

OPERATION AND MAINTENANCE MANUAL

PEMACO SUPERFUND SITE

**5050 E. Slauson Avenue
Maywood, California**

Volume I

O&M Manual, Tables, Appendices, As-Built Drawings

Prepared for:

**U.S. Environmental Protection Agency
Region V
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FOR

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U.S. Environmental Protection Agency – Region V
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November 2010


Review and Approval

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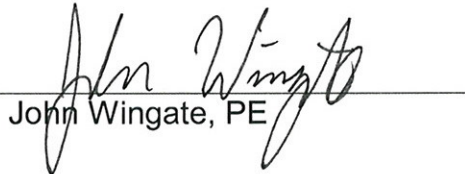
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ACRONYMS AND ABBREVIATIONS

ABS	Acrylonitrile-Butadiene-Styrene
BGS	Below Ground Surface
BTU	British Thermal Units
CFM	Cubic Feet per Minute
°F	Degrees Fahrenheit
DPE	Dual Phase Extraction
ERH	Electrical Resistance Heating
FQI	Flow Quantity Totalizer
FTO	Flameless Thermal Oxidizer
GAC	Granular Activated Carbon
GPD	Gallons per Day
GPM	Gallons per Minute
GTS	Groundwater Treatment System
HOA	Hand-Off-Auto
HP	Horsepower
HSP	Health and Safety Plan
LB(s)	Pound(s)
LCP	Local Control Panel
LEL	Lower Explosive Limit
LRP	Liquid-ring vacuum pump
LSH	Level Switch High
LSHH	Level Switch High High
LSL	Level Switch Low
LSLL	Level Switch Low Low
MCP	Main Control Panel
MSDS	Material Safety Data Sheet(s)
O&M	Operation and Maintenance
OSHA	Occupational Safety and Health Administration
OTIE	Oneida Total Integrated Enterprises
P&ID	Piping and Instrumentation Diagram
PD	Positive Displacement
PLC	Programmable Logic Controller
PPMV	Parts Per Million by Volume
PSI	Pounds per Square Inch
PSIG	Pounds per Square Inch Gauge
PVC	Polyvinyl Chloride
RPM	Revolutions per Minute

ACRONYMS AND ABBREVIATIONS (continued)

SCAQMD	South Coast Air Quality Management District
SCE	Southern California Edison
SCFM	Standard Cubic Feet per Minute
SDLAC	Sanitation District of Los Angeles County
SVE	Soil Vapor Extraction
TDH	Total Discharge Head
TEFC	Totally Enclosed Fan Cooled
USEPA	U.S. Environmental Protection Agency
VFD	Variable Frequency Drive
VTs	Vapor Treatment System
VOC	Volatile Organic Compound
W.C.	Water Column

1.0 INTRODUCTION

This operation and maintenance (O&M) manual is applicable to the Pemaco treatment system, which consists of dual-phase extraction (DPE), groundwater extraction, and soil vapor extraction components. It has been prepared for the U.S. Environmental Protection Agency (USEPA), the current owner, and Sullivan International Group (Sullivan), the current operator. This manual consists of one volume of operating instructions (Volume I) and one volume of vendor data (Volume II) containing manufacturers' instructions and information regarding individual treatment system components. The treatment system is located on the Maywood Riverfront Park property. The legal address is 5050 East Slauson Avenue Maywood, California. [Drawing G-1](#) shows an area map and site location map.

1.1 PURPOSE AND SCOPE

This manual describes the O&M requirements for the treatment system and provides the basis for an operator-training program.

Throughout this manual, references are made to manufacturers' detailed instructions that are organized under tabs in the Vendor Data section. Each section of the O&M manual should be read carefully and understood by all operating personnel before attempting to operate the treatment system.

1.2 PROCESS FLOW DESCRIPTION

The treatment system described in this manual is an automated, vapor and groundwater treatment system that has been designed to reduce the mass of volatile organic compounds (VOCs), primarily TCE, present in soil vapor and groundwater. The groundwater treatment system (GTS) and vapor treatment system (VTS) are designed to operate independently of each other. The treatment system is located within a steel frame building (treatment plant) approximately 80 feet long x 48 feet wide with a 4-inch tall concrete containment berm to contain any possible spills or leaks.

Groundwater is extracted from the subsurface using bottom loading pneumatic submersible pumps, also called total fluids pumps, which are installed in the exposition zone extraction wells. A total of thirty-three pneumatic submersible pumps are removing groundwater from the corresponding number of exposition zone extraction wells. Refer to [Drawing C-2](#). Piping from the extraction wells is constructed below ground and piping in the treatment plant is constructed aboveground. Extracted groundwater is pumped to a groundwater booster tank (T-401) where some suspended solids settle out. Groundwater is then pumped by transfer pump (P-401) through a multiple bag filter housing (F-401) with a single bag filter bypass (F-402) to a 5,000-gallon holding tank (T-402). A variable speed drive (VFD) transfer pump (P-402) then pumps the groundwater through another set of single bag filters (F-403 & F-404), a flow totalizer (FQI-402), and finally through two liquid-phase carbon adsorbers (T-403 & T-404) operated in series. Each adsorber contains 3,000 lbs of granular activated carbon (GAC). After passing through the carbon adsorbers, the treated water is then discharged to a sampling box (T-405) prior to discharging to the sanitary sewer. Sampling of the treated water entering the sanitary sewer is performed in accordance with Sanitation District of Los Angeles County (SDLAC) sampling requirements and associated permits to operate.

Treatment of the contaminated soil vapors can be conducted concurrently with groundwater extraction, but the vapor treatment system can also function independently from the GTS. The remediation system will separate the condensate from extracted vapors and treat the removed condensate using the GTS, prior to discharge to the sanitary sewer.

Soil vapors are extracted from the extraction wells using two 75-hp liquid-ring vacuum pumps (LRPs, B-101 & B-102) to provide the required vacuum, which is 12-inches of Hg ($\pm 20\%$) at the wellhead. The vapor stream initially passes through a 500-gallon moisture separator (T-101) to remove any entrained water. The separated water is stored in T-101 and sent by a transfer pump (P-501) through bag filters (F-501 & F-502) to holding tank T-402 of the GTS. After T-101, the vapor stream passes through the particulate filters (F-101 & F-102) to remove any particles in the vapor stream. After passing through the LRPs, the vapor stream then passes through the oil mist filters (F-103 & F-104) to knock out any oil trapped in the vapor stream. Residual oil that is not removed by the oil mist filters is intercepted by oil scavenging lines and returned to the LRPs.

Then the vapor stream enters a three stage heat exchanger (H-201) with a vapor conditioning package (VCP). The VCP includes a cooling tower (CT-201) and a refrigerated chiller (RC-201). The cooling tower pump (P-203) circulates potable water through the first two stages of H-201 heat exchanger. The heat from the vapor stream is transferred to the water which is then circulated through CT-201 cooling tower where the heat is dissipated. RC-201 refrigerated chiller (currently not in use) supplies potable water, cooled down to about 40° F, to the third stage of H-201 heat exchanger as a final step to further reduce the temperature of the vapor stream. It was mostly required during the electrical resistance heating (ERH) part of the remediation, which has concluded. As the temperature of the vapor stream decreases, excess moisture is knocked out of the vapor stream and collected in a condensate tank (T-201). The vapor stream exiting the third stage of H-201 then passes through a vapor heater (H-202) to increase the temperature of the vapor stream, thereby reducing the relative humidity and improving conditions for carbon adsorption. The vapor stream then passes through two vapor phase carbon adsorption vessels (T-301 & T-302) operated in series. Each vessel contains 4,000 lbs of granular activated carbon (GAC). A positive displacement (PD) blower (B-301) pulls the treated vapors through the carbon adsorbers and discharges them through a stack through the roof of the building to the atmosphere. The discharge stack is 8-inch diameter fiberglass epoxy pipe and 30 feet tall above the ground.

The O&M manual is designed to be used in conjunction with the as-built drawings. The as-built drawings include treatment system details, pipe and trench location plans, well vault details, piping and instrumentation diagrams, electrical plans, and additional system details. An equipment summary list is provided in [Table 1](#). [Drawing M-4](#) presents the treatment plant layout and general process flow. [Drawings M-1](#) and [M-1A](#) present the process and instrumentation diagram for the Pemaco treatment system.

[Table 2](#) provides a list that cross-references major equipment by their designation on the PI&D [Drawings M-1](#) and [M-1A](#) and corresponding vendor data information. [Table 3](#) summarized the as-built extraction well specifications.

1.3 OPERATING PERSONNEL REQUIREMENTS

The operator is responsible for the daily O&M of the treatment system. Additionally, the operator is responsible for operating the system safely and ensuring that it complies with all treatment requirements and effluent limitations. The operator is also responsible for preparation of the daily reports and data logs that summarize the operation of the treatment system.

The operator is responsible for revision, when appropriate, of this O&M manual. Upon revision of this manual, the operator shall perform the following tasks:

- Revise date of manual on operating instructions as well as all cover and binder spines.
- Revise revision number of manual on operating instructions as well as cover and binder spines.
- Make appropriate revisions on software copies as well as in the appropriate back up copies located in the field trailer/office.

2.0 OPERATING PROCEDURES

2.1 OPERATING PHILOSOPHY

The operating philosophy for the Pemaco treatment system includes:

1. The system is to be operated as to protect the health and safety of site workers and the public.
2. The system is to be operated in compliance with all applicable air and water discharge requirements.
3. The system is to be operated with a minimum of downtime.
4. The system is to be operated so that the mass of VOCs removed is maximized while operating costs are minimized.

2.2 PREPARATION FOR STARTING THE TREATMENT SYSTEMS

Start-up preparation involves ensuring that equipment, piping, instruments, electrical, and control system components are in the proper configuration required to operate the treatment systems. Components that have undergone maintenance will require individual inspection and configuration. All breakers for groundwater operation or vapor operation or both should be verified "ON" in the electrical room in the plant. [The bucket assignments are outlined in Appendix B – Pemaco System Controls and Operation.](#) The system main computer (SMC), located in the control room should have power and be turned on. There is a desktop icon labeled "Pemaco". Double clicking on this icon will launch the treatment system control program. [Appendix B](#) has detailed information regarding the startup of the control program and software installed on the SMC. Once the SMC is on and the control program is loaded for operation, the program should never be closed and the computer should never be turned off. The water pressure boost system should be turned off, as it is associated with the FTO and is no longer needed. The valves of the water pressure boost system should be left open.

This start-up preparation procedure assumes that valves are in start up positions prior to commencing this procedure. Valve tag numbers and locations are shown in [Drawings M-1 and M-1A](#). This procedure also assumes that all treatment system components are ready for operation. Note: The treatment system was commissioned in Spring-Summer of 2007. Additionally, this procedure assumes that the operator performing the procedure has been trained in the operation of the treatment system, and has knowledge and experience in equipment and instrument operation.

Before the GTS or VTS are started, the extraction wells must be inspected for operation. The following tasks are required at the well vault to prepare the wells for groundwater and vapor extraction:

1. Prior to accessing the well vault, refer to the Accident Prevention Plan (TN&A 2007) and Activity Hazard Analysis (AHA) tables, for well vault health and safety considerations, and then proceed with opening and entering the well vault.
2. Verify that the discharge sample port is closed.

3. Open air supply ball valve in each groundwater extraction well that is to be operated.
4. Open extracted vapor isolation ball valve in each extraction well.
5. Check and record air regulator and air pulse counter reading. Adjust air pressure as required by manufacturer's recommendations. Do not over-pressurize.
6. Open extracted fluids isolation ball valve in each extraction well that is to be operated.
7. Verify water level access ports are closed.
8. Close vault lid on each extraction well and bolt down.

2.2.1 Emergency Shutdown

There are four emergency shutdown switches (E-stop switches) located throughout the system and, when engaged, will immediately stop all system components. Prior to any type of system startup (GTS or VTS or both), the operator should be familiar with the locations of the emergency shutdown switches. These are for emergency use only. E-stop switches are located at the following locations:

Vapor Conditioning Panel: Pressing the E-Stop button removes power from all vapor conditioning motor contactors, with the exception of RC-201 refrigerated chiller. A hard wired signal is sent to the Main Control Panel and removes power to all system enable outputs.

Liquid Ring Pump Panel: Pressing the E-Stop button removes power from all LRP motor contactors. A hard wired signal is sent to the Main Control Panel and removes power to all system enable outputs.

Main Control Panel: Pressing the E-stop button removes power to all system enable signals.

Building E-Stop: Building E-Stop is located by T-403 & T-404 liquid carbon adsorbers. Pressing the E-Stop button sends a hard wired signal to the Main Control Panel and removes power to all system enable signals.

Refer to [Drawing M-4](#) for these E-stop switch locations.

Also, the treatment system control program (on SMC) has a "STOP" button that may be clicked on to shutdown all systems. Whether using an E-Stop button or shutting the system down via the SMC, the operator will need to manually unplug the chlorine injection pump since it is powered from a wall outlet and not connected to the SMC.

2.2.2 Startup after a Prolonged Shutdown

The following procedures should be followed after a prolonged shutdown or maintenance. SKIP SECTION 2.2.2 AND PROCEED TO THE NORMAL START-UP PROCEDURES IN SECTION 2.3 IF THE SYSTEM HAS ALREADY BEEN ADJUSTED FOR DAILY OPERATION.

If the GTS has been shut down for a prolonged period time for maintenance, it is important to walk through and confirm the following valves are open: V-402, V-404, V-406, V-412, V-414, V-

416, V-417, V-418, V-419, V-422, V-425, V-426, V-427, V-428, and V-429. These valves may have been closed to isolate bag filters or carbon vessels and must be in the open position for operation of the groundwater system. **Important note:** Isolation valve V-407 must also be checked to verify it is open. This is an auto-operated valve. If this valve has been left closed or the auto mechanism has failed in closed position, the well pumps will pump against a closed valve and no water will enter T-401. Operating well pumps against a closed V-107 valve will put stress on all well pumps and as well as the valve itself.

The positions for all inlet and outlet valves for the liquid carbon adsorbers V-432 through V-435 (for T-404) and V-441 through V-444 (for T-403) must also be inspected to ensure they are configured to allow water to pass through the two adsorbers in series flow before leaving the plant through FQI-402.

If the VTS has been shut down for a prolonged period for maintenance, it is important to confirm the following valves are open: V-101, V-102, V-103, V-104, V-105, V-106, V-107, V-108, V-109, V-501, V-503, V-506, V-507, V-508, V-509, V-112, V-113, V-114, V-115, V-116, V-117, V-118, V-121, V-122, V-123, V-124, V-125, V-126, and V-320. The positions for all inlet and outlet valves for the vapor phase carbon adsorbers V-301 through V-305 (for T-301) and V-310 through V-315 (for T-302) must also be inspected to ensure they are configured to allow vapor to pass through the two adsorbers in series flow. One of these two valves, V-310 or V-311, should be open.

For operation of the vapor conditioning package, the valves V-210 and V-217 must be open.

If the air compressor has been offline, it is important to verify that isolation valves V-601 and V-604 are open. In addition, all breakers in the electrical room should be verified “ON” for operation, the SMC in the control room should be booted up and ready for system startup and the timers on the water softener (F-801) should be checked so the water softener system is ready for operation.

2.3 NORMAL STARTUP PROCEDURES

Before any system startup, confirm that the system valves are in the operation positions. Confirm the set points on the SMC according to [Table 4 – Alarm List and System Control Set Points](#), or as adjusted. Failure to verify proper valve and control settings may result in potentially hazardous discharge, personal injury, or property damage.

The system is configured to run as a GTS, or a VTS, or both simultaneously. The systems can only be started, stopped, and reset from the “System Overview” screen on the SMC.

GTS Start

No critical system alarms may be present prior to starting the GTS and all selector switches must be in the AUTO position.

1. Clear system alarms by following procedures in [Section 2.5](#).
2. Start GTS by clicking “ON” button on System Overview Screen (automatic functions below)

- a. (Automated Function) V-407 well field isolation valve opens
- b. (Automated Function) P-502 secondary containment sump pump is enabled
- c. (Automated Function) P-401 groundwater booster pump is enabled
- d. (Automated Function) P-402 holding tank transfer pump starts pumping to maintain set pressure point on T-402 holding tank at PT-402 pressure transmitter.
- e. (Automated Function) Normal operation

NOTE: The groundwater treatment system may be "ON" with no pumps running depending on liquid levels in the tanks. Use extreme caution when servicing the groundwater system components as these will start automatically.

VTS Start

No critical system alarms may be present prior to starting the VTS and all selector switches must be in the AUTO position.

1. Clear system alarms by following procedures in [Section 2.5](#).
2. Start VTS by clicking "START" button on System Overview screen (automatic functions follow)
 - a. (Automated Function) CT-201 cooling tower fan starts
 - b. (Automated Function) P-201 cooling tower pump starts
 - c. (Automated Function) P-202 refrigerated chiller pump starts
 - d. (Automated Function) Wait 30 seconds
 - e. (Automated Function) RC-201 refrigerated chiller starts
 - f. (Automated Function) Wait 2 minutes
 - g. (Automated Function) B-301 PD carbon polish blower starts
 - h. (Automated Function) H-202 vapor heater enables
 - i. (Automated Function) P-203 condensate transfer pump is enabled
 - j. (Automated Function) P-502 secondary containment sump pump is enabled
 - k. (Automated Function) Position "Process Water Control" valve (V-452) to T-402 holding tank

- l. (Automated Function) B-101 & B-102 LRP blowers start. Note: This is a 60 second delay between the starts.
- m. (Automated Function) B-301 PD carbon polish blower adjusts VFD to maintain negative pressure at VT-201
- n. (Automated Function) Normal operation

2.4 NORMAL SHUTDOWN PROCEDURES

Each system, GTS and VTS, can be stopped individually or both at the same time. When system stop sequence is completed, the system is ready to be re-started.

