: CI-03

50138-00(006)CI-WA002 .IAN 05/2011



PLAN

SCALE: ½"=1'-0"

GENERAL NOTES

GENERAL REQUIREMENTS

1. ALL WORK TO REPAIR PIPING IN TRENCHES SHALL CONFORM TO CONSTRUCTION SPECIFICATIONS NOTED BELOW.
2. LOCATE, VERIFY AND MARK THE LOCATION OF UNDERGROUND UTILITIES PRIOR TO ANY EXCAVATION. NOTIFY AFFECTED UTILITY COMPANIES AND OWNERS BEFORE STARTING WORK AND COMPLY WITH THEIR REQUIREMENTS.
3. SEE DRAWINGS CI-02 AND CI-03 FOR PIPE LOCATIONS.

EARTHWORK & BACKFILL

1. UNLESS NOTED OTHERWISE:

   EXCAVATIONS ARE TO BE FREE OF FROST, WATER AND LOOSE SOIL PRIOR TO PLACING CONCRETE.

   BASE OF EXCAVATIONS SHALL BE FIRM UNDISTURBED SOIL OR COMPACTED FILL MATERIAL, WITH A MINIMUM ALLOWABLE BEARING CAPACITY OF 1,000 lbs PER SQUARE FOOT.

   ANY UNSUITABLE MATERIAL SHALL BE REMOVED AND REPLACED WITH PROPERLY COMPACTED MATERIAL APPROVED BY THE ENGINEER.

2. ANY BACKFILL MATERIAL THAT MAY BE REQUIRED TO BRING THE SUBGRADE TO BEARING ELEVATION IS TO BE AN APPROVED FILL MATERIAL PLACED IN LIFTS NOT TO EXCEED 9 INCHES. COMPACT TO 95% MAXIMUM STANDARD PROCTOR DRY DENSITY PER ASTM D-698
3. FILL MATERIAL UNDER SLABS SHALL BE CLEAN GRANULAR BACKFILL COMPACTED TOAT LEAST 95% OF ITS MAXIMUM STANDARD PROCTOR DRY DENSITY (ASTM D-698).
4. QUALITY CONTROL:

   THE GENERAL CONTRACTOR SHALL RETAIN THE SERVICES OF A QUALIFIED GEOTECHNICAL ENGINEER TO VERIFY THE STATED SOIL BEARING CAPACITY AND PERFORM SOIL DENSITY TESTS ON FILL PLACEMENT.

   THE SOIL BEARING CAPACITY SHALL BE VERIFIED PRIOR TO PLACING SLAB ON GRADE CONCRETE.

   SOIL DENSITY TESTS ARE TO BE TAKEN UNIFORMLY THROUGHOUT FILL PLACEMENT TO VERIFY THE SPECIFIED COMPACTION REQUIREMENTS.

CAST-IN-PLACE CONCRETE

1. REINFORCING STEEL:

WELDED WIRE FABRIC.E.....E.E...ASTM A185/A185M

2. CONCRETE MIX REQUIREMENTS
   1. CONCRETE CONSTRUCTION SHALL CONFORM TO ALL APPLICABLE ACI SPECIFICATIONS AND GUIDELINES INCLUDING BUT NOT LIMITED TO ACI 302.1R, 224.3R.
   2. CONCRETE SHALL DEVELOP A MINIMUM COMPRESSIVE STRENGTH OF 4,000 psi AT 28 DAYS. SLUMP SHALL BE 3 1/2 INCHES± 1 INCH.
   3. CONCRETE SHALL BE AIR ENTRAINED. CEMENT SHALL BE PORTLAND CEMENT CONFORMING TO ASTM C150, TYPE II WITH AIR-ENTRAINING ADMIXTURE CONFORMING TO ASTM C260. AIR CONTENT (% BY VOLUME) SHALL NOT BE LESS THAN 4% NOR GREATER THAN 6.5% AND SHALL DEPEND ON MAXIMUM SIZE AGGREGATE USED.
   4. NO ADMIXTURE SHALL CONTAIN CALCIUM CHLORIDE BASED COMPOUNDS. FLYASH AND POZZOLAN CONTENT SHALL NOT EXCEED 20% BY WEIGHT OF CEMENTITIOUS MATERIAL.
   5. FINISH CONCRETE SLABS ON GRADE TO MATCH EXISTING CONCRETE SURFACE.

STRUCTURAL STEEL

1. MATERIALS: ANGLES, PLATE AND MISCELLANEOUS SHAPES.....ASTM A36
2. ALL HOLES REQUIRED FOR FIELD CONNECTIONS SHALL BE DRILLED OR PUNCHED, NO BURNING IS PERMITTED.

SCALE VERIFICATION: THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY

No	Revision	Date	Initial

Approved

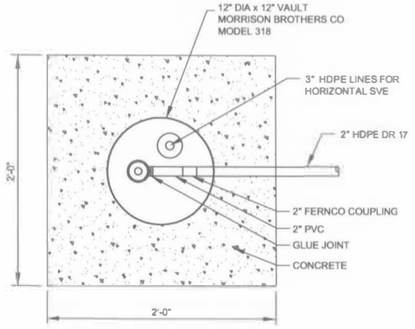
HWD SITE
FARMINGDALE, NEW YORK

AS-BUILT ISCO / SVE TREATMENT

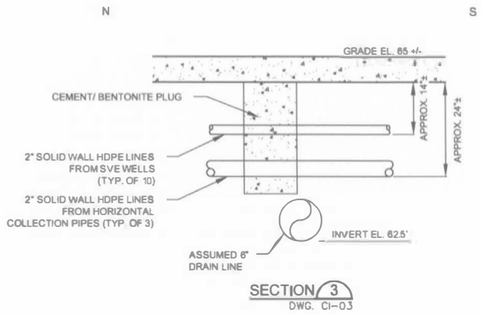
EQUIPMENT LAYOUT / MISC. NOTES

CRA Infrastructure & Engineering, Inc.

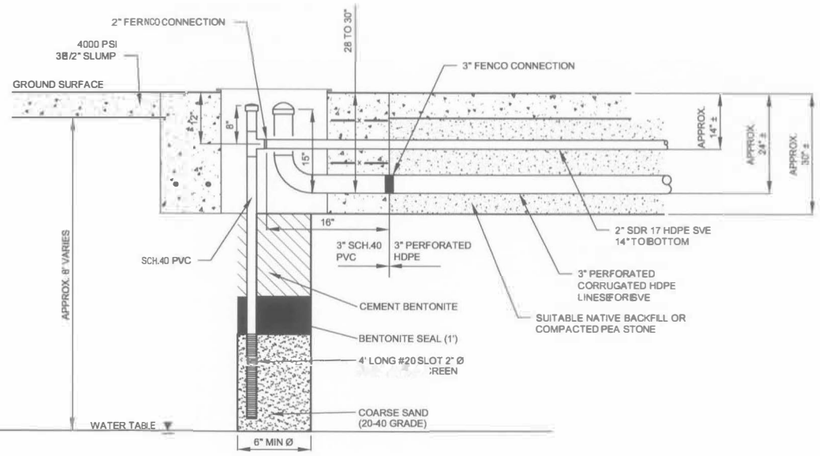
Source Reference:			Date: SEPTEMBR 2010
Project Manager: J. PUSKAS	Reviewed By: R. MEOSCER	Designed By: K. LYNCH	Drawn By: M. WOLFER
Scale: 1/2"=1'-0"	Project No: 50138-00	Report No: 006	Drawing No: CI-04



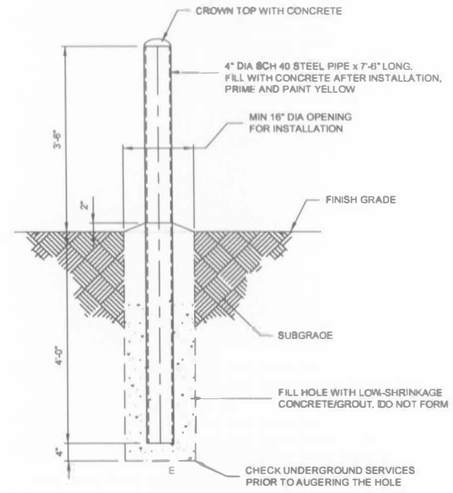
WELL VAULT PLAN VIEW
N.T.S.



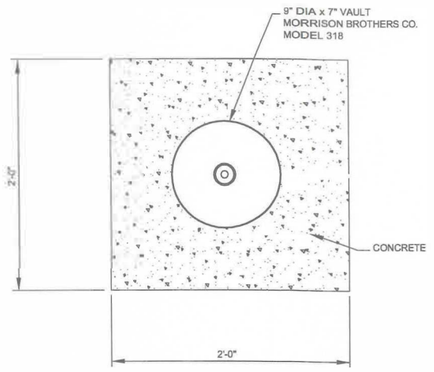
SECTION 3
DWG. CI-03



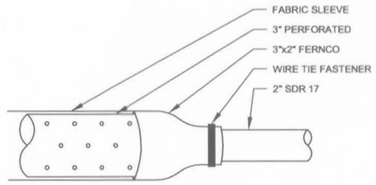
SVE WELL DETAIL (10 REQ'D.)
N.T.S.



BOLLARD

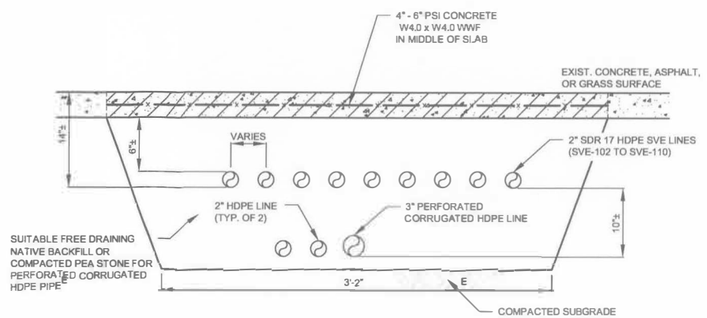


TYPICAL ISCO INJECTION WELL VAULT PLAN VIEW
N.T.S.

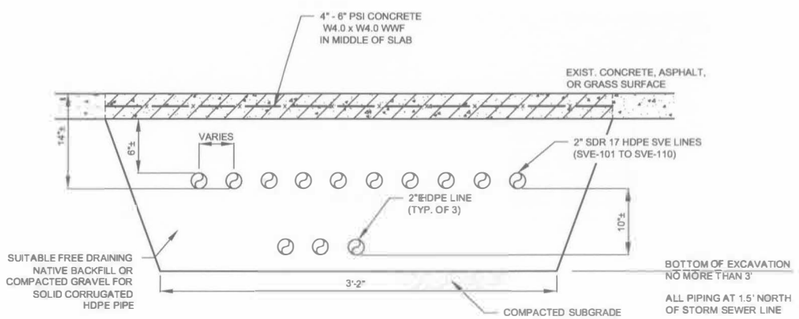


PERFORATED TO SOLID WALL PIPE TRANSITION
N.T.S.

DIRECT-PUSH ISCO INJECTION WELL DETAIL (40 REQ'D)
N.T.S.



SECTION 1
DWG. CI-03
(SEE NOTES ON CI-04)



SECTION 2
DWG. CI-03
(SEE NOTES ON CI-04)

AS-BUILT DRAWINGS

THIS AS-BUILT DRAWING HAS BEEN PREPARED, IN PART, BASED ON INFORMATION FURNISHED BY OTHERS. WHILE THIS INFORMATION IS BELIEVED TO BE RELIABLE, CRA CAN NOT AND DOES NOT WARRANT ITS ACCURACY AND/OR COMPLETENESS, AND THUS SHALL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH MAY HAVE BEEN INCORPORATED HEREIN AS A RESULT. THOSE RELYING ON THIS AS-BUILT DRAWING ARE ADVISED TO OBTAIN VERIFICATION OF ITS ACCURACY AND/OR COMPLETENESS BEFORE USING IT FOR ANY PURPOSE.

SCALE VERIFICATION: THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY

No	Revision	Date	Initial

Approved

HWD SITE
FARMINGDALE, NEW YORK

AS-BUILT ISCO / SVE TREATMENT

WELL AND TRENCH DETAILS

CRA Infrastructure & Engineering, Inc.

Source/Reference:			Date: SEPTEMBER 2010
Project Manager: J. PUSKAS	Reviewed By: R. MEDSGER	Designed By: K.LYNCH	Drawn By: M. WOLFER
Scale: AS SHOWN	Project No: 50138-00	Report No: 006	Drawing No: CI-05

50138-00(006)CI-WA005 JAN 05/2011

PROCESS / INSTRUMENT LINES

- MAIN PROCESS LINE
- SECONDARY PROCESS LINE
- UNDEFINED SIGNAL
- PNEUMATIC SIGNAL
- ELECTRICAL SIGNAL
- CAPILLARY/TUBE
- ELECTROMAGNETIC OR SONIC SIGNAL (GUIDED)
- ELECTROMAGNETIC OR SONIC SIGNAL (NOT GUIDED)
- INTERNAL SYSTEM LINK
- HYDRAULIC SIGNAL
- MECHANICAL LINK
- ELECTRICAL BINARY SIGNAL
- MAIN PROCESS FLOW INDICATION
- SECONDARY PROCESS FLOW INDICATION
- TO / FROM SHEET No. — OFF PAGE CONNECTOR
- UTILITY — UTILITY IN/OUT

LINE SYMBOLS

- BALL VALVE — BA-*
- BUTTERFLY/VALVE — BU-*
- GATE VALVE — GA-*
- GLOBE VALVE — GL-*
- THREE WAY VALVE (FAIL OPEN TO PATH A-C)
- FOUR WAY VALVE (FAIL OPEN TO PATH A-C AND B-D)
- CHECK VALVE — CH-*
- REDUCER
- FLEXIBLE PIPE
- BLIND FLANGE
- FLANGE
- HOSE CONNECTION — C
- SCREWED CAP, CLEANOUT
- Y-LINE STRAINER
- SPECIFICATION CHANGE
- LEVEL DEVICE, FLOAT TYPE
- BB — BLOCK& BLEED VALVE SETUP
- TP/1 — TIE POINT TO EXISTING SYSTEM
- RESTRICTION ORIFICE
- DRAIN
- FLOW STRAIGHTENING VANE
- SP/4 — SPECIALITY PART
- STATIC MIXER
- AV — AIR VENT, AUTOMATIC
- FILTER/REGULATOR/LUBRICATOR
- IRIS DAMPER
- CAMLOC (QUICK CONNECT)
- SILENCER
- PIPE SUPPORT (PS-)

- FILTER/REGULATOR
- FILTER
- X" — EQUIPMENT INSULATED WITH X" OF INSULATION
- PULSATION DAMPER
- BASKET STRAINER

INSTRUMENT SYMBOLS

- LOCALLY MOUNTED INSTRUMENTS
- PNL A — PANEL MOUNTED INSTRUMENTS A = PANEL No. WHEN MORE THAN ONE PANEL IS PRESENT
- BEHIND BOARD MOUNTED INSTRUMENTS
- IN LINE INSTRUMENTS AS INDENTIFIED
- SG — SIGHT GLASS
- RUPTURE DISC
- PRESSURE RELIEF VALVE
- VACUUM RELIEF VALVE
- V P — CONSERVATION VENT
- PRESSURE REDUCING REGULATOR (SELF CONTAINED)
- BACKPRESSURE REGULATOR (SELF CONTAINED)
- LEVEL REGULATOR WITH MECHANICAL LINKAGE
- TE — TEMPERATURE ELEMENT WITH THERMOWELL
- DIAPHRAM ACTUATOR, SPRING-OPPOSED
- CYLINDER ACTUATOR SPRINGNOPPOSED
- M — ELECTRIC ACTUATOR
- S — SOLENOID ACTUATOR
- HAND ACTUATOR OR HANDWHEEL
- AIR ACTUATED VALVE W/POSITIONER

VALVE FAIL SYMBOLS

ATON AIR TO OPEN
ATC - AIR TO CLOSE
FO - FAIL OPEN
FC - FAIL CLOSED
FL - FAIL LOCKED (LAST POSITION)
FI - FAIL INDETERMINATE

ATO/FC

SP — SAMPLE PORT (WATER)

- SP — SAMPLE PORT (AIR)
- TARGET TYPE FLOW SENSOR
- PT — SINGLE PORT PITOT TUBE
- AVERAGING PITOT TUBE
- M — MAGNETIC FLOWMETER
- TURBINE OR PROPELLER FLOWMETER
- POSITIVE-DISPLACEMENT FLOWMETER
- FI — VARIABLE AREA FLOWMETER
- INSERTION THERMAL MASS AIR FLOWMETER
- PI — DIAPHRAM SEAL WITH PRESSURE LEAD LINE
- PI — DIAPHRAM SEAL (LINE-MOUNTED)
- XY — SIGNAL CONVERTER (INPUT/OUTPUT)
  [* E - VOLTAGE I - CURRENT P - PNEUMATIC B - BINARY (MODBUS, RS232..)
- PL — COLOR — PILOT LIGHT
  A - AMBER
  G - GREEN
  R - RED

ELECTRICAL SYMBOLS

	AT MOTOR	AT PANEL	ELSEWHERE	NOMENCLATURE
	◉	◉	◉	START - MOMENTARY CONTACT
	⊠	⊠	⊠	START - GREEN ILLUMINATED BUTTON
	◉S	◉S	◉S	STOP - MOMENTARY CONTACT
	⊠S	⊠S	⊠S	STDP - RED ILLUMINATED BUTTON
	⊡	⊡	⊡	START/STOP
	⊠	⊠	⊠	START/STOP - GREEN & RED ILLUMINATED BUTTONS
	⊡R	⊡R	⊡R	PILOT LIGHT LENS
	⊡	⊡	⊡	START - STOP W/GREEN RUNNING PILOT LIGHT
	⊡	⊡	⊡	START - STOP W/GREEN RUNNING PILOT LIGHT AND RED STOP PILOT LIGHT
	◉*	◉*	◉*	SELECTOR SWITCH 2 POSITION
	◉*	◉*	◉*	SELECTOR SWITCH 3 POSITION
	⊡	⊡	⊡	PUSHBUTTON WITH MUSHROOM HEAD

THESE SYMBOLS ARE FOR OCCIDENTAL CHEMICAL DRAWINGS ONLY

SUBSCRIPTS

LIGHTS
A = AMBER
B = BLUE
C = CLEAR
G = GREEN
R = RED
W = WHITE
Y = YELLOW

PUSHBUTTONS
ES = EMERGENCY STOP
J = JOG
L = LOCAL PANEL
LON= LOCKOUT
SPN= STOP
ST = START

TYPICAL ISA LETTER COMBINATIONS

First Letters	Initiating or Measured Variable	Controllers: Recording	Controllers: Indicating	Controllers: Blind	Self-Actuated Control Valves	Readout Devices: Recording	Readout Devices: Indicating	Switches and Alarm Devices *: High **	Switches and Alarm Devices *: Low	Switches and Alarm Devices *: Comb	Transmitters: Recording	Transmitters: Indicating	Transmitters: Blind	Solenoids, Relays, Computing Devices	Primary Element	Test Point	Well or Probe	Viewing Device, Glass	Safety Device	Final Element
A	Analysis	ARC	AIC	AC		AR	AI	ASH	ASL	ASHL	ART	AIT	AT	AY	AE	AP	AW			AV
B	Burner/Combustion	BRC	BIC	BC		BR	BI	BSH	BSL	BSHL	BRT	BIT	BT	BY	BE		BW	BG		BZ
C	User's Choice																			
D	User's Choice																			
E	Voltage	ERC	EIC	EC		ER	EI	ESH	ESL	ESHL	ERT	EIT	ET	EY	EE					EZ
F	Flow Rate	FRC	FIC	FC	FCV, FICV	FR	FI	FSH	FSL	FSHL	FRT	FIT	FT	FY	FE	FP		FG		FV
FQ	Flow Quantity	FQRC	FQIC			FQR	FQI	FQSH	FQSL			FQIT	FQT	FQY	FQE					FQV
FF	Flow Ratio	FFRC	FFIC	FFC		FFR	FFI	FFSH	FFSL						FE					FFV
G	User's Choice																			
H	Hand		HIC	HC						HS										HV
I	Current	IRC	IIC			IR	II	ISH	ISL	ISHL	IRT	IIT	IT	IY	IE					IZ
J	Power	JRC	JIC			JR	JI	JSH	JSL	JSHL	JRT	JIT	JT	JY	JE					JV
K	Time	KRC	KIC	KC	KCV	KR	KI	KSH	KSL	KSHL	KRT	KIT	KT	KY	KE					KV
L	Level	LRC	LIC	LC	LCV	LR	LI	LSH	LSL	LSHL	LRT	LIT	LT	LY	LE		LW	LG		LV
M	User's Choice																			
N	User's Choice																			
O	User's Choice																			
P	Pressure/Vacuum	PRC	PIC	PC	PCV	PR	PI	PSH	PSL	PSHL	PRT	PIT	PT	PY	PE	PP			PSV, PSE	PV
PD	Pressure, Differential	PDRC	PDIC	PDC	PDCV	PDR	PDI	PDSH	PDSL		PDRT	PDIT	PDT	PDY	PE	PP				PDV
Q	Quantity	QRC	QIC			QR	QI	QSH	QSL	QSHL	QRT	QIT	QT	QY	QE					QZ
R	Radiation	RRC	RIC	RC		RR	RI	RSH	RSL	RSHL	RRT	RIT	RT	RY	RE		RW			RZ
S	Speed/Frequency	SRC	SIC	SC	SCV	SR	SI	SSH	SSL	SSHL	SRT	SIT	ST	SY	SE					SV
T	Temperature	TRC	TIC	TC	TCV	TR	TI	TSH	TSL	TSHL	TRT	TIT	TT	TY	TE	TP	TW		TSE	TV
TD	Temperature, Differential	TDRC	TDIC	TDC	TDCV	TDR	TDI	TDSH	TDSL		TDRT	TDIT	TDT	TDY	TE	TP	TW			TDV
U	Multivariable					UR	UI							UY						UV
V	Vibration/Machinery Analysis					VR	VI	VSH	VSL	VSHL	VRT	VIT	VT	VY	VE					VZ
W	Weight/Force	WRC	WIC	WC	WCV	WR	WI	WSH	WSL	WSHL	WRT	WIT	WT	WY	WE					WZ
WD	Weight/Force, Differential	WDRC	WDIC	WDC	WDCV	WDR	WDI	WDSH	WDSL		WDRT	WDIT	WDT	WDY	WE					WDZ
X	Unclassified																			
Y	Event/State/Presence		YIC	YC		YR	YI	YSH	YSL				YT	YY	YE					YZ
Z	Position/Dimension	ZRC	ZIC	ZC	ZCV	ZR	ZI	ZSH	ZSL	ZSHL	ZRT	ZIT	ZT	ZY	ZE					ZV
ZD	Gauging/Deviation	ZDRC	ZDIC	ZDC	ZDCV	ZDR	ZDI	ZDSH	ZDSL		ZDRT	ZDIT	ZDT	ZDY	ZDE					ZDV

Note: This table is not all-inclusive.
* A, alarm, the annunciating device, may be used in the same fashion as B, switch, the actuating device.
** The letters H and L may be omitted in the unfilled case.

Other Possible Combinations:
FO (Restriction Orifice)
FRK,HK (Control Stations)
FX (Accessories)
TJR (Scanning Recorder)
LLH (Pilot Light)
LCH (Level Control High)
PFR (Ratio)
KQI (Running Time Indicator)
QQI (Indicating Counter)
WKIC (Rate-of Weight-Loss Controller)
HMS (Hand Momentary Switch)
LCL (Level Control Low)

DISTRIBUTED CONTROL / SHARED DISPLAY INSTRUMENTS

- INDICATOR/CONTROLLER/RECORDER OR ALARM POINTS - USUALLY USED TO INDICATE VIDEO DISPLAY
  *NORMALLY ACCESSIBLE TO OPERATOR
- DISTRIBUTED CONTROL INTERCONNECTING LOGIC CONTROLLER OR PC WITH BINARY OR SEQUENTIAL LOGIC FUNCTIONS
  * NORMALLY ACCESSIBLE TO OPERATOR
- PAH / PAL / dP/dT / PDA — XAH / XAL / d/dT / PR
  INPUT ALARMS — OUTPUT ALARMS
  PAHN HIGH — XAHN HIGH
  PAL- LOW — XAL-NOW
  dP/dT - RATE CHANGE — d/dT - RATE CHANGE
  PDA - DEVIATION
  MISCELLANEOUS
  PRNTREND
  * NORMALLY ACCESSIBLE TO OPERATOR
- OLC — SP
  OLC- OPERATIONAL LIGHTED CONTROL
  OA - OPERATIONAL ALARM (STATUS)
  SP - STOP/INHIBIT FUNCTION FROM CRT
  ST - START/ENABLE FUNCTION FROM CRT
  A - AUTO ON/OFF FUNCTION FROM CRT
  O - OFF FUNCTION FROM CRT
  H - HAND/MANUAL FUNCTION FROM CRT
- NORMALLY BLIND OPERATION
  * NOT NORMALLY ACCESSIBLE TO OPERATOR
- 1 / 99 — DISTRIBUTED CONTROL INTERCONNECTING LOGIC CONTROLLER OR PC WITH BINARY OR SEQUENTIAL LOGIC FUNCTIONS NUMBER IN DIAMOND REFERS TO SEQUENCE NUMBER

PLC1 MAIN PLC

INSTRUMENT / PROCESS LINES DESIGNATIONS

0000	UNDERGROUND LINES
1000	PROCESS LINES
2000	VENDOR SUPPLIED LINES
3000	UTILITY LINES
CS	CARBON STEEL PIPE
CSVD	CARBON STEEL VENT DUCT (12 GAUGE)
DVW	DRAIN VENT WASTE PIPE
HDPE	HIGH DENSITY POLYETHYLENE PIPE
KYA	KYNAR
PDE	CPVC,/SOLID
PVC	POLYVINYL CHLORIDE PIPE SCHEDULE 80
PPL	POLYPROPYLENE LINED/LINED DUCTILE PIPE
SS	STAINLESS STEEL
TFO	TEFLON
B	BARE
I	INSULATED
J	JACKETED AND INSULATED
TE	ELECTRICALLY TRACED AND INSULATED

TYPICAL PIPELINE DESIGNATION

TYPE	SIZE	MAT.	NO.
TE-	4"-	HDPE-	1000

AS-BUILT DRAWINGS
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SCALE VERIFICATION: THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY.

No	Revision	Date	Initial

Approved

HWD SITE
FARMINGDALE, NEW YORK

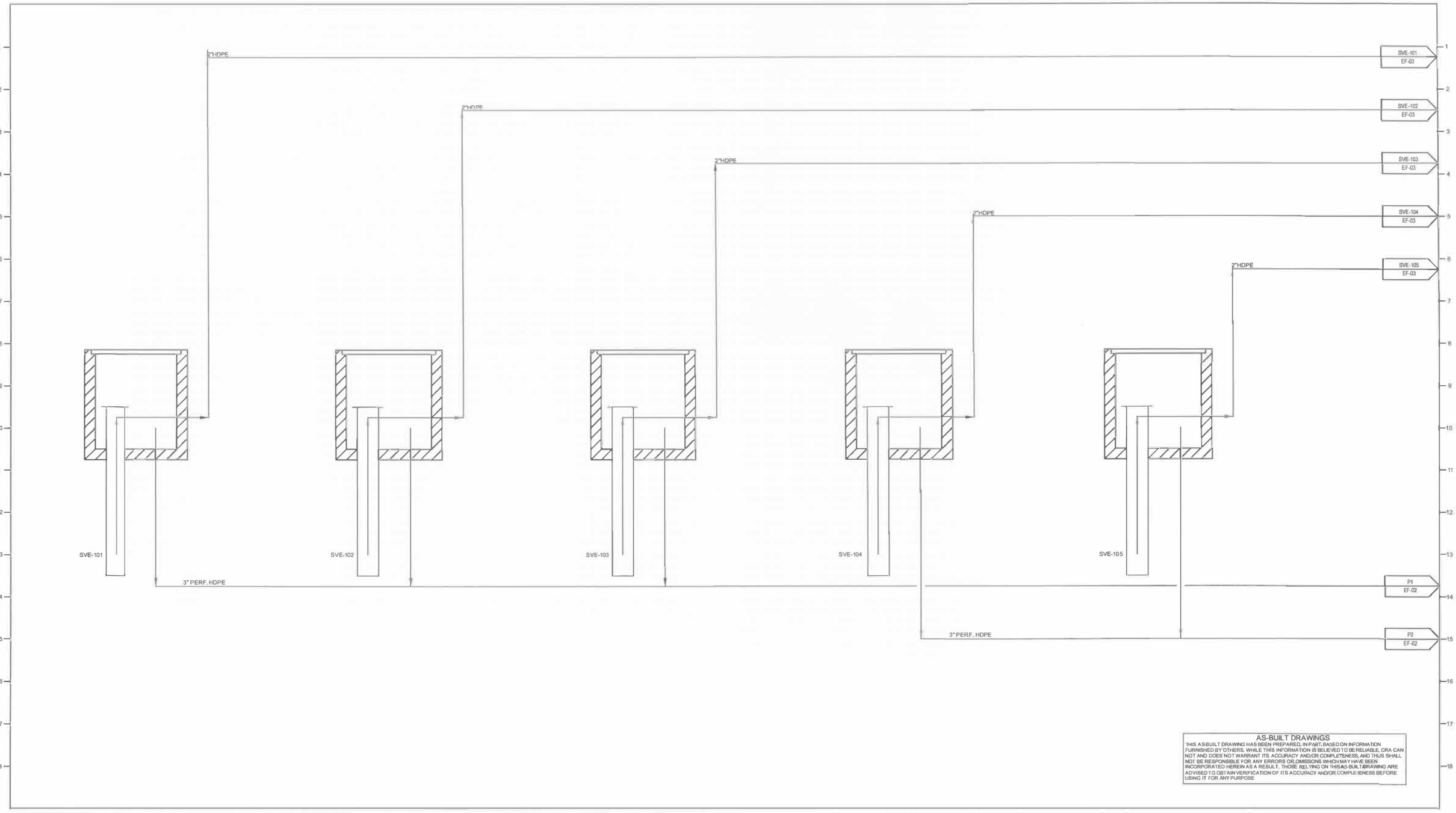
AS-BUILT ISCO / SVE TREATMENT

ENGINEERING FLOW SHEET LEGEND

CRA Infrastructure & Engineering, Inc.