GTS Stop

1. Press the “Groundwater System Stop” button on the “System Overview” screen.
2. The GTS will perform a normal shutdown.
3. All pumps stop and V-407 isolation valve closes.

VTS Stop

1. Press the “Vapor Treatment System Stop” button on the “System Overview” screen.
2. The VTS system will perform a normal shutdown.
3. All VTS and VCP components stop.

2.5 RESPONDING TO AN ALARM CONDITION

All system alarms must be cleared, acknowledged, and then reset to clear the alarm condition for the system.

To reset an alarm, follow the procedures below:

1. ***Determine which alarm occurred by observing the Alarm Banner line.*** Alarm banner will display the alarm and how many current alarms are present. When no alarms are present, the Alarm Banner will be blank and there will be zero alarms.

For example, LSHH-402 Holding Tank High-High Level Alarm.
2. ***Clear the alarm condition***

For example, if tank hits high-high level probe, pump the tank down manually until high-high level probe is cleared.
3. ***Press the “ACTIVE ALARMS” button.*** This will change the display to the “ACTIVE ALARMS” summary screen.
4. ***Press the “Ack All” button to acknowledge the alarms.*** The Alarm Banner clears and displays zero alarms

5. ***Go back to the “System Overview” screen***
6. ***Press the “Reset Button” on the “System Overview” screen.*** The red flashing “ALARM CONDITION” text will disappear

Once all alarms are cleared and reset, follow the normal startup procedures detailed in [Section 2.3](#).

3.0 GROUNDWATER & CONDENSATE TREATMENT COMPONENTS

3.1 PNEUMATIC SUBMERSIBLE PUMPS

Groundwater is extracted from the groundwater wells at the Pemaco Superfund Site using submersible, bottom loading pneumatic, total fluids pumps. The pumps are manufactured by QED Environmental Systems, Model Long AP4B, Long AP2B (MW-25-110), and Short AP2B (MW-33-90). The manufacturer manual is provided in Vendor Data, [Tab A](#).

Extraction well pumping rates have ranged from roughly 0 to 3 gpm. The pump intake is located at the bottom of the pump. Once the groundwater has filled the pump cylinder, a floating lever actuates a valve to allow compressed air inside the cylinder. Compressed air is supplied by a continuous duty air compressor (K-601) in the treatment plant. The compressed air then pushes the extracted groundwater up the discharge tubing through the well vault piping assembly towards T-401, the groundwater booster tank.

The extraction pumps are typically set approximately three feet above the bottom of the well to allow room for silt to settle out and reduce the amount of sediments pumped to the treatment plant. Pump depths should be adjusted as part of routine O&M to maximize extraction efficiency and minimize sediment uptake.

An air pulse counter, air regulator, pressure gauges and sample ports are located in each well vault. Refer to the as-built [Drawing C-8](#) for the well vault layout. The compressed air is regulated according to the manufacturer schedule, found in Air Consumption Curve of the QED AutoPump manual in [Tab A](#). Generally, each vault regulator is set between 70 ~ 80 psig. The air pulse counter records the number of discharge cycles and can be used to calculate flow per well based on the factor 0.6 gallons pumped per cycle. Refer to the QED AutoPump manual in [Tab A](#).

The frequency of pump maintenance depends upon the nature of the fluids being pumped: the more solids and contaminants that are pumped, the greater the maintenance requirements. The detailed maintenance procedures of extraction pumps are provided in [Appendix A](#). Following are some general maintenance checks that should be done periodically:

- Periodically inspect all hoses and connections for damage. Make sure that the hoses are not split or cracked and listen for leaks in the system.
- Check air filter and filter bowl drain on the pressure regulator/filter for saturation and operation every few weeks.
- Check the regulator to ensure the pressure setting has not drifted appreciably.
- Use the air pulse counter and discharge pressure readings to evaluate well performance and to determine when preventative maintenance should be performed.
- Evaluate pump set points (depth to pump inlet in well) to determine if the pump intake is properly located for optimizing groundwater removal.

3.2 GROUNDWATER EXTRACTION MANIFOLD

The groundwater extraction manifold consists of three groundwater headers (GW-1, GW-2, and GW-3) receiving groundwater from the well field. The groundwater manifold is constructed of 4-inch diameter Schedule 80 PVC pipe. The manifold outlet is controlled by the PLC via an actuated butterfly valve (V-407). The manifold and V-407 should be inspected on a routine, scheduled basis and the findings of the inspections recorded. The inspection should cover the following:

- Check the exterior of manifold and actuated valve for cracking, crazing, and brittle appearance.
- Check fittings and gaskets for leaks and signs of general corrosion and deterioration.

The butterfly valve of V-407 is manufactured by OSCAF Valves, Model 5213-09-0400, mounted with an electric actuator. The actuator is manufactured by TRIAC, Model ETI 1300. The installation & maintenance manual is provided in Vendor Data, [Tab B](#).

3.3 T-401 GROUNDWATER BOOSTER TANK

Groundwater from the extraction wells, as well as accumulated water in the condensate sumps outside the treatment plant, is pumped into a 905-gallon groundwater booster tank (T-401). The water level in T-401 is controlled by level switches which turn transfer pump P-401 on and off. The level switches serve to protect P-401 transfer pump from running dry and to protect T-401 booster tank against overflow.

The inlet piping to T-401 booster tank consists of Schedule 80 PVC piping flanged with viton gaskets. Tank fill piping consists of a 4-inch diameter PVC bulkhead fitting and 4-inch diameter Schedule 80 PVC interior drop pipe installed to the bottom of the tank. The outlet is a 3-inch diameter PVC bulkhead fitting with flexible connections to P-401 transfer pump to allow tank expansion/contraction and reduce piping vibration on T-401. The booster tank has a sight tube/level indicator with unions and isolation valves for quick disassembly and clean-out. T-401 is a high density, cross-linked polyethylene tank, flat-bottomed, domed top tank, 5'4" diameter by 6'9" tall. T-401 is equipped with an indoor seismic zone IV restraint system installed per manufacturer's requirements and a ladder.

T-401 booster tank should be inspected on a routine, scheduled basis and the findings of the inspections recorded. Prior to inspection, the exterior of the tank should be cleaned. The inspection should cover the following:

- Check the exterior and interior of the tank for cracking, crazing, and brittle appearance.
 - Pay particular attention to areas around fittings and where different planes of the tank radius into one another.
 - Use a bright light source to inspect the interior from the manway opening to avoid a confined space entry.
- Check fittings and exterior gaskets for leaks and signs of general corrosion and deterioration.

- Check sediments in the tank. If sediments build up more than 3-inches in height, the tank should be cleaned.

The detailed maintenance procedures of T-401 are provided in [Appendix A](#).

T-401 booster tank is manufactured by Poly Processing Company and manufacturer specifications are provided in Vendor Data, [Tab C](#).

3.4 P-401 TRANSFER PUMP

P-401 transfer pump transfers water from T-401 booster tank to T-402 holding tank at a maximum rate of approximately 110 gpm. It is controlled by the level switches of T-401. The transfer pump bearings are located in and are part of the motor. They are permanently lubricated therefore no greasing is required for P-401. The detailed disassembly and reassembly procedures are provided in [Appendix A](#).

P-401 transfer pump is manufactured by ITT Goulds Pumps, Model 2ST1H2B4 and the manufacturer manual is provided in Vendor Data, [Tab D](#).

3.5 F-401 & F-402 BAG FILTERS

F-401 particulate bag filter filters the groundwater after T-401 booster tank. It consists of four bag filter housings in one vessel with a spring assisted cover. The inlets and outlets on F-401 are 4-inch diameter Schedule 80 PVC flanged connections. F-401 is constructed of 316 stainless steel and is 22 inches in diameter, 5'8" tall, and rated for 400 gpm. F-401 is mounted on skid with one single bag filter (F-402) for bypass operation during filter replacement or maintenance on F-401.

F-402 is a single 316 stainless steel bag filter mounted with size two bag filter housing. F-402 bypass single bag filter is 7.68 inches diameter, rated for 180 gpm. Inlets and outlets are 2-inch diameter Schedule 80 PVC flanged connections.

Filter bags of F-401 & F-402 need to be replaced when pressures across filter bags (measured at PT-401) are between 10 and 35 psi. Normal operating pressures of clean bags are between 2 and 5 psi. Presently, F-401 and F-402 are operated with multi grade high efficiency filter bags, size two, with 25/10 micron openings. The detailed maintenance procedures are provided in [Appendix A](#).

F-401 multiple bag filters housing is manufactured by Hayward. F-402 bypass single bag filter is manufactured by Krystil Kleer Filtration and the manufacturer specifications are provided in Vendor Data, [Tab E](#).

3.6 FQI-401 GROUNDWATER FLOW TOTALIZER

FQI-401 flow totalizer consists of a paddlewheel flow sensor and a flow transmitter. It is installed after F-401 & F-402 bag filters and prior to T-402 holding tank. FQI-401 is used to determine the T-402 inlet flow received from the groundwater extraction wells and condensate sumps. FQI-401 is connected to the SCADA system and provides signals for recording and displaying water flow readings on the SMC screen. The real-time flow data can be obtained either on the FQI-401 built-in screen or on the SMC screen. The operating personnel should

record this reading on the daily data log. FQI-401 should be inspected and cleaned once per year during the annual system maintenance event.

Both FQI-401 paddlewheel flow sensor and flow transmitter are manufactured by Georg Fischer Signet, Model P51530-V0 and 3-8550-3 respectively. The manufacturer manual and specifications are provided in Vendor Data, [Tab F](#).

3.7 T-402 GROUNDWATER HOLDING TANK

After F-401 & F-402 bag filters, the groundwater is then transferred to a 5,000-gallon holding tank (T-402). The inlet piping to T-402 consists of 2-inch diameter Schedule 80 PVC piping flanged with viton gaskets. Tank fill piping consists of a 3-inch diameter PVC bulkhead fitting and 3-inch diameter Schedule 80 interior drop pipe installed to the bottom of the tank. The outlet is a 3-inch diameter PVC bulkhead fitting with flexible connections to the transfer pump (P-402) to allow tank expansion/contraction and reduce piping vibration on T-402. The holding tank has a sight tube/level indicator with unions and isolation valves for quick disassembly and clean-out. It is a high density, cross-linked polyethylene, flat-bottomed, domed top tank, 12 feet diameter by 8'1" tall with a 5,000-gallon capacity. The holding tank is equipped with an indoor seismic zone IV restraint system installed per manufacturer's requirements, a ladder, and a pressure relief pipe that captures residual gases from T-402 as well as T-401 booster tank and processes them through a 55-gallon carbon filter (T-701) with 200 lbs of vapor phase GAC.

T-402 holding tank should be inspected on a routine, scheduled basis. Prior to inspection, the exterior of the tank should be cleaned. The tank should be inspected at the same time T-401 booster tank is inspected and should cover the following:

- Check the exterior and interior of the tank for cracking, crazing, and brittle appearance.
 - Pay particular attention to areas around fittings and where different planes of the tank radius into one another.
 - Use a bright light source to inspect the interior from the manway opening to avoid a confined space entry.
- Check fittings and exterior gaskets for leaks and signs of general corrosion and deterioration.
- Check sediments in the tank. If sediments build up more than 3-inch high, the tank should be cleaned.

The detailed maintenance procedures are provided in [Appendix A](#).

T-402 holding tank is manufactured by Poly Processing Company and manufacturer specifications are provided in Vendor Data, [Tab G](#).

3.8 P-402 TRANSFER PUMP

P-402 transfer pump controls the liquid level in T-402 holding tank as shown on [Drawing M-1](#). A VFD controls the operation of P-402 and a pressure switch (PT-402) located in T-402 controls the frequency or the speed that P-402 operates at. The maximum rate of P-402 is

approximately 100 gpm. P-402 bearings are located in and are part of the motor. They are permanently lubricated therefore no greasing is required. The detailed disassembly and reassembly procedures are provided in [Appendix A](#).

P-401 transfer pump is manufactured by ITT Goulds Pumps, Model 2ST1JSA4 and the manufacturer manual is provided in Vendor Data, [Tab D](#).

3.9 F-403 & F-404 BAG FILTERS

After T-402 holding tank, the water is pumped through the particulate bag filters (F-403 & F-404) prior to the liquid phase GAC vessels (T-403 & T-404). F-403 & F-404 bag filters have the same specifications of F-402; namely 7.68 inches in diameter and rated for 180 gpm. They are both mounted on the same skid and have 2-inch flanged inlets and outlets.

Filter bags for F-403 & F-404 need to be replaced when pressures across filter bag (measured at PT-403) are between 20 and 35 psi. Normal operating pressures of clean bags are between 6 and 15 psi. Presently, F-403 and F-404 are operated with multi grade high efficiency filter bags, size two, with 5/1 micron openings. The detailed maintenance procedures are provided in [Appendix A](#).

F-403 & F-404 bag filters are manufactured by Krystil Kleer Filtration and manufacturer specifications are provided in Vendor Data, [Tab E](#).

3.10 FQI-402 FLOW TOTALIZER

FQI-402 flow totalizer is located upstream of T-403 & T-404 liquid-phase GAC vessels to determine the total discharge volume of treated groundwater from the Pemaco treatment system. FQI-402 is connected to the SCADA system and provides signals for recording and displaying discharge flow readings on the SCM screen.

Since FQI-402 is an electromagnetic type flow sensor, it should be relatively maintenance free. It is manufactured by Krohne, Model OptiFlux 2000. The manufacturer's specification is provided in Vendor Data, [Tab H](#).

3.11 T-403 & T-404 LIQUID-PHASE GAC ADSORBERS

The liquid-phase GAC adsorption system (T-403 & T-404) is comprised of two 5 feet diameter by 8 feet high, epoxy coated, GAC adsorption pressure vessels. T-403 & T-404 are operated in series, rated for 75 psig at 140 °F, maximum 150 gpm flow, and contain 3,000 lbs of virgin coconut shell carbon. The inlet of the liquid-phase GAC system is a 4-inch diameter Schedule 80 PVC nominal diameter interconnecting pipe rack system. The pipe rack system has been provided with an 8-valve manifold to allow for either vessel to be the primary vessel.

T-403 & T-404 liquid-phase GAC adsorbers should be inspected on a routine, scheduled basis and the findings of the inspections recorded. The inspection should cover the following:

- Check the exterior and interior of the vessel for corrosion, pitting, or cracks.
- Check the manifold piping and valves for cracking, or brittle appearance.

- Check fittings, exterior gaskets and pressure gauges for leaks and signs of general corrosion and deterioration.

The detailed maintenance procedures are provided in [Appendix A](#).

T-403 & T-404 liquid-phase GAC adsorbers are manufactured by TetraSolve Filtration. The manufacturer specifications are provided in Vendor Data, [Tab I](#).

3.12 T-405 SAMPLING BOX

After T-403 & T-404 carbon adsorbers, there is a discharge sampling box (T-405) prior to discharge to the sanitary sewer. Quarterly groundwater sampling must be performed at T-405 sampling box in accordance with SDLAC sampling requirements of sewer discharge. T-405 is a 28 inches by 28 inches square pre-cast concrete vault with a 4-inch PVC cleanout trap and vent.

T-405 sampling box is fabricated by Pyramid Precast. It should be inspected and cleaned during the quarterly sampling event. The inspection should cover the following:

- Check the exterior and interior of the vault for cracking or pitting.
- Check if there is trash or remnant carbon inside the vault. Cleanout the vault if needed.

3.13 CONDENSATE SUMPS

There are seven condensate sumps outside the north wall of treatment plant that remove condensate from soil vapor in vapor pipe lines (DPE-A thru DPE-D, VE-2 thru VE-4) prior to entering the treatment system. Refer to [Drawing M-4](#) for the sump locations. Each condensate sump consists of a 12-inch diameter by 8'4" deep Schedule 40 PVC reservoir, a flanged top cover, a float switch, and a 42 inches x 42 inches x 29 inches vault box.

DPE-A, DPE-B, DPE-C, and DPE-D condensate sumps contain an AP4B pneumatic submersible low-drawdown pump and a float switch, therefore, these sumps are able to dewater automatically. VE-2, VE-3, and VE-4 condensate sumps are manually pumped down using two double diaphragm pumps (P-101 & P-102) located in the treatment plant.

A condensate sump panel is next to the groundwater extraction manifold in the treatment plant. There are seven light indicators on the panel to show if the condensate sumps (DPE-A thru DPE-D, VE-2 thru VE-4) are full with water. Please note that VE-1 header has no condensate sump or light indicator on the panel. The condensate in VE-1 header needs to be pumped down when water is visible in the sight tube or when other condensate sumps are pumped down.

One remote condensate sump is located on the VE-2 vapor extraction pipe line at the intersection of VE-2 main line and the branch that leads to DAB-8. Refer to [Drawing C-2](#) for the location and [Drawing C-18](#) for the detailed view of the condensate sump. The VE-2 remote condensate sump should be checked once per month for the accumulation of water and/or silt. If wither the silt or water level in the sump is more than 18" from the bottom, it should be cleaned out and the contents disposed in accordance with the Waste Management Plan.

Note that VE-2 branch line to DAB-8 is intended for vapor and condensate only. The vacuum side of this line should never be used for cleaning at wells because of the risk of clogging the remote sump plumbing.

The condensate sumps should be inspected on a routine, scheduled basis and the findings of the inspections recorded. The inspection should cover the following:

- Check the interior of the sump for cracking, crazing, and brittle appearance. Use a bright light source to inspect the interior from the top opening.
- Check fittings and gaskets for leaks and signs of general corrosion and deterioration.

The pneumatic submersible pumps require the same maintenance and cleaning as the groundwater well pumps, except at a higher frequency due to conditions conducive to scale formation, partially covered by aeration. The detailed maintenance procedures of condensate sumps are provided in [Appendix A](#).

The pneumatic submersible pumps are manufactured by QED Environmental Systems, Model Low-Drawdown AP4B. The manufacturer manual is provided in Vendor Data, [Tab A](#).

3.14 P-101 & P-102 DOUBLE DIAPHRAGM PUMPS

Two double diaphragm pumps (P-101 & P-102) are installed to remove water from the condensate sumps (VE-2 thru VE-4) and for miscellaneous pumping tasks within the plant. P-101 & P-102 double diaphragm pumps are located next to the groundwater extraction manifold. Refer to [Drawing M-4](#) for the pump locations. The double diaphragm pumps are air operated. The compressed air is supplied from the air compressor (K-601) to the pumps via a 2-inch diameter ABS air line reduced to a 1-inch diameter compressed air hose. Each pump is controlled by an ABS ball valve on the compressed air supply line. Do not exceed 125 psig air supply under any circumstance.

P-101 & P-102 should be inspected on a routine, scheduled basis and the findings of the inspections recorded. The inspection should cover the following:

- Check the exterior and diaphragms of the pump for cracking, crazing, and brittle appearance.
- Check fittings and gaskets for leaks and signs of general corrosion and deterioration.
- Check if the pump is functioning well. If needed, disassembly and reassembly should be performed for maintenance.

The detailed maintenance procedures are provided in [Appendix A](#).

P-101 & P-102 double diaphragm pumps are manufactured by Price Pump, Model AOD-1 PVVP. The manufacturer's manual is provided in Vendor Data, [Tab J](#).

3.15 P-501 TRANSFER PUMP

P-501 transfer pump is installed to remove accumulated water (condensate) within the moisture separator (T-101) of the VTS. The pump sends the condensate through bag filters (F-501 & F-502) and then into T-402 holding tank. From T-402, the condensate is processed through the groundwater treatment system (GTS). P-501 is a self-priming centrifugal pump rated for 30 gpm at 75 feet of head. The bearings are located in and are part of the motor. They are permanently lubricated therefore no greasing is required. The detailed maintenance procedures are provided in [Appendix A](#).

P-501 transfer pump is manufactured by AMT, Model 282B-98 and the manufacturer manual is provided in Vendor Data, [Tab K](#).

3.16 F-501 & F-502 BAG FILTERS

F-501 & F-502 particulate bag filters filter liquids received from T-101 moisture separator and the secondary containment sump prior to being sent to T-402 holding tank.

F-501 & F-502 are single 316 stainless steel housings that are mounted on one skid. The filters are 7.68 inches diameter, rated for 180 gpm, and are fitted with size two multi grade high efficiency filters (currently using 5/1 micron filter bag). Inlets and outlets are 2-inch diameter Schedule 80 PVC flanged connections.

Filter bags of F-501 & F-502 need to be replaced when pressures across filter bags (measured at PT-501) are between 10 and 12 psi. Normal operating pressures of clean bags are between 3 and 5 psi. The detailed maintenance procedures are provided in [Appendix A](#).

The particulate bag filters (F-501 & F-502) are manufactured by Krystil Kleer Filtration and manufacturer specifications are provided in Vendor Data, [Tab E](#).

3.17 FQI-501 WATER FLOW TOTALIZER

FQI-501 flow totalizer consists of a paddlewheel flow sensor and a flow transmitter. It is installed after F-501 & F-502 bag filters and prior to T-402 holding tank. FQI-501 is used to determine the T-402 inlet flow received from the moisture separator (T-101) and the secondary containment sump. FQI-501 is connected to the SCADA system and provides signals for recording and displaying water flow readings on the SMC screen. The real-time flow data can be obtained either on the FQI-501 built-in screen or on the SMC screen. The operating personnel should record this reading on the daily data log. FQI-501 should be inspected and cleaned once per year during the annual system maintenance event.

Both FQI-501 paddlewheel flow sensor and flow transmitter are manufactured by Georg Fischer Signet, Model P51530-V0 and 3-8550-3 respectively. The manufacturer manual and specifications are provided in Vendor Data, [Tab F](#).

4.0 SOIL VAPOR EXTRACTION & TREATMENT COMPONENTS

4.1 VAPOR EXTRACTION MANIFOLD

The vapor extraction manifold consists of eight vapor extraction headers (DPE-A thru DPE-D, VE-1 thru VE-4) receiving soil vapor from the well field. The manifold is constructed of 8-inch diameter Schedule 80 PVC pipe. Each header riser has a 6-inch diameter Schedule 40 clear PVC sight tube, so the operating personnel can for check excess water entrained in the vapor stream and pump down the affected condensate sump, if needed. The manifold outlet is controlled by a butterfly valve (V-109). This valve should be always open during the VTS operation.

The manifold and V-109 butterfly valve should be inspected on a routine, scheduled basis and the findings of the inspections recorded. The inspection should cover the following:

- Check the exterior for cracking, crazing, and brittle appearance.
- Check fittings and gaskets for leaks and signs of general corrosion and deterioration.

4.2 T-101 MOISTURE SEPARATOR

Soil vapor exiting the manifold header enters a moisture separator (T-101) where condensate is dropped out of the vapor stream prior to entering the particulate filters (F-101 & F-102). The moisture separator has a 500-gallon working capacity with an air flow capacity of 1,000 SCFM at 22 inches of Hg and is constructed of 316 stainless steel. T-101 is equipped with an 8-inch diameter flanged 316 stainless steel vapor inlet and outlet, 316 stainless steel level switches, and a demister element designed to remove 95% of all liquid and reduce water droplets down to 250 micron. T-101 also contains a 2-inch diameter auto condensate drain at the bottom of the tank where entrained liquid is pumped by P-501 transfer pump through F-501 & F-502 bag filters and then into T-402 holding tank to be processed by the GTS. T-101 has a sight tube/level indicator with unions and isolation valves for quick disassembly and clean-out.

T-101 moisture separator should be inspected on a routine, scheduled basis and the findings of the inspections recorded. Prior to inspection, the exterior of the tank should be cleaned. The inspection should cover the following:

- Check the exterior and interior of the tank for cracking, crazing, and corrosion.
 - Pay particular attention to areas around fittings and welds.
 - Use a bright light source to inspect the interior from the manway opening. Inspect for stress cracks in the interior welds or at the seams. Under no circumstances are any personnel to enter the moisture separator.
- Check fittings and exterior gaskets for leaks and signs of general corrosion and deterioration.
- Check angle iron braces for deflections and stress cracks in the welds monthly.

The detailed maintenance procedures are provided in [Appendix A](#).

T-101 moisture separator is manufactured by TetraSolve Filtration and manufacturer specifications are provided in Vendor Data, [Tab L](#).

4.3 V-112 DILUTION VALVE & SILENCER

V-112 dilution valve and silencer are located immediately downstream of the outlet of T-101 moisture separator. V-112 is a 4-inch diameter butterfly valve. The silencer is manufactured by Solberg Manufacturing, Model SLCRT400. The silencer can reduce high frequency noise as much as 30 decibels while dilution valves are functioning. The dilution valve and silencer should be inspected for cracking, crazing, and brittle appearance on a routine basis.

4.4 F-101 & F-102 VACUUM PARTICULATE FILTERS

The vacuum particulate filters (F-101 & F-102) remove particulates from the inlet vapor stream prior to entering B-101 & B-102 LRP system. F-101 & F-102 vacuum particulate filters are rated for 99% removal efficiency for particles down to 5 micron and consist of twin stainless steel housings, each with a cartridge filter. F-101 & F-102 vacuum particulate filters are designed for a maximum flow rate of 2,000 SCFM and are to be operated in parallel. The filter elements should be replaced when system reaches 10" to 15" w.c. (water column) or higher pressure drop. Refer to [Appendix A](#) for the detailed maintenance procedures.

F-101 & F-102 vacuum particulate filters are manufactured by Solberg Manufacturing, Model CSL-485P (2)-1200FS1, and manufacturer manual is provided in Vendor Data, [Tab M](#).

4.5 B-101 & B-102 LIQUID RING VACUUM PUMPS

B-101 & B-102 liquid ring vacuum pumps are used to generate high vacuum to pull vapors from the well field to the treatment plant for treatment/destruction. The LRPs are rated for vacuum of up to 27 inches of Hg at 1,000 SCFM. However, observations from operation indicate a capability of roughly 600 SCFM at 27 inches of Hg. Each LRP is comprised of a 75-hp motor, a cooling radiator, and an oil pump. The LRP system can be run with either one or both LRPs. When the system is set up to use both LRPs, and the vacuum drops below the lead pump's set point, the lag pump will start-up and run until the lag pump reaches its "pump off" set point. The LRPs can be operated locally by a local control panel, however all H-O-A switches on the local control panel (LCP) must be set in "AUTO" position for control by the PLC.

Before start up of B-101 & B-102, the pump reservoirs will be checked to make sure they are filled with pump sealing fluid (oil). Another major maintenance item to be addressed is the lubrication of the bearings. Pump bearings should be lubricated every 3,000 hours with a quality high temperature lithium based grease of #2 consistency. Since the pumps will be operating 24 hours a day, the motor ball bearings should be lubricated every 6-12 months.

The inlet filters should be checked after the first eight hours of operation. The filter elements will need to be replaced every 10,000 hours or if an excessive pressure drop is noticed. If excessive pressure drops are common, it will be necessary to replace the filters more often.

The LRPs are shipped to the site with the seal fluid in place. Vmaxol sealing fluid should be used to obtain ultimate performance from the LRP system. It is recommended that the seal fluid be changed every 10,000 hours of operation. When it is time to change the fluid, make sure that the pump is off and there is no power being applied to the LRP system. Do not fill the oil

above the shaft centerline. Oil can be added by removing the suction or discharge flange and pouring oil through pump suction or discharge port. The reservoir should be filled to the fill line on the sight gage. Refer to the manufacturer's data for diagrams of locations of oil fill port and the drain plug. The air bleed valve on the heat exchanger should be opened to remove all air from the system. The pump should be run for a few minutes, and then stopped and check the fluid level again. If needed, additional fluid should be added to the reservoir.

The seal fluid level in the reservoir should be checked periodically, every 500 hours of operation. The seal fluid strainer should be cleaned after the first 50 hours of operation to remove any debris in the process system. The strainer should be inspected and cleaned every 1,000 hours of normal operation. A high fluid level could mean a build-up of water in the reservoir, which should be drained. The detailed maintenance procedures are provided in [Appendix A](#).

B-101 & B-102 liquid ring vacuum pumps are manufactured by Dekker Vacuum Technologies, Inc., Model VMX1103K. Manufacturer's operations manual is provided in Vendor Data, [Tab N](#).

4.6 F-103 & F-104 OIL MIST FILTERS

The oil mist exhaust filters (F-103 & F-104) are used to remove residual oil from the vapor stream after B-101 & B-102 LRPs. F-103 & F-104 oil mist filters are designed to remove residual oil from the vapor stream prior to entering the vapor conditioning package. The oil mist filters are capable of removing oil particles down to five micron in size and rated for 1,000 SCFM of air flow. The oil mist filters are stainless steel with a cartridge filter. The element replacement and maintenance procedures are provided in [Appendix A](#).

F-103 & F-104 oil mist filters are manufactured by Solberg Manufacturing Inc., Model HDL-PSG474-2-600 with filter element PSG-476. Manufacturer manual is provided in Vendor Data, [Tab O](#).

4.7 MOISTURE TRAP & OIL SCAVENGE LINES FOR VAPOR LINE

A 12-inch diameter x 5-inch tall PVC moisture trap is installed for B-101 & B-102 LRPs to avoid moisture condensate from entering oil reservoirs. It was observed that accumulated water condensate in the oil reservoir of the LRPs caused "High Oil Level Alarm". This situation was remedied partly by placing the moisture trap upstream, and mostly by raising the operating temperature of LRPs to between 182-190°F. By keeping the LRP operating at temps above 180°F and less than 200°F (for mechanical safety), the water "flashes" inside the blower lobes and is pushed through the system in the vapor phase, instead of forming condensate. In addition to observing the excess moisture, the LRPs tend to pass residual oil to the vapor line. As a remedy, six oil scavenge/return lines were installed from the housings of F-103 & F-104 oil mist filters, and several locations downstream of the oil mist filters, to return oil to the vacuum pumps.

Maintenance of the 12-inch diameter PVC moisture trap consists of visually inspecting all scavenge/return line connections for leaks and making repairs as necessary. On a daily basis, operating personnel should inspect the sight glass located on the side of the 12-inch diameter PVC trap and drain water from the bottom of the sight glass, if required. There is always some level of oil visible in the sight glass and the separation between water and oil can be seen in the sight glass. When the oil level starts to increase in the sight glass (4 inches or more), the oil

scavenging system should be isolated and the oil should be removed from the trap and recycled.

4.8 T-301 & T-302 VAPOR-PHASE GAC ADSORBERS

The vapor-phase GAC adsorbers (T-301 & T-302) provide VOC treatment prior to discharge to the positive displacement (PD) blower (B-301) and discharge stack as shown on [Drawing M-1](#). T-301 & T-302 vapor-phase GAC vessels are constructed out of vacuum rated double layered, epoxy coated, carbon steel, contain 4,000 lbs of virgin coconut shell carbon each and are rated for a maximum flow rate of 3,000 SCFM. The inlet of the GAC system is a 10-inch Schedule 80 PVC interconnecting pipe rack system. The pipe rack system has been provided with an 8-valve manifold to allow for either vessel to be the primary vessel.

T-301 & T-302 vapor-phase GAC adsorption system should be inspected on a routine, scheduled basis and the findings of the inspections recorded. The inspection should cover the following:

- Check the exterior and interior of the vessel, especially welds, for cracking, crazing, and corrosion.
- Check the manifold piping for cracking, or brittle appearance.
- Check fittings, exterior gaskets and vacuum gauges for leaks and signs of general corrosion and deterioration.

Refer to [Appendix A](#) for the detailed maintenance procedures.

T-301 & T-302 vapor-phase GAC vessels are manufactured by TetraSolve Filtration, Model VFV-5000. The manufacturer specifications are provided in Vendor Data, [Tab P](#).

4.9 V-319 DILUTION VALVE & SILENCER

V-319 dilution valve and silencer are located between the vapor-phase GAC vessels and B-301 PD blower. V-319 is a 4-inch butterfly valve. The silencer is an air intake filter manufactured by Solberg Manufacturing, Model FS-238P-400F. The silencer can reduce high frequency noise by as much as 30 decibels when dilution valve is open. The dilution valve and silencer should be inspected for cracking, crazing, and brittle appearance on a routine basis. The elements inside the silencer should be inspected every 6 months and replaced if necessary. The detailed replacement procedures are provided in [Appendix A](#).

4.10 B-301 POSITIVE DISPLACEMENT BLOWER & SOUND ENCLOSURE

B-301 PD blower is designed to pull the treated vapors through the vapor-phase GAC adsorbers (T-301 & T-302) and discharge them to the atmosphere through the discharge stack in the top of the building. B-301 PD blower is equipped with a 25-hp motor and a blower frame designed for a maximum vapor flow rate of 1,500 SCFM. The blower motor is controlled by a VFD which is controlled by the PLC. A sound enclosure with cooling fans covers both the motor and the blower frame to reduce the PD blower noise level while it is in operation.

B-301 PD blower and sound enclosure should be inspected on a routine, scheduled basis and the findings of the inspections recorded. The inspection should cover the following:

- Check the exterior of the sound enclosure for cracks and structural integrity.
- Check the vapor piping for cracking, or brittle appearance.
- Check fittings and exterior gaskets for leaks and signs of general corrosion and deterioration.
- Check if the blower requires lubrication and maintenance.
- Clean the cooling fans on the sound enclosure if needed.

The detailed maintenance procedures of B-301 PD blower and sound enclosure are provided in [Appendix A](#).

The motor of B-301 PD blower is manufactured by Baldor Electric, Model EM4103T. The blower frame is manufactured by Roots, Model 615. Manufacturer manual is provided in Vendor Data, [Tab Q](#).

4.11 T-701 CARBON FILTER

A 55-gallon carbon filter (T-701) is located next to T-402 holding tank to receive the off-gases captured by the pressure relief pipe on T-402 as well as T-401 booster tank. The off-gases flow through T-701 carbon filter loaded with 200 lbs of vapor-phase GAC prior to being released to the atmosphere.

T-701 carbon filter should be inspected on a routine, scheduled basis and the findings of the inspections recorded. The inspection should cover the following:

- Check the exterior of the tank for rust and corrosion.
- Check the vapor piping for cracking, or brittle appearance.
- Check if the vapor-phase GAC needs to be replaced by monitoring with a PID or other VOC analyzer. Readings of 0.0 ppm or equivalent to background indicate no GAC change is required.

T-701 carbon filter is manufactured by Tetrasolv Filtration, Model VFD-55. Manufacturer specifications are provided in Vendor Data, [Tab R](#).

5.0 VAPOR CONDITIONING PACKAGE

5.1 H-201 THREE PHASE HEAT EXCHANGER

After exiting B-101/B-102 LRPs and F-103/F-104 oil mist filters, the vapor stream enters the three stage, water cooled heat exchanger (H-201) at a temperature between 140°F and 170°F. The heat exchanger is comprised of three sections: Stage one is 1.5M Btu/hr, 2,050 SCFM, 300 gpm service. The second stage is 1.3M Btu/hr, 1,500 SCFM, and the third stage is 275K Btu/hr, 1,100 SCFM. The first two stages use the cooling tower (CT-201) to cool the vapor stream. The third stage uses the refrigerated chiller (RC-201, currently not in use) to cool the vapor stream. There are temperature indicators at the inlet and outlet of H-201 heat exchanger to monitor its operation and efficiency.