Source Reference:			Date: SEPTEMBER 2010
Project Manager: J. PUSKAS	Reviewed By: R. MEDSGER	Designed By: K. LYNCH	Drawn By: M.WOLFER
Scale: 1"=1'-0"	Project No: 50138-00	Report No: 006	Drawing No: EF-00

50138-00(006)EF-WA001 JAN052011



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PLANT ID	1	2	3	4	5	6	7	8	9	10	11	12
NAME												
DESCRIPTION: MATERIAL												
SIZE												
CAPACITY												
TEMP/PRESS												
RPM/RPH												
WEIGHT												
MANUFACTURE												
MODEL												
VENDOR												

No	Revision	Date	Initial

HWD SITE
FARMINGDALE, NEW YORK

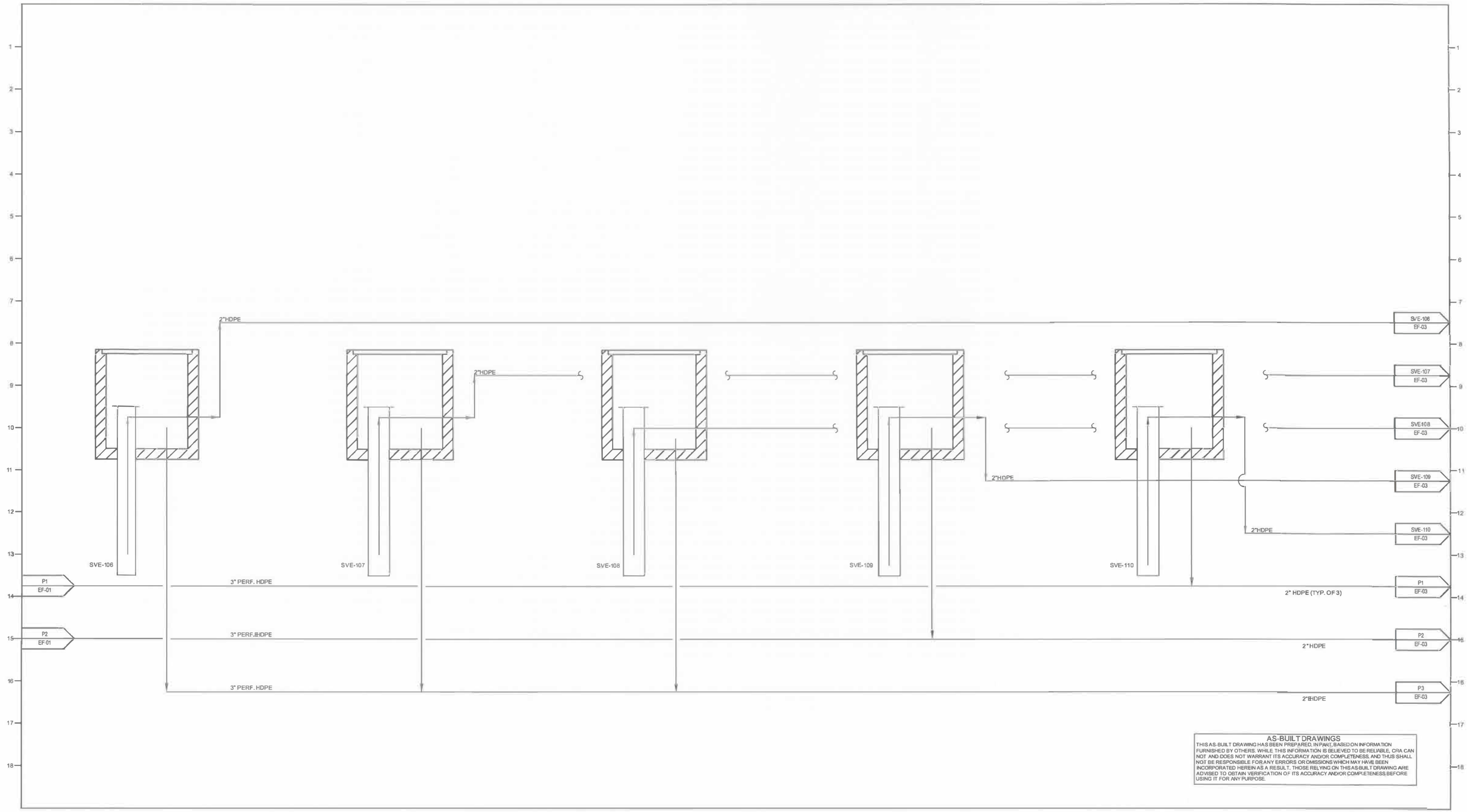
AS-BUILT ISCO / SVE TREATMENT

PROCESS FLOW SHEET
SVE WELLS

CRA Infrastructure & Engineering, Inc.

Source Reference:			Date: SEPTEMBR 2010
Project Manager: J. PUSKAS	Reviewed By: R. MEDSGER	Designed By: K. LYNCH	Drawn By: M.WOLFER
Scale: NONE	Project No: 50138-00	Report No: 006	Drawing No: EF-01

50138-00(006)EF-WA001 JAN 05/2011



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PLANT ID	1	2	3	4	5	6	7	8	9	10	11	12
NAME												
DESCRIPTION: MATERIAL												
SIZE												
CAPACITY												
TEMP/PRESS												
HP/RPM												
WEIGHT												
MANUFACTURE												
MODEL												
VENDOR												

No	Revision	Date	Initial

HWD SITE
FARMINGDALE, NEW YORK

AS-BUILT ISCO / SVE TREATMENT

PROCESS FLOW SHEET
SVE WELLS

CRA Infrastructure & Engineering, Inc.

Source Reference:			Date: SEPTEMBER 2010
ProjectManager: J. PUSKAS	Reviewed By: R.MEDSGER	Designed By: K. LYNCH	Drawn By: M.WOLFER
Scale: NONE	Project No: 50138-00	Report No: 006	Drawing No: EF-02

50138-00(006)EF-WA001 JAN 05/2011

FRONT OF TRAILER

SVE-101 EF-01 — FI — BA-2 " 4X2
SVE-102 EF-01 — FI — BA-2 " 4X2
SVE-103 EF-01 — FI — BA-2 " 4X2
SVE-104 EF-01 — FI — BA-2 " 4X2
SVE-105 EF-01 — FI — BA-2 " 4X2
SVE-106 EF-02 — FI — BA-2 " 4X2
SVE-107 EF-02 — FI — BA-2 " 4X2
SVE-108 EF-02 — FI — BA-2 " 4X2
SVE-109 EF-02 — FI — BA-2 " 4X2
SVE-110 EF-02 — FI — BA-2 " 4X2
P1 EF-02 — FI — BA-2 " 4X2
P2 EF-02 — FI — BA-2 " 4X2
P3 EF-02 — FI — BA-2 " 4X2
MAKEUP AIR — FI — BA-2 " 4X2

4" SVE HEADER

1/4" BALL VALVE PE SAMPLE PORT (EACH SVE)

SDR 17 HDPE SCH. 80 PVC

REAR OF TRAILER

SKID MOUNTED EQUIPMENT

TI — MANUAL DILUTION VALVE — PVC-4" — PI — BA-½" — BA-1 " — A-4" — B-4" — PSV VAC — BA-1" — INLINE FILTER — 2

SCH. 80 C.S.

LAHH — LSHH — R — E-1" — BA-1" DRAIN — C-" — 1

HS HOA — A-4" — B-4" — 3 — 4 — TI — FI — MAGNA HELIC — PI — BA-½" — BA-1 " — CS-4" — BA-1/4" — A-"

STACK — BA-1/4" SAMPLE PORT

D-" — B-" — A-" — C-" — BA-½" DRAIN — 5

D-" — B-" — A-" — BA-1/4" SAMPLE PORT — C-" — BA-½" DRAIN — 5

AS-BUILT DRAWINGS

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PLANT ID	1	2	3	4	5	6	7	8	9	10	11	12
NAME	KNOCKOUT POT	INLET SILENCER	AIR BLOWER	DISCHARGE SILENCER	VAPOR PHASE CARBON VESSEL NO.1	VAPOR PHASE CARBON VESSEL NO.2						
MATERIAL	STEEL				STEEL	STEEL						
SIZE	24"D X 48"H				34"D X 67"H	34"D X 67"H						
CAPACITY	40 GALLONS		300 SCFM @ 100" W.C.		500 LBS	500 LBS						
TEMP/PRESS			68°F									
HP/VRPM			10 / 230 /									
WEIGHT					1050 LBS (OPER.)	1050 LBS (OPER.)						
MANUFACTURE			SUTORBILT		CARBON AIR GPC18R	CARBON AIR GPC5R						
MODEL			5M									
VENDOR												

DESCRIPTION

No	Revision	Date	Initial

HWD SITE
FARMINGDALE, NEW YORK

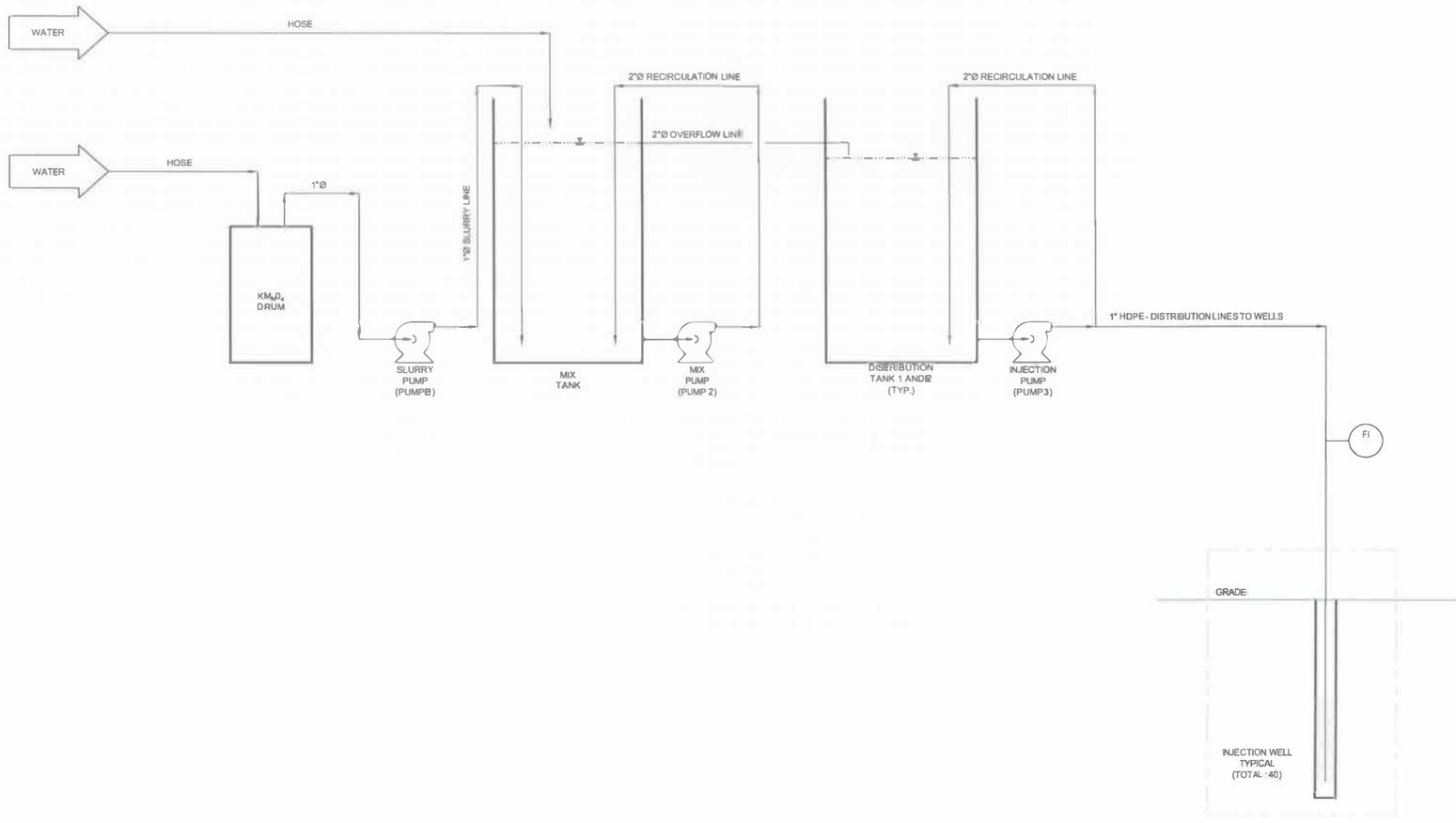
AS-BUILT ISCO / SVE TREATMENT

PROCESS FLOW SHEET
SVE SYSTEM

CRA Infrastructure & Engineering, Inc.

Source Reference:			Date: SEPTEMBER 2010
Project Manager: J. PUSKAS	Reviewed By: R. MEDSGER	Designed By: K.LYNCH	Drawn By: M.WOLFER
Scale: NONE	Project No: 50138-00	Report No: 006	Drawing No: EF-03

50138-00(006)EF-WA001 JAN 05/2011



AS-BUILT DRAWINGS

THIS AS-BUILT DRAWING HAS BEEN PREPARED, IN PART, BASED ON INFORMATION FURNISHED BY OTHERS. WHILE THIS INFORMATION IS BELIEVED TO BE RELIABLE, CRA CAN NOT AND DOES NOT WARRANT ITS ACCURACY AND/OR COMPLETENESS, AND THUS SHALL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH MAY HAVE BEEN INCORPORATED HEREIN AS A RESULT. THOSE RELYING ON THIS AS BUILT DRAWING ARE ADVISED TO OBTAIN VERIFICATION OF ITS ACCURACY AND/OR COMPLETENESS BEFORE USING IT FOR ANY PURPOSE.

SCALE VERIFICATION. THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY

No	Revision	Date	Initial

Approved

HWD SITE
FARMINGDALE, NEW YORK

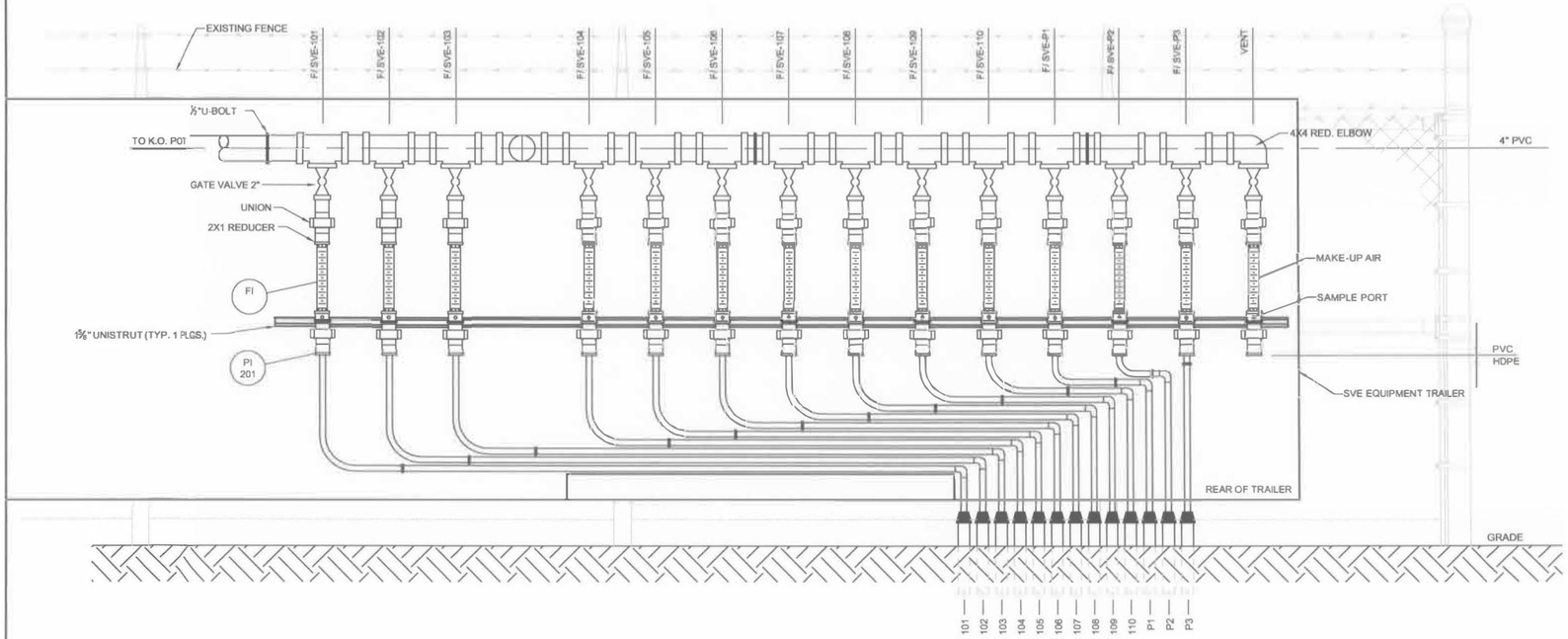
AS-BUILT ISCO / SVE TREATMENT

PROCESS FLOW SHEET
ISCO SYSTEM

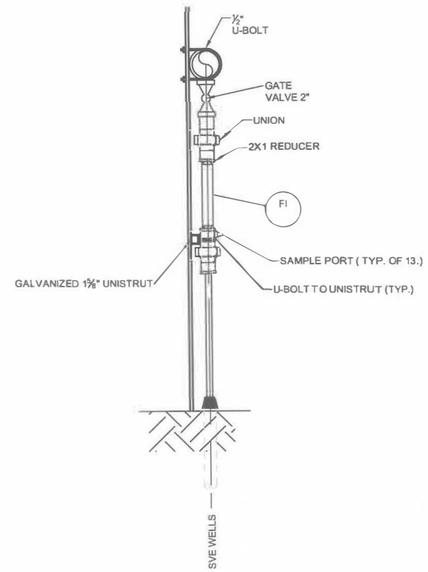
CRA Infrastructure & Engineering, Inc.

Source Reference:			Date: SEPTEMBER 2010
Project Manager: J. PUSKAS	Reviewed By: R. MEDSGER	Designed By: K.AYNCH	Drawn By: M.JWOLFER
Scale: 1"-1'-0"	Project No: 50138-00	Report No: 006	Drawing No: EF-04

50138-00(006)EF.WA001 JAN05/2011



MANIFOLD LAYOUT
NTS



ELEVATION LOOKING WEST
NTS

AS-BUILT DRAWINGS

THIS AS-BUILT DRAWING HAS BEEN PREPARED, IN PART, BASED ON INFORMATION FURNISHED BY OTHERS. WHILE THIS INFORMATION IS BELIEVED TO BE RELIABLE, CRA CAN NOT AND DOES NOT WARRANT ITS ACCURACY AND/OR COMPLETENESS, AND THUS SHALL NOT BE RESPONSIBLE FOR ANY ERRORS OR OMISSIONS WHICH MAY HAVE BEEN INCORPORATED HEREIN AS A RESULT. THOSE RELYING ON THIS AS-BUILT DRAWING ARE ADVISED TO OBTAIN VERIFICATION OF ITS ACCURACY AND/OR COMPLETENESS BEFORE USING IT FOR ANY PURPOSE.

SCALE VERIFICATION: THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY

No	Revision	Date	Initial
A			

Approved

HWD SITE
FARMINGDALE, NEW YORK

AS-BUILT ISCO / SVE TREATMENT

SVE MANIFOLD LAYOUT

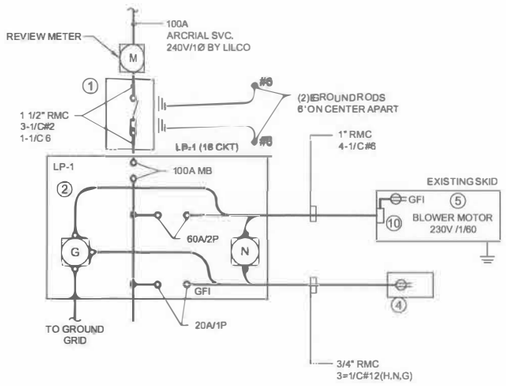
CRA Infrastructure & Engineering, Inc.

Source Reference			Date: SEPTEMBER 2010
Project Manager: J. PUSKAS	Reviewed By: R. MEDSGER	Designed By: K. LYNCH	Drawn By: M.WOLFER
Scale: 1"-1'-0"	Project No.: 50138-00	Report No: 006	Drawing No: ME-01

50138-00(006)ME_WA001 JAN 05/2011

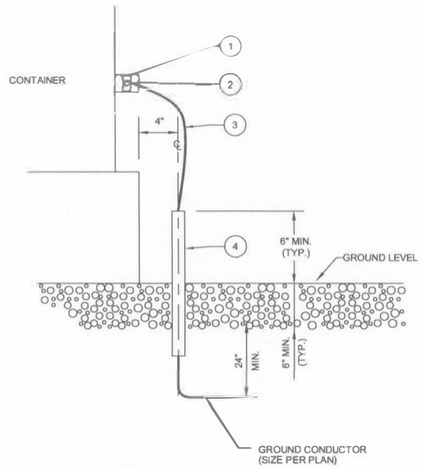
EQUIPMENT SCHEDULE

ITEM	DESCRIPTION	MANUFACTURER/TRADE NAME	PART/MODEL NUMBER
1	DISCONNECT SWITCH-100A	SQUARE-D	H363NRB COMPLETE WITH BUSSMANN FRS FUSES, GROUND KIT
2	DISTRIBUTION LIGHTING PANEL	SQUARE-D	CL 1170ENEMA 3R CAT HOM818L125RB W/ 30A MCB
3	WIREWAY	SQUARE-D	WEATHERTIGHT, 4 x ENCLOSURE
4	DUPLEX RECEPTACLE	HUBBEL HBL RECEPTACLE FS BOX AND WATERTIGHT COVER	HUBBELL BLS262 RECEPTACLE CROUSE-HIND RP-1 BOX W/ WLRD-1 COVER
5	BLOWER MOTOR 230V / 1Ø / 10 HP 1725 RPM / TEFC	BALDOR	L3712T



1 LINE DIAGRAM

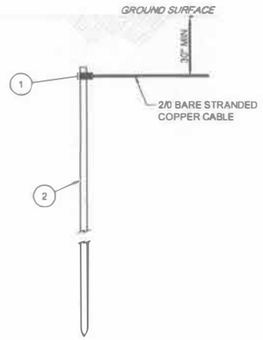
N.T.S.



1. WELDED TAB: BURNDY GSTUD - HY
2. CONNECTOR: BURNDY GB (1 CABLE)
3. GROUNDING CONDUCTOR: BARE STRANDED COPPER CABLE (SIZE PER PLAN)
4. SLEEVE: 1" SCHEDULE 40 PVC CONDUIT

UNDERGROUND GROUNDING
WELDED FLANGE CONNECTION

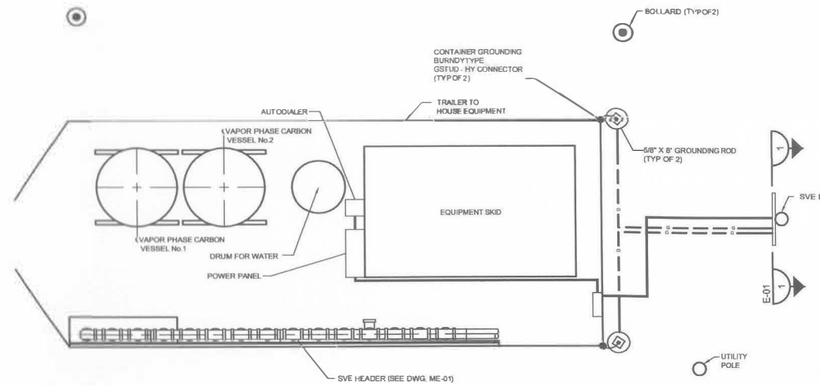
N.T.S.



1. CONNECTOR: BURNDY CAT. No. TGLR29C34
2. GROUND ROD: 3/4" DIA. x 10' LG.

GROUNDING ROD INSTALLATION - BURIED TYPE

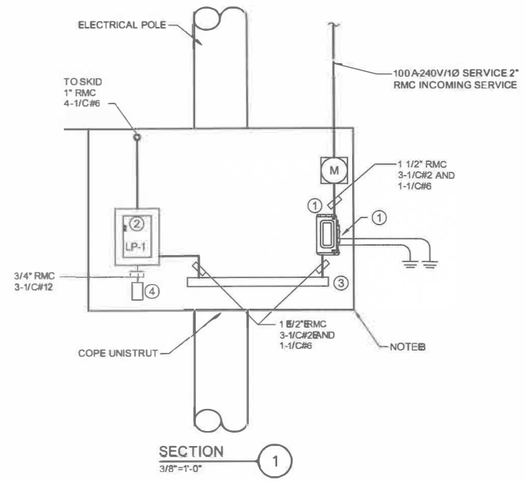
N.T.S.



NOTE:

GROUND RODS TO BE SEPARATED BY AT LEAST 6 FEET ON CENTER

PLAN



SECTION
3/8"=1'-0"

1

ELECTRICAL NOTES

1. REFERENCES

A. ALL PROJECT ELECTRICAL WORK CONFORMS TO THE LATEST REQUIREMENTS OF THE FOLLOWING CODES, STANDARDS, GUIDES, AND WORK PRACTICES PERTAINING TO THE JOB:

1. NATIONAL FIRE PROTECTION ASSOCIATION, INC. (NFPA): 70 - NATIONAL ELECTRICAL CODE (NEC).
2. INSTITUTE OF ELECTRICAL AND ELECTRONICS ENGINEERS (IEEE): C2 - NATIONAL ELECTRICAL SAFETY CODE (NESC).
3. LOCAL AUTHORITY HAVING JURISDICTION (AHJ) AS DEFINED BY NEC (NFPA 70). 3.

2. WIRING

A. THE WIRING AS SHOWN ON THE DRAWINGS IS DIAGRAMMATIC. DETERMINE EXACT WIRING LOCATIONS BY FIELD VERIFYING EACH ROUTE BEFORE BEGINNING WORK. ALL WIRING LOCATIONS AND RUNS SHALL BE COMPLETELY VERIFIED AND CONFIRMED.

AS-BUILT DRAWINGS

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SCALE VERIFICATION: THIS BAR MEASURES 1" ON ORIGINAL. ADJUST SCALE ACCORDINGLY

No.	Revision	Date	Initial

HWD SITE
FARMINGDALE, NEW YORK

AS-BUILT ISCO / SVE TREATMENT

GROUNDING / POWER
PLAN AND DETAILS

CRA Infrastructure & Engineering, Inc.

Source/Reference:			Date: SEPTEMBER 2010
Project Manager: J. LEUSKAS	Reviewed By: R. MEDSGER	Designed By: K. LYNCH	Drawn By: M. WOLFER
Scale: 1"=1'-0"	Project No: 50138-00	Report No: 006	Drawing No: EL-01

50138-00(006)EL-WA001 JAN 05/2011

APPENDIX D

ENERGY CONTROL PROCEDURES

TABLE OF CONTENTS

HWD SITE
ENERGY CONTROL PROCEDURE
(LOCKOUT/TAGOUT PROCEDURE)

Project Name:	HWD Site - Farmingdale NY	**Procedure No. 1**
Name of Facility:	HWD Site	**Maintenance or Repair Activities:** Repair components within control panel. Drainage of condensate from knockout pot. Repair or maintenance of blower / motor components.
Equipment Name:	Soil Vapor Extraction (SVE) Skid	

Energy Sources Present:

☒ **Electrical** ☐ **Chemical** ☐ **Mechanical** ☐ **Pneumatic** ☐ **Hydraulic** ☐ **Thermal**

☐ **Other:** _____

SHUT DOWN

	Energy Source	Isolating Device	Location	Action	Verification Step
1	Electrical	Disconnect Switch	Utility pole	Turn Disconnect Switch XX to the OFF position. Apply lockout device and tag on switch.	Open up the SVE control panel. Use a volt or multi-meter and touch the probes to the incoming power conductors to verify that there is no power.