H-201 heat exchanger should be inspected, cleaned, and maintained on a scheduled basis. The maintenance should cover the following:

- Maintenance:
 - The exterior of H-201 heat exchanger will be checked for stress spots, corrosion, or cracks in welds on a monthly basis.
 - Inspect the rear and front cover plate bolted connections for leaks on a monthly basis. Tighten or replace bolts/nuts as required.
 - For fin-tube core removal and installation, refer to XChanger, Inc. Installation, Operation and Maintenance Manual ([Tab S](#)) Section 6.2.1 C/TV SERIES Core Removal (Pages 12, 13) and Figure (Page 2).
- Cleaning:
 - Refer to XChanger, Inc. Installation, Operation and Maintenance Manual ([Tab S](#)) Section 6.2.1 C/TV SERIES Core Removal (Pages 12, 13) and Figure (Page 2) for disassembly instructions.
 - For dirt/dust contamination, a soap and water wash is usually adequate to clean the service side of these units. If not, the use of compressed air is recommended. Pressure washers can damage the fins and should not be used for cleaning.

H-201 heat exchanger is manufactured by XChanger, Inc., Model TV-275. Manufacturer manual for the maintenance are provided in Vendor Data, [Tab S](#). For further troubleshooting questions, please contact XChanger, Inc., Phone: (952) 933-2559 or email: info@xchanger.com.

5.2 CT-201 COOLING TOWER

The cooling tower (CT-201) uses water from the city as a cooling agent to reduce the temperature of the effluent vapor stream. CT-201 cooling tower has a recommended continuous blowdown rate of 2 to 3 gpm. Water circulates through the cooling tower and H-201 heat exchanger via transfer pump (P-201).

Since CT-201 cooling tower is constantly circulating recycled water, the main maintenance concern is to prevent algae growth and scaling. Algae growth can be prevented by the monthly addition of bromide tablet. Scaling is controlled by the blowdown. The blowdown rate is set for 2 to 3 gpm. The blowdown rate is controlled by the valve immediately prior to the cooling tower condensate sump. This valve is only partially open. This valve is fed by two pipes from CT-201 cooling tower: the overflow discharge (normally open) and the cooling tower sump drain (normally closed). To increase the blowdown rate, open this valve more.

The detailed maintenance procedures of this cooling tower are provided in [Appendix A](#).

CT-201 cooling tower is manufactured by Aqua-Loop Cooling Tower, Model MB-300. Manufacturer manual for the maintenance of CT-201 cooling tower are provided in Vendor Data, [Tab T](#).

5.3 P-201 TRANSFER PUMP

P-201 transfer pump is used to pump cooling water from CT-201 to the first two stages of H-201 heat exchanger. P-201 transfer pump consists of a 20-hp, 1750 RPM motor, and a TEFC pump frame. P-201 should be inspected on a routine, scheduled basis and the findings of the inspections recorded. The inspection should cover the following:

- Check the exterior of the pump for rust, corrosion, and proper mounting.
- Check the piping for cracking, or brittle appearance.
- Check if the pump needs cleaning or lubrication. There are grease fittings located with this unit.

The detailed maintenance procedures of this transfer pump are provided in [Appendix A](#).

P-201 transfer pump is manufactured by SCOT MOTORPUMP, Model JP256. Manufacturer manual is provided in Vendor Data, [Tab U](#).

5.4 OVERFLOW SUMP FOR CT-201

A PVC overflow sump receives overflow discharge from CT-201 cooling tower. The sump is equipped with a submersible effluent pump and a float switch. Once the water level in the sump reaches the set height of the float switch, it will activate the submersible pump and begin pumping the excess water through a flow totalizer (FQI-201) to T-405 sampling box for permitted discharge to the sanitary sewer.

The overflow sump and the submersible pump should be inspected on a routine, scheduled basis and the findings of the inspections recorded. The inspection should cover the following:

- Check the interior of the sump for cracking, crazing, and brittle appearance.
- Check the piping for cracking, or brittle appearance.
- Check if the sump and pump need to be cleaned.

5.5 FQI-201 WATER FLOW TOTALIZER

FQI-201 flow totalizer is installed after the CT-201 overflow sump prior to discharge to T-405 sampling box. FQI-201 is used to determine the blowdown rate from the cooling tower. The total overflow from CT-201 will be part of the total discharge flow to the sanitary sewer. Therefore the FQI-201 flow reading should be recorded on a daily basis and reported to SDLAC quarterly. FQI-201 should be inspected everyday while the operating personnel collect its reading. If FQI-201 is clogged by dirt or sediment accumulates, it should be removed and cleaned. The detailed maintenance procedures are provided in [Appendix A](#).

5.6 RC-201 REFRIGERATED CHILLER

The third stage of H-201 heat exchanger is fed with water from the refrigerated chiller (RC-201). Since the vapor temperature can be cooled down to below 95°F by the first two stages of H-201, RC-201 refrigerated chiller has been shut down for both practical reasons and for energy savings. Therefore the third stage of H-201 requires minimum O&M care until it is placed back in service. The fins of RC-201 should be visually inspected and washed off with a hose periodically to remove dust.

RC-201 refrigerated chiller is manufactured by Cold Shot Chillers, Model ACWC-300-E. Manufacturer manual for the maintenance of the refrigerated chiller are provided in Vendor Data, [Tab V](#).

5.7 T-202 REFRIGERATED CHILLER TANK

The refrigerated chiller tank (T-202) is located on the concrete pad outside the treatment plant which contains components of the VCP (refer to [Drawing M-4](#)). T-202 has 280 gallons of storage capacity. It receives a potable water supply from the City of Maywood for the purposes of filling the tank only; then the water may be used for 6 months before it should be replaced. The primary maintenance concern is algae growth in the tank. Therefore, a pool algicide may be used in accordance with manufacturer instruction, to eliminate algae growth.

T-202 refrigerated chiller tank should be inspected on a routine, scheduled basis and the findings of the inspections recorded. Prior to inspection, the exterior of the tank should be cleaned. The inspection should cover the following:

- Check the exterior and interior of the tank for cracking, crazing, and brittle appearance. Pay particular attention to areas around fittings.
- Check fittings and exterior gaskets for leaks and signs of general corrosion and deterioration.
- Check if water quality in tank is visibly poor.

The detailed maintenance procedures are provided in [Appendix A](#).

T-202 refrigerated chiller tank is a 280 gallons upright tank manufactured by Poly Processing. Manufacture specifications are provided in Vendor Data, [Tab W](#).

5.8 P-202 TRANSFER PUMP

P-202 transfer pump circulates the potable water through RC-201 refrigerated chiller from T-202 tank at a maximum rate of approximately 80 gpm. P-202 bearings are located in and are part of the motor. They are permanently lubricated therefore no greasing is required. The detailed disassembly and reassembly procedures are provided in [Appendix A](#).

P-202 transfer pump is manufactured by ITT Goulds Pumps, Model 2ST1H2B4 and the manufacturer manual is provided in Vendor Data, [Tab D](#).

5.9 T-201 CONDENSATE TANK

The condensate from H-201 heat exchanger is collected in a 60-gallon upright condensate tank (T-201) and pumped by transfer pump (P-203) to T-402 holding tank of the GTS for further treatment. The tank is located inside the treatment plant beneath H-201 (refer to [Drawing M-4](#)). Float switches are connected to the PLC and installed on the sight glass mounted on the side of the tank. Once the liquid level reaches the float switch set height, P-203 transfer pump will be activated and begin pumping to T-402 or through a bypass pipe that connects to T-405. The normal operation mode is for discharge to T-402, for contingency treatment of the condensate.

T-201 condensate tank should be inspected on a routine, scheduled basis and the findings of the inspections recorded. Prior to inspection, the exterior of the tank should be cleaned. The inspection should cover the following:

- Check the exterior and interior of the tank for cracking, crazing, and brittle appearance. Pay particular attention to areas around fittings.
- Check fittings and exterior gaskets for leaks and signs of general corrosion and deterioration.

The detailed maintenance procedures are provided in [Appendix A](#).

T-201 condensate sump is manufactured by Poly Processing. Manufacturer specifications are provided in Vendor Data, [Tab X](#).

5.10 P-203 TRANSFER PUMP

P-203 transfer pump transfers water from T-201 condensate tank to T-402 holding tank at a rate of approximately 52 gpm. It is controlled by float switches of T-201 condensate tank as detailed in Section 5.9. P-203 bearings are located in and are part of the motor. They are permanently lubricated therefore no greasing is required. The detailed maintenance procedures are provided in [Appendix A](#).

P-203 transfer pump is manufactured by Pacer Pumps, Model Z-40 and the manufacturer specifications are provided in Vendor Data, [Tab Y](#).

5.11 H-202 VAPOR HEATER

After H-201 heat exchanger, the vapor stream is then passed through a vapor heater (H-202) to heat the vapor stream prior to entering the vapor phase (GAC) adsorbers (T-301 & T-302) to

increase carbon adsorption. H-202 vapor heater is manufactured by Vulcan, Model VFT612-10C3. Manufacturer specifications and manual are provided in Vendor Data, [Tab Z](#).

6.0 TREATMENT SYSTEM UTILITIES & SUPPORTING SYSTEM

6.1 P-502 SECONDARY CONTAINMENT SUMP PUMP

P-502 secondary containment sump pump is a submersible effluent pump with a 2-inch solids handling capacity. Refer to [Drawing M-4](#) for the pump and secondary containment sump location. It pumps out the water in the secondary containment sump through F-501 & F-502 bag filters to T-402 holding tank.

A local control panel (LCP) located near the sump controls the operation of P-502 secondary containment sump pump by the actuation of three level switches ([Drawing M-1](#)). Level switch low (LSL-501) turns P-502 sump pump off when the water level in the sump drops below approximately three inches. Level switch high (LSH-501) turns P-502 sump pump on when the water level in the sump is approximately 70% full. Level switch high-high (LSHH-501) activates a system interlock/failsafe condition which shuts down the groundwater treatment system when the sump reaches 80% full.

If P-502 pump will not deliver water, or delivers less water than normal, check the following:

- Verify that the pump is spinning, should be clockwise, looking downward.
- Check the impeller to see that it is not plugged or clogged with debris.
- Check the power supply (AC voltage) problems.
- Check for clogs in the discharge plumbing or a closed valve.

The detailed maintenance procedures are provided in [Appendix A](#).

P-502 secondary containment sump pump is manufactured by Dayton, Model DN2110070T. Manufacturer manual for the maintenance of the secondary sump pump are provided in Vendor Data, [Tab AA](#).

6.2 COMPRESSED AIR SYSTEM

The compressed air system supplies compressed air to the extraction well pneumatic pumps, condensate sumps, and to the two double diaphragm pumps (P-101/P-102) via ABS air lines. The compressed air system consists of a 30-hp rotary screw air compressor (K-601), a 240-gallon air receiver tank (T-601), a 55-gallon condensate drum (T-602), six air regulators (R-601 thru R-606), and a 3-way solenoid valve (V-607).

K-601 air compressor system must be serviced by a specialized technician who is qualified to service Kaiser Compressors. Refer to Table 31, Section 10.2.2 in Service Manual Screw Compressor Kaeser Compressors for service units. Smaller Maintenance Tasks can be completed by the operating personnel and are as follows:

- Check cooling oil level (weekly)
- Clean or renew filter mats (weekly)

Larger Maintenance Tasks (per Table 31 in manufacturer's service manual) should be completed by a specialty contractor, American Compressor Company, Santa Fe Springs, CA. Phone: (562) 944-6188. Larger Maintenance tasks are as follows:

- Clean and re-tension drive belt (every 500 hours)
- Oil and Air Cooler maintenance (every 1,000 hours)
- Air Filter maintenance (every 3000 hours). Note: This interval should be checked with American Compressor Company due to the persistent dusty conditions inside and outside the treatment compound.
- Change oil separator cartridge (up to 3,000 hours at least every 3 years)
- Change the oil filter (up to 6,000 hours at least annually)
- Change the drive belt (up to 12,000 hours at least every 3 years)
- Changing the oil (see below for oil change intervals per each type of oil):
 - Sigma Lubricant M-460- ISO 46 Semi-Synthetic – First oil change at 2,000 hours, then change oil every 3,000 hours thereafter.
 - Sigma Lubricant M-460- ISO 46 Synthetic – First oil change at 6,000 hours, then change oil every 8,000 hours thereafter
- Check electrical connections, safety relief valve, overheating shut down function and check oil and air cooler for leaks annually.

K-601 air compressor has a service interval counter located on the Control Cabinet door which indicates the operating intervals between maintenance tasks (in hours) and should be checked weekly. When the service interval counter approaches zero (0) hours, the O&M personnel in charge of scheduling maintenance should contact the service company to schedule the required service. When the counter reaches zero (0) hours, the warning message “S” will be displayed. It should be noted that it takes, at a minimum, 3 to 5 business days from the time that the specified contractor, American Compressor Co. is contacted, and when they arrive on site for the actual service work.

The environment inside the Pemaco treatment plant can be extremely dry and dusty. Excessive dust accumulation on the surfaces of the compressor should be cleaned off with low pressure compressed air with the unit in standby (to prevent dirt laden air from fouling the air intake filter).

K-601 air compressor is manufactured by Kaeser Compressor, Model AS-30. T-601 air receiver tank is manufactured by Manchester Tank. T-602 condensate drum is manufactured by Skolnik Industries, Inc. R-601 thru R-606 air regulators are supplied by McMaster-Carr. V-607 3-way solenoid valve is manufactured by ASCO, Model 8316G34. Manufacturer specifications and manual are provided in Vendor Data, [Tab AB](#).

6.3 AUTOMATED WATER PRESSURE BOOST SYSTEM

The automated potable water supply pressure boost system was used to boost water pressure to a minimum of 65 psi for the FTO quench chamber. Since the FTO is offline and no longer needed, the water pressure boost system is offline and no longer needed.

The automated water pressure boost system is manufactured by Goulds Pumps and manufacturer manual is provided in Vendor Data, [Tab AC](#).

6.4 CHLORINE INJECTION SYSTEM

During groundwater treatment system start-up it was noticed that algae (biosolids) buildup in the holding tanks, led to clogging of the bag filters and eventual auto-shutdown of the treatment plant. This problem was remedied with the chlorine injection system. The chlorine injection system is built to reduce the amount of algae present and to improve GTS efficiency. Refer to [Drawing M-4](#) for the chlorine injection system location. The chlorine injection system consists of one metering pump, one 55-gallon drum of 12.5% sodium hypochlorite solution (provided by a local chemical supplier), 1-drum platform (secondary containment), and suction/injection tubing. The metering pump injects the 12.5% liquid chlorine to T-401 booster tank and maintains the residual chlorine concentration at ~2.5 ppm. The residual chlorine concentration should be checked at SP-204 sample port with a chlorine test kit on a daily basis. If the chlorine test result shows concentration is lower or higher than 2.5 ppm, the operating personnel should adjust pump speed and stroke settings on the pump to maintain adequate chlorine concentration level in the tanks. In very hot weather, the dosage may need to be increased to a maximum of 3.5 ppm. The detailed maintenance procedures of the chlorine injection system are provided in [Appendix A](#).

The chlorine injection pump is manufactured by LMI Milton Roy, Model AA-151-398HI. Manufacturer manual for maintenance is provided in Vendor Data, [Tab AD](#).

6.5 F-801 WATER SOFTENER

The water softener (F-801) is comprised of US Filter KF series Duplex alternating water softener with brine tank, 50-inch x 24-inch x 80-inch with 1- ½ inch diameter flanged inlet and outlet.

F-801 water softener is used to reduce hardness of the city potable water supply before it enters the Pemaco treatment plant systems to help reduce scaling. F-801 water softener uses a high quality ion exchange resin and has a design capacity of 20 GPM. It is capable of reducing the levels of calcium in the water to below 3 PPM. The maximum design feed pressure is 100 psig. The brine tank should be inspected on a daily basis to make sure it has a sufficient quantity of salt (visible above the water line) required for regenerating (backwashing) the ion exchange resin inside the filters. Salt should be added to the brine tank by the operating personnel as needed. Typical salt required is 2- 50# bags of salt per day during periods of normal water usage.

F-801 water softener is manufactured by U.S. Filter and manufacturer manual is provided in Vendor Data, [Tab AE](#).

6.6 ELECTRICAL SYSTEM

The electrical system includes the power service and distribution points for the treatment system. The main power service is 480 volt, 800 amperes three phase service provided by a Southern California Edison, Inc. (SCE) utility transformer located west of the treatment building. The treatment plant electrical system is then distributed from the main service by the motor control center (MCC) located in the electrical room at the northwest end of the treatment building ([Drawing E-3](#)). A kilowatt hour (KWH) electric meter is located in the MCC and records the electricity usage of the treatment system. The meter was set to zero prior to startup.

Manufacturer manual for the MCC are provided in Vendor Data, [Tab AF](#).

6.7 SOLAR POWER SYSTEM

Pemaco solar power system was designed and installed by California Solar Engineering, Inc. The solar power system consists of 22 Kyocera KC-175GT PV modules (panels), one Xantrex GT3.3-240 inverter, and Professional Solar mounting system. The modules are mounted on the treatment compound roof facing south, and consist of four columns, two of which contain 7 PV modules and two of which contains 4 PV modules – for a total of 22 PV modules. The inverter is mounted inside the electrical room, while the system AC Disconnect is mounted outside on the west wall of the treatment plant. The AC output of the system is fed into the LC-1 subpanel via a two-pole 20A breaker. The operating personnel track the energy production on a weekly basis. The cumulative energy produced to date by the solar power system can be obtained on the Xantrex solar inverter panel inside the electrical room.

Manufacturer specifications for the solar power system are provided in Vendor Data, [Tab AG](#).

6.8 BUILDING EXHAUST FANS

Two exhaust fans are installed on the east wall of the Pemaco treatment plant for air recirculation and reducing the ambient temperature inside the building. The exhaust fans are controlled by a Dayton thermostat. Once the indoor temperature reaches the set temperature, the exhaust fans will be turned on automatically to vent. Refer to [Appendix A](#) for the detailed maintenance procedures.

Manufacturer specifications for the building exhaust fans are provided in Vendor Data, [Tab AH](#).

7.0 OFFLINE TREATMENT SYSTEM COMPONENTS

Since the flameless thermal oxidizer (FTO) was shut down on June 9, 2008 after the project team and EPA decided the FTO was no longer necessary for efficient vapor treatment, the treatment system components associated with the FTO operation are presently offline and no longer needed. These components include the following:

- FTO
- T-901 caustic soda tank
- P-901 metering pump
- D-601 desiccant dryer
- Automatic water pressure boost system

Refer to [Table 1](#) – Equipment List for the manufacturer specifications and model numbers of these offline components.

Although these components are no longer requiring maintenance, the operating personnel should periodically inspect the exterior and interior of these components for cleanliness, cracking, and corrosion. Check fittings and gaskets for signs of corrosion and deterioration. Repair of these components should be in lower priority comparing to other operating components.

8.0 SYSTEM CONTROLS

8.1 SYSTEM MAIN COMPUTER

The treatment equipment is controlled and monitored by a System Main Computer (SMC) located in the control room. The SMC provides an interface between the equipment and the operator. This allows the operator to start, stop, reset, change set points, view alarms, and monitor the system, all from the SMC. The SMC is configured to data log all process analog signals at 1 minute intervals and also keeps a trend of all the analog channels of the treatment system. The SCADA system has a built-in autodialer that will phone or email selected personnel when any alarm occurs. The alarm history is automatically logged to an alarm log file once per month. The computer is configured with a username and password to prevent unwanted access to the computer. The SMC display can also be accessed remotely.

The control system is fitted with an auxiliary power supply that will give the PLC and SMC about 1 hour of run time in the event of a power failure. This allows the system to autodial the necessary personnel that the system went offline.

NOTE: The treatment system will not function in the event of a power failure. The SMC and PLC only stay on for monitoring purposes.

8.2 PROGRAMMABLE LOGIC CONTROLLER (PLC)

The SMC communicates via an Ethernet network to the main control panel programmable logic controller (PLC). The main control panel PLC monitors and controls the physical inputs and outputs (e.g. monitor level switches; pumps, etc.) of the system and holds all the logic that controls the system. The logic path for the instrumentation and control system is illustrated on [Drawings M-1 and M-1A](#), P&ID diagrams.

8.3 PROCESS CONTROL POINTS & SYSTEM ALARM OVERVIEW

System shutdown and alarm set points are intended to prevent damage to equipment and the discharge of untreated water. Various system control set points are presented in [Table 4](#). When an alarm condition occurs, red flashing text "ALARM CONDITION" will appear on each screen on the SMC notifying the operator that an alarm condition exists and they must clear the alarm and reset the system. There are several types of alarms that trigger specific system responses. An alarm list for various alarms and associated system response is also presented in [Table 4](#). All alarms should be investigated to determine why they occurred.

Groundwater System Warning Alarm: The GTS has a process non-critical alarm. When a GTS warning alarm occurs, the alarm is time & date stamped, logged to the alarm file and sent to the autodialer for notification. Groundwater system operation is unaffected by a GTS warning alarm.

Groundwater System Shutdown Alarm: The GTS has an alarm that will prevent the system from running within normal parameters. When a GTS Shutdown alarm occurs, all components within the GTS shut down. The alarm is time & date stamped, logged to the alarm file and sent to the autodialer for notification. Other vapor treatment system functions are not affected.

Vapor Treatment System Warning Alarm: The VTS has a process non-critical alarm. When the VTS system has a VTS Warning alarm, the alarm is time & date stamped, logged to the alarm file and sent to the autodialer for notification. VTS operation is unaffected.

Vapor Treatment System Shutdown Alarm: The VTS has an alarm that will prevent the system from running within normal parameters. When a VTS Shutdown alarm occurs, the VTS will perform a normal system shutdown. The alarm is time & date stamped, logged to the alarm file and sent to the autodialer for notification. Groundwater system functions are not affected.

Critical Shutdown Alarm: A critical condition on the system has occurred and could cause possible equipment damage or flooding. Both treatment systems (GTS & VTS) shut down immediately. The alarm is time & date stamped, logged to the alarm file and sent to the autodialer for notification.

8.4 CONTROL PANEL INDICATORS

The diaphragm pumps (P-101 & P-102), which pump down the condensate sumps outside the treatment plant, are the only control panel indicator that requires manual operation. Indicator lights located on a panel on the wall above P-101 & P-102 are lit when a condensate sump becomes filled with water to the designated set point (high water level float switch). The diaphragm pump is then activated manually by opening the air supply ball valve and enabling compressed air to operate the diaphragm pump. This allows the diaphragm pump to begin removing water from the condensate sump. When the water level in the condensate sump clears the water level set point, the indicator light will turn off. Manual pumping is continued until water being pumped to T-401 cannot be seen in the clear section of discharge piping located after the diaphragm pump discharge and before entrance location to T-401.

All other local control panels should be set for "AUTO" operation.

9.0 SYSTEM MONITORING

The routine operation categories for continuous operations of the remediation system include:

- Operating parameters
- Performing operations duties
- Maintenance of operating records
- Permit monitoring
- Regulatory and status reporting
- Vapor phase GAC exchanges
- Liquid phase GAC exchanges

9.1 OPERATING PARAMETERS

The following operating parameters for the vapor extraction and groundwater treatment system shall be maintained:

- Vapor extraction treatment:
 - The vapor stream between the liquid ring vacuum pumps (B-101 & B-102) and the discharge blower (B-301) shall not exceed 1,000 SCFM.
 - The discharge blower (B-301) after the vapor GAC shall not exceed a discharge of twenty-five lbs of VOCs in any one day (69 ppmv).
- Groundwater treatment system:
 - The groundwater treatment system shall not discharge at an average flow rate greater than 50 gpm.
 - Samples shall be collected at the sampling box (T-405) and analyzed for the constituents listed on the Industrial Wastewater Discharge Permit from the SDLAC.

9.2 OPERATIONAL DUTIES

The following is a list of duties required for continuous operation of the remediation system:

- Fill out daily field input forms for process physical parameters, gauges and sampling ports as required. The intent of the field form is not just to collect data, but to require the plant operator to inspect the plant while collecting the data.
- Maintain daily logbook.

- Perform periodic maintenance as recommended by the individual equipment manufacturers, as outlined in vendor manuals located in the O&M Vendor Manual Volume.
- Monitor vapor phase GAC system (T-301 & T-302) for proper operation and permit compliance.
- Monitor liquid phase GAC system (T-403 & T-404) for proper operation and permit compliance.
- Monitor Groundwater Booster Tank (T-401) for safe operating levels. This includes periodic removal of biological growth.
- Monitor Holding Tank (T-402) for proper operation, including periodic removal of biological growth.
- Clean all water system “y” strainers to maintain flow through the system.
- Monitor LRPs (B-101 & B-102) for proper operation, temperatures, and proper oil levels.
- Monitor Cooling Tower (CT-201) for scaling and biological growth.
- Change bag filters (F-401, F-401, F-403 F-404, F-501, and F-502) and clean vapor particulate filters (F-101 & F-102) as needed or when there is a 10 PSI pressure drop across the filters. This could be as frequently as twice a day or once every two days or more. Best way is to monitor the pressure drop at multiple times daily.
- Maintain proper oil levels in the equipment that requires oil.
- Repair any leaking or broken valves.

9.3 OPERATIONAL RECORDS

The operator for the remediation system must maintain the following records and files on site:

- A daily operations log/O&M checklist sheet for each day of attended operation
- Quarterly material inventory sheets to record the type and quantity of materials stored on-site and corresponding material safety data sheets (MSDS).
- Quarterly spare parts inventory sheets to record the type and quantity of parts stored on-site.
- Maintenance and calibration records for equipment and instrumentation.

10.0 REFERENCES

Jacob and Hefner Associates, Inc., Operation and Maintenance Manual, Pemaco Superfund Site, February 19, 2008.

T N & Associates, Inc., Final Remedial Design Report, Pemaco Superfund Site, August 2006.

T N & Associates, Inc., Accident Prevention Plan, Operation and Maintenance of Dual Phase Groundwater and Vapor Treatment System, Pemaco Superfund Remediation Site, August 2007.

T N & Associates, Inc., Final Construction Completion Report, Pemaco Superfund Site, September 30, 2007.

T N & Associates, Inc., Draft Final Monitoring Operations and Maintenance Plan, Pemaco Superfund Site, October 2007.

Tables

Table 1
Treatment System Equipment Summary
Pemaco Superfund Site, Maywood, CA

P&ID	Item Description	Material/Schedule	Operating Specifications	"As-Built" Specified Manufacturer Catalog	Other Specifications
B-101	Liquid-Ring Vacuum Pump System	TYP	75 hp/1100 acfm (nominal)	Oil-Sealed 75 hp Dekker Vacuum Technologies, Inc. System Model #VMX1103KA1-01	Equipped with oil liquid ring, system interlock/failsafe, alarms, and hour meters. Maximum vacuum 29 in. Hg. 1100 rpm. Max. noise level: 80 dBA.
B-102	Liquid-Ring Vacuum Pump System	TYP	75 hp/1100 acfm (nominal)	Oil-Sealed 75 hp Dekker Vacuum Technologies, Inc. System Model #VMX1103KA1-01	Equipped with oil liquid ring, system interlock/failsafe, alarms, and hour meters. Max. vac. 29 in. Hg. 1100 rpm. Max. noise level: 80 dBA.
B-301	System Exhaust Blower with Sound Enclosure	TYP	25 hp/1,000 cfm (nominal)	Baldor EM4103T - 25 hp Motor, Roots Rotary Positive Blower - Frame Size 615, SDY 54-106-AA Silencer	25 hp, 1770 rpm, TEFC, 1036 cfm @ 1750 rpm, 7 psi.
CT-201	Cooling Tower, VC Package	TYP	650 gpm	AQUA-Loop Cooling Tower MB-300	Provided as part of the vapor conditioning package.
CV-401, 402	Bypass Control Valves	CPVC schedule 80	Rated for 15 psig, 200° F	Hayward Manual Butterfly Valve Engineer Approved Equivalent	Flanged Butterfly valve with Viton elastomer
D-601	Regenerative Desiccant Dryer	TYP	5 scfm, 90 psig, -90°F Dew Point	KAESER KADW-10	Regenerative desiccant dryer provided for use with FTO. Presently offline.
dPIT-101	Differential Pressure Indicating Transmitter	Stainless Steel	0-10in. wc	Dwyer Instrument Model# 605-10	Electrical accuracy ±0.5%, mechanical accuracy ±2%, 4-20 mA, 2 wire, 10-35 VDC, 0-10 in. wc stainless steel connection tubing
F-101	Inlet Vacuum Particulate Filter	Stainless Steel	5 microns/4950 scfm (nominal)	Solberg CSL-485P(2)-1200FS1 485P Polyester Element	99%+ removal efficiency, Inlet air enters canister above element, SS Housing cartridge filter, Positive sealing O-ring seal system, 0.5 bar pressure for vacuum tightness, Vacuum level: 1x10 ³ mmHg. Two filters installed in parallel with valving as shown in Drawing M-4. Nominal Rating: 4950 scfm, two (2) 485P elements per filter housing. 6" inlet/outlet are custom welded.
F-102	Inlet Vacuum Particulate Filter	Stainless Steel	5 microns/4950 scfm (nominal)	Solberg CSL-485P(2)-1200FS1 485P Polyester Element	99%+ removal efficiency, Inlet air enters canister above element, SS Housing cartridge filter, Positive sealing O-ring seal system, 0.5 bar pressure for vacuum tightness, Vacuum level: 1x10 ³ mmHg. Two filters installed in parallel with valving as shown in Drawing M-4. Nominal Rating: 4950 scfm, two (2) 485P elements per filter housing. 6" inlet/outlet are custom welded.
F-103	Oil Mist Exhaust Filter	Stainless Steel	0.3 microns/1100 scfm (nominal)	Solberg HDL-PSG474-2-600	0-5 psig operating, 10 psig proof pressure, Minimum 99.97% D.O.P. on 0.3 micron diameter particles, Positive sealing O-ring seal system, SS Housing cartridge filter. Two filters installed in parallel with valving as shown in Drawing M-4.
F-104	Oil Mist Exhaust Filter	Stainless Steel	0.3 microns/1100 scfm (nominal)	Solberg HDL-PSG474-2-600	0-5 psig operating, 10 psig proof pressure, Minimum 99.97% D.O.P. on 0.3 micron diameter particles, Positive sealing O-ring seal system, SS Housing cartridge filter. Two filters installed in parallel with valving as shown in Drawing M-4.
F-401	Water Filter, four (4) size two bag filter housings in one vessel	316 Stainless Steel	400 gpm	Hayward/Eaton Filtration, LLC. VMBF-0402 AB10-040A-UT-11SE 150 psi	Multiple 316 SS bag filter with (4) size two bag filter housings inside one vessel, spring assisted cover, 4" flanged inlet/outlets, low profile for quick filter replacement. Mounted on skid with single bag filter F-402. Inlet/outlet shut-off valves as shown in Drawing M-4.
F-402	Water Filter, one (1), size two bag filter housing	316 Stainless Steel	180 gpm	Krystil Klear Filtration L88302FB610, 100 psi	Single 316 SS bag filter with (1) size two bag filter housing, 2" flanged inlet/outlets, low profile for quick filter replacement. Mounted on skid with multiple bag filter housing F-401. Shut-off valves as shown in Drawing M-4.
F-403	Water Filter, size two bag filter housing	316 Stainless Steel	180 gpm	Krystil Klear Filtration L88302FB610, 100 psi	Single 316 SS bag filter with size two bag filter housing, 2" flanged inlet/outlets. Skid mounted. Shut-off valves as shown in Drawing M-4.
F-404	Water Filter, size two bag filter housing	316 Stainless Steel	180 gpm	Krystil Klear Filtration L88302FB610, 100 psi	Single 316 SS bag filter with size two bag filter housing, 2" flanged inlet/outlets. Skid mounted. Shut-off valves as shown in Drawing M-4.
F-501	Water Filter, size two bag filter housing	316 Stainless Steel	180 gpm	Krystil Klear Filtration L88302FB610, 100 psi	Single 316 SS bag filter with size two bag filter housing, 2" flanged inlet/outlets. Skid mounted. Shut-off valves as shown in Drawing M-4.
F-502	Water Filter, size two bag filter housing	316 Stainless Steel	180 gpm	Krystil Klear Filtration L88302FB610, 100 psi	Single 316 SS bag filter with size two bag filter housing, 2" flanged inlet/outlets. Skid mounted. Shut-off valves as shown in Drawing M-4.
F-601	Air Filter-compressed air particulate filter with automatic drain	Aluminum	250 cfm @ 100 psig	Kaeser KPF-250	Maximum working pressure: 250 psig. Maximum operating temp: 150°F.
F-801	Calcium Filter/Softener	TYP	20 gpm min/<3ppm Calcium	U.S. Filter Duplex KF-2 21"x62" KFZSDO21FPZVCX	US Filter KF Series Duplex Alternating Softener w/ brine tank, Feed Temp 45-100°F, Feed pressure 30-100 psig, <3ppm Calcium, 77 gpm, 110V
FA-301	Flame Arrestor	Aluminum outer body with 316 SS internal	Not Specified	GROTH Model 80013075	Flame arrestor to serve as a backflash prevention device (from vapor phase carbon vessels). Aluminum outer body with 316 SS internal, 12.72" outer diameter, 55 pounds.
FE-101	Vapor Flow Element-Averaging Pitot Tube	Sensor Tube - 304 SS	0-3040 scfm	Dwyer DS-300-8"	Averaging pitot tube to be used with differential pressure transmitter (dPIT-101), valve is rated at 200 psig and 200°F, 1/4" NPT connection.
FI-101 to 108	Vapor Flow Indicator	Brass	Not Specified	Swagelock Borethrough B-500-1-4BT with Plug (B-500-P)	1/4" NPT borethrough fitting for insertion of averaging pitot tube.
FQI-201	Water Flow Totalizer	Bronze	3-50 gpm	McMaster-Carr 9743K17	Hot-water totalizer, 1" inlet ID x 1" coupling, NPT male, nonresettable dial register volume up to 9,999,990 gallons. 2 1/2" dial mounted horizontally, rubber O-ring, temperature range 33° to 155°F. AWWA Standard C-708.
FQI-401	Flow Totalizer & Indicator	PVDF Rotor, PVC schedule 80 TEE	22-450 gpm	Signet Series 515 Rotor X, Signet Series 8550 ProcessPro Flow Transmitter, Signet Installation Fitting 3" Tee	Self-powered flow sensor, housing material PVDF, rotor material nat. PVDF, pipe size 1/2" to 4" <Harrington Plastics Part# PS1530-V0>, Field mount with dual input/output <Harrington Plastics Part# 3-8550-3>, 4-20mA, 24 VDC power, <Harrington Plastics Part# PV8T030>, Accuracy: +/- 0.5%.
FQI-402	Flow Totalizer & Indicator	Polypropylene	2.3-160 gpm	KROHNE Optiflux 2000	Electromagnetic type, min. 2Qs/cm electrical conductivity, maintenance free. The original FQI-402 was broken and replaced by this totalizer on 6/11/09.
FQI-501	Flow Totalizer & Indicator	PVDF Rotor, PVC schedule 80 TEE	20-200 gpm	Signet Series 515 Rotor X, Signet Series 8550 ProcessPro Flow Transmitter, Signet Installation Fitting 2" Tee	Self-powered flow sensor, housing material PVDF, rotor material nat. PVDF, pipe size 1/2" to 4" <Harrington Plastics Part# PS1530-V0>, Field mount with dual input/output <Harrington Plastics Part# 3-8550-3>, 4-20mA, 24 VDC power, <Harrington Plastics Part# PV8T020>, Accuracy: +/- 0.5%.
FTO-101	Flameless Thermal Oxidizer and Scrubber	Mixed	1000 scfm	ANGUIL EDGE QR-1000	Provided by Anguil Environmental Systems.
H-201 A/B/C	Air Chiller/Condenser	Stainless Steel/Zinc Plated Steel	297 gpm	Xchanger Model TV-275	VC Package, 297 gpm, Design Temp: -100°F to 225°F.
H-202	Air Warmer	Stainless Sheath and Fins	Not Specified	Vulcan VFT612-10C3 Low Temp Duct Heater	For use with FTO, presently offline.
H-401	Heat Exchanger	Stainless Steel/Copper coils	20 gpm	Xchanger, Inc. LC series or equivalent	Temperature in: 165°F, Temperature out: 130°F. Pressure loss: 2.1 psi. Design temperature: -300 to 200°F.
K-601	Rotary Screw Air Compressor and Receiver tank	TYP	100 psi	Kaeser Compressor AS-30	125 psi Max, 155 psi blow-off setting of the safety relief valve, 124 cfm max free air delivery, 30 Hp, 240 gallon receiver, 71 dB(A)
LI-101	Level Indicator	Clear PVC	Not Specified	MK Environmental Stilling Well Level Control Typical	Level indicator for moisture separator.
LI-201	Level Indicator	Clear PVC	Not Specified	MK Environmental Stilling Well Level Control Typical	Level indicator for moisture separator.
LI-401	Level Indicator	Clear PVC	Not Specified	MK Environmental Stilling Well Level Control Typical	Level indicator for moisture separator.
LI-402	Level Indicator	Clear PVC	Not Specified	MK Environmental Stilling Well Level Control Typical	Level indicator for moisture separator.
LI-901	Level Indicator	Clear PVC	Not Specified	Poly Processing Co. Float Type Sight Gage	Level indicator for caustic tank. Mechanical gauge mounted onto the top of the double contained caustic tank. For use with FTO, presently offline.
LSH-101	Level Switch High	Stainless Steel	Not Specified	W.E. Anderson Flotec® Series L6 L6EPBBS3A	Plumbing and electrical configured for quick removal for cleaning/replacement, -4 to 220°F, Explosion proof, SPDT switch type, 1" NPT, 304 SS Cylindrical Float.
LSH-201	Level Switch High	Stainless Steel	Not Specified	W.E. Anderson Flotec® Series L6 L6EPBBS3A	Plumbing and electrical configured for quick removal for cleaning/replacement, -4 to 220°F, Explosion proof, SPDT switch type, 1" NPT, 304 SS Cylindrical Float.
LSH-401	Level Switch High	Stainless Steel	Not Specified	W.E. Anderson Flotec® Series L6 L6EPBBS3A	Plumbing and electrical configured for quick removal for cleaning/replacement, -4 to 220°F, Explosion proof, SPDT switch type, 1" NPT, 304 SS Cylindrical Float.
LSH-501	Level Switch High	Stainless Steel	Not Specified	GEMS Stainless Steel Multilevel Float Switch - LS800-3-BR-SS-SPST-20-GR2-3	Plumbing and electrical configured for quick removal for cleaning/replacement, 316 SS, SS ARMCO PH-15-7MO Grip Rings, -40 to 300°F.
LSHH-101	Level Switch High-High	Stainless Steel	Not Specified	W.E. Anderson Flotec® Series L6 L6EPBBS3A	Plumbing and electrical configured for quick removal for cleaning/replacement, -4 to 220°F, Explosion proof, SPDT switch type, 1" NPT, 304 SS Cylindrical Float.
LSHH-201	Level Switch High-High	Stainless Steel	Not Specified	W.E. Anderson Flotec® Series L6 L6EPBBS3A	Plumbing and electrical configured for quick removal for cleaning/replacement, -4 to 220°F, Explosion proof, SPDT switch type, 1" NPT, 304 SS Cylindrical Float.
LSHH-401	Level Switch High-High	Stainless Steel	Not Specified	W.E. Anderson Flotec® Series L6 L6EPBBS3A	Plumbing and electrical configured for quick removal for cleaning/replacement, -4 to 220°F, Explosion proof, SPDT switch type, 1" NPT, 304 SS Cylindrical Float.
LSHH-402	Level Switch High-High	Stainless Steel	Not Specified	W.E. Anderson Flotec® Series L6 L6EPBBS3A	Plumbing and electrical configured for quick removal for cleaning/replacement, -4 to 220°F, Explosion proof, SPDT switch type, 1" NPT, 304 SS Cylindrical Float.
LSHH-501	Level Switch High-High	Stainless Steel	Not Specified	GEMS Stainless Steel Multilevel Float Switch - LS800-3-BR-SS-SPST-20-GR2-3	Plumbing and electrical configured for quick removal for cleaning/replacement, 316 SS, SS ARMCO PH-15-7MO Grip Rings, -40 to 300°F.
LSL-101	Level Switch Low	Stainless Steel	Not Specified	W.E. Anderson Flotec® Series L6 L6EPBBS3A	Plumbing and electrical configured for quick removal for cleaning/replacement, -4 to 220°F, Explosion proof, SPDT switch type, 1" NPT, 304 SS Cylindrical Float.
LSL-201	Level Switch Low	Stainless Steel	Not Specified	W.E. Anderson Flotec® Series L6 L6EPBBS3A	Plumbing and electrical configured for quick removal for cleaning/replacement, -4 to 220°F, Explosion proof, SPDT switch type, 1" NPT, 304 SS Cylindrical Float.
LSL-401	Level Switch Low	Stainless Steel	Not Specified	W.E. Anderson Flotec® Series L6 L6EPBBS3A	Plumbing and electrical configured for quick removal for cleaning/replacement, -4 to 220°F, Explosion proof, SPDT switch type, 1" NPT, 304 SS Cylindrical Float.
LSL-501	Level Switch Low	Stainless Steel	Not Specified	GEMS Stainless Steel Multilevel Float Switch - LS800-3-BR-SS-SPST-20-GR2-3	Plumbing and electrical configured for quick removal for cleaning/replacement, 316 SS, SS ARMCO PH-15-7MO Grip Rings, -40 to 300°F.
LSL-901	Level Switch Low	316 Stainless Steel	Not Specified	Dwyer/W. E. Anderson Series F7-ST713 Vertical Level Switch	Vertical Level Switch installed from the top of the double contained tank. Float material must be chemically compatible with 25% NaOH solution. For use with FTO, presently offline.
LSLL-401	Level Switch Low-Low	Stainless Steel	Not Specified	W.E. Anderson Flotec® Series L6 L6EPBBS3A	Plumbing and electrical configured for quick removal for cleaning/replacement, -4 to 220°F, Explosion proof, SPDT switch type, 1" NPT, 304 SS Cylindrical Float.
LSLL-402	Level Switch Low-Low	Stainless Steel	Not Specified	W.E. Anderson Flotec® Series L6 L6EPBBS3A	Plumbing and electrical configured for quick removal for cleaning/replacement, -4 to 220°F, Explosion proof, SPDT switch type, 1" NPT, 304 SS Cylindrical Float.