START UP

	Energy Source	Isolating Device	Location	Action	Verification Step
1	Electrical	Disconnect Switch	Utility pole	Remove the lockout devices and tags on Disconnect Switch XX. Turn Disconnect Switch to ON position.	Turn the HAND/OFF/AUTO switch on the SVE blower to the HAND position. Look at the SVE blower motor to verify that the blower is running. Return switch to the desired position.

Procedure Verification

The procedure listed above was field tested/verified by _____ of _____ on the _____ day of _____, 200__.

If the energy sources affecting this equipment are modified in any way, the overall procedure should be reevaluated.

HWD SITE
ENERGY CONTROL PROCEDURE
(LOCKOUT/TAGOUT PROCEDURE)

Project Name:	HWD Site – Farmingdale NY	**Procedure No. 2**
Name of Facility:	HWD Site	**Maintenance or Repair Activity:** Repair of oxidant transfer pump.
Equipment Name:	In-Situ Chemical Oxidation (ISCO) System	

Energy Sources Present:

☒ **Electrical** ☐ **Chemical** ☐ **Mechanical** ☐ **Pneumatic** ☒ **Hydraulic** ☐ **Thermal**

☐ **Other:** _____

SHUT DOWN

	Energy Source	Isolating Device	Location	Action	Verification Step
1	Electric	Breaker Switch	DP-1 Panel	Turn Breaker Switch XX to the OFF position. Apply lockout device and tag on switch.	Use a volt or multi-meter and touch the probes to the incoming power conductors to verify that there is no power.
2	Hydraulic	Ball Valve	Oxidant Tank Outlet	Turn tank outlet ball valve to CLOSED position. Apply lockout device and tag on switch.	Turn bleed valve immediately downstream to the OPEN position and ensure no further flow from the tank.

START UP

	Energy Source	Isolating Device	Location	Action	Verification Step
1	Hydraulic	Ball Valve	Oxidant Tank Outlet	Remove lockout device from valve. Ensure adjacent bleed valve is in the CLOSED position. Turn tank outlet ball valve to OPEN position.	Verify flow from pump in next step.
2	Electrical	Breaker Switch	DP-1 Panel	Remove the lockout devices and tags on Breaker Switch XX. Turn Breaker Switch to ON position.	Turn pump starter to ON position. Visually verify operation of the pump. Return switch to the desired position.

Procedure Verification

The procedure listed above was field tested/verified by _____ of _____ on the _____ day of _____, 200__.

If the energy sources affecting this equipment are modified in any way, the overall procedure should be reevaluated.

HWD SITE
ENERGY CONTROL PROCEDURE
(LOCKOUT/TAGOUT PROCEDURE)

Project Name:	HWD Site - Farmingdale NY	**Procedure No. 3**
Name of Facility:	HWD Site	**Maintenance or Repair Activity:** Repair of tank mixer.
Equipment Name:	In-Situ Chemical Oxidation (ISCO) System	

Energy Sources Present:

☒ **Electrical** ☐ **Chemical** ☐ **Mechanical** ☐ **Pneumatic** ☐ **Hydraulic** ☐ **Thermal**

☐ **Other:** _____

SHUT DOWN

	Energy Source	Isolating Device	Location	Action	Verification Step
1	Electric	Breaker Switch	DP-1 Panel	Turn Breaker Switch XX to the OFF position. Apply lockout device and tag on switch.	Use a volt or multi-meter and touch the probes to the incoming power conductors to verify that there is no power.

START UP

	Energy Source	Isolating Device	Location	Action	Verification Step
1	Electrical	Breaker Switch	DP-1 Panel	Remove the lockout devices and tags on Breaker Switch XX. Turn Breaker Switch to ON position.	Turn mixer motor starter to ON position. Visually verify operation of the mixer. Return switch to the desired position.

Procedure Verification

The procedure listed above was field tested/verified by __e e _____ _____ e__ of _____e_____e_____ on the _____e___ day of _____, 200__.

If the energy sources affecting this equipment are modified in any way, the overall procedure should be reevaluated.

APPENDIX C

USEPA UIC PERMIT LETTER

UNITED STATES ENVIRONMENTAL PROTECTION AGENCY
REGION 2
290 BROADWAY
NEW YORK, NY 10007-1866

FEB 25 2019

CERTIFIED MAIL – RETURN RECEIPT REQUESTED
Article Number: 7005 3110 0000 5937 5136

Carl Palazzolo, President
JPD United, Inc., 1, LLC
11 A Picone Boulevard
Farmingdale, NY 11735

Re: Underground Injection Control (UIC) Program Regulation
Property - 11 A Picone Boulevard (**Reference UICID: 10NY10319003**)
11 A Picone Boulevard
Farmingdale, NY 11735
Suffolk County
Authorization to Inject

Dear Mr. Palazzolo:

This letter serves to inform you that the U.S. Environmental Protection Agency is in receipt of inventory information addressing wells authorized by rule located at the above-referenced facility in accordance with 40 Code of Federal Regulations (CFR) §144.26. The operation of the following Underground Injection Control wells are authorized by rule, pursuant to 40 CFR §144.24:

Forty monitoring wells on site will be injected with Chemical Oxidation (ISCO) as the treatment for contaminated soils and groundwater. This will occurr in two sessions, three months apart The groundwater will be monitored for a period of three years. Owner is working in conjunction with New York State Department of Environmental Conservation on this project.

Should any conditions change in the operation of any of the wells listed above (such as injectate composition, closure of the well, injection of cooling water greater than 98 degrees Fahrenheit, construction of additional wells, etc.) you are required to notify this

office within five (5) days. Any accidental spills into a well should be reported within twenty-four (24) hours after the event. Change in operation information should be addressed to:

Nicole Foley Kraft, Chief
Ground Water Compliance Section
United States Environmental Protection Agency
290 Broadway, 20th Floor
New York, NY 10007-1866
Re: 10NY10319003
Attn: Norma Ortega

Should you own or operate **other** facilities using underground injection wells, please use the enclosed inventory form (EPA Form 7520-16) and instructions, copy for multiple facilities, and submit them to the address listed above. These documents can also be found on the internet at:

http://www.epa.gov/safewater/uic/pdfs/7520-16.pdf
http://www.epa.gov/region02/water/compliance/supplemental_instructions_inventory.pdf
http://www.epa.gov/region02/water/compliance/wellclasstypetable_inventoryc_form

Failure to respond to this letter truthfully and accurately within the time provided may subject you to sanctions authorized by federal law. Please also note that all information submitted by you may be used in an administrative, civil judicial, or criminal action. In addition, making a knowing submission of materially false information to the U.S. Government may be a criminal offense.

Should you have any questions, please contact Norma Ortega of my staff at (212) 637-4234 or ortega.norma@epa.gov.

Sincerely,

Nicole Foley Kraft, Chief
Ground Water Compliance Section

Enclosure

OPTIONAL FORM 99 (7-90)

FAX TRANSMITTAL # of pages ▸ 3

To Robert Medsger	From N. Ortega
Dept./Agency Orrestosa & Rovers	Phone # 212 637.4234
Fax # (519) 884.0525	Fax #

NSN 7540-01-317-7368 5099-101 GENERAL SERVICES ADMINISTRATION

cc: Bill Spitz
NYSDEC, Region 1
SUNY Stony Brook, 50 Circle Rd
Stony Brook, NY 11790

Robert Seyfarth
Division of Environmental Quality
Office of Pollution Control Suffolk County Dept. of Health
15 Horseblock Place
Farmingville, NY 11738

Robert Mcdsger
Conestoga - Rovers & Associates
65d Colby Drive, Waterloo
Ontario, Canada N2V 1C2

APPENDIX B

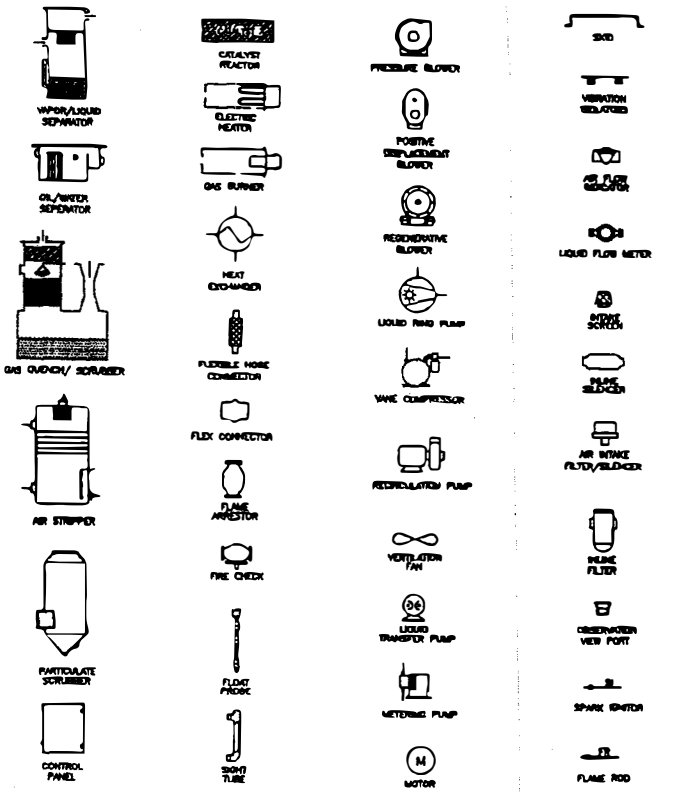
SVE PACKAGE SPECIFICATIONS SHEETS AND MAINTENANCE REQUIREMENTS

LEGEND OF SYMBOLS

NOTE:
SPECIFICATIONS AND DIMENSIONS SUBJECT TO CHANGE WITH OUT NOTIFICATION.

SYMBOLOGY

EQUIPMENT



PROCESS LINES

- PIPING
- HOSE
- LINE SIZE
- FLOW DIRECTION

INSTRUMENT LINES

- UNDEFINED SIGNAL
- /ELECTRICAL SIGNAL
- DATA LINK
- INSTRUMENT CAPILLARY TUBING
- INSTRUMENT AIR

MATERIAL

- C CAST IRON
- CPVC CHLORINATED POLYVINYL CHLORIDE
- CS CARBON STEEL
- CU COPPER
- FRP FIBERGLASS REINFORCED PLASTIC
- GS GALVANIZED STEEL
- PVC POLYVINYL CHLORIDE
- SCH SCHEDULE
- SS STAINLESS STEEL

PIPING & VALVES

- BALL
- BUTTERFLY
- CHECK
- GATE
- ORIFICE METERING
- LUBRICATED PLUG
- SOLENOID 3-WAY
- VACUUM RELIEF
- PRESSURE RELIEF
- PRESSURE REDUCING INTERNAL RELIEF
- PRESSURE REDUCING EXTERNAL PRESSURE
- PRESSURE REDUCING DIFFERENTIAL PRESSURE
- PRESSURE REDUCING VENTED
- MOTOR ACTUATED
- 3 WAY
- REDUCER
- Y-STRAINER
- SAMPLE/TEST PORT
- SCREW/CAP PORT
- FLANGE
- UNION
- ORIFICE PLATE

MEASURED VARIABLES

ELECTRICAL

- LOCALLY MOUNTED
- PANEL MOUNTED
- ALARM/ANNUNCIATED
- INTERLOCKS
- PROGRAMMABLE LOGIC CONTROLLER

FIRST LETTERS		SUCCEEDING LETTERS	
F	FLOW	A	ALARM
I	CURRENT.	C	CONTROL
L	LEVEL	D	DIFFERENTIAL
P	PRESSURE or VAC	E	PRIMARY ELEMENT
T	TEMPERATURE	G	GAUGE
W	pH	H	HIGH
X	CONDUCTIVITY	I	INDICATOR
Y	EVENT	L	LOW
Z	POSITION	M	METER
		Q	TOTALIZER
		R	RECORD
		S	SWITCH
		T	TRANSMITTER

SD-232

REV	DESCRIPTION	DATE	BY

MAT'L: SEE BOM

WEIGHT: N/A

TOLERANCES
.X = 0.06
.XX = 0.03
.XXX = 0.015
∠ = 0.5°

CATALYTIC COMBUSTION
709 - 21st Avenue Bloomer, Wisconsin 54724
Telephone 715-568-2882 FAX 715-568-2884

THIRD ANGLE PROJECTION

INCH [mm] | DO NOT SCALE THIS DRAWING

DATE: 8-2-02

SCALE: none

DRAWN BY: SAL

CHECKED BY:

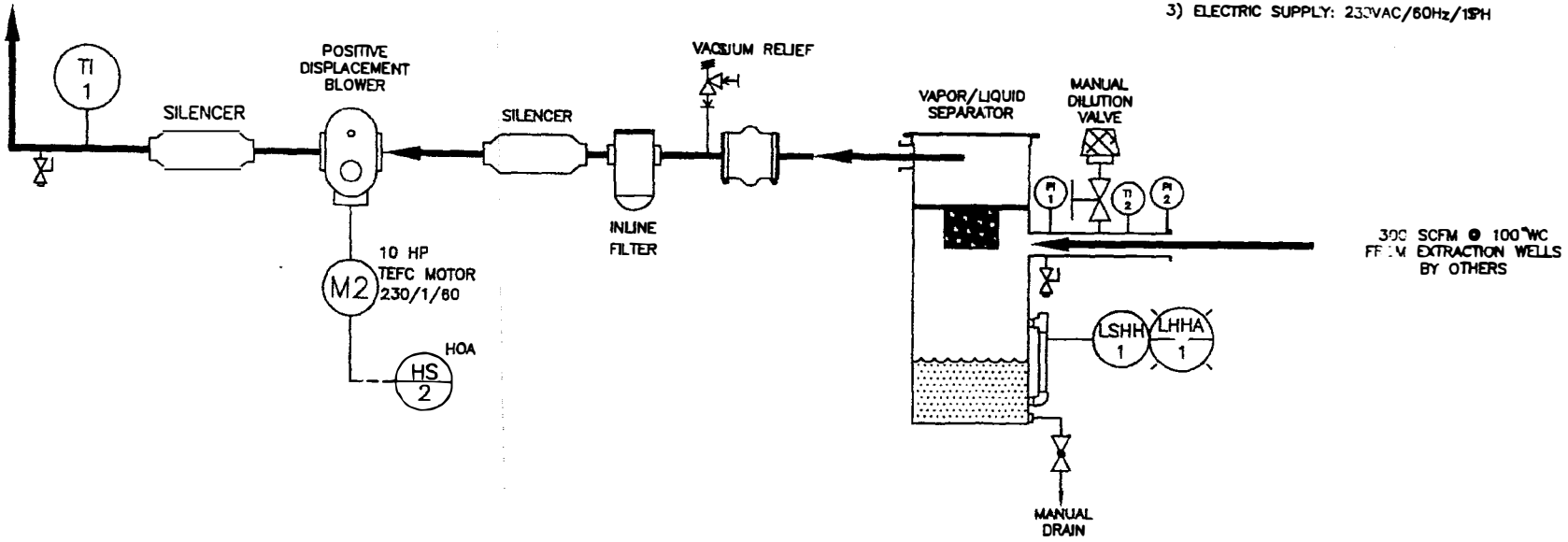
CUSTOMER:

TITLE: CCC LEGEND OF SYMBOLS
LEGEND

PROJECT/PRODUCT	DRAWING	REV	SIZE
SD-232		0	A

NOTES

1) CLASSIFICATION: NON-CLASSIFIED
2) FOR COMPONENT INFORMATION AND WIRING DETAILS SEE ELECTRICAL SCHEMATICS.
3) ELECTRIC SUPPLY: 230VAC/60Hz/1PH



REV	DESCRIPTION	DATE	BY

MAT'L:

WEIGHT

TOLERANCES

.X = 0.06
.XX = 0.03
.XXX = 0.015
∠ = 0.5°

CATALYTIC COMBUSTION

Catalytic Combustion Corporation
709 ~ 21st Avenue
Bloomer, WI 54724

Telephone: 715-568-2882
Fax: 715-568-2884

www.catalyticcombustion.com

DATE: 10-27-04

SCALE: NONE

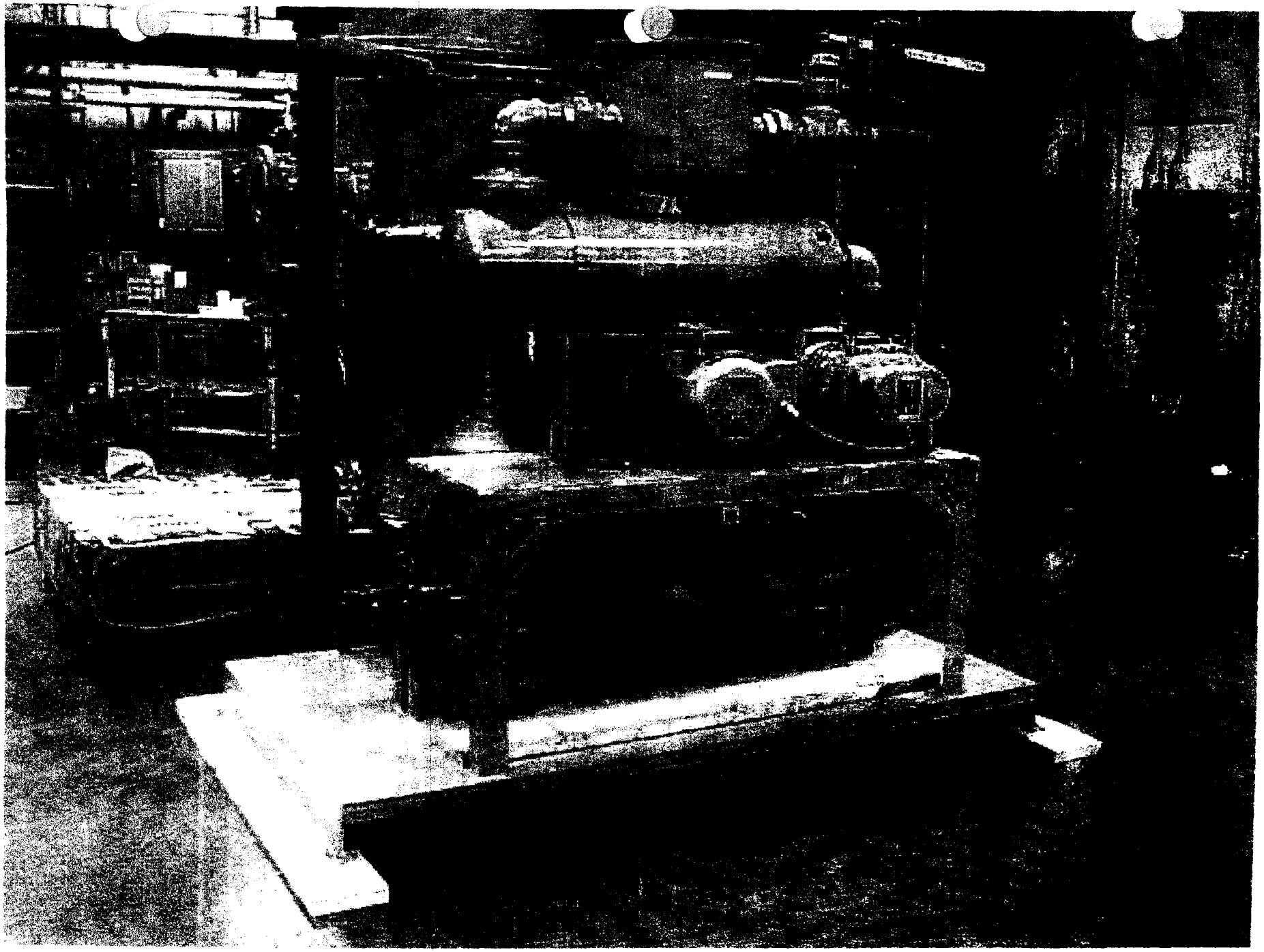
DRAWN BY: KW

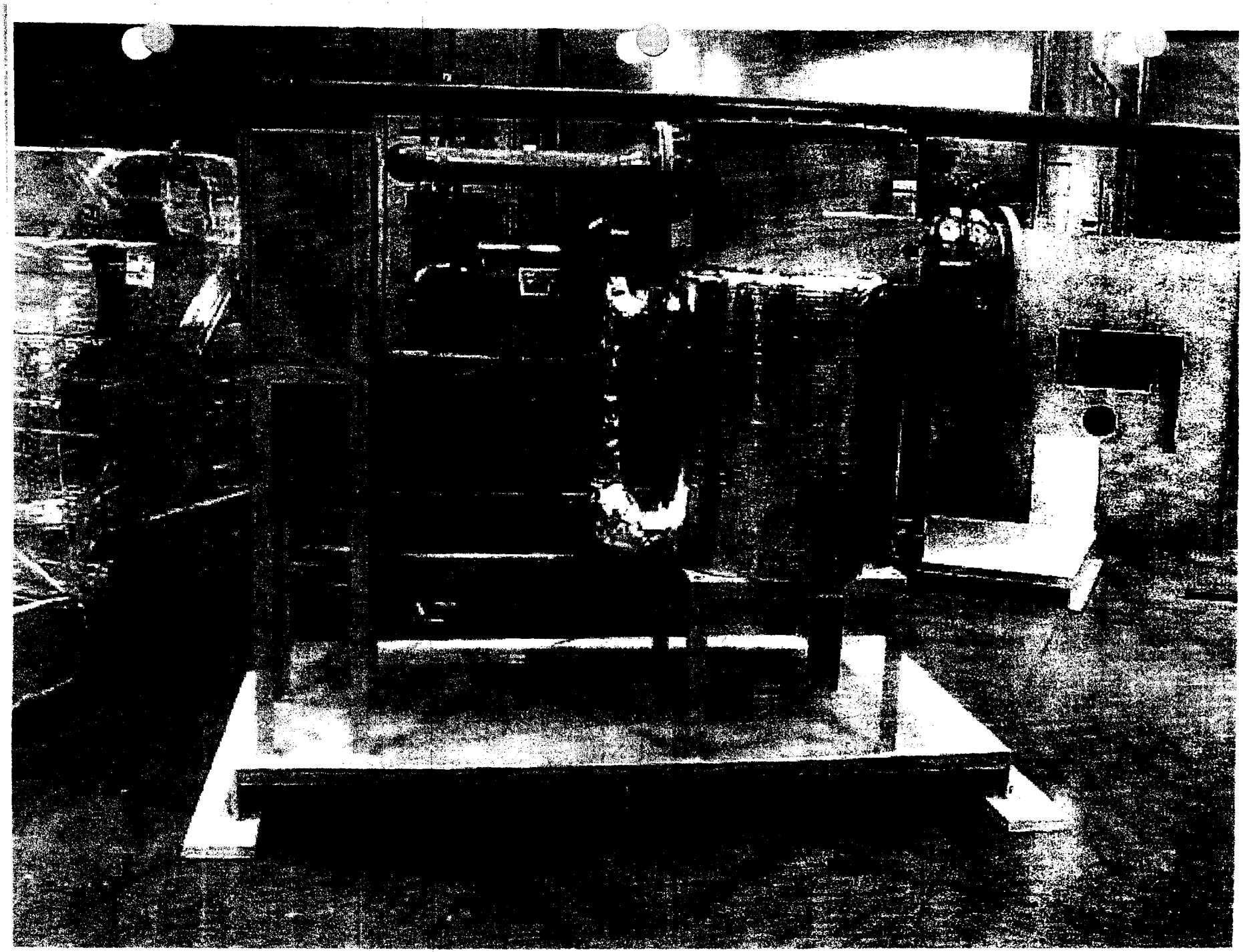
CHECKED BY: KW

CUSTOMER: RENTAL 125

TITLE: SVE-VLS 300 SCFM @100"
P&ID

PROJECT/PRODUCT	DRAWING	REV	SIZE
04-0552	500	0	A





PROJ. NAME:		RENTAL SVE 125				**MATERIAL ARRIVAL DEADLINE:**							
CCC PROJ. NO:		J-04-0552				**TARGET SHIP DATE:**							
PROJ. MANAGER:		KW				**BOM ISSUE DATE:**							
Items added to BOM						**Items removed from BOM**							
Phase & Cat.	**Qty**	**U/M**	**Ref. Dwg**	**Unit Cost**	**Description**	**Mfg. Part No.**	**Vendor Code**	**PO#**	**PO Date**	**Proj. Del. Date**	**Rec'd Date**	**Extended PO Cost**	
					OXIDIZER FABRICATION COMPONENTS								
OX-MT 40	1	EA		0.00	ENCLOSURE	SCE-24EL2010LP	SCE	25930	18-Oct	18-Oct	18-Oct	0.00	
OX-MT 40	1	EA		0.00	MOUNTING PANEL	SCE-24P20	SCE	25930	18-Oct	18-Oct	18-Oct	0.00	
OX-MT 40	1	EA		0.00	10PN GROUNDBAR KIT	GB10	WER	25927	18-Oct	18-Oct	18-Oct	0.00	
OX-MT 40	1	EA		0.00	3P, 110-120 CNT	100-C60D10	WER	25927	18-Oct	18-Oct	18-Oct	0.00	
OX-MT 40	1	EA		0.00	RELAY OVERLOAD	193-EA2KE	WER	25927	18-Oct	27-Oct	27-Oct	0.00	
OX-MT 40	1	EA		0.00	LEGEND PLATE	E22NS51	AUD	25926	18-Oct	18-Oct	18-Oct	0.00	
OX-MT 40	1	EA		0.00	22MM METAL PB	GCX1101	AUD	25926	18-Oct	18-Oct	18-Oct	0.00	
OX-MT 40	1	EA		0.00	22MM METAL PB	GCX1102	AUD	25926	18-Oct	18-Oct	18-Oct	0.00	
OX-MT 40	1	EA		0.00	22MM METAL PB	GCX1262-120	AUD	25926	18-Oct	18-Oct	18-Oct	0.00	
OX-MT 40	1	EA		0.00	10HP, SINGLE PHASE MOTOR	MOTOR	BHC	25895	11-Oct	21-Oct	21-Oct	0.00	
OX-MT 40	1	EA		0.00	MOTOR BASE	B215T	BHC	25895	11-Oct	21-Oct	21-Oct	0.00	
OX-MT 40	1	EA		0.00	SHEAVE	BK95H	BHC	25895	11-Oct	21-Oct	21-Oct	0.00	
OX-MT 40	1	EA		0.00	SHEAVE	BK75H	BHC	25895	11-Oct	27-Oct	27-Oct	0.00	
OX-MT40	1	EA		0.00	BUSHING	HX13/8	BHC	25895	11-Oct	21-Oct	21-Oct	0.00	

PROJ. NAME:	RENTAL SVE 125	**MATERIAL ARRIVAL DEADLINE:**	
CCC PROJ. NO:	J-04-0552	**TARGET SHIP DATE:**	
PROJ. MANAGER:	KW	**BOM ISSUE DATE:**	

Items added to BOM | **Items removed from BOM**

Phase & Cat.	Qty	U/M	Ref. Dwg	Unit Cost	Description	Mfg. Part No.	Vendor Code	PO #	PO Date	Proj. Del. Date	Rec'd Date	Extended PO Cost
OX-MT40	1	EA		0.00	BUSHING	HX10/8	BHC	25895	11-Oct	21-Oct	21-Oct	0.00
OX-MT40	1	EA		0.00	BELT	BX64	BHC	25895	11-Oct	21-Oct	21-Oct	0.00
OX-MT40	1	EA		0.00	3' ELL-90 SCHED 80 PVC	806-030	INC	25987	25-Oct	27-Oct	27-Oct	0.00
OX-MT40	2	EA		0.00	FLANGE, 3" SCHED 80 PVC	851-030	INC	25987	25-Oct	27-Oct	27-Oct	0.00
OX-MT40	1	EA		0.00	TEE, 3" SCHED 80 PVC	801-030	INC	25987	25-Oct	27-Oct	27-Oct	0.00
OX-MT40	2	EA		0.00	FERNCO, 4"		SCE		25-Oct			0.00
OX-MT40	1	EA		0.00	Gem Sensor	LS750	ELE	25960	22-Oct	27-Oct	10/273	0.00
OX-MT40	2	EA		0.00	Vaccuum Guage	3854SK6	MCM	25961	22-Oct	27-Oct	27-Oct	0.00
OX-MT40	1	EA		0.00	Insulation Foil	9333K31	MCM	25961	22-Oct	27-Oct	27-Oct	0.00
OX-MT40	1	EA		0.00	VACUUM RELIEF VALVE, BUHLER	AUPK-83001-31	BUH					0.00
OX-MT40	1	EA		0.00	BLOWER, SUTORBILT 5M		ST	ST				0.00
OX-MT40	1	EA		0.00	STODDARD INLINE FILTER	F65V	ST	ST				0.00
Total BOM												0.00

VACUUM PERFORMANCE DATA

For Air at Standard Conditions: Sea Level 14.7 PSIA, 68° F Inlet Temperature, 36% Relative Humidity.
For performance with gases other than air, or at non-standard conditions, contact your authorized Sutorbilt distributor.