Table 1 (Cont'd)
Treatment System Equipment Summary
Pemaco Superfund Site, Maywood, CA

P&ID	Item Description	Material/Schedule	Operating Specifications	"As-Built" Specified Manufacturer Catalog	Other Specifications
P-101 & P-102	Double Diaphragm Pump	Elastomer - Viton Pump Body - Polypropylene	29 gpm @ 100 psi	Price Pump AOD1-PVVP	35 gal maximum, max air inlet pressure: 125 psi, max spherical solids size: 3/16", high temp: 180°F.
P-201	Cooling Tower Transfer Pump	Stainless Steel	Not Specified	SCOT ARDOX Motorpump - 1750 rpm, 20 hp, 9.38" Impeller, TEFC	Part of the vapor conditioning package.
P-202	Refrigerated Chiller Pump	Stainless Steel	Not Specified	ITT Goulds Pump - 2ST1H5B4, 3 hp, TEFC Motor	Part of the vapor conditioning package.
P-203	VC Package Condensate Pump	Polypropylene, ETFE	52 gpm/45' TDH	Pacer Pumps - Z-40, 1/2 hp	Part of the vapor conditioning package.
P-401	Booster Tank Pump	316 Stainless Steel	110 gpm/55' TDH/3 Phase, 460 V	ITT Goulds Pump - 2ST1H2B4, 3 hp, ODP Motor	Centrifugal pump see Major Equipment Specifications for more details. The pump may pass no more than 3/16" particle.
P-402	Holding Tank Pump	316 Stainless Steel	100 gpm/75' TDH/3 Phase, 460 V	ITT Goulds Pump - 2ST1JSA4, 5 hp, ODP Motor	Centrifugal pump see Major Equipment Specifications for more details. The pump may pass no more than 3/16" particle.
P-501	Transfer Pump	316 Stainless Steel	30 gpm/75' TDH/3 Phase, 460 V	AMT Self-Priming Centrifugal Pump 282B-98 2hp motor	Self priming centrifugal see Major Equipment Specifications for more details. The pump can handle 3/8" diameter semi-solids.
P-502	Pump for Secondary Containment Sump	316 Stainless Steel	30 gpm/35' water/3 Phase, 460 V	Dayton Submersible Sewage Pump DN2110070T 1hp motor	Submersible sump pump, self priming. Equipped with LSL, LSH, LSHH, system interlock, and alarms. 2" Solids Handling Capacity
P-901	Metering Pump	TYP	34 gph @ 1725 rpm	MacRoy Pump D7688PE1NIN	Associated with FTO, presently offline.
PI-101 to 103, 201 to 203, 414	Air Pressure Indicator	304 SS Case/316 SS Internal	0-15 PSI	McDaniel Controls K9A-GF (0-15 psi)	2-1/2" Dial Glycerin-Filled, Grade 1A, 1/4" Bottom NPT male connection
PI-401 to 405, 407, 408, 501, 502	Water Pressure Indicator	304 SS Case/316 SS Internal	0-60 PSI	McDaniel Controls K9C-GF (0-60 psi)	2-1/2" Dial Glycerin-Filled, Grade 1A, 1/4" Bottom NPT male connection
PI-406, 409 to 413, 415, 503, 504	Water Pressure Indicator	304 SS Case/316 SS Internal	0-30 PSI	McDaniel Controls K9B-GF (0-30 psi)	2-1/2" Dial Glycerin-Filled, Grade 1A, 1/4" Bottom NPT male connection
PI-601	Air Pressure Indicator	316 Stainless Steel	0-200	Kodiak Controls Glycerine Filled, 2-1/2-in Dial Size, SS316, Model KC301L Pressure Indicating Gauge (0-200 psi)	2-1/2" Dial Glycerin-Filled, 1.5% Accuracy, 1/4" Bottom NPT male connection
PI-602	Air Pressure Indicator	304 SS Case/316 SS Internal	0-160	McDaniel Controls K9E-GF (0-160 psi)	2-1/2" Dial Glycerin-Filled, Grade 1A, 1/4" Bottom NPT male connection
PRV-401, 402, 403, 404, 901, 902	Pressure Relief Valve	Not Specified	Not Specified	Poly Processing Co. 2" Mushroom (PPL) Relief Valve with Viton Seals	T-401 has (3) 2" vents. T-402 has (2) 2" vents. T-901 has (3) 2" vents.
PRV-405	Pressure Relief Valve	Not Specified	Not Specified	McMaster-Carr #4780K16, 2", set at 65 psi	PRV-406 is not necessary as PRV-405 will be mounted on the inlet manifold to T-403 and T-404 and will serve both tanks adequate pressure and flow should be maintained down stream of valve.
PRV-101, 301, 303	Pressure Relief Valve	Not Specified	Not Specified	Kunkle Model 337 #0337-H01ANE0005	2", set point 6 psig.
PRV-602	Pressure Relief Valve	Not Specified	Not Specified	Control Devices, Inc. SF50	Set point 140 psi, capacity 257 scfm
PS-601	Pressure Switch	Stainless Steel	22.5-125 PSI	McMaster# 46995K18, 22.5-125 psi, Nema 4	Compact cylindrical pressure switch, Nema 4, 1/2" NPT male, 5A @ 125/250 VAC, Buna - N diaphragm - sealed piston, set point range 22.5-125 psi, SPDT
PT-101	Air Pressure Transmitter	Stainless Steel	0-5 PSI	Dwyer Instrument Model# 673-3C, 0-5 psi	±0.25% full span accuracy, 17-4 PH SS, 4 to 212°F, 4-20 mA, 2 wire, 0-15 psi
PT-401	Water Pressure Transmitter	316 Stainless Steel	0-60 PSI	McMaster# 3196K1, 0-60 psi	Economy transducer, 1/4" NPT male, 316 SS, -40 to 212°F, ± 0.5% accuracy, 10-30 VDC, 2 wire, 4-20 mA
PT-402	Water Pressure Transmitter	Stainless Steel	0-5 PSI	Dwyer Instrument Model# 673-3C, 0-5 psi	±0.25% full span accuracy, 17-4 PH SS, 4 to 212°F, 4-20 mA, 2 wire, 0-5 psi
PT-403	Water Pressure Transmitter	316 Stainless Steel	0-60 PSI	McMaster# 3196K1, 0-60 psi	Economy transducer, 1/4" NPT male, 316 SS, -40 to 212°F, ± 0.5% accuracy, 10-30 VDC, 2 wire, 4-20 mA
PT-404	Water Pressure Transmitter	316 Stainless Steel	0-60 PSI	McMaster# 3196K1, 0-60 psi	Economy transducer, 1/4" NPT male, 316 SS, -40 to 212°F, ± 0.5% accuracy, 10-30 VDC, 2 wire, 4-20 mA
PT-501	Water Pressure Transmitter	316 Stainless Steel	0-60 PSI	McMaster# 3196K1, 0-60 psi	Economy transducer, 1/4" NPT male, 316 SS, -40 to 212°F, ± 0.5% accuracy, 10-30 VDC, 2 wire, 4-20 mA
R-601	Air Regulator	TYP	5-125 psi	McMaster# 4959K57	1 1/2" NPTF, Maximum scfm @ 100 psi: 440 scfm
R-602	Air Regulator	TYP	10-250 psi	McMaster# 4959K54	3/4" NPTF, Maximum scfm @ 100 psi: 220 scfm
R-603	Air Regulator	TYP	5-125 psi	McMaster# 4959K55	1" NPTF, Maximum scfm @ 100 psi: 480 scfm
R-604	Air Regulator	TYP	5-125 psi	McMaster# 4959K55	1" NPTF, Maximum scfm @ 100 psi: 480 scfm
R-605	Air Regulator	TYP	5-125 psi	McMaster# 4959K55	1" NPTF, Maximum scfm @ 100 psi: 480 scfm
R-606	Air Regulator	TYP	5-50 psi	McMaster# 4959K55	1" NPTF, Maximum scfm @ 100 psi: 480 scfm
RC-201	Refrigerated Chiller, VC Package	Copper Tube/Aluminum Fin	25 Ton/300,000 Btu/h	Zarsky Water Chillers - Model: ACWC-300-E	Part of VC package. Carrier Semi-Hermetic Compressor, 460V, 3 Phase
T-101	Moisture Separator	1/4" minimum hot rolled steel	Remove 95% of all liquid droplet/30 in. Hg Max. Vacuum	TetraSOLV Filtration, 500 gallon., 316 SS, 30" Hg Vacuum, (Skid: 60"Wx60"Lx4"H)	250 microns droplet size @ 95% removal efficiency.
T-201	Moisture Separator	cross linked HDPE	60 gallon	Poly Processing - 60 gallon Upright Tank	Part of VC Package.
T-202	Cooling Water Tank, VC Package	cross linked HDPE	280 gallon	Poly Processing - 280 gallon Upright Tank	The VC Package must be capable of interfacing with both the FTO PLC and treatment compound PLC.
T-301 & 302	Vapor-Phase Carbon Vessel	Double layered Epoxy Coated Carbon Steel, Vacuum Rated	4,000 lb, 3000 cfm, 15 psig, 4 in. Hg vacuum.	TetraSOLV Filtration VFV-5000, 4000 pounds	Operating fill: 4,000 lb virgin coconut shell carbon.
T-401	Groundwater Booster Tank	cross linked HDPE	905 gallon	Poly Processing Company Stock Number 41100905	Vapor tight, bolted, polyethylene man way with viton gaskets with 19" opening. Sight tube/level indicator with unions and isolation valves for quick disassembly/replacement and clean-out.
T-402	Water Holding Tank	cross linked HDPE	4,900 gallon	Poly Processing Company Stock Number 11004900.	Vapor tight, bolted, polyethylene man way with viton gaskets with 19" opening. Sight tube/level indicator with unions and isolation valves for quick disassembly/replacement and clean-out.
T-403 & 404	Liquid-Phase Carbon Adsorber	Double layered Epoxy Coated Carbon Steel	3,000 pound/150 gpm/75 psig	tetraSOLV Filtration, hpAF-3000, 3000 lbs	Operating fill: 3,000 pound virgin coconut shell carbon.
T-601	Air Receiver Tank	Painted Carbon Steel	240 gallon	Manchester Tank - Vertical Air Receiver, 240 gallon	Maximum working pressure: 200 psi @ 400°F. Include a pressure gauge, pressure relief valve, automatic drain, manual drain, and galvanized steel plumbing.
T-602	Air Receiver Tank Condensate Drum	Epoxy Coated Steel	55-gallon Drum/200 pound capacity	SKOLNIK - 55 gallon. TH Drum, 2 Hoops	Not Specified
T-701	Holding Tank Carbon Vessel (vent)	Internal: Polyamide Epoxy Resin/External: Urethane Enamel	55 gallon	tetraSOLV - VFD-55	55-gallon carbon drum filled with virgin coconut shell carbon.
T-901	Caustic Soda Tank	Crosslinked Polyethylene Double-wall	1,550 gallon	Poly Processing Company SAFE-TANK® Stock Number 42001550	Inner tank - 1,790 gal; Outer tank - 1,954 gal; with 19" bolt manway cover and bolted flange fitting; float type sight gage and restraint system.
TI-101 to 108, TI-201 to 207	Temperature Indicator	Stainless Steel	30-240°F	Taylor Bitherm Dial Thermometer BB3102E083	3" Dial Bimetal Stem Thermometer, 30 to 240°F, 316 SS, Back or Bottom NPT male connection with thermowell
TIT-101, 102, 201, 202, 301, 401, 402, 501	Temperature Indicating Transmitter	Stainless Steel	0-200°F	Siemens SITRANS TF2 7NG3140-3BK00	Temperature Transmitter with Display and RTD sensor, straight thermowell, 1/2" NPT, 4" bore depth, 316 SS
V-101 to 108	Vapor Diaphragm Valves	316 SS Trim	250 psi	NIMCO 250 PSI Gear-Actuated Butterfly Valve, Wafer Style, Memory Stop	Wafer style, Fluoroelastomer seal, 316 SS Trim, Geometric drive, Extended neck, Molded-in seat liner, Gear operator: memory stop.
V-319	Air Intake Filter with Silencer	Steel Housing w/ Polyester Filter Element	520 scfm max	Solberg Manufacturing FS-238P-400F	Max temperature 220°F, 16" diameter housing, 4" Class 125/150 flange connection, 5-micron polyester element.
V-407	Actuated Valve	PVC SCH 80	150 psig	OSCAF #5213-09-0400 mounted with ETI 1300 Electric Actuator	Controlled by PLC
V-452	3-Way True Union Ball Valve with Electric Actuator	CPVC schedule 80	Rated for 15 psig, 200° F	Spears True Union 2000 Industrial 3 Way Ball Valve with Viton seals and L port Spears Premium Electric TU Ball Valve	Controlled by PLC.
V-607	Compressed air supply 3-way solenoid valve	Brass	150 psig	ASCO 1" Air and Water Solenoid Valve 8316G34	Controlled by PLC, normally closed, 150psi (AC)/125 psi (DC)
VI-101 to 111, 201, 301 to 306	Vacuum Indicator	Stainless Steel	0 to -30" Hg	McDaniel Controls K9S-GF (30"-0in. Hg)	2-1/2" Dial Glycerin-Filled, Grade A, Back or Bottom connection, 5" Figure Interval, 0.5" Grad. Mark, 1/2" NPT male, 316 SS
VT-101, 201	Pressure Transmitter	Stainless Steel	0 to -30" Hg	McMaster# 3200K1, -30 in. Hg-0 psi	High accuracy transducer, 1/2" male NPT, 316 SS, -40 to 212°F, < 0.25% accuracy, 10-30 VDC, 2 wire, 4-20 mA