LOW VACUUM UNITS

SIZE	DIA. INLET & OUTLET	DISPL. CU. FT. REV.	RPM	2" HG		4" HG		8" HG		10" HG		12" HG		14" HG	
				CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP
2LP 2LVP	2"-S	0.035	2800	82	0.7	74	1.1	61	2.0	55	2.5				
			3250	98	0.7	90	1.3	77	2.3	71	2.8	64	3.4		
			3560	108	0.8	101	1.4	88	2.5	82	3.1	75	3.7		
			4165	130	0.9	122	1.6	109	2.9	103	3.6	96	4.3		
			5275	168	1.1	161	1.9	148	3.6	142	4.5	135	5.2	128	6.0
3LP 3LVP	2½"-S	0.104	1760	158	1.1	147	1.9	128	3.6	118	4.5	108	5.1		
			2265	211	1.3	199	2.4	180	4.6	170	5.5	160	6.6		
			2770	263	1.5	252	2.9	233	5.4	223	6.7	213	8.0		
			3600	350	1.9	338	3.7	319	7.0	309	8.7	299	10.5	288	12.2
4LP 4LVP	3"-S	0.370	1760	256	1.6	250	3.0	224	5.6	211	7.0	197	8.4		
			2190	339	1.9	323	3.7	297	6.9	284	8.7	270	10.4		
			2620	418	2.3	396	4.3	370	8.3	357	10.4	343	12.4	328	14.5
			3600	579	3.0	553	5.7	527	11.4	514	14.2	501	17.1	485	19.9
5LP 5LVP	4"-S	.0350	1500	290	2.6	269	5.1	223	9.8	199	12.2	174	14.7	146	
			1760	373	3.1	350	5.7	304	11.5	281	14.3	257	17.2	232	20.1
			2100	490	3.6	469	6.8	423	13.7	400	17.1	377	20.5	352	24.0
			2850	653	4.8	631	9.3	586	18.6	563	23.2	540	27.9	516	32.5
6LP 6LVP	6"-F	0.718	1170	466	4.1	442	7.8	393	15.6	369	19.6	344	23.5		
			1760	690	5.9	665	11.8	616	23.5	591	29.4	566	35.3	1005	41.2
			1930	812	6.5	787	12.9	738	25.8	713	32.3	688	38.7	1127	45.2
			2350	1114	7.9	1089	15.7	1041	31.4	1017	39.3	993	47.1	1428	55.0
7LP 7LVP	8"-F	1.200	1170	1111	6.5	1068	13.1	1025	26.2	1004	32.7	983	39.2		
			1465	1405	8.2	1362	16.4	1319	32.7	1298	40.9	1276	49.1		
			1760	1699	9.8	1656	19.7	1613	39.3	1592	49.2	1570	59.0		
			2050	1987	11.5	1944	22.9	1901	45.8	1880	57.3	1857	68.7		
8LP 8LVP	10"-F	1.740	880	1111	7.1	1066	14.3	1021	28.5	1000	35.7	978	42.8		
			1170	1416	9.5	1370	19.0	1325	37.9	1303	47.4	1280	56.9		
			1375	1673	11.1	1627	22.3	1582	44.6	1560	55.7	1538	66.8		
			1800	2192	14.6	2146	29.2	2101	58.3	2079	72.9	2056	87.5		

MEDIUM VACUUM UNITS

SIZE	DIA. INLET & OUTLET	DISPL. CU. FT. REV.	RPM	6" HG		10" HG		12" HG		14" HG		15" HG		16" HG	
				CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP
2MP 2MVP	1"-S	0.017	2800	31	0.8	24	1.2								
			3250	39	0.9	32	1.4								
			3560	44	0.9	37	1.5	34	1.8						
			4165	54	1.1	48	1.7	44	2.1	40	2.4				
			5275	73	1.4	67	2.2	63	2.6	59	3.0	57	3.2		
3MP 3MVP	2"-S	0.060	1760	76	1.6	63	2.6	57	3.1						
			2265	106	2.0	93	3.3	87	3.9						
			2770	136	2.4	124	4.0	117	4.7	110	5.4				
			3600	196	3.1	174	5.0	167	6.0	160	7.0	156	7.5		
4MP 4MVP	2½" S	0.117	1760	161	3.0	142	4.9	132	5.8						
			2190	211	3.7	193	6.0	183	7.2						
			2620	262	4.4	243	7.1	233	8.6	222	10.0				
			3600	376	5.9	357	9.8	346	11.8	337	13.7	331	14.7	325	15.7
5MP 5MVP	4"-S	0.210	1500	258	4.5	235	7.3	223	8.8	209	10.3				
			1760	319	5.2	296	8.6	284	10.3	273	12.0				
			2100	414	6.2	391	10.3	379	12.3	367	14.4	428	15.4		
			2850	612	8.4	589	13.9	578	16.7	567	19.5	485	20.9	477	22.3
6MP 6MVP	5"-S	0.383	1170	383	6.3	354	10.4	339	12.5	289	14.6	276	15.6	266	16.7
			1760	569	9.4	541	15.7	526	18.8	515	22.0	504	23.5	492	25.1
			1930	654	10.3	619	17.2	601	20.7	566	24.1	549	25.8	532	27.5
			2350	815	12.6	780	21.0	762	25.1	741	29.3	730	31.4	718	33.5
7MP 7MVP	6"-F	0.733	1170	768	12.0	728	20.0	708	24.0	688	28.0	667	30.0	647	31.9
			1465	954	15.0	914	25.0	894	30.0	874	35.0	854	37.5	834	40.0
			1760	1170	18.0	1120	30.0	1095	36.0	1065	42.1	1040	45.1	1015	48.1
			2050	1383	21.0	1333	35.0	1307	42.0	1278	49.0	1253	52.5	1226	56.0
8MP 8MVP	8"-F	1.040	880	1185	12.8	1142	21.3	1120	25.6	1094	29.8	1074	32.0	1053	34.1
			1170	1567	17.0	1524	28.3	1502	34.0	1476	39.7	1456	42.5	1435	45.3
			1375	1880	20.0	1838	33.3	1815	40.0	1789	46.6	1769	49.9	1748	53.3
			1800	2322	26.2	2280	43.6	2257	52.3	2231	61.0	2211	65.4	2190	69.7

HIGH VACUUM UNITS

SIZE	DIA. INLET & OUTLET	DISPL. CU. FT. REV.	RPM	6" HG		8" HG		12" HG		14" HG		15" HG		16" HG	
				CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP	CFM	BHP
3HP 3HVP	1¼"-S	0.045	1760	65	1.3	50	1.7	30	2.4						
			2265	78	1.6	63	2.1	43	3.0						
			2770	100	1.9	85	2.5	65	3.7	79	4.3	76	4.6		
			3600	136	2.5	115	3.2	102	4.7	117	5.3	113	5.7	110	6.0
4HP 4HVP	1½"-S	0.069	1760	91	1.9	65	2.5	72	3.6						
			2190	121	2.3	115	3.0	102	4.4	95	5.1	91	5.3		
			2620	151	2.7	144	3.6	132	5.1	124	5.9	120	6.3		
			3600	218	3.7	212	4.8	199	6.9	192	8.1	188	8.7	184	9.3
5HP 5HVP	2½"-S	0.140	1500	170	3.1	161	4.1	144	5.9	134	6.8				
			1760	206	3.6	198	4.8	180	6.9	174	8.0	165	8.6		
			2100	254	4.3	245	5.5	228	8.2	218	9.6	213	10.3		
			2850	359	5.6	350	7.4	333	11.1	323	13.0	318	13.9	312	14.9
6HP 6HVP	3"-S	0.227	1170	209	3.9	197	5.1	173	7.4	159	8.7	152	9.3		
			1760	343	5.6	331	7.4	307	11.2	293	13.0	286	14.0	278	14.9
			1930	381	6.1	370	8.2	345	12.2	332	14.3	324	15.3	316	16.3
			2350	477	7.5	465	9.9	441	14.9	427	17.4	420	18.6	412	19.9
7HP 7HVP	4"-S	0.367	1170	359	6.0	344	8.0	314	12.0	297	14.0	288	15.0	278	16.0
			1465	467	7.5	452	10.0	422	15.0	405	17.5	396	18.8	386	20.0
			1760	575	9.0	561	12.0	530	18.0	514	21.1	504	22.6	495	24.1
			2050	682	10.5	667	14.0	637	21.0	620	24.5	611	26.3	601	28.0
8HP 8HVP	4"-S	0.566	880	400	7.0	380	9.3	338	13.9	314	16.2	302	17.4		
			1170	564	9.3	544	12.3	502	18.5	479	21.6	466	23.1	452	24.7
			1375	680	10.9	660	14.5	618	21.7	595	25.4	582	27.2	568	29.0
			1800	921	14.2	901	19.0	859	28.5	835	33.2	822	35.6	809	38.0

S=SCREWED CONNECTIONS STD. PIPE F=FLANGE CONNECTIONS STD. PIPE
INTAKE AND OUTLET PIPE CONNECTIONS SAME TYPE AND SIZE

Gardner Denver

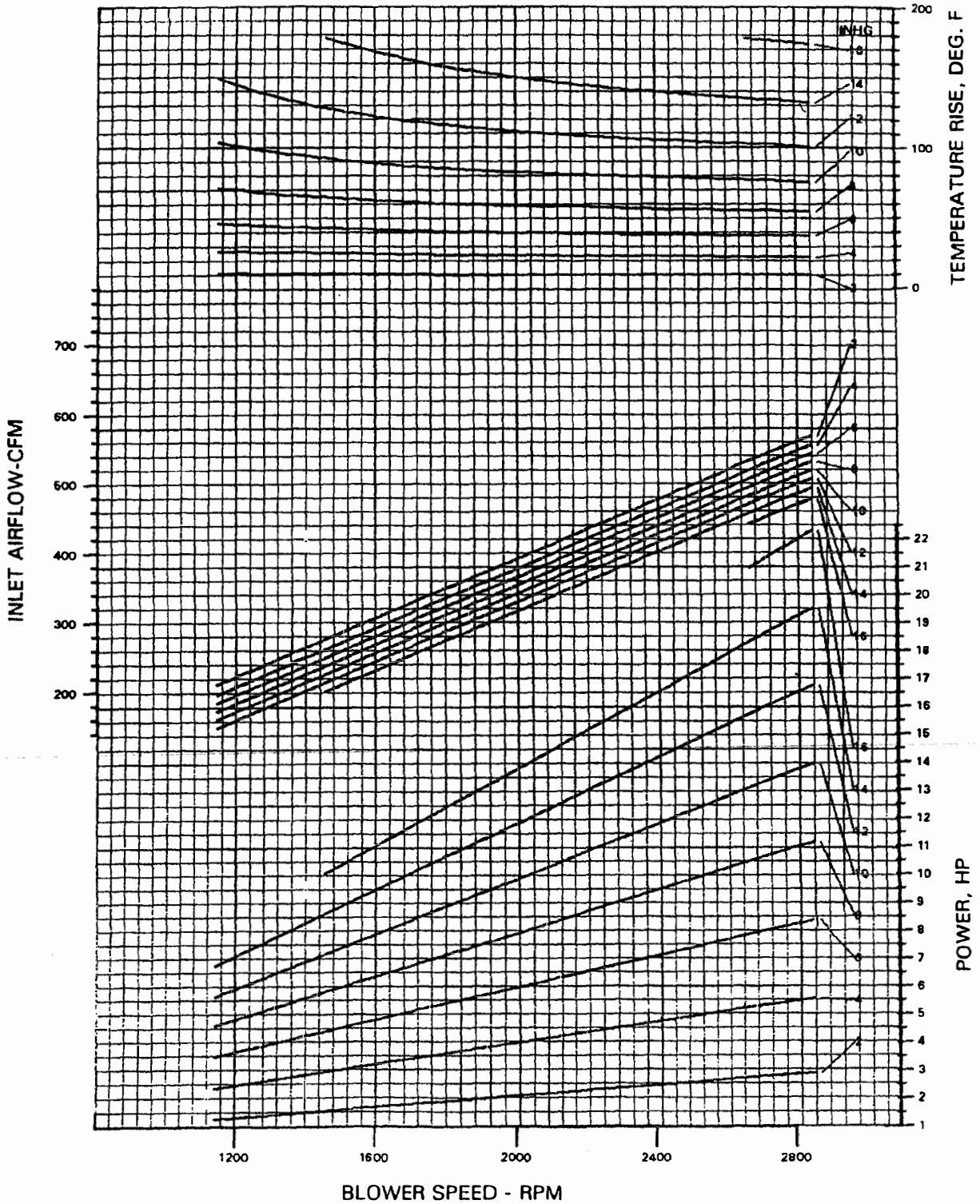
SUTORBILT LEGEND™
MODEL 5M
P-VERSION

DATA SHEET: SB-2-362P
DATED: 4-3-95

VACUUM PERFORMANCE CURVE

INLET AIR AT 68 DEG F, SPECIFIC GRAVITY = 1.0, DISCHARGE AT 29.92 IN HG ABS

DISPLACEMENT 0.21 FT^3/REV

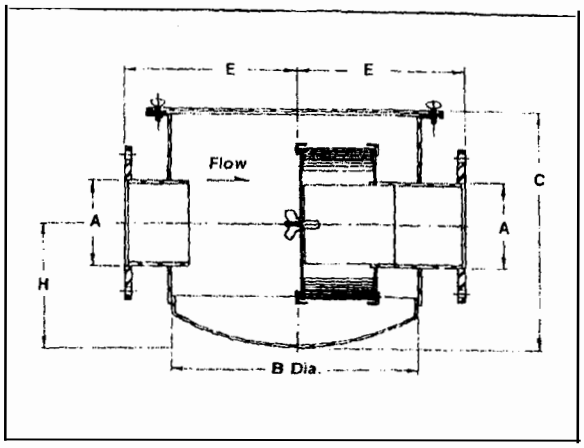


INLINE AIR FILTERS

F65V

INLINE AIR FILTERS - VACUUM SERVICE ONLY

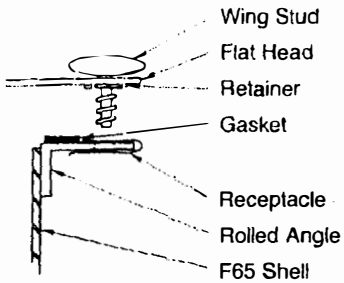
The Series F65V Inline Air Filter is designed to mount directly in the air piping system for engines, blowers or compressors. The filter element, which is fabricated from pleated paper media, has an efficiency of 99% on 1 micron particles and larger. The housing is designed to withstand a full vacuum. Pressure taps are provided on the intake and discharge nozzles for installation of a pressure drop indicator or switch by the customer. The F65V Inline Air Filter surfaces are prime coated with a red oxide primer.



ALTERNATE FILTRATION MEDIA
AVAILABLE FOR F65V

Cleanable Polyurethane Foam - 98% on 10 micron particles
Cleanable Polyester Felt - 98% on 3 micron particles
Epoxy Coated Wire Mesh - 90% on 10 micron particles (When Oil Wetted)

FOR PRESSURE SERVICE USE F65 (See Page 2)



F65V up to and including 8" size:
Coarse threaded wing studs allow for easy access to the F65V for servicing the filter elements. See diagram at left.

F65V 10" size and larger:
Wing nuts are provided to allow for easy access to the F65V for servicing the filter elements.

F65V SERIES

MODEL	A	B	C	E	H	RATED CFM(1)	WEIGHT	REPLACEMENT ELEMENT NUMBER
F65V-2	2 NPT	12	10 3/4	9	5	135	38	F8-108
F65V-2 1/2	2 1/2 NPT	12	10 3/4	9	5	180	40	F8-108
F65V-3	3 NPT	16	15 1/4	11	7	285	70	F8-109
F65V-4	*4 FLG	16	15 1/4	11	7	520	77	F8-109
F65V-5	*5 FLG	16	15 1/4	11	7	750	80	F8-109
F65V-6	*6 FLG	18	18 5/8	12	10	1075	100	F8-110
F65V-8	*8 FLG	24	19 1/2	15	10	1800	180	F8-111
F65V-10	*10 FLG	36	37	22	17	3335	390	F8-137
F65V-12	*12 FLG	36	37	22	17	4675	415	F8-137
F65V-14	*14 FLG	36	37	22	17	5655	435	F8-137

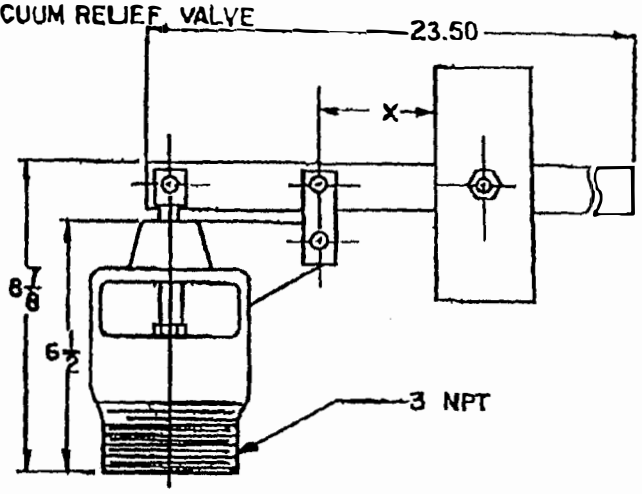
*Flanges match 125# ASA Diameter and Drilling.
(1) Rated capacity is based upon a maximum exit velocity of 5500 fpm.

Standard Part VALVE, RELIEF BUHLER PRESSURE OR VACUUM

BUHLER
MINNEAPOLIS, MN. USA

SET VACUUM	COUNTER WEIGHT ARM DISTANCE	CAPACITY
IN.HG	"X"	ACFM
4	1.75	644
6	3.40	789
8	5.00	910
10	6.75	1018
12	8.40	1115
14	10.00	1204
16	11.75	1287
18	13.40	1368

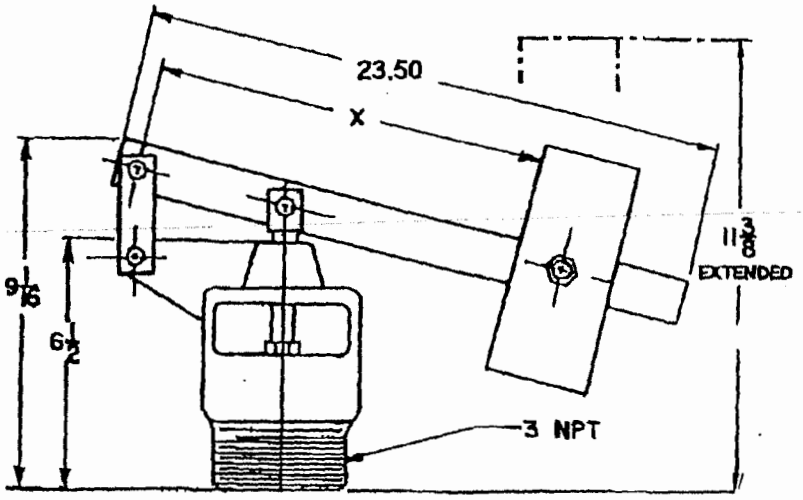
3" VACUUM RELIEF VALVE



PART NO.	DESCRIPTION
AUPK-83001-81	3" VACUUM RELIEF VALVE WITH NO SETTING
AUPK-83001-82	3" VACUUM RELIEF VALVE - SPECIFY SETTING

SET PRESSURE	COUNTER WEIGHT ARM DISTANCE	CAPACITY
PSI	"X"	ACFM
6	6.25	1125
7	7.75	1215
8	9.25	1300
9	10.75	1378
10	12.25	1452
11	13.75	1523
12	15.25	1591
13	16.75	1656
14	18.25	1718
15	19.75	1778

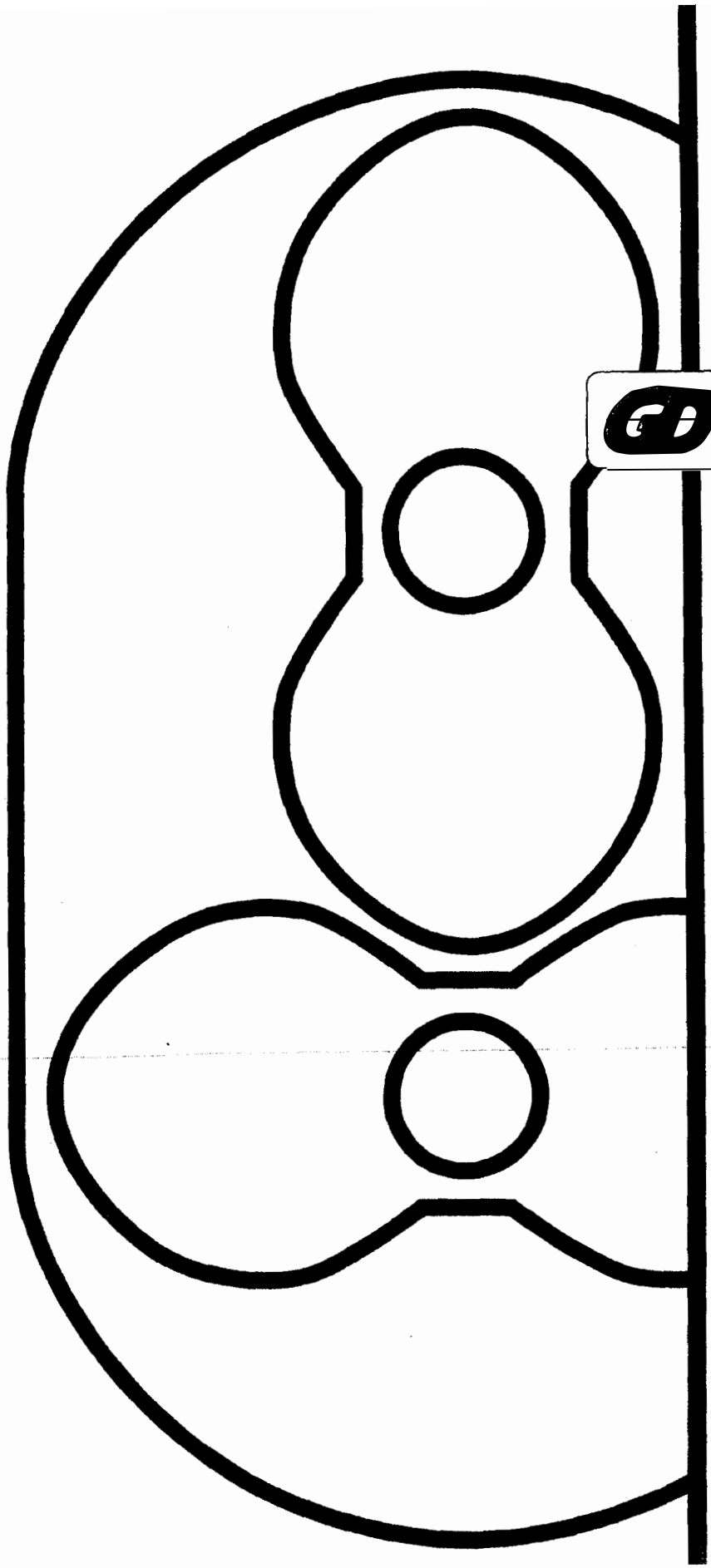
3" PRESSURE RELIEF VALVE



PART NO.	DESCRIPTION
AUPK-83000-81	3" PRESSURE RELIEF VALVE WITH NO SETTING
AUPK-83000-82	3" PRESSURE RELIEF VALVE - SPECIFY SETTING

Dept.	Name	Date	Revisions		Sheet
E3	PHR	6/19/96	6/23/98 BLN	USP-69301	

FORM 11239



PARTS LIST
OPERATING AND SERVICE MANUAL

GARDNER DENVER
Sutorbilt

LEGEND

"P" SERIES
BLOWERS

6" – 8" GEAR DIAMETER

Models
GAR_ _P_
GAG_ _P_
GAH_ _P_

SB–7–622
Version 02
January, 2002

MAINTAIN BLOWER RELIABILITY AND PERFORMANCE WITH GENUINE GARDNER DENVER PARTS AND SUPPORT SERVICES

Factory genuine parts, manufactured to design tolerances, are developed for optimum dependability — specifically for your blower. Design and material innovations are born from years of experience with hundreds of different blower applications. When you specify factory genuine parts you are assured of receiving parts that incorporate the most current design advancements . . . manufactured in our state–of–the–art blower factory under exacting quality standards.

Your **AUTHORIZED DISTRIBUTOR** offers all the backup you require. A worldwide network of authorized distributors provides the finest product support in the blower industry.

Your local **AUTHORIZED DISTRIBUTOR** maintains a large inventory of genuine parts and is also backed by direct access to our Master Distribution Center (MDC) in Memphis, Tennessee, for immediate emergency response.

Your **AUTHORIZED DISTRIBUTOR** can support your blower investment with these services:

1. Trained parts technical representatives to assist you in selecting the correct replacement parts.
2. Complete inventory of new machines and new, genuine factory parts.
3. A full line of factory tested AEON® PD blower lubricants specifically formulated for optimum performance in all blowers.
4. Authorized Distributor service technicians are factory-trained and skilled in blower maintenance and repair. They are ready to respond and assist you by providing fast, expert maintenance and repair services.

INSTRUCTIONS FOR DETERMINING BLOWER CONFIGURATION

1. Face the blower drive shaft.
2. In a **VERTICAL** configuration, air flow is horizontal.
3. In a **HORIZONTAL** configuration, air flow is vertical.
4. In a vertical configuration, a **BOTTOM HAND** exists when the drive shaft is below the horizontal center line of the blower. A **TOP HAND** exists when the drive shaft is above the horizontal center line of the blower.
5. In a horizontal configuration, a **RIGHT HAND** exists when the drive shaft is to the right of the vertical center line of the blower. A **LEFT HAND** exists when the drive shaft is to the left of the vertical center line of the blower.

INSTRUCTIONS FOR ORDERING REPAIR PARTS

For pricing and ordering information, contact your nearest AUTHORIZED FACTORY DISTRIBUTOR.

When ordering parts, specify Blower **MODEL** and **SERIAL NUMBER** (see nameplate on unit).

Rely upon the knowledge and experience of your AUTHORIZED DISTRIBUTOR and let them assist you in making the proper parts selection for your blower.

For the location of your local authorized Gardner Denver blower distributor refer to the yellow pages of your phone directory or contact:

Gardner Denver Blower Division
100 Gardner Park
Peachtree City, GA 30269
Phone: (770) 632–5000
(800) 982–3009
Fax: (770) 486–5629

FOREWORD

Sutorbilt® blowers are the result of advanced engineering and skilled manufacturing. To be assured of receiving maximum service from this machine the owner must exercise care in its operation and maintenance. This book is written to give the operator and maintenance department essential information for day-to-day operation, maintenance and adjustment. Careful adherence to these instructions will result in economical operation and minimum downtime.

⚠ DANGER

Danger is used to indicate the presence of a hazard which will cause severe personal injury, death, or substantial property damage if the warning is ignored.

⚠ WARNING

Warning is used to indicate the presence of a hazard which can cause severe personal injury, death, or substantial property damage if the warning is ignored.

⚠ CAUTION

Caution is used to indicate the presence of a hazard which will or can cause minor personal injury or property damage if the warning is ignored.

NOTICE

Notice is used to notify people of installation, operation or maintenance information which is important but not hazard–related.

SAFETY PRECAUTIONS

Safety is everybody's business and is based on your use of good common sense. All situations or circumstances cannot always be predicted and covered by established rules. Therefore, use your past experience, watch out for safety hazards and be cautious. Some general safety precautions are given below:

⚠ DANGER

Failure to observe these notices could result in injury to or death of personnel.

- **Keep fingers and clothing away from blower inlet and discharge ports, revolving belts, sheaves, drive coupling, etc.**
- **Do not use the air discharge from this unit for breathing – not suitable for human consumption.**
- **Do not loosen or remove the oil filler plug, drain plugs, covers, or break any connections, etc., in the blower air or oil system until the unit is shut down and the air pressure has been relieved.**
- **Electrical shock can and may be fatal.**
- **Blower unit must be grounded in accordance with the National Electrical Code. A ground jumper equal to the size of the equipment ground conductor must be used to connect the blower motor base to the unit base.**
- **Open main disconnect switch, tag and lockout before working on the control.**
- **Disconnect the blower unit from its power source, tag and lockout before working on the unit – the machine may be automatically controlled and may start at any time.**

⚠ WARNING

Failure to observe these notices could result in damage to equipment.

- **Stop the unit if any repairs or adjustments on or around the blower are required.**
- **Disconnect the blower unit from its power source, tag and lockout before working on the unit – the machine may be automatically controlled and may start at any time.**
- **Do not exceed the rated maximum speed shown on the nameplate.**
- **Do not operate unit if safety devices are not operating properly. Check periodically. Never bypass safety devices.**

TABLE OF CONTENTS

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LIST OF ILLUSTRATIONS

SUTORBILT LEGEND SERIES SUTORBILT BLOWERS
MATRIX/MENU

NOTICE TO CUSTOMER – To find the construction options for your blower unit, FILL IN THE BALANCE OF LETTERS OR NUMBERS FROM YOUR UNIT NAMEPLATE

	G	A				P	
COLUMN NUMBER:	1	2	3	4	5	6	7

FOLLOW THE LINE DOWN AND OVER FROM EACH SPACE THUS FILLED IN TO FIND THE APPROPRIATE CONSTRUCTION OPTION WITH WHICH YOUR MACHINE IS EQUIPPED.

COLUMN 1 – BASIC DESIGNATOR

COLUMN 2 – PRODUCT FAMILY

COLUMN 3 – GEAR DIAMETER

- F. 6"
- G. 7"
- H. 8"

COLUMN 4 – CASE LENGTH

- L – Low Pressure
- M – Medium Pressure
- H – High Pressure

COLUMN 5 – CONFIGURATION

- A. Vertical–Top Hand–Central Timed
- B. Vertical–Bottom Hand–Central Timed
- C. Horizontal–Left Hand–Central Timed
- D. Horizontal–Right Hand–Central Timed

COLUMN 6 – DESIGN VERSION

COLUMN 7 – ADDITIONAL DESCRIPTION

- A. Lip Seal
- B. Mechanical Seal

INTRODUCTION
YOUR KEY TO TROUBLE FREE SERVICE

Thank you for investing in Sutorbilt quality. The Sutorbilt reputation for rugged dependability has been earned by over 50 years of service in demanding, industrial operations where downtime cannot be tolerated and efficient blower performance is expected.

Your Sutorbilt blower is a precision engineered blower that has been carefully manufactured and thoroughly tested at the state-of-the-art Gardner Denver Blower Factory in Sedalia, Missouri.

As with other precision machinery, there are several relatively simple installation, operation and maintenance procedures that you must observe to assure optimum blower performance. There is no guesswork in the manufacture of your highly advanced Sutorbilt blower and there must be none in preparing the blower to get the job done in the field.

The purpose of this manual is to help you properly install, operate and maintain your Sutorbilt blower. It is essential that you review all sections of this manual in preparation for installing your blower. Follow the instructions carefully and you will be rewarded with trouble–free Sutorbilt service . . . year in and year out.

WHERE TO CALL FOR SUTORBILT BLOWER ASSISTANCE:

For prompt professional Sutorbilt service always contact your authorized Sutorbilt Distributor first. If you do not know your authorized Sutorbilt Distributor, contact the numbers below for immediate assistance.

SUTORBILT CUSTOMER SERVICE	(770) 632–5000
SUTORBILT FACTORY SERVICE DEPARTMENT	(770) 632–5000

SUTORBILT HEADQUARTERS:
GARDNER DENVER BLOWER DIVISION
100 GARDNER PARK
PEACHTREE CITY, GA 30269
PHONE: (770) 632–5000 FAX: (770) 486–5629

IMPORTANT SUTORBILT TELEPHONE NUMBERS

YOUR AUTHORIZED SUTORBILT DISTRIBUTOR

NAME: _____

TELEPHONE: _____

FAX: _____

CONTACT: _____

THANKS . . . FOR THE PRIVILEGE OF SERVING YOU WITH DEPENDABLE SUTORBILT QUALITY.

SECTION 1
EQUIPMENT CHECK

Before uncrating, check the packing slip carefully to be sure all the parts have been received. All accessories are listed as separate items on the packing slip, and small important accessories such as relief valves can be overlooked or lost. After every item on the packing slip has been checked off, uncrate carefully. Register a claim with the carrier for lost or damaged equipment.

⚠ WARNING

Customers are cautioned to provide adequate protection, warning and safety equipment necessary to protect personnel against hazards involved in installation and operation of this equipment in the system or facility.

STORAGE

Your Sutorbilt Blower was packaged at the factory with adequate protection to permit normal storage for up to six (6) months.

If the unit is to be stored under adverse conditions or for extended periods of time, the following additional measures should be taken to prevent damage.

1. Store the blower in a clean, dry, heated (if possible) area.
2. Make certain inlet and discharge air ports are tightly covered to prevent foreign material from entering the air box.
3. All exposed, non–painted surfaces should be protected against rust and corrosion.
4. Provide adequate protection to avoid accidental mechanical damage.
5. In high humidity or corrosive environments, additional measures may be required to prevent rusting of the blower internal surfaces.
6. To prevent rusting of gears, bearings, etc., the oil reservoirs may be filled with normal operating oil.

⚠ CAUTION

Before running the blower, drain the oil and replace to the proper operating level with clean, fresh lubricant.

7. Rotate the blower shaft (10 to 25 turns) monthly during storage. Inspect the blower shaft (near the shaft seal area) monthly and spray with rust inhibitor if needed.
8. For long term storage (over six (6) months), contact Sutorbilt Customer Service for recommendations.

REMOVING PROTECTIVE MATERIALS

The shaft extension is protected with rust inhibitor which can be removed with any standard solvent.

⚠ CAUTION

Follow the safety directions of the solvent manufacturer.

Blower inlet and outlet are temporarily capped to keep out dirt and other contaminants during shipment. These covers must be removed before start–up.

The internal surfaces of all Sutorbilt units are mist sprayed with a rust preventative to protect the machine during shipment. Remove this film upon initial startup, using any commercial safety solvent. Care should be exercised to lock out the blower to prevent start–up

⚠ WARNING

Rotating components will cause severe injury in case of personal contact. Keep hands away from blower inlet and discharge ports.

SECTION 2
INSTALLATION

LOCATION

If possible, install the blower in a well lit, clean, dry place with plenty of room for inspection and maintenance.

FOUNDATIONS

For permanent installations we recommend concrete foundations be provided, and the equipment should be grouted to the concrete. It is necessary that a suitable base be used, such as a steel combination base under blower and motor, or a separate sole plate under each. Before grouting, equipment must be leveled, free of all strains, and anchored so no movement will occur during setting of grout. After grout has completely hardened, a recheck is necessary to compensate for shrinkage, etc. If required, add shims under blower feet after final tightening of foundation anchor bolts to remove strain from the blower housing.

Where jack screws or wedges are used during grouting, they must be backed off or removed before final tightening of anchor bolts.

Where a concrete foundation is not feasible, care must be taken to insure that equipment is firmly anchored to adequate structural members.

MOUNTING CONFIGURATIONS

The blower flex–mount design enables horizontal and vertical mounting configurations with top or bottom hand, right or left hand shaft positioning. The units are center timed allowing rotation in either direction (refer to FIGURE 1). If converting a blower from vertical to horizontal, or horizontal to vertical mounting configuration, additional mounting feet will be required.

REPOSITIONING THE MOUNTING FEET:

1. Position the mounting feet to the desired location and snug the capscrew.
2. Place the blower on its feet on a flat surface.
3. Loosen mounting feet capscrews and level unit up. The bench or blower base flatness should be within .002 of an inch.

NOTICE

If the unit is not flat within .002 of an inch, it will be necessary to shim the blower feet at installation.

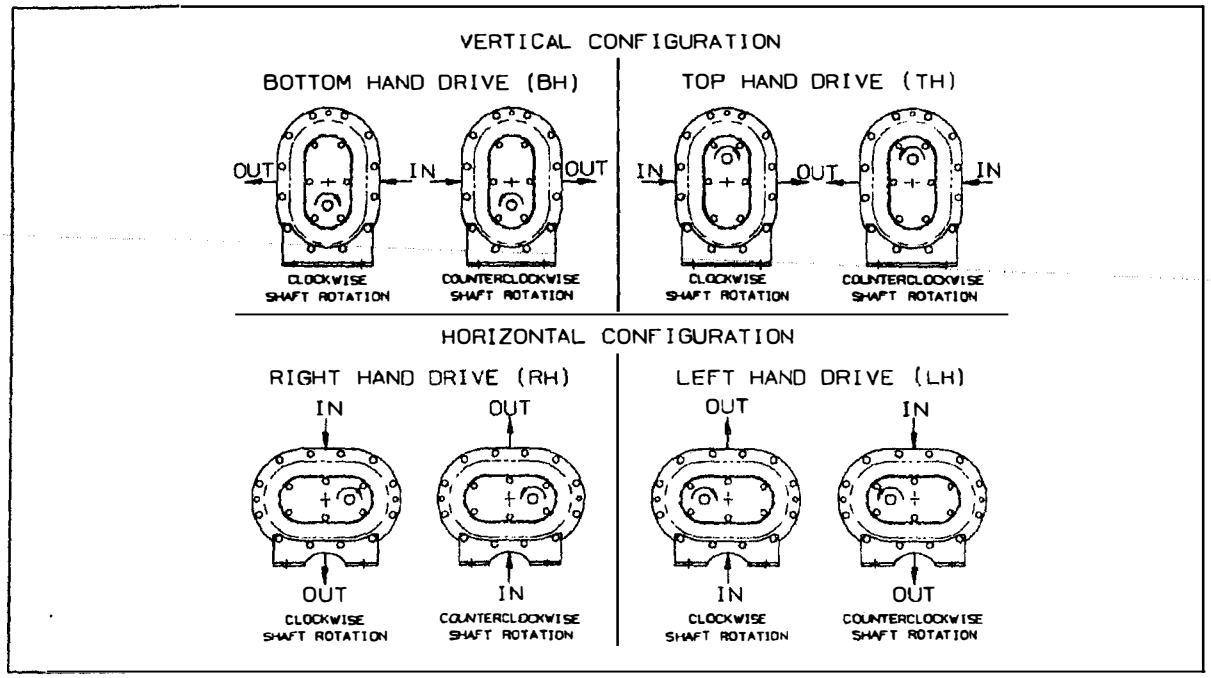


FIGURE 1 – BLOWER MOUNTING CONFIGURATIONS

4. Secure the mounting feet capscrews to the torque value in FIGURE 24, page 24.

NOTICE

When changing mounting configuration, it may be necessary to reposition vent plug (B), and drain plug (A). Refer to FIGURE 3, page 6, for correct location.

DRIVE INSTALLATION

When selecting a V-belt drive, check to be sure the shaft overhung load limitation is not exceeded. Refer to FIGURE 2, page 5, for overhung load calculations and limitations.

Belt drives must be carefully aligned. Motor and blower pulleys must be parallel to each other and in the same plane within 1/32 inch. Belt tension should be carefully adjusted to the belt manufacturer's recommendation using a belt tension gauge. Check tension frequently during the first day of operation.

⚠ WARNING

Overtightening belts leads to heavy bearing loads and premature failure.

On the direct connected units, alignment and lubrication of couplings to specifications of the coupling manufacturer is very important. When mounted drives are supplied from the factory, proper alignment has been established before shipment. However, during shipping, handling and installation, it is likely that the alignment has been disturbed and final adjustment must be made before startup.

⚠ WARNING

Exceeding overhung load limitations leads to unwarrantable premature bearing failure and shaft breakage.

The location of the sheave on the blower shaft greatly affects the stress in the shaft. The optimum blower sheave positioning is as close as possible to the blower drive cover, not to exceed dimension "C" in Drive Shaft Illustration, FIGURE 2, page 5.

The calculated shaft moment must not exceed the maximum allowable moment listed in Maximum Allowable Moment Chart, FIGURE 2, page 5. If the calculated shaft moment exceeds the maximum allowable moment:

- Increase Sheave Diameters to Reduce Belt Pull
- Use Jackshaft Drive
- Use Direct Coupled or Gearbox Drive

To calculate shaft moment for a given V–Belt Drive Arrangement:

1. Use the formula for Calculation of Belt Pull, FIGURE 2, page 5, to calculate belt pull. Refer to Arc of Contact Factor Chart, FIGURE 2, page 5.
2. Insert the calculated belt pull into the formula for Calculation of Shaft Moment, FIGURE 2, page 5, to arrive at the calculated shaft moment.

PIPING

Inlet and discharge connections on all blowers are large enough to handle maximum volume with minimum friction loss. Reducing the pipe diameter on either inlet or discharge will only create additional line loss and increase the overall pressure differential.

Excessive weight and thermal expansion of piping and fittings will cause internal misalignment and premature wear. Never allow the blower to carry the weight of the pipe. If possible, a spool or sleeve-type expansion joint should be installed between the unit and the piping. Where a flexible connection is not practical, the weight of the rigid connection must be separately supported.

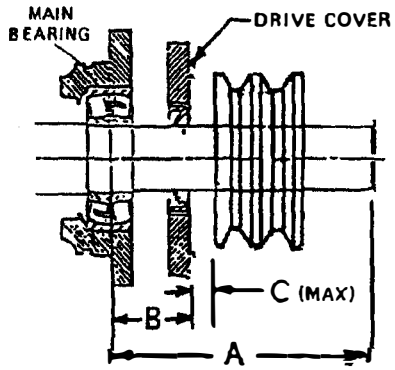
All system piping must be cleaned internally before connecting to the blower.

⚠ WARNING

Sutorbilt blowers are shipped dry from the factory. Do not attempt to operate the blower before following proper lubrication instructions. Permanent damage to the gears, bearings and seals will occur.

Gear Diameter (Inches)	Dimensions (Inches)			Maximum Allowable Moment (LB–IN)
	A	B	C (Max)	
6	4.08	1.14	.38	1788
7	4.50	1.31	.38	3000
8	5.57	1.77	.38	4144

MAXIMUM ALLOWABLE MOMENT



DRIVE SHAFT ILLUSTRATION

Z	Ac	Z	Ac	Z	Ac	Z	Ac	Z	Ac	Z	Ac
0.000	1.000	0.250	0.966	0.500	0.926	0.750	0.879	1.000	0.823	1.250	0.751
0.025	0.997	0.275	0.962	0.525	0.922	0.775	0.874	1.025	0.816	1.275	0.742
0.050	0.994	0.300	0.958	0.550	0.917	0.800	0.869	1.050	0.810	1.300	0.734
0.075	0.990	0.325	0.954	0.575	0.913	0.825	0.864	1.075	0.803	1.325	0.725
0.100	0.987	0.350	0.951	0.600	0.908	0.850	0.858	1.100	0.796	1.350	0.716
0.125	0.983	0.375	0.947	0.625	0.904	0.875	0.852	1.125	0.789	1.375	0.706
0.150	0.980	0.400	0.943	0.650	0.899	0.900	0.847	1.150	0.782	1.400	0.697
0.175	0.977	0.425	0.939	0.675	0.894	0.925	0.841	1.175	0.774	1.425	0.687
0.200	0.973	0.450	0.935	0.700	0.889	0.950	0.835	1.200	0.767		
0.225	0.969	0.475	0.930	0.725	0.884	0.975	0.829	1.225	0.759		

ARC OF CONTACT FACTORS

$$\text{Belt Pull} = \left[\frac{2.5 - Ac}{Ac}\right]\left[\frac{125954 \times Hp \times S.F.}{D \times RPM}\right]$$

Key:
- Ac = Arc of Contact Factor (Refer to Arc of Contact Factors Chart above)
- Hp = Blower Horsepower for Operating Conditions
- S.F. = Actual Drive Service Factor
- D = Blower Sheave Pitch Diameter in Inches
- RPM = Blower Sheave Speed
- $Z = \left[\frac{\text{Large Sheave Pitch Diameter (in)} - \text{Small Sheave Pitch Diameter (in)}}{\text{Sheave Center Distance (in)}}\right]$

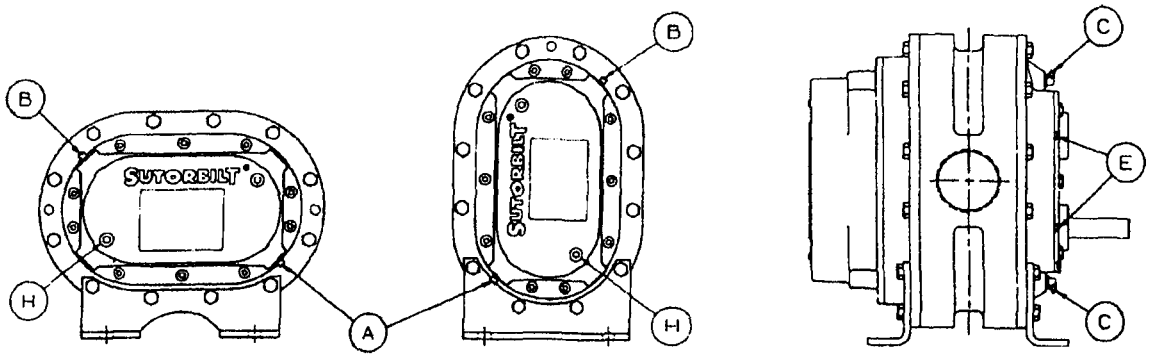
CALCULATION OF BELT PULL

$$\text{Shaft Moment (LB–IN)} = \text{Belt Pull} \times \left[B + C + \left(\frac{\text{Sheave Width}}{2}\right)\right]$$

CALCULATION OF SHAFT MOMENT

FIGURE 2 – BELT DRIVE OVERHUNG LOAD CALCULATIONS

SECTION 3
LUBRICATION



A. OIL DRAIN PLUG
B. BREATHER / OIL FILL
C. GREASE FITTING
E. GREASE VENTS
H. OIL LEVEL GAUGE

FIGURE 3 – LUBRICATION

At the gear end the timing gear teeth are lubricated by being partially submerged in oil. The gear teeth serve as oil slingers for gear end bearings. At the drive end the bearings are grease lubricated.

FILLING PROCEDURE

Refer to FIGURE 3. Remove the breather (B) from the gear cover. Add oil to the gear case until it reaches the center line of the oil level gauge (H). Secure breather (B) in its correct location.

LUBRICATION SERVICE

Add fresh oil as required to maintain proper level. The oil should be drained, flushed and replaced every 1500 hours or more frequently if inspection so indicates. The oil drain plug is located at (A).

⚠ WARNING

Do not overfill as this will tend to cause excessive heating of the gears and may damage the unit.

Bearings on the drive end of the blower require grease lubrication every 500 hours of operation. Lubricate the bearings through grease fittings located at (C). When regreasing, the old grease will be forced out of the vents (E). To prevent damage to seals, these vents must be open at all times.

RECOMMENDED LUBRICANT

Gear Diameter	Vertical	Horizontal
6"	1–1/4 PT.	3 PT.
7"	1–2/3 PT.	3–1/2 PT.
8"	2–1/2 PT.	7 PT.
Quantities are for purchase estimates only.		

FIGURE 4 – APPROXIMATE OIL CAPACITIES

GEAR END LUBRICATION

AEON PD is formulated especially for positive displacement blower service to provide maximum blower protection at any temperature. One filling of AEON PD will last a minimum of 4 times longer than a premium mineral oil. Refer to FIGURE 5, page 7.

Order AEON PD from your Sutorbilt Distributor or call Gardner Denver Blower Division direct at:
770–486–5655

AEON PD	1 Quart Bottle	Part No. 28G23
AEON PD	12 Quart Case	Part No. 28G24

Blower Discharge Temperature		Factory Tested Recommended and Approved Lubricant
° F	° C	AEON PD
32°	0°	Synthetic Blower Lubricant
100°	38°	One Superior Lubricant
275°	135°	For
350°	177°	All Operating Temperatures

FIGURE 5 – TEMPERATURE CHART

DRIVE END LUBRICATION

Grease drive end bearings every 500 hours of operation with a non–corrosive, extreme pressure bearing grease of the following specification:

Blower Discharge Temperature	Grease Specification
Up to 350ê F (177° C)	NLGI Grade 2 EP

If not using AEON PD synthetic blower lubricant, use oils with rust and oxidation inhibitors, anti-foam additives and the viscosities listed in FIGURE 6.

AIR FILTERS AND FILTER SILENCERS

⚠ WARNING

Servicing the air filters is one of the most important maintenance operations to be performed to insure long blower life.

Servicing frequency of filter elements is not time predictable. A differential pressure indicator, with a continuous gauge reading, should be installed across the inlet filter. It will tell how much of the service life of the filter element has been used. It will also eliminate both premature filter servicing and premature blower failure due to a plugged filter when the filter pressure drop is used to establish maintenance points.

In all cases refer to the filter manufacturer's service instructions. Due to the many types of filters, it is not practical to give specific instructions covering all models.

NOTICE

No matter what type of filter is used, always make sure all seats, gaskets, clamps and hose connections on the filter and inlet line are absolutely air tight. Each time the filter is serviced, inspect interior of the blower for dirt.

Blower Discharge Temperature	Oil Grade ISO	Oil Viscosity SUS @ 100° F
32° F to 100° F (0° C to 38° C)	100	465
100° F to 225° F (38ê C to 105ê C)	150	700
225° F to 300ê F (105ê C to 149° C)	220	1000
Over 300ê F (149° C)	*	*

* The oil viscosity must be 70 SUS minimum at discharge temperature minus 50° F.

FIGURE 6 – LUBRICATION RECOMMENDATION

SECTION 4
OPERATION

Future operating problems can be avoided if proper precautions are observed when the equipment is first put into service.

Before starting under power, the blower should be turned over by hand to make certain there is no binding, or internal contact.

Each size blower has limits on pressure differential, running speed, and discharge temperature which must not be exceeded. These limits are shown in the following tabulation.

⚠ WARNING

Operating beyond the specified operating limitations will result in damage to the unit.

It is important that the pressures and temperatures are measured directly at the ports of the blower to avoid error that may be caused by intervening pipe runs, fittings, etc.

Relief valves should be used to protect against excessive pressure or vacuum conditions. These valves should be tested at initial startup to be sure they are adjusted to relieve at or below the maximum pressure differential rating of the blower.

NOTICE

Relief valves should be placed as close as possible to the blower inlet or discharge.

In some instances, pressure may be relieved at a lower point than the blower maximum in order to protect the motor or the equipment served by the blower.

Discharge temperature switches are recommended to protect against excessive inlet restriction or inlet temperatures. Check valves in the discharge line on pressure blowers and in the inlet line on vacuum blowers are recommended to protect the blower from motoring backwards when shut down under load.

LIMITATIONS

For information regarding limitations, refer to FIGURE 7, below.

MAXIMUM OPERATING LIMITATIONS

SIZE	RPM	PRESSURE PSI	VACUUM IN HG	DISCHARGE TEMPERATURE °F
6LP	2350	7	14	260
6MP	2350	14	16	325
6HP	2350	15	16	340
7LP	2050	6	12	260
7MP	2050	10	16	325
7HP	2050	15	16	340
8LP	1800	6	12	260
8MP	1800	10	16	325
8HP	1800	15	16	340

DO NOT EXCEED THESE LIMITS

NOTICE

Blower speed, line losses, elevation, and increased inlet temperatures will affect the maximum operating limitations.

FIGURE 7 – MAXIMUM OPERATING LIMITATIONS

BLOWER STARTUP CHECKLIST

This startup procedure should be followed during the initial installation and after any shutdown periods or after the blower has been worked on or moved to a new location. It is suggested that the steps be followed in sequence and checked off (✓) in the boxes provided.

☐ 1. Check the unit and all piping for foreign material and clean if required.

☐ 2. Check the flatness of the feet and the alignment of the drive. Feet that are bolted down in a bind can cause case distortion and internal rubbing. Misaligned V-drives can cause the impellers to rub against the headplates and cause a reduction in the volumetric efficiency of the unit. Misaligned couplings can ruin bearings.

☐ 3. If blower is V–belt driven, check the belt tension and alignment. Over-tensioned belts create heavy bearing loads which leads to premature failure.

☐ 4. Be sure adequate drive guards are in place to protect the operator from severe personal injury from incidental contact.

☐ 5. Check the unit for proper lubrication. Proper oil level cannot be overemphasized. Too little oil will ruin bearings and gears. Too much oil will cause overheating and can ruin gears and cause other damage. Insure drive end bearings are greased.

☐ 6. With motor locked out, turn the drive shaft by hand to be certain the impellers do not bind.

☐ 7. "Jog" the unit with the motor a few times to check rotation and to be certain it turns freely and smoothly.

☐ 8. The internal surfaces of all Sutorbilt units are mist sprayed with a rust preventive to protect the machine during the shipping and installation period. This film should be removed upon initial start–up.

☐ 9. Start the unit and operate 15 minutes at no load. During this time, check for hot spots and other indications of interference.

☐ 10. Apply the load and observe the operation of the unit for one hour. Check frequently during the first day of operation.

☐ 11. If malfunctions occur, do not continue to operate. Problems such as knocking impellers can cause serious damage if the unit is operated without correction.

SAFETY PRECAUTIONS

1. Do not operate blower with open inlet or outlet port.
2. Do not exceed specified vacuum or pressure limitations.
3. Do not operate above or below recommended blower speed range.
4. Blower is not to be used where non-sparking equipment is specified.
5. Do not operate without belt guard or coupling shield.

⚠ WARNING

Do not exceed sheave or coupling manufacturers' rim speed limit.

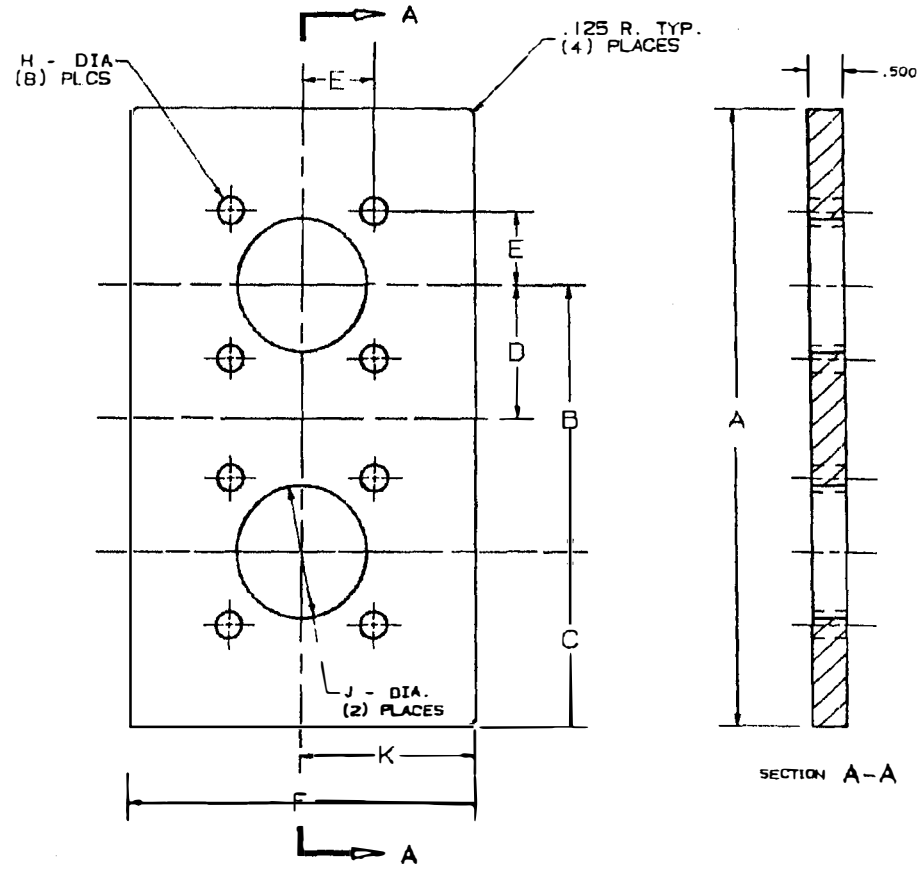
6. The blower and blower discharge piping may be extremely hot and can cause skin burns on contact.
7. Prolonged exposure may require ear protection.

TROUBLE SHOOTING

No matter how well the equipment is designed and manufactured, there may be times when servicing will be required due to normal wear, the need for adjustment, or various external causes. Whenever equipment needs attention, the operator or repairman should be able to locate the cause and correct the trouble quickly. The Trouble Shooting Chart below is provided to assist the mechanic in those respects.

PROBLEM	POSSIBLE CAUSES	SOLUTION
Knocking	1. Unit out of time.	1. Retime impellers.
	2. Distortion due to improper mounting or pipe strains.	2. Check mounting alignment and relieve pipe strains.
	3. Excessive pressure differential.	3. Reduce to manufacturer's recommended pressure. Examine relief valve, re-set if necessary.
	4. Worn gears.	4. Replace timing gears.
	5. Worn bearings.	5. Replace bearings.
Excessive blower temperature.	1. Too much oil in gear case.	1. Reduce oil level.
	2. Too low operating speed.	2. Increase blower speed.
	3. Clogged filter or muffler.	3. Remove cause of obstruction.
	4. Excessive pressure differential.	4. Reduce pressure differential across the blower.
	5. Worn impeller clearances.	5. Replace impeller.
	6. Internal contact.	6. Correct clearances.
Impeller end or tip drag.	1. Insufficient assembled clearances.	1. Correct clearances.
	2. Case or frame distortion.	2. Check mounting and pipe strain.
	3. Excessive operating pressure.	3. Remove cause.
	4. Excessive operating temperature.	4. Remove cause.
Lack of volume.	1. Slipping belts.	1 Tighten belts.
	2. Worn clearances.	2. Re-establish proper clearances.
Excessive bearing or gear wear.	1. Improper lubrication.	1. Correct lubrication level. Replace dirty oil.
Loss of oil.	1. Headplate, gear case or drive cover vents plugged.	1. Clean vents.
	2. Worn seal.	2. Replace seals.