Notes:

AC - alternating current
CPVC - chlorinated polyvinyl chloride
DC - direct current
ETFE - ethylene tetrafluoroethylene
FTO - flameless thermal oxidizer
NPT - national pipe thread
NPTF - national pipe thread, female
P&ID - piping and instrumentation diagram
PLC - programmable logic controller

PVC - polyvinyl chloride
PVDF - polyvinylidene fluoride
SPDT - single pole, double throw
SS - stainless steel
TDH - total dynamic head
TEFC - totally enclosed, fan-cooled
TYP - typical
VC - vapor conditioning

acfm - actual cubic feet per minute
Btu/h - British thermal units per hour
cfm - cubic feet per minute
dBA - A-weighted decibels
gph - gallons per hour
gpm - gallons per minute
hp - horsepower
in. Hg - inches of mercury
in. wc - inches of water column

mmHg - millimeters of mercury
°F - degree Fahrenheit
ppm - part per million
psi - pounds per square inch
psig - pounds per square inch gauge
rpm - revolutions per minute
scfm - standard cubic feet per minute
V - volt

Table 2
Major Equipment Cross Reference
Pemaco Superfund Site, Maywood, California

Equipment	P&ID Reference	Vendor Data Reference
Pneumatic Submersible Pumps	N/A	TAB A
Actuated Butterfly Valve for GW Manifold	V-407	TAB B
Groundwater Booster Tank	T-401	TAB C
Transfer Pumps	P-202, P-401, P-402	TAB D
Particulate Bag Filter Vessels	F-401, F-402, F-403, F-404, F-501, F-502	TAB E
Water Flow Totalizer	FQI-401 & FQI-501	TAB F
Groundwater Holding Tank	T-402	TAB G
Electromagnetic Flow Totalizer	FQI-402	TAB H
Liquid-Phase GAC Adsorbers	T-403 & T-404	TAB I
Double Diaphragm Pumps	P-101 & P-102	TAB J
Moisture Separator Transfer Pump	P-501	TAB K
Moisture Separator	T-101	TAB L
Vacuum Particulate Filters	F-101 & F-102	TAB M
Liquid Ring Vacuum Pumps	B-101 & B-102	TAB N
Oil Mist Filters	F-103 & F-104	TAB O
Vapor-Phase GAC Adsorbers	T-301 & T-302	TAB P
Positive Displacement Blower	B-301	TAB Q
Carbon Filter	T-701	TAB R
Three Phase Heat Exchanger	H-201	TAB S
Cooling Tower	CT-201	TAB T
Cooling Tower Transfer Pump	P-201	TAB U
Refrigerated Chiller	RC-201	TAB V
Refrigerated Chiller Tank	T-202	TAB W
Condensate Tank	T-201	TAB X
Condensate Tank Transfer Pump	P-203	TAB Y
Vapor Heater	H-202	TAB Z
Secondary Containment Sump Pump	P-502	TAB AA
Compressed Air System	K-601, T-601, T-602, V-607	TAB AB
Automated Water Pressure Boost System	N/A	TAB AC
Chlorine Injection System	N/A	TAB AD
Water Softener	F-801	TAB AE
Motor Control Center	N/A	TAB AF
Solar Power System	N/A	TAB AG
Building Exhaust Fans	N/A	TAB AH

Table 3
Extraction Well Specifications
Pemaco Superfund Site, Maywood, CA

Well ID	Associated Hydrogeologic Unit	Casing Diameter (inches)	Screen Material	Well Casing Material	Screen Interval (feet bgs)	Screen Slot Size (inches)	Screen Length (feet)	Filter Pack Sand Size	Total Depth of Well (feet bgs)
PA-1	Perched Zone	4	Schedule 40 PVC	Schedule 40 PVC	17 - 27	0.020	10	2/12	30
PA-2	Perched Zone	4	Schedule 40 PVC	Schedule 40 PVC	22 - 32	0.020	10	2/12	35
PA-3	Perched Zone	4	Schedule 40 PVC	Schedule 40 PVC	22 - 32	0.020	10	2/12	35
PA-4	Perched Zone	4	Schedule 40 PVC	Schedule 40 PVC	20 - 30	0.020	10	2/12	30
PA-5	Perched Zone	4	Schedule 40 PVC	Schedule 40 PVC	20 - 30	0.020	10	2/12	30
PB-1	Perched Zone	4	Schedule 40 PVC	Schedule 40 PVC	26 - 36	0.020	10	2/12	40
PB-2	Perched Zone	4	Schedule 40 PVC	Schedule 40 PVC	22 - 32	0.020	10	2/12	35
PB-3	Perched Zone	4	Schedule 40 PVC	Schedule 40 PVC	22 - 32	0.020	10	2/12	35
PB-4	Perched Zone	4	Schedule 40 PVC	Schedule 40 PVC	16 - 26	0.020	10	2/12	30
PB-5	Perched Zone	4	Schedule 40 PVC	Schedule 40 PVC	24 - 34	0.020	10	2/12	35
PB-6	Perched Zone	4	Schedule 40 PVC	Schedule 40 PVC	22 - 32	0.020	10	2/12	35
PB-7	Perched Zone	4	Schedule 40 PVC	Schedule 40 PVC	24 - 34	0.020	10	2/12	35
PC-1	Perched Zone	4	Schedule 40 PVC	Schedule 40 PVC	15 - 25	0.020	10	2/12	25
PC-2	Perched Zone	4	Schedule 40 PVC	Schedule 40 PVC	17 - 27	0.020	10	2/12	30
PC-5	Perched Zone	4	Schedule 40 PVC	Schedule 40 PVC	29 - 39	0.020	10	2/12	40
PC-6	Perched Zone	4	Schedule 40 PVC	Schedule 40 PVC	28 - 38	0.020	10	2/12	40
PD-1	Perched Zone	4	Schedule 40 PVC	Schedule 40 PVC	17 - 27	0.020	10	2/12	30
PD-4	Perched Zone	4	Schedule 40 PVC	Schedule 40 PVC	27 - 37	0.020	10	2/12	40
PD-5	Perched Zone	4	Schedule 40 PVC	Schedule 40 PVC	27 - 37	0.020	10	2/12	40
PD-6	Perched Zone	4	Schedule 40 PVC	Schedule 40 PVC	24 - 34	0.020	10	2/12	35
PD-7	Perched Zone	4	Schedule 40 PVC	Schedule 40 PVC	26 - 36	0.020	10	2/12	40
PD-8	Perched Zone	4	Schedule 40 PVC	Schedule 40 PVC	26 - 36	0.020	10	2/12	37
PD-9	Perched Zone	4	Schedule 40 PVC	Schedule 40 PVC	28 - 38	0.020	10	2/12	40
DA-1	A Zone	6	Schedule 40 PVC	Schedule 40 PVC	61 - 76	0.020	15	2/12	77
DA-2	A Zone	6	Schedule 40 PVC	Schedule 40 PVC	72 - 82	0.020	10	2/12	83
DA-3	A Zone	6	Schedule 40 PVC	Schedule 40 PVC	74 - 84	0.020	10	2/12	85
DA-4	A Zone	6	316 Stainless Steel	Low Carbon Steel	56 - 66	0.020	10	2/12	67
DA-5	A Zone	6	Schedule 40 PVC	Schedule 40 PVC	68 - 78	0.020	10	2/12	80
DA-6	A Zone	6	Schedule 40 PVC	Schedule 40 PVC	60 - 70	0.020	10	2/12	71
DA-7	A Zone	6	316 Stainless Steel	Schedule 80 PVC	61 - 71	0.020	10	2/12	72
DA-8	A Zone	6	Schedule 40 PVC	Schedule 40 PVC	65 - 75	0.020	10	2/12	76
DA-9	A Zone	6	316 Stainless Steel	Schedule 80 PVC	66 - 76	0.020	10	2/12	77
DA-10	A Zone	6	316 Stainless Steel	Low Carbon Steel	66 - 76	0.020	10	2/12	77
DA-11	A Zone	6	316 Stainless Steel	Low Carbon Steel	64 - 74	0.020	10	2/12	76
DA-12	A Zone	6	Schedule 40 PVC	Schedule 40 PVC	66 - 76	0.020	10	2/12	77
MW-03-70	A Zone	2	Schedule 80 CPVC	Schedule 80 CPVC	60 - 70	0.010	10	2/16 and 0/30	70
MW-19-70	A Zone	2	Schedule 40 PVC	Schedule 40 PVC	62 - 67	0.010	5	2/16	67
MW-26-75	A Zone	4	Schedule 80 CPVC	Schedule 80 CPVC	65 - 75	0.010	10	2/16 and 0/30	75
MW-27-70	A Zone	2	Schedule 80 CPVC	Schedule 80 CPVC	60 - 70	0.020	10	2/12 and 0/30	70
RW-01-70	A Zone	6	316 Stainless Steel	Low Carbon Steel	55 - 70	0.030	15	No.3 and 0/30	70
DAB-1	A & B Zone	6	Schedule 80 PVC	Schedule 80 PVC	70 - 90	0.020	20	2/12	91
DAB-2	A & B Zone	6	Schedule 80 PVC	Schedule 80 PVC	70 - 90	0.020	20	2/12	91
DAB-3	A & B Zone	6	Schedule 80 PVC	Schedule 80 PVC	68.5 - 88.5	0.020	20	2/12	89.5
DAB-4	A & B Zone	6	Schedule 80 PVC	Schedule 80 PVC	66 - 86	0.020	20	2/12	87
DAB-5	A & B Zone	6	Schedule 80 PVC	Schedule 80 PVC	69 - 89	0.020	20	2/12	90
DAB-6	A & B Zone	6	Schedule 80 PVC	Schedule 80 PVC	67 - 87	0.020	20	2/12	88
DAB-7	A & B Zone	6	Schedule 80 PVC	Schedule 80 PVC	68 - 88	0.020	20	2/12	89
DAB-8	A & B Zone	6	Schedule 80 PVC	Schedule 80 PVC	65 - 85	0.020	20	2/12	86
DB-1	B Zone	6	Schedule 80 PVC	Schedule 80 PVC	83 - 93	0.020	10	2/12	94
DB-2	B Zone	6	Schedule 80 PVC	Schedule 80 PVC	86 - 96	0.020	10	2/12	97
DB-3	B Zone	6	Schedule 80 PVC	Schedule 80 PVC	77 - 87	0.020	10	2/12	88
DB-4	B Zone	6	316 Stainless Steel	Low Carbon Steel	75 - 85	0.020	10	2/12	86
DB-5	B Zone	6	Schedule 80 PVC	Schedule 80 PVC	80 - 90	0.020	10	2/12	90
DB-6	B Zone	6	Schedule 80 PVC	Schedule 80 PVC	80 - 90	0.020	10	2/12	91
DB-7	B Zone	6	316 Stainless Steel	Schedule 80 PVC	81 - 91	0.020	10	2/12	92
DB-8	B Zone	6	Schedule 80 PVC	Schedule 80 PVC	81 - 91	0.020	10	2/12	92
DB-9	B Zone	6	316 Stainless Steel	Schedule 80 PVC	84 - 94	0.020	10	2/12	94
DB-10	B Zone	6	316 Stainless Steel	Low Carbon Steel	81 - 91	0.020	10	2/12	92
DB-11	B Zone	6	316 Stainless Steel	Low Carbon Steel	76 - 86	0.020	10	2/12	87
DB-12	B Zone	6	Schedule 80 PVC	Schedule 80 CPVC	83.5 - 93.5	0.020	10	2/12	94.5
MW-03-90	B Zone	2	Schedule 80 CPVC	Schedule 80 CPVC	75 - 85	0.010	10	2/16 and 0/30	85
MW-19-90	B Zone	2	Schedule 40 PVC	Schedule 40 PVC	82 - 87	0.010	5	2/16	87
MW-26-90	B Zone	4	Schedule 80 CPVC	Schedule 80 CPVC	80 - 90	0.010	10	2/16 and 0/30	90
MW-27-90	B Zone	2	Schedule 80 CPVC	Schedule 80 CPVC	80 - 90	0.020	10	2/12 and 0/30	90
MW-33-90	B Zone	4	316 Stainless Steel	Low Carbon Steel	79.5 - 89.5	0.010	10	1/20	91.5
RW-01-95	B Zone	6	316 Stainless Steel	Low Carbon Steel	80 - 95	0.020	15	2/12 and 2/16	95
MW-24-110	C Zone	6	316 Stainless Steel	Low Carbon Steel	100 - 110	0.010	10	1/20	110
MW-25-110	C Zone	4	Schedule 80 PVC	Schedule 80 PVC	102 - 107	0.010	5	2/16 and 0/30	107
MW-24-140	D Zone	4	Schedule 80 PVC	Schedule 80 PVC	130 - 140	0.010	10	2/16 and 0/30	140

Table 3
Extraction Well Specifications
Pemaco Superfund Site, Maywood, CA

Well ID	Associated Hydrogeologic Unit	Casing Diameter (inches)	Screen Material	Well Casing Material	Screen Interval (feet bgs)	Screen Slot Size (inches)	Screen Length (feet)	Filter Pack Sand Size	Total Depth of Well (feet bgs)
VR-01LV	Lower Vadose	2	Schedule 80 CPVC	Schedule 80 CPVC	37 - 47	0.020	10	2/12	47.6
VR-02LV	Lower Vadose	2	Schedule 80 CPVC	Schedule 80 CPVC	39 - 49	0.020	10	2/12	49.7
VR-02P	Perched Zone	2	Schedule 80 CPVC	Schedule 80 CPVC	24 - 34	0.020	20	2/12	34.5
VR-03LV	Lower Vadose	2	Schedule 80 CPVC	Schedule 80 CPVC	40 - 50	0.020	10	2/12	50.5
VR-04LV	Lower Vadose	2	Schedule 80 CPVC	Schedule 80 CPVC	39 - 49	0.020	10	2/12	49.9
VR-04P	Perched Zone	2	Schedule 80 CPVC	Schedule 80 CPVC	23 - 33	0.020	10	2/12	33.5
VR-05LV	Lower Vadose	2	Schedule 80 CPVC	Schedule 80 CPVC	40 - 50	0.020	10	2/12	50.5
VR-05P	Perched Zone	2	Schedule 80 CPVC	Schedule 80 CPVC	25 - 35	0.020	10	2/12	35.3
VR-06LV	Lower Vadose	2	Schedule 80 CPVC	Schedule 80 CPVC	39 - 49	0.020	10	2/12	49.8
VR-07LV	Lower Vadose	2	Schedule 80 CPVC	Schedule 80 CPVC	40 - 50	0.020	10	2/12	50.6
VR-07P	Perched Zone	2	Schedule 80 CPVC	Schedule 80 CPVC	24 - 34	0.020	10	2/12	34.6
VR-08LV	Lower Vadose	2	Schedule 80 CPVC	Schedule 80 CPVC	40 - 50	0.020	10	2/12	50.5
VR-09LV	Lower Vadose	2	Schedule 80 CPVC	Schedule 80 CPVC	40 - 50	0.020	10	2/12	50.4
VR-10LV	Lower Vadose	2	Schedule 80 CPVC	Schedule 80 CPVC	40 - 50	0.020	10	2/12	50.0
VR-10P	Perched Zone	2	Schedule 80 CPVC	Schedule 80 CPVC	24 - 34	0.020	10	2/12	34.6
VR-11LV	Lower Vadose	2	Schedule 80 CPVC	Schedule 80 CPVC	40 - 50	0.020	10	2/12	50.5
VR-11P	Perched Zone	2	Schedule 80 CPVC	Schedule 80 CPVC	24 - 34	0.020	10	2/12	34.9
VR-12LV	Lower Vadose	2	Schedule 80 CPVC	Schedule 80 CPVC	40 - 50	0.020	10	2/12	50.0
VR-12P	Perched Zone	2	Schedule 80 CPVC	Schedule 80 CPVC	24 - 34	0.020	10	2/12	34.7
VR-13LV	Lower Vadose	2	Schedule 80 CPVC	Schedule 80 CPVC	40 - 50	0.020	10	2/12	50.5
VR-14LV	Lower Vadose	2	Schedule 80 CPVC	Schedule 80 CPVC	40 - 50	0.020	10	2/12	50.0
VR-15LV	Lower Vadose	2	Schedule 80 CPVC	Schedule 80 CPVC	40 - 50	0.020	10	2/12	50.2
VR-16LV	Lower Vadose	2	Schedule 80 CPVC	Schedule 80 CPVC	40 - 50	0.020	10	2/12	50.5
VR-17LV	Lower Vadose	2	Schedule 80 CPVC	Schedule 80 CPVC	39 - 49	0.020	10	2/12	49.9
VR-17P	Perched Zone	2	Schedule 80 CPVC	Schedule 80 CPVC	24 - 34	0.020	10	2/12	34.8
VR-18LV	Lower Vadose	2	Schedule 80 CPVC	Schedule 80 CPVC	40 - 50	0.020	10	2/12	50.0
VR-18P	Perched Zone	2	Schedule 80 CPVC	Schedule 80 CPVC	24 - 34	0.020	10	2/12	34.8
VR-19LV	Lower Vadose	2	Schedule 80 CPVC	Schedule 80 CPVC	40 - 50	0.020	10	2/12	50.0