SECTION 5
SPECIAL TOOLS REQUIRED

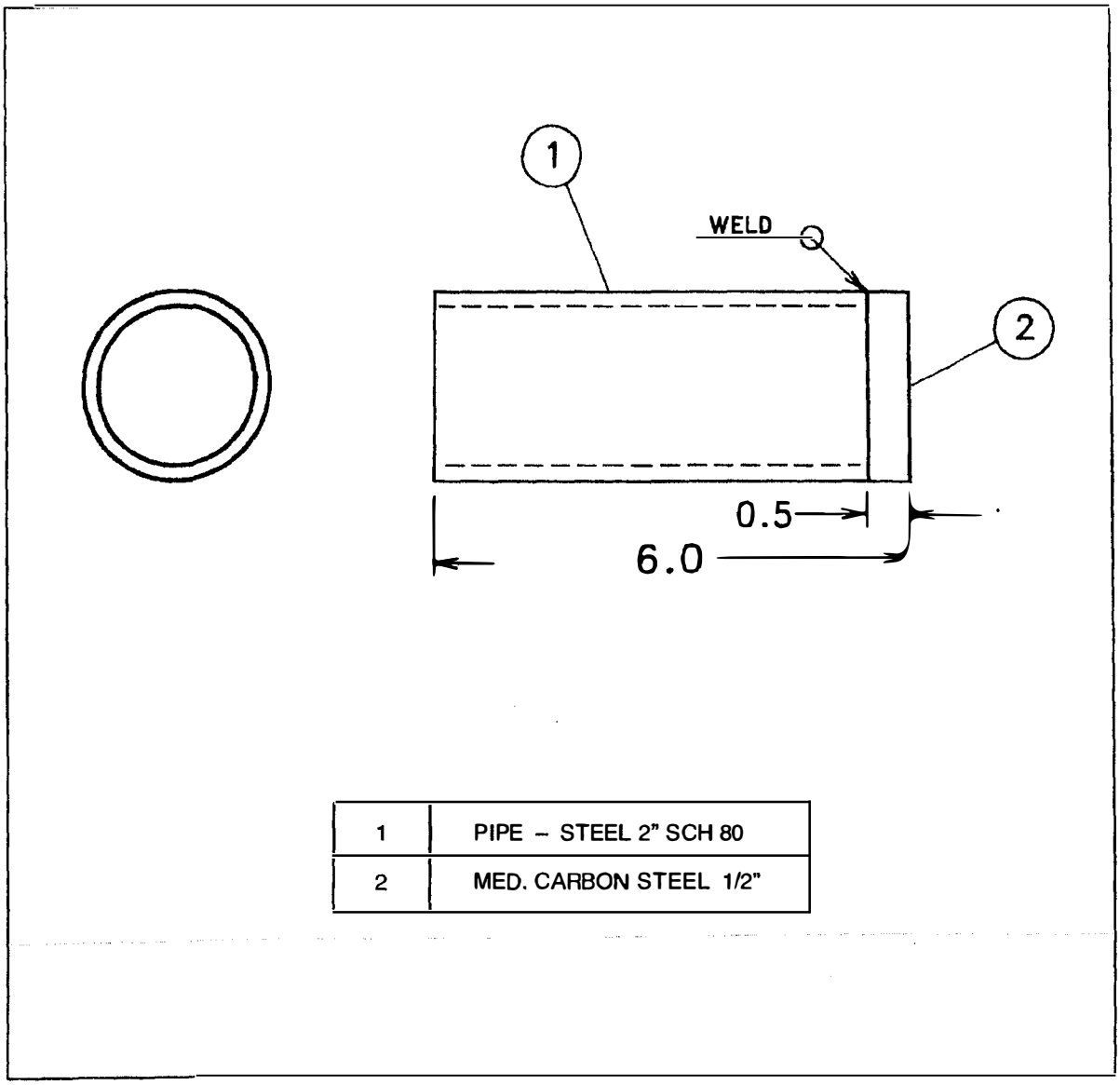


	6"	7"	8"
A	11.00	13.00	16.00
B	6.000	7.000	8.000
C	2.500	3.000	4.000
D	3.000	3.500	4.000
E	1.503	1.679	2.210
F	11.00	13.00	15.00
H	0.437	0.500	0.500
J	1.500	1.688	1.875
K	5.500	6.500	7.500

NOTE:

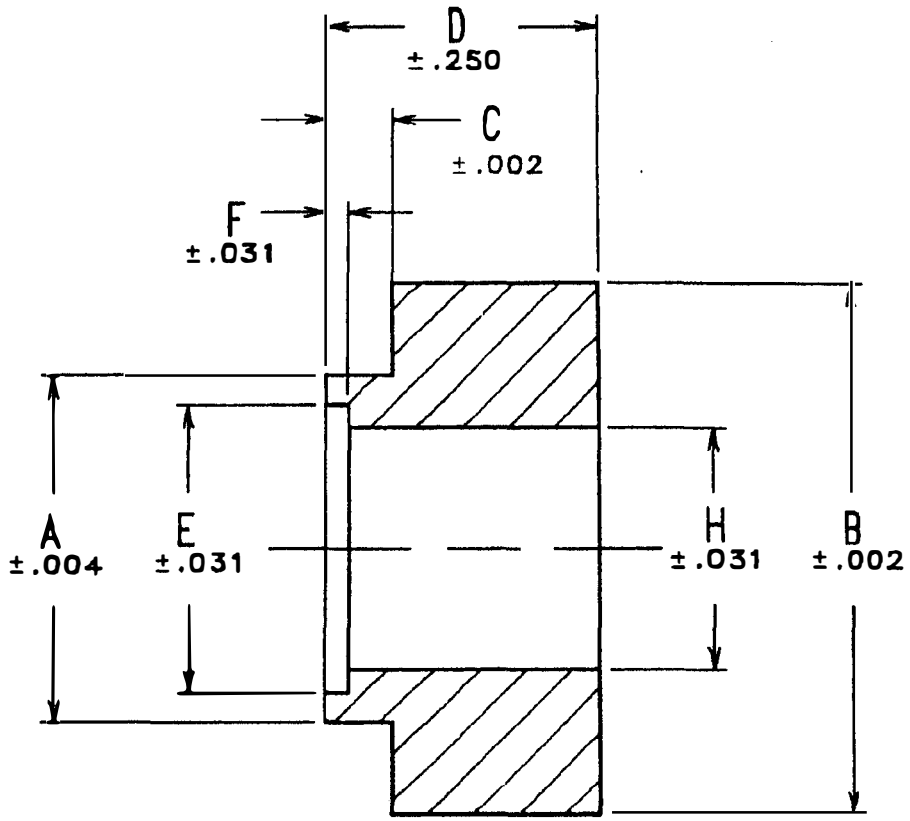
1. REMOVE SHARP EDGES
2. MAT'L: MED. CARBON STEEL

FIGURE 8 – PULLER PLATE – SK2154



1	PIPE – STEEL 2" SCH 80
2	MED. CARBON STEEL 1/2"

FIGURE 9 – GEAR DRIVER – SK2150

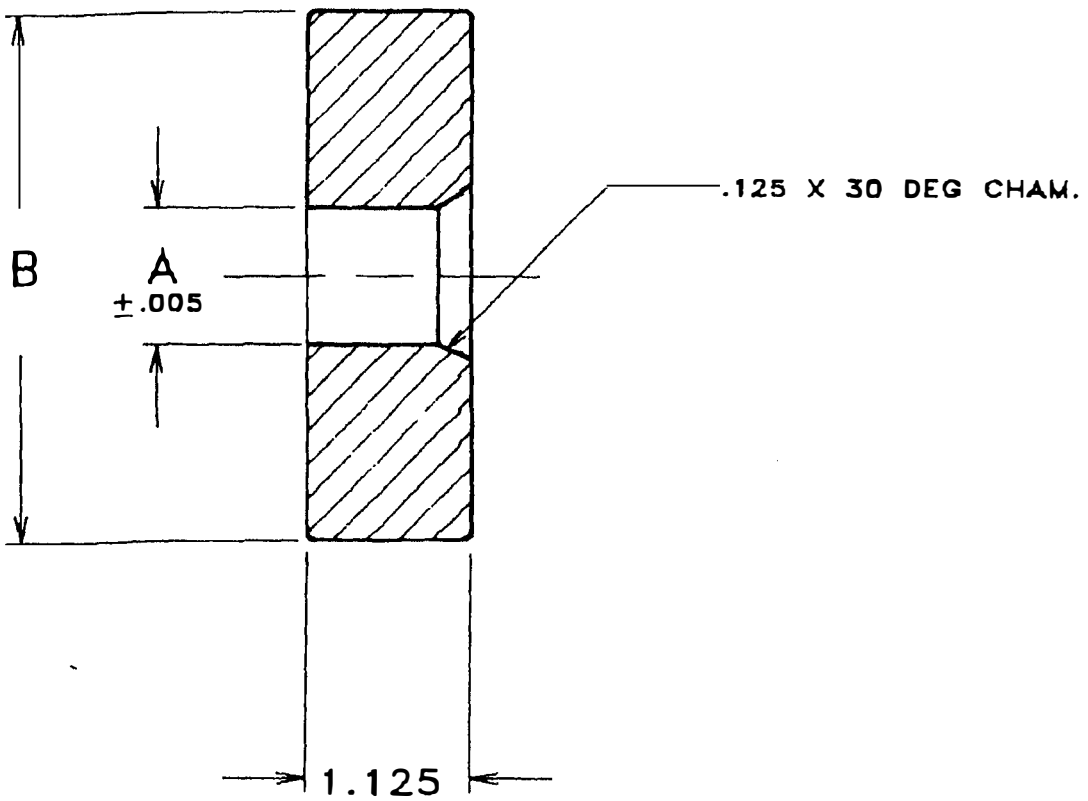


NOTES:

1. BREAK SHARP EDGES
2. MATERIAL: 4140
3. HEAT TREAT TO RC 48 – 52

UNIT SIZE	A	B	C	D	E	F	H
6"	2.748	3.150	0.515	1.890	2.450	0.125	1.400
7"	3.000	3.543	0.424	1.863	2.423	0.150	1.616
8"	3.250	3.938	0.407	2.000	2.800	0.150	1.813

FIGURE 10 – MECHANICAL SEAL INSTALLATION TOOL – SK2152



NOTES:

1. BREAK SHARP EDGES
2. MATERIAL: 4140
3. HEAT TREAT TO RC 52 – 56

UNIT SIZE	A	B
6"	1.900	5.000
7"	2.087	5.500
8"	2.406	6.000

FIGURE 11 – BEARING PRESS TOOL – MECHANICAL SEAL UNITS – SK2156

SECTION 6
DISASSEMBLY INSTRUCTIONS

NOTICE

Numbers in parentheses ( ) refer to key numbers in assembly drawings on pages 25, 27 and 29.

1. Drain oil from gear case by removing drain plug (4).
2. Remove the socket head bolts (5) from the gear cover (3).
3. Remove the gear cover from gear headplate (18).

NOTICE

The cover and gear headplate gasket tends to bond tightly to both surfaces. After socket head bolt removal, it is sometimes necessary to take a ball peen hammer and a blunt chisel and drive off the cover.

IMPORTANT:

MARK ALL PARTS WITH A CENTER PUNCH SO THEY CAN BE REASSEMBLED IN THE SAME POSITION (IMPELLERS, HEADPLATES, AND GEARS).

4. If the timing gears appear undamaged, the gear backlash must be checked to see if the gears can be salvaged.
   A. Mount a magnetic base dial indicator on the gear headplate (see FIGURE 12).
   B. Lock one impeller stationary by wedging a feeler gage between the impeller and the headplate.
   C. The tip of the indicator should be placed at the center of the contact surface on a tooth of the gear on the free shaft.
   D. Rock the impeller back and forth by hand and read the total rotational movement to the nearest .0005 inches. Do this at four gear mesh positions 90 degrees apart.
   E. Permissible gear backlash is shown below.

GEAR DIA.	GEAR BACKLASH
6"	.002 – .003
7"	.003 – .005
8"	.003 – .006

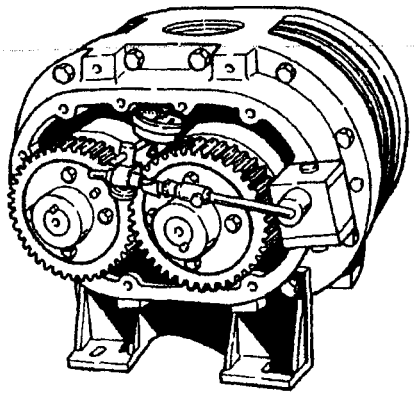


FIGURE 12

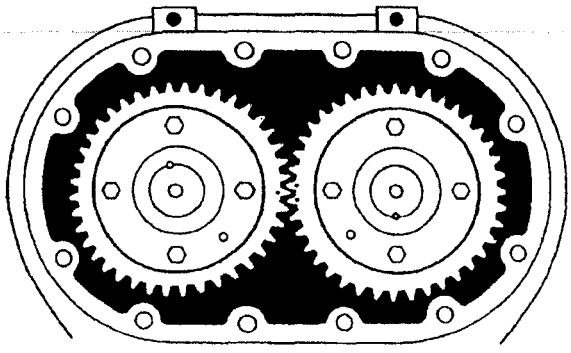


FIGURE 13

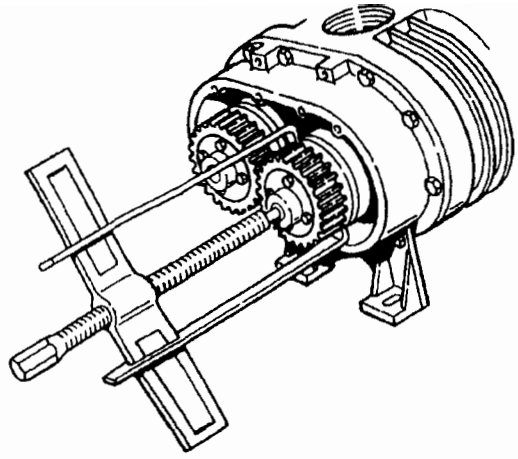


FIGURE 14

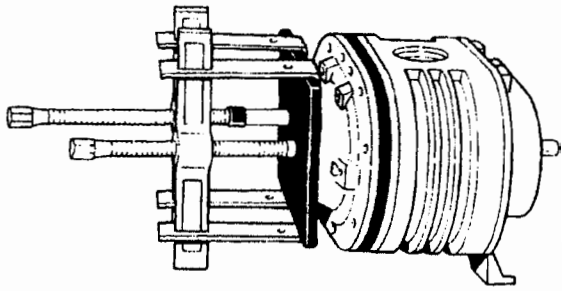


FIGURE 15

NOTICE

If backlash is above the specified limit, the gears are not necessarily unusable. Excessive play could be caused by worn bearings.

5. If timing gears appear to be reusable, matchmark timing gear toothmesh by making small punch marks on the ends of meshing gear teeth with a pin punch and hammer (see FIGURE 13, page 15). The impeller tip to valley (throat) and the case to headplates should also be match marked to facilitate blower reassembly.

6. Remove each timing hub (39) and the timing gear (9) as a complete assembly with a gear puller. (See FIGURE 14). Do not remove timing bolts (38) or threaded taper pins (36), unless the gears or hubs will be replaced.

NOTICE

If replacing the timing gears (9), remove the timing hub taper pins (36) by placing washers or an oversized nut over the extending threaded area of the pin. Tighten a proper–sized nut on the pin and it will eject.

7. Remove the four socket head cap screws (30) from the drive end bearing cover (29) and remove the cover. Drive shaft oil seal (31) should come free when cover is removed.

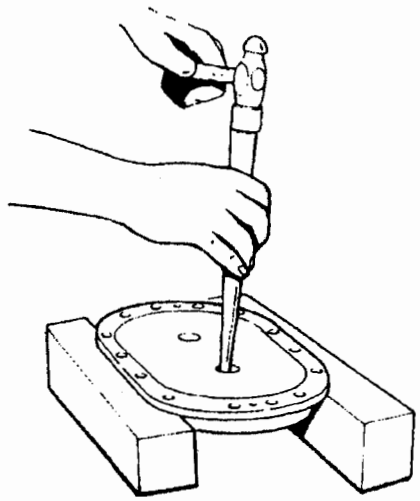


FIGURE 16

8. Remove mounting foot (17) from the drive headplate (24) by removing the capscrews (16).

9. Remove the capscrews (21) which secure the drive headplate (24) to the impeller case (22).

10. Using the fabricated puller plate shown on page 11, bolt to the drive headplate using the tapped holes used to secure the drive cover.

11. Install a gear puller to each shaft and attach the puller arms to the fabricated plate. Turn each puller only half a revolution at a time keeping the advance of the shafts as uniform as possible (see

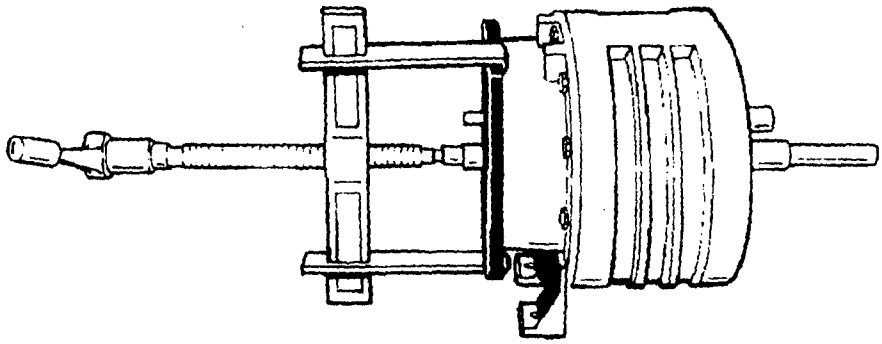


FIGURE 17

FIGURE 15, page 16). After the headplate has been removed, detach the puller plate.

12. Remove the two drive end bearings (14) from the drive headplate (24) using a ball peen hammer and punch (see FIGURE 16, page 16).

⚠ CAUTION

Exercise care not to damage the headplate bearing bores when removing bearings.

13. Remove the drive end spacers (33), (34) and (41). The grease seals (15) can now be driven out of the drive headplate with hammer and punch (see FIGURE 16, page 16). Discard the seals as they will not be reused. Replace grease seals each time the headplate is removed.

NOTICE

Seals and bearings should be replaced during overhaul as a matter of service policy.

14. Remove the four cap screws (10) which fasten each bearing retainer (12) to the gear headplate.

15. Attach fabricated puller plate to the gear headplate using the tapped holes used to secure the bearing retainers.

16. Install a gear puller to one of the shafts and attach the puller arms to the fabricated plate (see FIGURE 17).

17. Push the impeller shaft through the gear headplate and remove the impeller assembly (23) (see FIGURE 17). Remove the other impeller assembly following the same procedure.

18. Remove mounting foot (17) from the gear headplate by removing 4 capscrews (16).

19. Remove the cap screws (21) securing the gear headplate to the impeller case. Located near each dowel pin on the headplate is a threaded hole. Insert a 3/8–16 UNC capscrew into each of the threaded holes. Tighten the screws evenly until the headplate separates from the impeller case.

20. Remove the two gear end bearings (14) from the gear headplate (18) as done in step 12.

21. Remove the bearing seal spacers (33) and oil seals (15) from the gear headplate as done in Step 13.

SECTION 7
ASSEMBLY INSTRUCTIONS

NOTICE

Numbers in parentheses ( ) refer to key numbers in assembly drawings on pages 25, 27 and 29.

1. Make sure all metallic parts are clean and free of any nicks or burrs.

2. Lubricate the outside diameter of the lip seal (15) with a light oil or grease. Install seals in both the drive head–plate (24) and gear headplate (18). The seal lip should always face towards the bearing or lubricant. New seals should be installed each time the headplate is removed.

NOTICE

Make sure seals are fully seated. Use extremetcaretwhentinstatling.

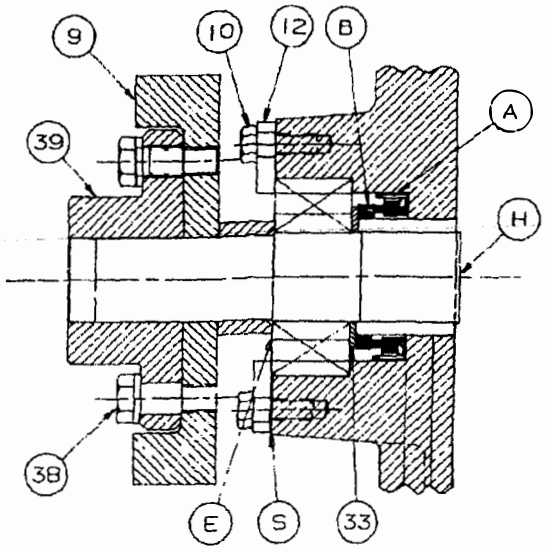
INSTALLING MECHANICAL SEALS

A. Lightly coat the headplate bores with assembly lubricant.

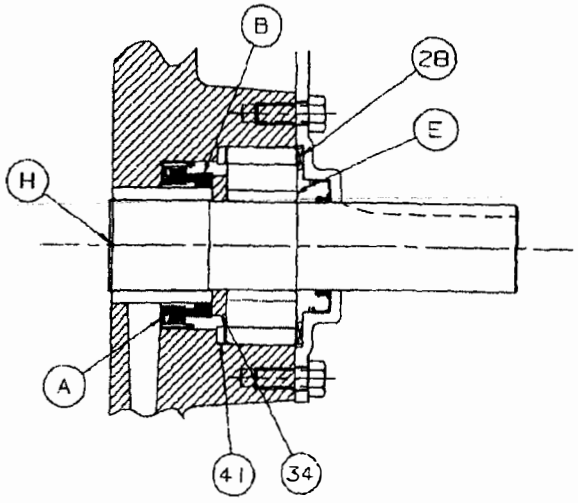
B. Refer to FIGURE 18. Install mechanical seal (A) into the headplate bore using a press and the correct driver shown on page 13. Drive the seal securely on to its seat.

⚠ CAUTION

Use extreme care when installing seals in the headplate bores. Do not attempt to install the mechanical seals without the use of a press. Blows from a hammer or mallet can damage the fragile seal surface. Too much force can crush the seal casing. Make certain the seal is properly seated and undamaged before proceeding.



GEAR END



DRIVE END

FIGURE 18

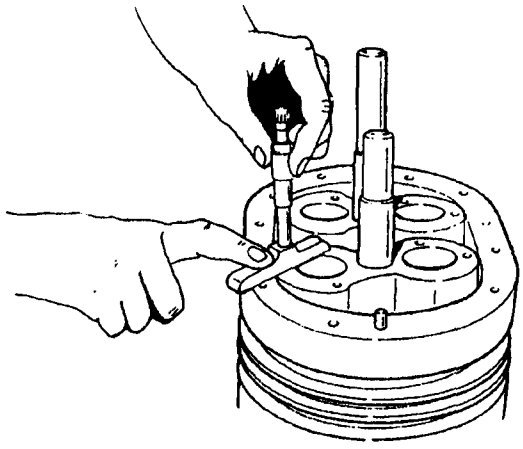


FIGURE 19

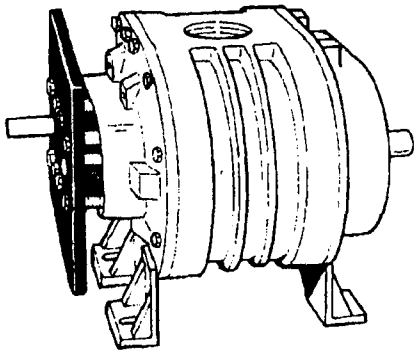


FIGURE 20

3. Assemble gear headplate (18) and mounting foot (17) to the impeller case with cap screws (21) and where the mounting foot is secured to the headplate use capscrews (16). The two positioning dowel pins (19) will ensure proper alignment of the headplate and impeller case. Also secure lifting lugs using capscrews (21) (see exploded assembly drawing page 25). Torque capscrews alternately and evenly. Refer to FIGURE 24, page 24, for torque specifications.

4. Apply a light oil or grease on the shaft seal areas and the bearing areas. Insert impellers into the gear headplate using the same headplate bores as used in the original assembly.

⚠ CAUTION

Seals are delicate; use extreme care when installing impeller shafts in the headplate bores. A piece of light shim stock wrapped around the shaft keyway will prevent cutting the seal lip.

5. Position blower so that impellers are vertical, with the drive end on top. It will be necessary to use blocks in order for the unit to set level. Measure the total end clearance using a depth micrometer (see FIGURE 19).

If total clearance is not within the limits specified in FIGURE 21, page 20, it may be necessary to shim the case to obtain the proper total end clearance. The shim should be placed between the drive headplate and impeller case.

NOTICE

If more than .007" shim is required, put .007" on the drive end and the remaining on the gear end.

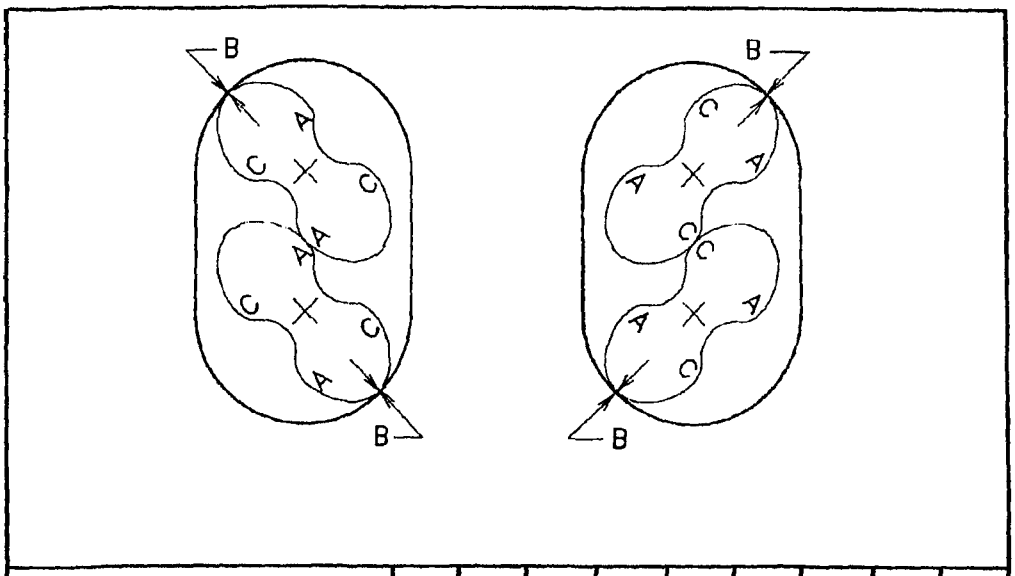
6. Assemble drive headplate (24) to impeller case as done in step 3 with the gear headplate. If shims were required, place shims between drive headplate and impeller case.

7. Insert bearing–seal spacers (34), (41) into the drive shaft headplate bore and spacer (33) into the remaining bores (see exploded view, page 25).

MECHANICAL SEALS ONLY

A. Refer to FIGURE 18, page18. Lightly coat the impeller shaft (H) and the inside diameter of the mating ring (B) with assembly lubricant.

B. Install the mating ring (B) on the shaft only far enough to install spacer (34), (41) in the bore and allow for the bearing inner race (E) to be started on the shaft.



	6H	6M	6L	7H	7M	7L	8H	8M	8L
TOTAL END CLEARANCE	.008–.012			.009–.012			.009–.012		
IMPELLER TO GEAR HEADPLATE	.004–.005			.004–.005			.004–.005		
IMPELLER TIMING (A–A) (C–C)	.009–.011			.009–.011			.011–.013		
RADIAL CLEARANCE (B–B)	.006–.007			.006–.009			.007–.010		

FIGURE 21

⚠ CAUTION

Do not drive the mating ring down to the mechanical seal, as this can damage the seal.

C. Install mating ring (B) on the drive end short shaft and the gear end shafts as done in the previous step, but use spacer (33) (refer to gear end, FIGURE 18, page 18).

D. Brush the bearing inner race (E) with a light oil or grease.

E. Using a press and the bearing installation tool shown on page 14, install the spherical roller bearing (35) on the drive end drive shaft. Install the three double row ball bearings on the remaining shaft ends. Bearings will position the mating ring (B) to the proper depth with respect to the mechanical seal (A) when the installation tool is tight against the headplate.

8. Apply a light oil to the drive headplate bearing bore, bearing inside diameter, and shaft seat. Install the spherical roller bearing (35) on the drive end drive shaft and the double row ball bearing (14) on the drive end driven shaft. Start the bearing in the bores without force.

9. Attach the puller plate shown on page 11 to the drive headplate using the tapped holes used to secure the drive cover (see FIGURE 20, page 19). Tighten the bolts so that the advance of the bearings stay as uniform as possible. Bearings should be pressed until fully seated in the bore.

NOTICE

Bearings will not be flush with gear headplate bores when completely seated.

10. Lubricate the gear end bearing fits with a light oil as described previously. Install gear end bearings (14) as far as possible without force. Use the fabricated plate, used to install the drive end bearings, to press the bearings on the shafts as described

in Step 9. Press bearings into the gear headplate until completely seated in the bearing bore.

NOTICE

Bearings will not be flush with gear headplate bores when completely seated.

11. Impeller should now be checked for free axial movement by hitting the ends of the impeller shafts with the palm of your hand.

12. Push the impellers against the gear headplate and recheck the total end clearance between the drive headplate and the impellers (see FIGURE 21, page 20).

    A. If total end clearance is insufficient, loosen impeller case to headplate bolts on either headplate, and move the headplate away from the case far enough to insert a paper shim in the amount equal to the insufficient clearance. Retighten case bolts and again check the total end clearance. Refer to FIGURE 21, page 20, for correct clearance.

    B. Excessive end clearances normally will require new impeller assemblies, but in some circumstances the impeller case can be removed and reduced in width by machining off the amount of excess clearance.

⚠ CAUTION

These impeller-to-impeller and impeller-to-case clearances are extremely critical. Even though the blower may turn freely by hand when cold, under operating conditions, the parts expand, and the rotors are subject to slight deflection.

If the clearances are not sufficient, the impellers may contact each other or the housing with destructive results. If the clearances are too great, the blower may not develop the pressure or airflow that is required to perform its function.

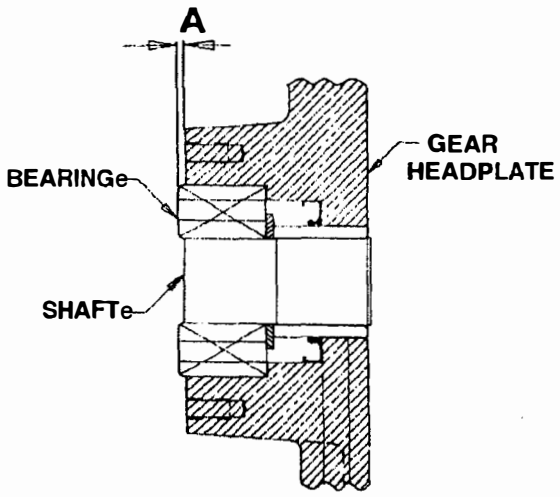


FIGURE 22

13. Impeller tip to case clearance should be checked at this time by inserting the correct thickness feeler gauge between the tip and the case (B) and rotating the impeller (see FIGURE 21, page 20). Repeat the procedure on both impellers.

NOTICE

When checking the tip to case clearance, move the feeler gauge over the entire length of the impeller to ensure that the tips do not bind along their length.

14. Replace the drive shaft grease seal (31) in the drive end cover (29). The seal lip should always face toward the bearing or lubricant. Pack the bearing cavities with the recommended grease.

15. Secure drive cover (29) and wavy spring (28) to drive headplate using capscrews (30). Refer to FIGURE 24, page 24, for torque specifications.

NOTICE

Exercise care not to damage the seal lip as it passes over shaft keyway.

16. SETTING IMPELLER END CLEARANCE

Refer to FIGURE 18, page 18. The gear end bearings are held in position by the force created by the wavy spring (28) on the drive end and the bearing retainer (12) on the gear end. The interference fit between the shaft (H) and the bearing inner race (E) keeps the shaft from moving axially.

End clearance adjustment of both impellers is controlled by adjustment of the bearing retainer (12). Tightening the bearing retainer screws (10) moves the bearing to load the wavy spring (28), and the impeller is forced toward the drive end. Relaxing the screws allows the wavy spring to return the impeller toward the gear end.

A. With impellers tight against the gear headplate, measure the distance (A) from the bearing outer race to the gear headplate using a depth micrometer (see FIGURE 22, page 21.

B. Subtract 1/3 of the total end clearance from the value measured at point A. This value is the amount of shim (13) that should be placed between the retainer and the headplate at point (S).

C. Secure bearing retainer (12) with the correct amount of shim, to the headplate using capscrews (10). Torque capscrews to the specifications given in FIGURE 24, page 24.

D. Recheck end clearances. Approximately 1/3 of the total end clearance should be on the gear end and the remaining 2/3 on the drive end (refer to FIGURE 21, page 20).

If clearances require adjusting, loosen the bearing retainer capscrews (10) and insert shims to move the impeller closer to the gear headplate and remove shims to move the impellers away from the gear headplate.

17. INSTALLING THE TIMING GEARS

Impellers are held in time by gears which are taper pinned and bolted to a timing hub, which in turn is pressed and taper pinned onto the shaft. The timing gears can be rotated in relation to the hub by removing the taper pins in the web of the gear and loosening the capscrews. Because the capscrews are oversized, the gear will rotate – within limits – relative to the timing hub when the screws are loosened.

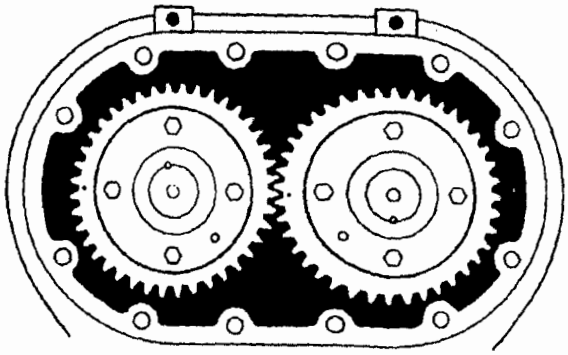


FIGURE 23

A. Apply a light grease, or oil, on the shaft area where the timing gear will be positioned.

B. Lubricate the inside diameter of spacers (32) with assembly lubricant and install on the gear end shafts.

C. Using a piece of paper large enough to cover the open end of the gear headplate, trace the shafts on the paper and cut-out shaft holes. This will be placed on the shafts before the gears to protect the bearings from metal shavings when drilling taper pin holes in the following procedure.

D. Place feeler stock in the amount of 1/3 of the total end clearance between drive headplate and both impellers. This will stop the impellers from contacting the headplate while the gears are being driven on.

⚠ CAUTION

If installing gears on a blower containing mechanical seals, a press must be used to drive the gears on the shafts. Blows from a hammer or mallet will damage the seal.

E. If reusing the timing gears and hubs, they should be returned to their original position with respect to the impellers.

If replacement gears are used, secure each gear (9) to its timing hub (39) with capscrews (38) and lockwasher (37) and tighten slightly.

NOTICE

Replacement gears have minimum backlash marks on the outside diameter of the gear face. These marks should be located 180 degrees from each other (see FIGURE 23).

F. Position impellers so they are 90 degrees to each other. Using the driving tool shown on page 12, install the gears and hubs on the shafts using the taper pin holes and match marks for correct positioning. Check to be sure impellers are in correct position as previously match marked.

NOTICE

Utilize a press whenever possible when installing gears.

G. Refer to diagram in FIGURE 21e page 20. Use feeler gauges to check clearances between impeller lobes at positions A–A and C–C. Add the clearances, and divide the total clearance evenly between A–A and C–C.

H. Loosen the four capscrews (38) in one gear only. Wedge the correct amount of feeler gauge between the impeller at A–A. If movement between the gear and hub is not sufficient to time the impellers, it will be necessary to loosen the four capscrews (38) in the mating gear to obtain a large adjustment range. Adjust so that the clearance at A–A is equal to C–C within .001 inch.

Clearances must be checked on both sides of each impeller lobe over the entire length. This procedure may require repeating several times until impeller lobe clearance is equal on both sides.

I. Secure the timing gears (9) to the hubs (39) with capscrews (38) and lockwasher (37). Tighten capscrews to the torque specification listed in FIGURE 24, page 24.

J. Check gear backlash four places at 90 degree intervals as described in the disassembly procedure (Item 4).

NOTICE

If any of the four gear backlash readings are not within the specified limits, the gears must be replaced.

K. Ream taper pin hole between the shaft and hub with a hand reamer and replace taper pin (8) if movement between the shaft and hub (39) was negligible. If reaming fails to eliminate edges due to slight misalignment, drill and ream a new hole approximately 90 degrees from the original hole. Control the depth of the taper pin, leaving approximately 1/8" taper pin protruding beyond the hub and shaft.

L. Ream center drilled hole in the hub and gear web. If reaming fails to eliminate edges set up by retiming, ream hole for the next larger taper pin or drill and ream a new hole approximately 90 degrees from the original hole. Control the depth of the threaded taper pin (36), leaving the threaded portion of the pin protruded beyond the hub.

Replacement gears are not drilled for taper pin (8). These holes must be drilled and reamed after the gears are in proper position and the unit retimed.

NOTICE

Be careful not to allow cuttings to drop behind the gears and contaminate the bearings.

M. Remove paper from behind the gears. Make certain metal cuttings did not contaminate the bearings.

18. Assemble gear cover (3) and gasket (7) to the gear headplate (18) using capscrews (5). Tighten capscrews alternately and evenly. Refer to FIGURE 24, page 24 for torque specifications.

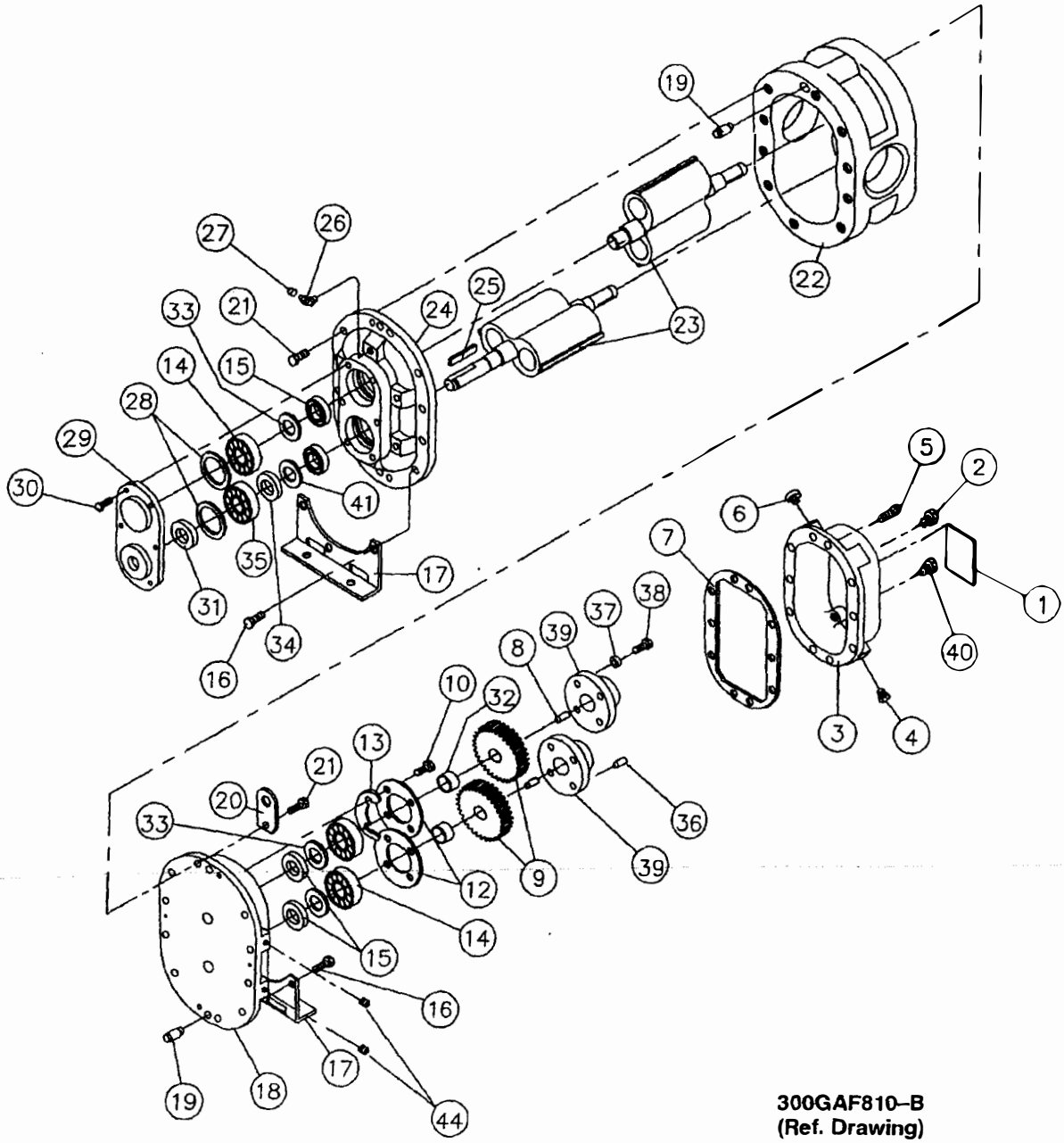
19. Place blower on its feet on a flat surface. Loosen capscrews (16) and level unit up. The bench or blower base flatness should be within .002 of an inch. Re-tighten cap screws (16) to the specifications in FIGURE 24, page 24.

Ref. No.	FASTENERS	GEAR DIAMETER		
		6	7	8
5	Screw -- Gear Case to Headplate	16	30	30
10	Screw – Bearing Retainer to Headp	16	30	30
16	Screw – Mounting Foot to Headplat	30	75	75
21	Screw – Headplate to Impeller Cas	30	75	75
30	Screw – Drive Cover to Headplate	16	30	30
38	Screw – Timing Hub to Gear	30	75	75

NOTE: REF. NO. DENOTES ITEMS IN EXPLODED VIEW DRAWINGS ON PAGES 25, 27 AND 29.

FIGURE 24 – TORQUE (FT–LBS)

SECTION 8
PARTS LIST



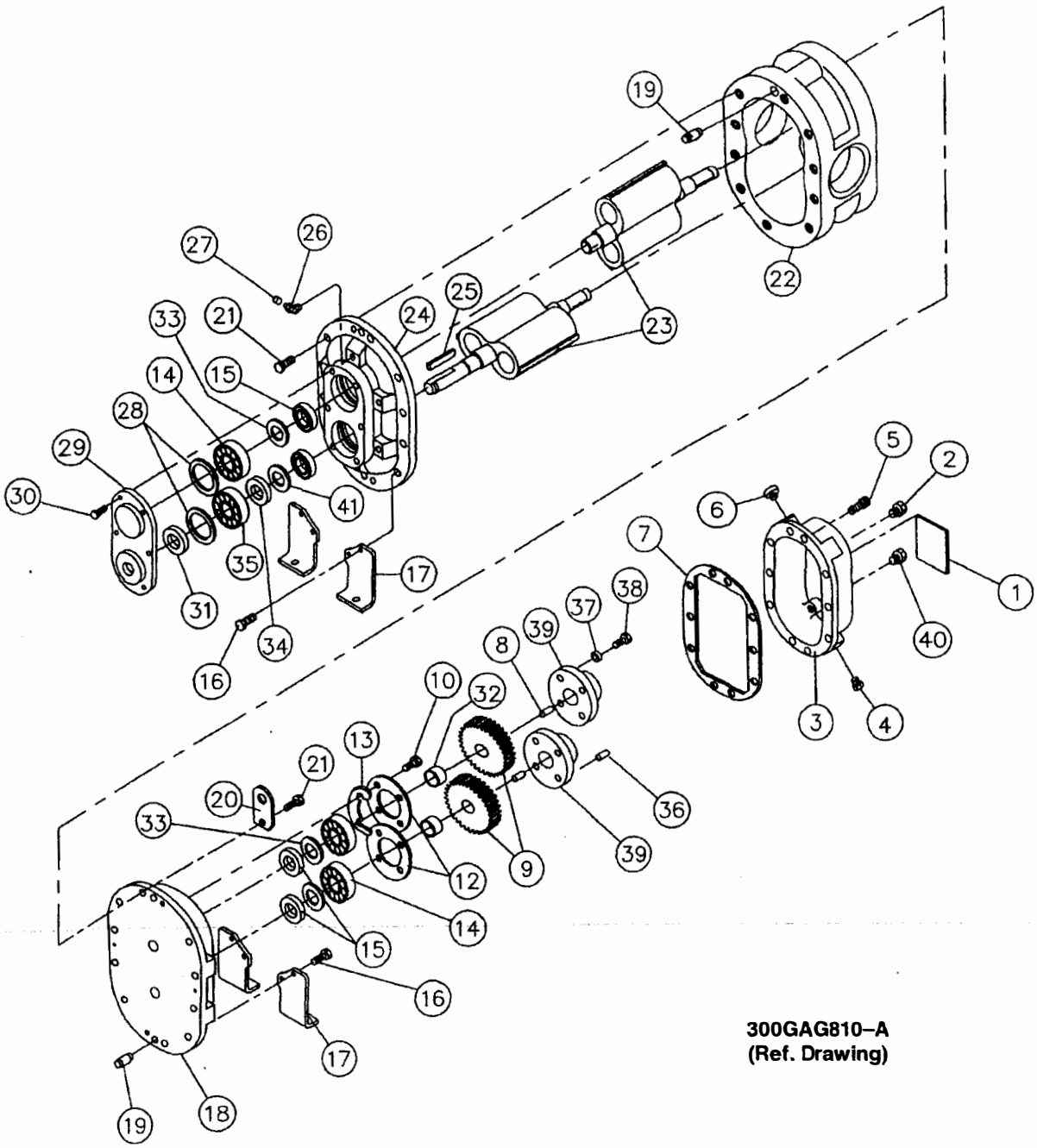
300GAF810–B
(Ref. Drawing)

Order by Part Number and Description. Reference Numbers are for your convenience only.

Ref. No.	Description	No. Req'd	MODEL GAF Size – 6H GAFH_P_	Size – 6M GAFM_P_	Size – 6L GAFL_P_
1	NAMEPLATE	1	301GAE496	301GAE496	301GAE496
2	PLUG FOR ALTERNATE OIL LEVEL CONN.	1	64AC4	64AC4	64AC4
3	GEAR CASE	1	900883064201	900883064201	900883064201
4	DRAIN PLUG	1	64AC4	64AC4	64AC4
5	SCREW–GEAR CASE TO HEADPLATE ..... E.	12	75LM113	75LM113	75LM113
6	BREATHER	1	5L223	5L223	5L223
Ø 7	GASKET GEAR CASE	1	200GAF715	200GAF715	200GAF715
Ø 8	TAPER PIN	2	62V59	62V59	62V59
9	TIMING GEAR GROUP	1	200GAF6008	200GAF6008	200GAF6008
Ø 10	SCREW–BEARING RETAINER TO HEADPLATE ..... E. E	8	75A33N	75A33N	75A33N
12	BEARING RETAINER	2	900883065501	900883065501	900883065501
Ø 13	SHIM SET	1	900881065400	900881065400	900881065400
Ø 14	BEARING	3	900639080506	900639080506	900639080506
Ø 15	MAIN SEAL–PER APPLICATION BELOW				
	MECHANICAL SEAL VERSION	4	900871020006	900871020006	900871020006
	LIP SEAL VERSION	4	60DD657	60DD657	60DD657
16	SCREW–FOOT TO HEADPLATE ..... E	8	655ED060	655ED060	655ED060
17	FOOT GROUP				
	VERTICAL FOOT GROUP	1	GAF81950	GAF81950	GAF81950
	HORIZONTAL FOOT GROUP	1	GAF81951	GAF81951	GAF81951
18	HOUSING–BEARING (GEAR END)				
	LIP SEAL	1	900883064401	90088364401	900883064401
	MECHANICAL SEAL	1	900883064501	90088364501	900883064501
19	DOWEL PIN ..... E	4	62M48	62M48	62M48
20	LIFTING LUG	2	200GAF451	200GAF451	200GAF451
21	SCREW–HEADPLATES TO IMPELLER CASE	24	655ED050	655ED050	655ED050
22	IMPELLER CASE	1	900883063901	900883064001	900883064101
23	SHAFT ASSEMBLY GROUP	1	GAF81952	GAF81954	GAF81953
	SHAFT ASSEMBLY GROUP CONSISTS OF: (1) ASSEMBLY SHAFT– LONG (1) ASSEMBLY SHAFT– SHORT				
24	HOUSING–BEARING (DRIVE END)				
	LIP SEAL ..... E.	1	900883064901	900883064901	900883064901
	MECHANICAL SEAL	1	900883064801	900883064801	900883064801
25	DRIVE KEY	1	900639910406	900639910406	900639910406
26	GREASE FITTING	2	911659990606	911659990606	911659990606
27	GREASE FITTING CAP	2	40P41	40P41	40P41
28	WAVY SPRING	2	900669170506	900669170506	900669170506
29	DRIVE COVER	1	900883064601	900883064601	900883064601
30	SCREW–DRIVE COVER TO HEADPLATE	8	75LM113	75LM113	75LM113
Ø 31	DRIVE SEAL	1	60DD658	60DD658	60DD658
32	SPACER–GEAR END	2	900811060401	900811060401	900811060401
33	SPACER–GEAR & DRIVE END–SEAL/BRG	3	900881066201	900881066201	900881066201
34	SPACER–DRIVE END DRIVE SHAFT–SEAL/BRG	1	900881066401	900881066401	900881066401
Ø 35	BEARING–DRIVE END DRIVE SHAFT	1	900811060801	900811060801	900811060801
36	THREADED TAPER PIN	2	62V67	62V67	62V67
37	WASHER–GEAR ..... E ..... E	8	900649440205	900649440205	900649440205
38	SCREW–TIMING HUB TO GEAR	8	655ED060	655ED060	655ED060
39	HUB–TIMING	2	900713060101	900713060101	900713060101
40	GAUGE–OIL LEVEL	1	40P31	40P31	40P31
* 41	SPACER–DRIVE END DRIVE SHAFT–HD PLT–BRG .. E .. REQUIRED WITH MECHANICAL SEAL UNITS	1	900881066301	900881066301	900881066301
* 42	PLUGS REQUIRED WITH MECHANICAL SEAL UNITS	8	64AC2	64AC2	64AC2
44	SCREW–SET	4	76F92	76F92	76F92
Ø	OVERHAUL KIT LIP SEAL	0	203GAF6010	203GAF6010	203GAF6010
	OVERHAUL KIT MECHANICAL SEAL	0	204GAF6010	204GAF6010	204GAF6010

* NOT SHOWN

Ø INCLUDED IN OVERHAUL KIT.

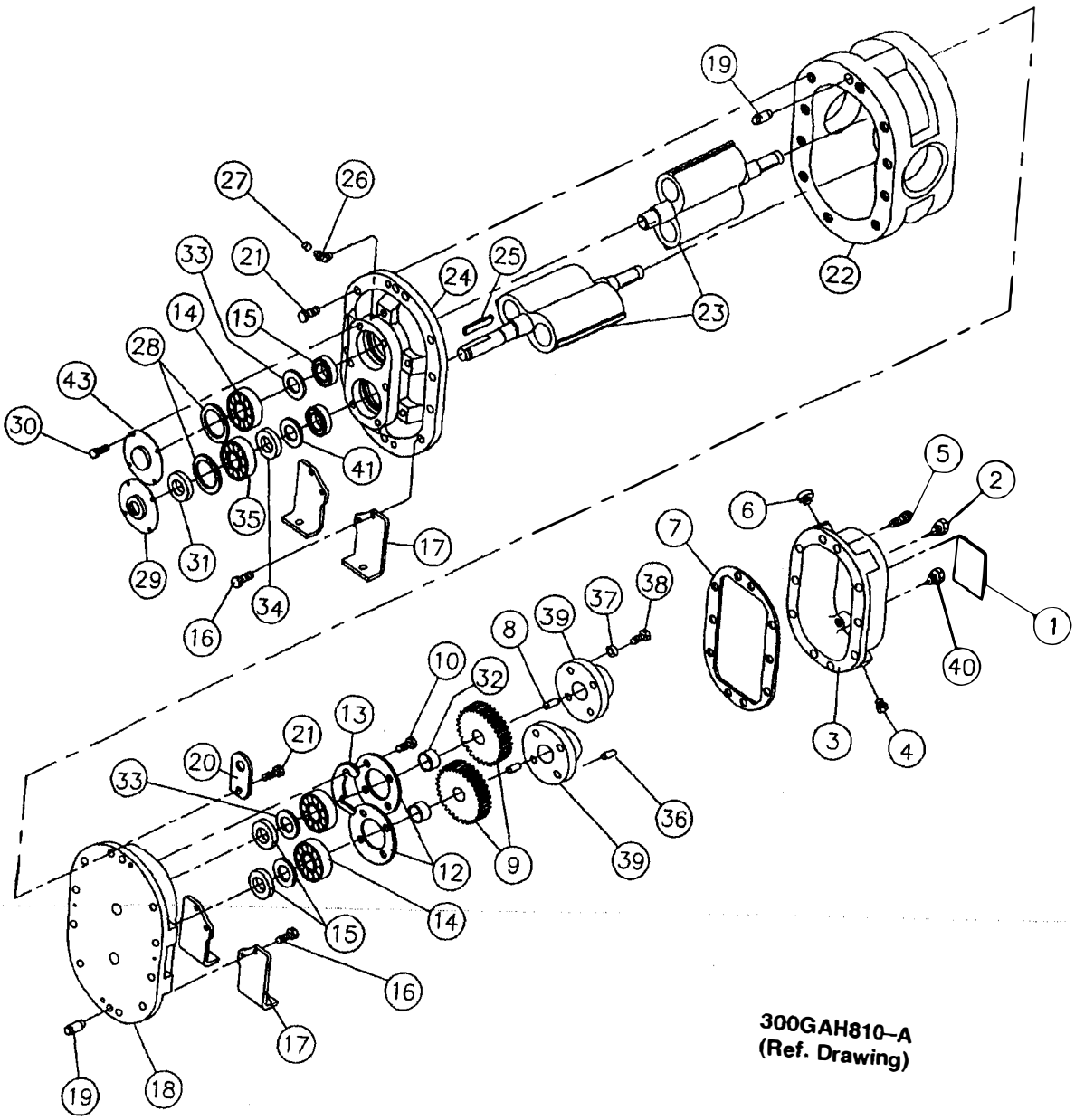


300GAG810–A
(Ref. Drawing)

Order by Part Number and Description. Reference Numbers are for your convenience only.

	Ref. No.	Description	No. Req'd	MODEL GAG Size – 7H GAGH_P_	Size – 7M GAGM_P_	Size – 7L GAGL_P_
	1	NAMEPLATE	1	301GAE496	301GAE496	301GAE496
	2	PLUG FOR ALTERNATE OIL LEVEL CONN	1	64B4	64B4	64B4
	3	GEAR CASE	1	900893071701	900893071701	900893071701
	4	DRAIN PLUG	1	64AC6	64AC6	64AC6
	5	SCREW–GEAR CASE TO HEADPLATE	12	75LM122	75LM122	75LM122
	6	BREATHER	1	5L223	5L223	5L223
Ø	7	GASKET GEAR CASE	1	200GAG715	200GAG715	200GAG715
Ø	8	TAPER PIN	2	62V60	62V60	62V60
	9	TIMING GEAR GROUP	1	200GAG6008	200GAG6008	200GAG6008
Ø	10	SCREW–BEARING RETAINER TO HEADPLATE	8	655ED040N	655ED040N	655ED040N
	12	BEARING RETAINER	2	900893070401	900893070401	900893070401
Ø	13	SHIM SET	1	900891073800	900891073800	900891073800
Ø	14	BEARING	3	DF138116	DF138116	DF1B8116
Ø	15	MAIN SEAL–PER APPLICATION BELOW				
		MECHANICAL SEAL VERSION	4	900871020007	900871020007	900871020007
		LIP SEAL VERSION	4	60DD715	60DD715	60DD715
	16	SCREW–FOOT TO HEADPLATE	8	655EE070	655EE070	655EE070
	17	FOOT GROUP				
		VERTICAL FOOT GROUP	1	GAG81958	GAG81958	GAG81958
		HORIZONTAL FOOT GROUP	1	GAG81959	GAG81959	GAG81959
	18	HOUSING–BEARING (GEAR END)				
		LIP SEAL	1	900893072801	900893072801	900893072801
		MECHANICAL SEAL	1	200GAG006	200GAG006	200GAG006
	19	DOWEL PIN	4	62M48	62M48	62M48
	20	LIFTING LUG	2	200GAF451	200GAF451	200GAF451
	21	SCREW–HEADPLATES TO IMPELLER CASE	24	655EE050	655EE050	655EE050
	22	IMPELLER CASE	1	900893070101	900893070201	900893070301
	E23	SHAFT ASSEMBLY GROUP	1	GAG81960	GAG81962	GAG81961
		SHAFT ASSEMBLY GROUP CONSISTS OF:				
		(1) ASSEMBLY SHAFT – LONG				
		(1) ASSEMBLY SHAFT – SHORT				
	24	HOUSING–BEARING (DRIVE END)				
		LIP SEAL	1	900893070601	900893070601	900893070601
		MECHANICAL SEAL	1	900893072601	900893072601	900893072601
	25	DRIVE KEY	1	900639910407	900639910407	900639910407
	26	GREASE FITTING	2	911659990606	911659990606	911659990606
	27	GREASE FITTING CAP	2	40P41	40P41	40P41
	28	WAVY SPRING	2	900669170607	900669170607	900669170607
	29	DRIVE COVER	1	900883073701	900883073701	900883073701
	30	SCREW–DRIVE COVER TO HEADPLATE	8	75LM122	75LM122	75LM122
Ø	31	DRIVE SEAL	1	60G261	60G261	60G261
	32	SPACER–GEAR END	2	900891073001	900891073001	900891073001
	33	SPACER–GEAR & DRIVE END–SEAL/BRG	3	200GAG144	200GAG144	200GAG144
	34	SPACER–DRIVE END DRIVE SHAFT–SEAL/BRG	1	201GAG144	201GAG144	201GAG144
Ø	35	BEARING–DRIVE END DRIVE SHAFT	1	910712068201	910712068201	910712068201
	36	THREADED TAPER PIN	2	62V68	62V68	62V68
	37	WASHER–GEAR	8	900649440507	900649440507	900649440507
	38	SCREW–TIMING HUB TO GEAR	8	655EE060	655EE060	655EE060
	39	HUB–TIMING	2	900713060102	900713060102	900713060102
	40	GAUGE–OIL LEVEL	1	40L15	40L15	40L15
*	41	SPACER–DRIVE END DRIVE SHAFT–HD PLT–BRG REQUIRED WITH MECHANICAL SEAL UNITS	1	900881073301	900881073301	900881073301
*	42	PLUGS REQ. W/MECH. SEAL UNITS(GEAR END)	4	64AC3	64AC3	64AC3
*	46	PLUGS REQ. W/MECH. SEAL UNITS (DRIVE END)	4	64AC2	64AC2	64AC2
Ø		OVERHAUL KIT LIP SEAL	0	200GAG6010	200GAG6010	200GAG6010
Ø		OVERHAUL KIT MECHANICAL SEAL	0	201GAG6010	201GAG6010	201GAG6010

* NOT SHOWN
Ø INCLUDED IN OVERHAUL KIT.



300GAH810–A
(Ref. Drawing)

Order by Part Number and Description. Reference Numbers are for your convenience only.

	Ref. No.	Description	No. Req'd	Size – 8H GAHH_P_	MODEL GAH SizeE- 8M GAHM_P_	Size – 8L GAHL_P_
	1	NAMEPLATE	1	301GAE496	301GAE496	301GAE496
	2	PLUG FOR ALTERNATE OIL LEVEL CONN.	1	64AC5	64AC5	64AC5
	3	GEAR CASE	1	900893082501	900893082501	900893082501
	4	DRAIN PLUG	1	64AC5	64AC5	64AC5
	5	SCREW–GEAR CASE TO HEADPLATE	12	2009649	2009649	2009649
	6	BREATHER	1	5L223	5L223	5L223
Ø	7	GASKET GEAR CASE	1	200GAH715	200GAH715	200GAH715
Ø	8	TAPER PIN	2	62V61	62V61	62V61
	9	TIMING GEAR GROUP	1	200GAH6008	200GAH6008	200GAH6008
	10	SCREW–BEARING RETAINER TO HEADPLATE	8	655ED04N	655ED04N	655ED04N
	11	LOCKWASHER	8	95B3	95B3	95B3
	12	BEARING RETAINER	2	900893083101	900893083101	900893083101
Ø	13	SHIM SET	1	910639630008	910639630008	910639630008
Ø	14	BEARING	3	900639080808	900639080808	900639080808
Ø	15	MAIN SEAL–PER APPLICATION BELOW				
		MECHANICAL SEAL VERSION	4	900871020008	900871020008	900871020008
		LIP SEAL VERSION	4	910751061902	910751061902	910751061902
	16	SCREW–FOOT TO HEADPLATE	8	655EE080	655EE080	655EE080
	17	FOOT GROUP				
		VERTICAL FOOT GROUP	1	GAH81966	GAH81966	GAH81966
		HORIZONTAL FOOT GROUP	1	GAH81967	GAH81967	GAH81967
	18	HOUSING–BEARING (GEAR END)				
		LIP SEAL	1	900894082301	900894082301	900894082301
		MECHANICAL	1	200GAH006	200GAH006	200GAH006
	19	DOWEL PIN	4	62M48	62M48	62M48
	20	LIFTING LUG	2	200GAF451	200GAF451	200GAF451
	21	SCREW–HEADPLATES TO IMPELLER CASE	36	655EE060	655EE060	655EE060
	22	IMPELLER CASE	1	900653021708	910613746808	910613747008
	23	SHAFT ASSEMBLY GROUP	1	GAH81968	GAH81970	GAH81969
		SHAFT ASSEMBLY GROUP CONSISTS OF: (1) ASSEMBLY SHAFT – LONG (1) ASSEMBLY SHAFT – SHORT				
	24	HOUSING–BEARING (DRIVE END)				
		LIP SEAL	1	900894082101	900894082101	900894082101
		MECHANICAL SEAL	1	201GAH006	201GAH006	201GAH006
	25	DRIVE KEY	1	900639910407	900639910407	900639910407
	26	GREASE FITTING	2	911659990606	911659990606	911659990606
	27	GREASE FITTING CAP	2	40P41	40P41	40P41
	28	WAVY SPRING	2	900669170708	900669170708	900669170708
	29	DRIVE COVER	1	900693086301	900693086301	900693086301
	30	SCREW–DRIVE COVER TO HEADPLATE	8	655ED030	655ED030	655ED030
Ø	31	DRIVE SEAL	1	60DD676	60DD676	60DD676
	32	SPACER–GEAR END	2	900811060403	900811060403	900811060403
	33	SPACER–GEAR & DRIVE END – SEAL/BRG	3	900871060803	900871060803	900871060803
	34	SPACER–DRIVE END DRIVE SHAFT–SEAL/BRG	1	202GAH144	202GAH144	202GAH144
Ø	35	BEARING–DRIVE END DRIVE SHAFT	1	910721070501	910721070501	910721070501
	36	THREADED TAPER PIN	2	62V69	62V69	62V69
	37	WASHER–GEAR	8	900649440507	900649440507	900649440507
	38	SCREW–TIMING HUB TO GEAR	8	655EE080	655EE080	655EE080
	39	HUB–TIMING	2	900713060103	900713060103	900713060103
	40	GAUGE–OIL LEVEL	1	8501275	8501275	8501275
*	41	SPACER–DRIVE END DRIVE SHAFT–HD PLT–BRG REQUIRED WITH MECHANICAL SEAL UNITS	1	900881082401	900881082401	900881082401
*	42	PLUGS REQUIRED WITH MECHANICAL SEAL UNITS	8	64AC3	64AC3	64AC3
	43	DRIVEN COVER	1	900693086401	900693086401	900693086401
Ø		OVERHAUL KIT LIP SEAL	0	GAH81972	GAH81972	GAH81972
Ø		OVERHAUL KIT MECHANICAL SEAL	0	GAH81971	GAH81971	GAH81971

* NOT SHOWN

Ø INCLUDED IN OVERHAUL KIT.

Gardner Denver

100 GARDNER PARK
PEACHTREE CITY, GA 30269
TEL: (770) 632-5000 FAX: (770) 486-5629

WARRANTY

SUTORBILT BLOWERS
SUTORBILT LEGEND SERIES

GENERAL PROVISIONS AND LIMITATIONS

Gardner Denver (the "Company") warrants to each original retail purchaser ("Purchaser") of its new products from the Company or its authorized distributor that such products are, at the time of delivery to the Purchaser, made with good material and workmanship. No warranty is made with respect to:

1. Any product which has been repaired or altered in such a way, in the Company's judgment, as to affect the product adversely.
2. Any product which has, in the Company's judgment been subject to negligence, accident, improper storage, or improper installation or application.
3. Any product which has not been operated or maintained in accordance with normal practice and with the recommendations of the Company.
4. Components or accessories manufactured, warranted and serviced by others.
5. Any reconditioned or prior owned product.

Claims for items described in (4) above should be submitted directly to the manufacturer.

WARRANTY PERIOD

The Company's obligation under this warranty is limited to repairing or, at its option, replacing, during normal business hours at an authorized service facility of the Company, any part which in its judgment proved not to be as warranted within the applicable Warranty Period as follows.

BARE BLOWERS

Basic bare blowers, consisting of all parts within, are warranted for 18 months from date of initial use or 24 months from date of shipment to the first purchaser, whichever occurs first.

Any disassembly or partial disassembly of the blower, or failure to return the "unopened" blower per Company instructions, will be cause for denial of warranty.

OTHER COMPONENTS

All other components are warranted for 12 months from date of initial use or 18 months from date of shipment to first purchaser, whichever comes first.

The Company reserves the right to withdraw the Uncontested Warranty where evidence indicates application outside the stated performance area, or where there is evidence of abuse

LABOR TRANSPORTATION AND INSPECTION

The Company will provide labor, by Company representative or authorized service personnel, for repair or replacement of any product or part thereof which in the Company's judgment is proved not to be as warranted. Labor shall be limited to the amount specified in the Company's labor rate schedule.

Labor costs in excess of the Company rate schedule amounts or labor provided by unauthorized service personnel is not provided for by this warranty.

Transportation of Company's choice, within the continental United States, is covered by this warranty for replacement of any blower which in the Company's judgement proved not to be as warranted. For user locations outside the continental United States, the Company will provide transportation, by the carrier of its choice to and from the nearest Authorized Distributor and the Company's designated facility. The Company may require the return of any blower claimed not to be as warranted to one of its facilities as designated by the Company, transportation prepaid by Purchaser, to establish a claim under this warranty.

Replacement parts provided under the terms of the warranty are warranted for the remainder of the Warranty Period of the product upon which installed to the same extent as if such parts were original components thereof.

DISCLAIMER

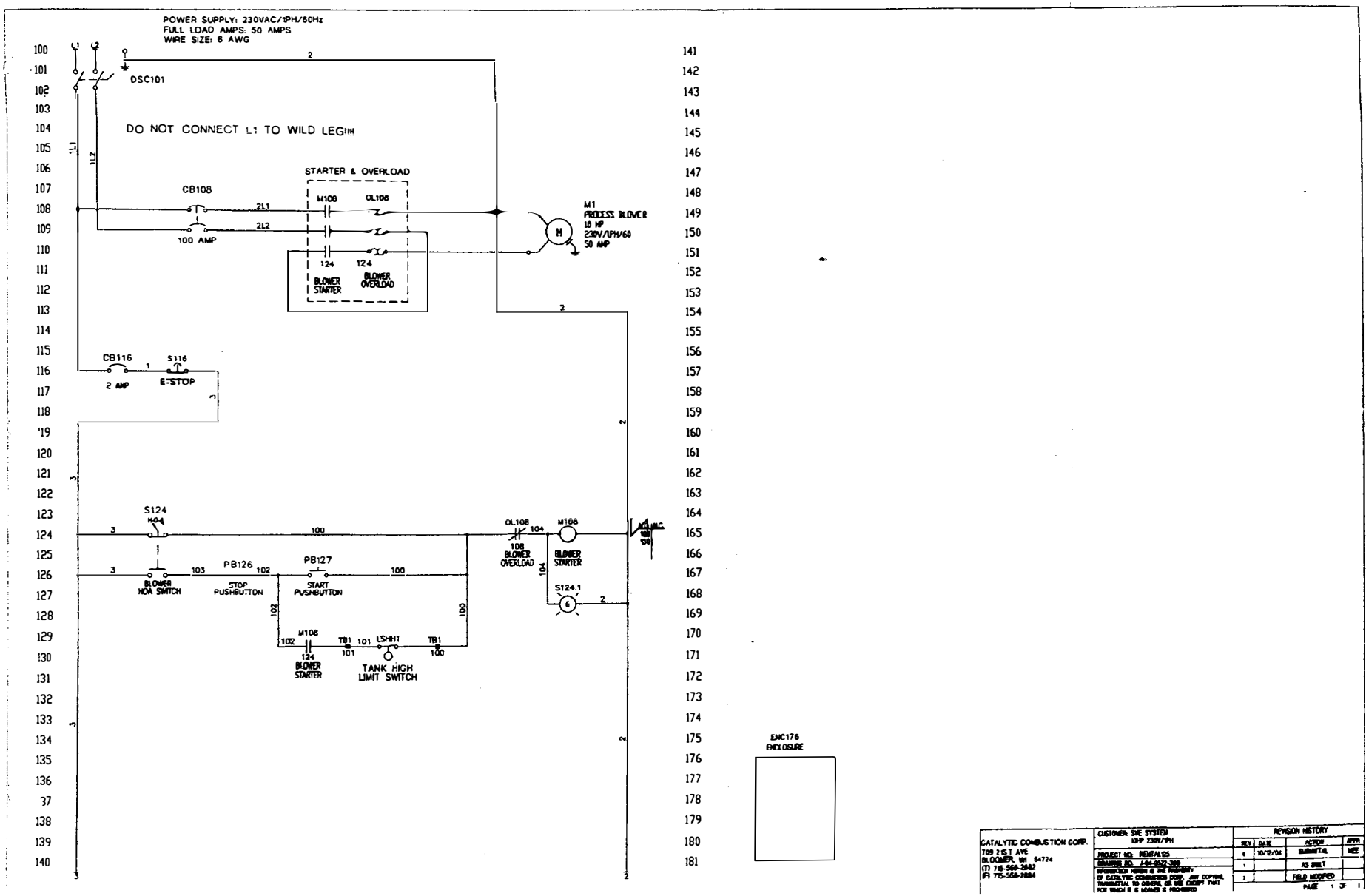
THE FOREGOING WARRANTY IS EXCLUSIVE AND IT IS EXPRESSLY AGREED THAT, EXCEPT AS TO TITLE, THE COMPANY MAKES NO OTHER WARRANTIES, EXPRESSED, IMPLIED OR STATUTORY, INCLUDING ANY IMPLIED WARRANTY OF MERCHANTABILITY.

THE REMEDY PROVIDED UNDER THIS WARRANTY SHALL BE THE SOLE, EXCLUSIVE AND ONLY REMEDY AVAILABLE TO PURCHASER AND IN NO CASE SHALL THE COMPANY BE SUBJECT TO ANY OTHER OBLIGATIONS OR LIABILITIES. UNDER NO CIRCUMSTANCES SHALL THE COMPANY BE LIABLE FOR SPECIAL, INDIRECT, INCIDENTAL OR CONSEQUENTIAL DAMAGES, EXPENSES, LOSSES OR DELAYS HOWSOEVER CAUSED.

No statement, representation, agreement, or understanding, oral or written, made by any agent, distributor, representative, or employee of the Company which is not contained in this Warranty will be binding upon the Company unless made in writing and executed by an officer of the Company.

This warranty shall not be effective as to any claim which is not presented within 30 days after the date upon which the product is claimed not to have been as warranted. Any action for breach of this warranty must be commenced within one year after the date upon which the cause of action occurred.

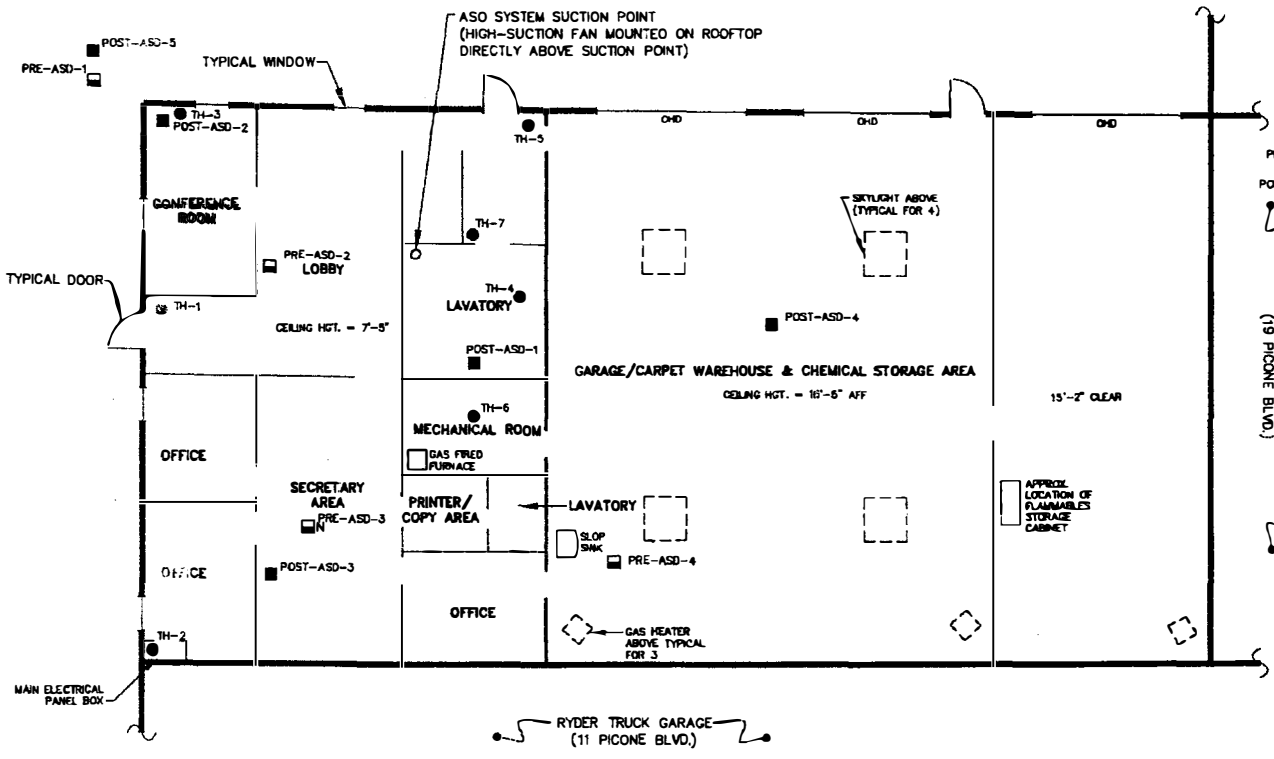
Any adjustment made pursuant to this warranty shall not be construed as an admission by the Company that any product was not as warranted.



CATALYTIC COMBUSTION CORP. 709 21 S T AVE BLOOMER, WI 54724 (T) 715-568-3882 (F) 715-568-2884	CUSTOMER SVE SYSTEM 10HP 230V/1PH PROJECT NO. REMEDIES DRAWING NO. J-04-0432-300 INFORMATION HEREIN IS THE PROPERTY OF CATALYTIC COMBUSTION CORP. AND SUPPLIED FOR TRANSMITTAL TO OWNER, OR USE EXCEPT THAT FOR WHICH IT IS LOANED IS PROHIBITED	REVISION HISTORY REV | DATE | ACTION | APPR 0 | 10/12/04 | SUBMITTAL | MEE 1 | | AS BUILT | 2 | | FIELD MODIFIED | PAGE 1 OF 1

APPENDIX A

ASD SYSTEM - BUILDING FLOOR PLAN (BBL FIGURE 1)
- ASD EQUIPMENT SPECIFICATION SHEETS



LEGEND:

PRE-ASD-1 ■ PRE-ASD AIR SAMPLING LOCATION

POST-ASD-1 ■ POST-ASD AIR SAMPLING LOCATION

TH-1 ● DIFFERENTIAL PRESSURE MEASUREMENT

SOURCE:

ALL BASE MAP INFORMATION UNLESS OTHERWISE NOTED WAS TAKEN FROM A MAP ENTITLED, "FLOOR PLAN OF EXISTING BUILDING – BUILDING LOCATED AT 20 PICONE BOULEVARD, FARMINGDALE, NY," PREPARED BY LITTLE JOSEPH REALTY, INC., JOB NO. 91-117, SCTM# 100-35-1-31.4, LAST REVISED 5/29/91.

NOTES:

1. OHD = OVERHEAD DOOR
2. AFF = ABOVE FINISHED DOOR
3. SAMPLE LOCATION DESIGNATION PREFIX "PRE-ASD" INDICATES SAMPLING AT THIS LOCATION WAS CONDUCTED PRIOR TO INSTALLATION AND OPERATION OF THE ACTIVE SLAB DEPRESSURIZATION (ASD) SYSTEM.
4. SAMPLE LOCATION DESIGNATION PREFIX "POST-ASD" INDICATES SAMPLING AT THIS LOCATION WAS CONDUCTED FOLLOWING INSTALLATION AND OPERATION OF THE ASD SYSTEM.

0 10' 20'

GRAPHIC SCALE

FORMER R&D CARPET AND TILE BUILDING
20 PICONE BOULEVARD
FARMINGDALE, NEW YORK

ASD SYSTEM SUMMARY REPORT

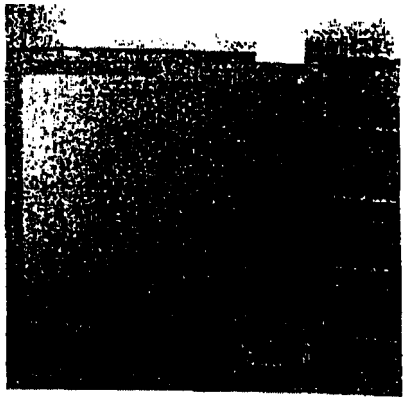
AIR SAMPLING LOCATIONS & DIFFERENTIAL PRESSURE MEASUREMENT LOCATIONS

BBL BABAND BOUCK & LEE, INC.

FIGURE 1

High Suction Series

Proven solution to tough mitigations: up to 25 times the suction of inline tube fans to deal with sand, dirt or clay sub-slab material.



Features:

- **Internal condensate bypass**
- **Brackets for vertical mount indoors or outdoors**
- **Inlet: 3.0" PVC/Outlet: 2.0" PVC**
- **Weight: 18 lbs.**
- **Size: 15"W x 13"H x 8"D**
- **Warranty: 1 year (3 year option available - see below)**

Model Selection Guidelines:

HS2000 - High suction and high flow for large areas such as schools and commercial buildings.

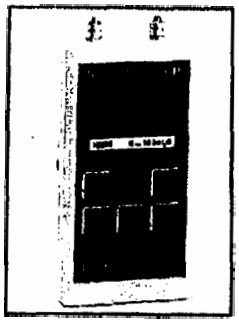
HS3000 - Single family homes with very tight sub-slab material.

HS5000 - For extremely tight sub-slab material or where the number of holes is restricted. Also useful for high altitudes.

Model	P/N	Watts	Max. Pressure "WC	Typical CFM vs. Static Pressure WC					
				0"	10"	15"	20"	25"	35"
HS2000	23004-1	150-270	18	110	72	40	-	-	-
HS3000	23004-2	105-195	27	40	33	30	23	18	-
HS5000	23004-3	180-320	50	53	47	42	38	34	24

Each fan includes 6ft. 18 ga. power cord with 3 prong plug.

HM28 Hand Held Digital Manometer



The Love Controls Series HM28 Digital Hand-Held Manometer is a precision instrument designed to measure a wide range of pressures to a very high accuracy. The unit incorporates a variety of features in an easy to use format that makes it useful in a wide variety of applications. Features include: measurement in all common pressure ranges, display resolution to 0.001, differential or relative measurement, two line liquid crystal display, and adjustable auto power off to conserve battery.

We are so proud of the accuracy of the HM28 that we provide a certificate of calibration with the unit at no additional cost. Depending on your application, the HM28 can be used as a secondary calibration standard for your other pressure instrumentation.

STANDARD FEATURES

- Microprocessor based
- Differential, Gage, or Absolute
- High accuracy, 0.2%, 0.1%, or 0.05% with Calibration Certificate
- Selectable Scales
- Resolution to 0.000 of selected unit
- Peak and Valley indication
- Hold Function
- Programmable Display
- Memory for up to 964 readings
- Output for Optional Printer or Computer Interface

Input Ranges

RANGE US	RANGE METRIC	OVERPRESSURE
gauge, underpressure and differential pressure		
0...10 inH_2O	0...2.5 kPa	12.5 kPa (50 inH_2O)
0...28 inH_2O	0...7 kPa	35.0 kPa (140 inH_2O)
0...80 inH_2O	0...20 kPa	150 kPa (600 inH_2O)
0...120 inH_2O	0...30 kPa	150 kPa (600 inH_2O)
0...200 inH_2O	0...50 kPa	400 kPa (1600inH_2O)
0...14.5 psi	0...100 kPa	400 kPa (58 psi)
0...29 psi	0...200 kPa	700 kPa (100 psi)
0...100psi	0...700 kPa	1700 kPa (246 psi)
0...145 psi	0...1000 kPa	2700 kPa (390 psi)
0...245 psi	0...1700 kPa	2700 kPa (390 psi)

RANGE US	RANGE METRIC	OVERPRESSURE
for gauge, media compatible with 18/8 SS (DIN 1.4305)		
0...14.5 psi	0...100 kPa	200 kPa (29 psi)
0...29 psi	0...200 kPa	400 kPa (58 ps.)i
0...100 psi	0...700 kPa	1400 kPa (203 psi)
0...145 psi	0...1000 kPa	3400 kPa (493 psi)
0...245 psi	0...1700 kPa	3400 kPa (493 psi)
0...435 psi	0...3000 kPa	7000 kPa (1015 psi)
0...1000 psi	0...7000 kPa	14000 kPa (2030 psi)

HOW TO ORDER

Specify by part number.

Error limit 0.2% F.S. for gauge, underpressure and differential pressure

0... 10	inH_2O	(2.5 kPa)	HM28**D3B1**0000
0... 28	inH_2O	(7 kPa)	HM28**D3C1**0000
0... 80	inH_2O	(20 kPa)	HM28**D3E1**0000
0... 120	inH_2O	(30 kPa)	HM28**D3F1**0000
0... 200	inH_2O	(50 kPa)	HM28**D3G1**0000
0... 14.5	psi	(100 kPa)	HM28**D3H1**0000
0... 29	psi	(200 kPa)	HM28**D3J1**0000
0... 100	psi	(700 kPa)	HM28**D3K1**0000
0... 145	psi	(1000 kPa)	HM28**D3L1**1000
0... 245	psi	(1700 kPa)	HM28**D3M1**1000

For gauge, media compatible with 18/8 (DIN 1.4305)

0... 14.5	psi	(100 kPa)	HM28**G3T1**1000
0... 29	psi	(200 kPa)	HM28**G3U1**1000
0... 100	psi	(700 kPa)	HM28**G3V1**1000
0... 145	psi	(1000 kPa)	HM28**G3P1**1000
0... 245	psi	(1700 kPa)	HM28**G3W1**1000
0... 435	psi	(3000 kPa)	HM28**G3N1**1000
0... 1000	psi	(7000 kPa)	HM28**G3R1**1000

Order Code for error limit 0.1% F.S. HM28XXX**2**XXXX
(Replace eighth character '1' with '2')

Error limit 0.05% F.S. for gauge, underpressure and differential pressure

0... 28	inH_2O	(7 kPa)	HM28**D3C3**0000
0... 120	inH_2O	(30 kPa)	HM28**D3F3**0000
0... 14.5	psi	(100 kPa)	HM28**D3H3**0000
0... 29	psi	(200 kPa)	HM28**D3J3**0000
0... 100	psi	(700 kPa)	HM28**D3K3**0000
0... 245	psi	(1700 kPa)	HM28**D3M3**1000

For absolute pressure

0... 15.9	pisa	0.2% F.S. (110 kPa abs)	HM28**A3I1**0000
0... 15.9	pisa	0.1% F.S. (110 kPa abs)	HM28**A3I2**0000
0... 29	pisa	0.2% F.S. (200 kPa abs)	HM28**A3J1**0000
0... 29	pisa	0.1% F.S. (200 kPa abs)	HM28**A3J2**0000
0... 29	pisa	0.05% F.S. (200 kPa abs)	HM28**A3J3**0000
0... 100	pisa	0.2% F.S. (700 kPa abs)	HM28**A3K1**0000
0... 100	pisa	0.1% F.S. (700 kPa abs)	HM28**A3K2**0000

Options

Communication-Software and measuring places management	21.14110.14
PC-cable	21.13362.14

SCS-certificate (new instruments include a free SCS certificate)

Returned units may be recertified at extra charge.

Soft Case (See L472 for details) L402-A

SPECIFICATIONS

Pressure Connection: Hose; 4/6mm or 1/8" NPT

Scales (Selectable):
Ranges 25 mbar to 7 bar: mbar, bar, Pa, kPa, hPa, mmH_2O, mmHg, psi, inH_2O, inHg.
Ranges 10 bar to 300 bar: mbar, bar, kPa, hPa, MPa, mmH_2O, mmHg, psi, inH_2O, inHg.
Ranges 70 bar: mbar, bar, kPa, MPa, mH_2O, psi, inH_2O.

Accuracy (includes linearity, hysteresis, and repeatability): per order code.
±0.20% full scale ± 1 digit
±0.10% full scale ± 1 digit
±0.05% full scale ± 1 digit

Measuring Media: Instrument Air or Inert Gases.
For HM28G3XXXXX, Any material compatible with 18/8 stainless steel.

Operating Conditions:

Operating Temperature: -5° to +50°C (23° to 122°F)

Storage Temperature: -20° to +60°C (-4° to +140°F)

Humidity: 30 to 95% rH, non-condensing.

Display: 2 line, 16 character, dot matrix LCD, with switchable display sizes.

Battery: 9V alkaline (included). Can operate from external power supply of 7 to 14 VDC.

Current Consumption: <9mA.

Memory: 964 measured values. Recording intervals adjustable from manual, 1, 5, 10, 20, 30 seconds, 1, 2, 3, 5, 10, 30, 60 minutes.

Case Protection: IP54.

Case Dimensions: 152 x 83 x 34 mm (6 x 3.27 x 1.34 inches)

Weight: 270 g (9.5 oz).

Maximum Measurement Rates:

Stand alone: 2-1/2 readings/sec (0.1% and 0.05% ratings), 5 readings/sec (0.2% rating).

Output to RS-232: 20 measurements/sec (0.2% rating). 10 measurements/sec (0.1% and 0.05% ratings.

RS-232 Baud Rate: Adjustable, 1200, 2400, 4800, or 9600 baud.