Notes:

CPVC - chlorinated polyvinyl chloride

PVC - polyvinyl chloride

VR - vapor recovery

feet bgs - feet below ground surface

Table 4
Alarm List and System Control Set Points
Pemaco Superfund Site, Maywood, CA

Alarm List	Device	Set Point	System	Response	Modification
Critical Shutdown Alarms					
MCP E-stop	ZSH-103	N/A	Universal	Total System Shutdown	
LRB E-stop	ZSH-101	N/A	Universal	Total System Shutdown	
VC E-stop	ZSH-104	N/A	Universal	Total System Shutdown	
FTO E-stop	ZSH-102	N/A	Universal	Total System Shutdown	
Building E-stop	ZSH-104	N/A	Universal	Total System Shutdown	
Power Failure	Universal	N/A	Universal	Total System Shutdown	
Air Compressor Low Pressure Alarm	PS-601	psi	Universal	Total System Shutdown (10-second delay)	
Holding Tank (T-402) High High Level	LSHH-402	N/A	GTS Shutdown	Total System Shutdown (10-second delay)	
Holding Tank VFD Fault (P-402)	P-402	N/A	Universal	Total System Shutdown (1-second delay)	
FTO Critical Shutdown Condition (while in FTO Mode)	FTO	N/A	Universal	Total System Shutdown	
GTS Shutdown Alarms					
Groundwater Booster Pump Fail	P-401	N/A	GTS Shutdown	GTS Offline (1-second delay)	
Holding Tank Low-Low Level	LSLL-402	N/A	GTS Shutdown	GTS Offline (5-minute delay)	Increased alarm trip time from 10 sec to 5 min. Alarm only enabled when P-402 switch on PLC is in HAND or AUTO positions. OFF position disables alarm and allows for tank cleaning.
Groundwater Booster Tank High-High Level	LSHH-401	N/A	GTS Shutdown	GTS Offline (30-minute delay)	When LSHH-401 is tripped, a 10-second delay occurs then the Wellfield solenoid is closed to stop wellfield water from filling the tank. After a 30-minute delay, if LSHH-401 continues to be tripped, a shutdown of the GTS occurs. If the T401 high level switch LSH-401 clears before the 30 minute alarm timer times out, the high level limit condition is cleared. The high level limit condition can also be cleared by the operator pressing the Reset Button on the computer.

Table 4
Alarm List and System Control Set Points
Pemaco Superfund Site, Maywood, CA

Alarm List	Device	Set Point	System	Response	Modification
GTS Shutdown Alarms Continued					
Groundwater Booster Tank Low-Low Level	LSLL-401	N/A	GTS Shutdown	GTS Offline (5-minute delay)	Increased alarm trip time from 10 sec to 5 min. Alarm only enabled when P-401 switch on PLC is in HAND or AUTO positions. OFF position disables alarm and allows for tank cleaning.
Secondary Containment Sump High-High Level	LSHH-501	N/A	GTS Shutdown	GTS Offline (10-second delay)	
Groundwater Filters High-High Pressure (F-401/402)	PT-401	44 psi	GTS Shutdown	GTS Offline (10-second delay)	Raised set point from 25 psi to 44 psi.
Holding Tank Filters High-High Pressure (F-403/404)	PT-403	55 psi	GTS Shutdown	GTS Offline (10-second delay)	Raised set point from 40 psi to 55 psi.
Liquid Carbon Adsorbers High-High Pressure (T-403/404)	PT-404	55 psi	GTS Shutdown	GTS Offline (10-second delay)	Raised set point from 35 psi to 55 psi.
GTS Warning Alarms					
Secondary Containment Sump Pump Failure	P-502	N/A	GTS Warning	Display Only (1-second delay)	
Groundwater Filters High Pressure (F-401/402)	PT-401	25 psi	GTS Warning	Display Only (25-second delay)	Raised set point from 20 psi to 25 psi.
Holding Tank Filters High Pressure (F-403/404)	PT-403	45 psi	GTS Warning	Display Only (25-second delay)	Raised set point from 35 psi to 45 psi.
Liquid Carbon Adsorbers High Pressure (T-403/404)	PT-404	40 psi	GTS Warning	Display Only (25-second delay)	Raised set point from 30 psi to 40 psi.
VTS Shutdown Alarms					
Liquid Ring Pumps Both Fail	B101/102	N/A	VTS Shutdown	VTS Offline (no delay)	
Moisture Separator Pump Failure	P-501	N/A	VTS Shutdown	VTS Offline (1-second delay)	
Chiller Pump Failure	P-202	N/A	VTS Shutdown	VTS Offline (1-second delay)	
Moisture Separator Tank High-High Level	LSHH-101	N/A	VTS Shutdown	VTS Offline (10-second delay)	
Moisture Separator Tank Filters High-High Pressure (F-501/502)	PT-501	35 psi	VTS Shutdown	VTS Offline (25-second delay)	
Vapor Conditioning Package Outlet High-High Temperature	TIT-202	150F	VTS Shutdown	VTS Offline Immediate shutdown in FTO Mode	
Cooling Tower Fan Failure	CT-201	N/A	VTS Shutdown	VTS Offline (1-second delay)	

Table 4
Alarm List and System Control Set Points
Pemaco Superfund Site, Maywood, CA

Alarm List	Device	Set Point	System	Response	Modification
VTs Shutdown Alarms					
Cooling Tower Pump Failure	P-201	N/A	VTs Shutdown	VTs Offline (1-second delay)	
Condensate Tank High-High Level	LSHH-201	N/A	VTs Shutdown	VTs Offline (20-second delay)	
Cooling Tower Low Level Alarm	LSL-2000	N/A	VTs Shutdown	VTs Offline (60-second delay)	
Oxidizer Exhaust High Negative Pressure	PS-101	7" w.c.	VTs Shutdown	VTs Offline Immediate shutdown in FTO Mode	Delinked PS-101 from E-Stop to turn off VTs only. High PS-101 (trip) will report to B-301 to reduce effort to roughly 30% or as needed to get below (7 in w.c. vacuum trip setting). This can protect the FTO scrubber so B-301 needs to reduce vacuum, or take down the entire vapor side via LRB's shutdown.
VTs Warning Alarms					
Liquid Ring Pump #1 Fail	B-101	N/A	VTs Warning	Display Only	
Liquid Ring Pump #2 Fail	B-102	N/A	VTs Warning	Display Only	
Caustic Tank Low Level	LSL-901	N/A	VTs Warning	Display Only	
Moisture Separator Tank Filters High Pressure	PT-501	20 psi	VTs Warning	Display Only	
H-202 Exit High Temperature	TIT-202	140 F	VTs Warning	Display Only	
LRB #1 Low Oil Level	B-101	N/A	VTs Warning	Display Only	
LRB #1 High Oil Level	B-101	N/A	VTs Warning	Display Only	
LRB #1 High Temperature	B-101	N/A	VTs Warning	Display Only	
LRB #2 Low Oil Level	B-102	N/A	VTs Warning	Display Only	
LRB #2 High Oil Level	B-102	N/A	VTs Warning	Display Only	
LRB #2 High Temperature	B-102	N/A	VTs Warning	Display Only	
Condensate Pump Fail	P-203	N/A	VTs Warning	Display Only	

Table 4
Alarm List and System Control Set Points
Pemaco Superfund Site, Maywood, CA

ERH & Treatment Plant Interlocks					
ERH System Condenser Status	ERH	N/A	N/A	Input from ERH system to MCP	
ERH Enable	ERH	N/A	N/A	Signal originates from LRB panel, when blowers start.	
ERH Running	ERH	N/A	N/A	Input from ERH system to MCP	

Notes:

MCP – main control panel; LRB – liquid ring blower; E-stop – emergency stop; VC – vapor conditioning; FTO – flameless thermal oxidizer; GTS – groundwater treatment system; VFD – various frequency drive; PLC – programmable logic controller; psi – pound per square inch; VTS – vapor treatment system; ERH – electrical resistance heating.

Appendix A

Equipment Maintenance Procedures

EQUIP. ID:	Well Pumps	DESCRIPTION:	AUTOMATIC PNEUMATIC SUBMERSIBLE PUMP	MFG:	QED ENVIRONMENTAL SYSTEMS
		SPECIFICATIONS:	316 SS CASING, BOTTOM INLET	MODEL:	LONG AP4B/AP2B, SHORT AP2B
OPERATING PARAMETERS:	80 PSI 0.58-0.78 Gal/Cycle (Long AP4B) 0.14-0.17 Gal/Cycle (Long AP2B) 0.05-0.08 Gal/Cycle (Short AP2B)	MAINTENANCE ITEMS:	1. GENERAL MAINTENANCE PUMP/HOSES AND AIR FILTER/REGULATOR		
			2. IRON BUILD-UP CLEANING PROCEDURES (GENERAL CLEANING PROCEDURES)		
			3. OTHER MAINTENANCE		
			REFER TO MANUFACTURER MANUAL FOR ALL OTHER REQUIREMENTS.		

MAINTENANCE PROCEDURES

- **GENERAL MAINTENANCE PUMP/HOSES AND AIR FILTER/REGULATOR**

- 1) Pumps should be removed for inspection on a schedule according to water quality and well performance specific to each well. Some pumps may require more or less maintenance based on silt, sand, flow rates and other local factors.
- 2) Follow SSHP and AHA's for maintenance activities.
- 3) When pump requires inspection & maintenance open the well vault and listen for leaks in the system first, then turn off the air supply to well pump at the filter regulator in the well vault or at one of the main air supply valves (GW-1, GW-2, and GW-3) inside the treatment plant for that well. NOTE: There are no electric components for these pumps.
- 4) Use the stainless steel lifting cable (when installed) to remove the pump, otherwise lift pump out of well by hand using the air supply and water discharge tubing (two technicians should be present when removing pumps with settings > 30 feet). Set pump on poly sheeting. Disconnect the quick connect fittings for the air and water tubing at the top of the well pump to isolate pump from tubing. Inspect hoses and connections for damage. Make sure hoses are not split or cracked.

- 5) Check the air filter and filter bowl drain on the filter/regulator for saturation and operation. QED recommends a frequency of every few weeks. Periodically drain the air filters on the air hose to the pumps of collected particles, water and oil. Check regulator pressure to ensure setting has not drifted.
- 6) If the air filter element requires replacement replace as follows: Wash out any dirt and oil buildup from the filter bowl with warm water. Replace filter element Blue or black filter bowl - QED Filter element Part No. 205071 or Silver filter bowl - QED Filter element Part No. 205800.
- 7) The pump can be opened up in the field if the area is dry and pump is on poly sheeting, otherwise open up pump on a clean workbench and inspect.
- 8) Refer to QED Operations/Maintenance Manual Figures 15, 16 and 17 for parts lists (attached in Appendix) and replace worn or damaged pump parts as required by manufacturer.
- 9) Re-install pump and place back into operation.

CONTINUED ON NEXT PAGE

EQUIP. ID:	Well Pumps	DESCRIPTION:	PNEUMATIC SUBMERSIBLE PUMP	MFG:	QED ENVIRONMENTAL SYSTEMS
		SPECIFICATIONS:	316 SS CASING, BOTTOM INLET	MODEL:	LONG AP4B/AP2B, SHORT AP2B
MAINTENANCE PROCEDURES (CONT'D)					
<ul style="list-style-type: none"><u>IRON BUILD-UP CLEANING PROCEDURES (GENERAL CLEANING PROCEDURES)</u><ol style="list-style-type: none">The bottom intake check valve assembly should be removed from the casing (QED Operations/Maintenance Manual Page 49 and Figure 15).Visually inspect both the 1" stainless steel (SS) fluid discharge pipe for iron (or other) build-up or debris. Do the same with the float that rides up and down the SS fluid discharge pipe.Should there be iron (or other) deposits on either or both the discharge pipe and float, then remove the float from SS fluid discharge pipe as follows: Remove the control rod guide (Figures 16 and 17). Remove the small SS pin from the bottom spring cup "stop". The "stop" is a small white part located just below the spring identified on Figures 16 and 17. The pin and stop removal will allow you to remove the spring and float from the SS discharge pipe.The 1" SS fluid discharge pipe can now be cleaned using a Scotch Brite pad, wire brush or a hand operated wire wheel. After removing the iron (or other) debris the pipe can be water rinsed. Also, prior to cleaning with a pad, brush or wire wheel the parts can be cleaned in dilute Simple Green solution.Usually the AP-4 float will be one of two types. Most floats have a metal plate on each end. The second type of float has round pins protruding into its center hole, and it does not have center plates. Both the internal and external surfaces of the float will generally require cleaning. The material choices include Scotch Brite pad, and light grade 150 sandpaper. For floats with plates, if they are removed for cleaning, they should be replaced on the same float end on which they came. (Maintain the plates on their original bottom and top positions). Floats without plates can be cleaned with a knife.			<ol style="list-style-type: none">The white plastic square control rod should be cleaned next. The control rod is the item that fits through the smaller hole in the float and is adjacent to the SS discharge pipe in the assembled pump. Again use a Scotch Brite pad or a razor or Exacto knife. Do not use sandpaper.The final component to be cleaned is the outer AutoPump casing. Casing can be either SS or FRP fiberglass. Using a three-stone honing tool is the fastest way to clean out the inside surface of the casing. The technique is to move the hone in-and-out a half dozen times or so through each end of the casing. This should not take more than 5 minutes. AutoPump is now ready for re-assembly.Re-assembly of pump casing. Inspect O-rings to ensure they are capable of sealing (no cuts or abrasions visible). Lubricate both inside and outside ends of casing to a depth of 3/4" with a thin layer of food-grade grease. Stand casing upright on clean level surface. Insert the bottom check valve into casing. Place one hand over another, with open palms, press down until bottom check valve is fully inserted into casing. PUMP CASING ENDS ARE SHARP. <ul style="list-style-type: none"><u>OTHER MAINTENANCE</u><ol style="list-style-type: none">Follow SSHP and AHA's for maintenance activities.Refer to QED Operations/Maintenance Manual for other maintenance items not covered herein.		

EQUIP. ID:	B-101 & B-102	DESCRIPTION:	LIQUID RING VACUUM PUMP	MFG:	DEKKER VACUUM TECHNOLOGIES
		SPECIFICATIONS:	75-HP MOTOR, 460 VOLT, 3 PHASE	MODEL:	VMX1103K
OPERATING PARAMETERS:	1,000 SCFM 27-Inch Hg	MAINTENANCE ITEMS:	1. OIL REPLACEMENT (EVERY 10,000 HOURS OR ONCE PER YEAR)		
			2. OIL RESERVOIR FILTER REPLACEMENTS (EVERY 10,000 HOURS OR ONCE PER YEAR)		
			3. BEARING LUBRICATION- PUMPS AND MOTORS (EVERY 3,000 HOURS)		
			4. OIL COOLER CLEANING (IF SYSTEM OVERHEATS OR OPERATES > 200°F)		
			REFER TO DEKKER O&M MANUAL FOR ALL OTHER REQUIREMENTS.		

MAINTENANCE PROCEDURES

• **OIL REPLACEMENT (EVERY 10,000 HOURS OR ONCE PER YEAR)**

- 1) Follow SSHP and AHA's for maintenance activities.
- 2) Ensure VTS has been shut down in accordance with [Section 2.4 Normal Shutdown Procedures](#) and LRPs (B-101/B-102) are OFF.
- 3) With VTS turned off, drain the oil reservoir, vacuum pump and heat exchanger using the factory drain valves. (Note that the Oil Reservoir filter elements should be changed at this time to avoid contaminating the new oil). Replace oil with Standard Vmaxol. If replacing with Long-life Vmaxol the frequency of oil changes can be reduced to once every 15,000 hours.
- 4) Make sure that the pump is filled with oil to the level of the shaft centerline. **DO NOT OVERFILL** above the shaft centerline. Fill the reservoir to the **FILL LINE** on the sight gauge. Open the air bleed valve on the heat exchanger system to remove all air from the system. Run the pump for a few minutes, stop and check fluid level again. Add additional fluid to the reservoir, if required. Repeat this process and check again fluid level is stable. **DO NOT OVERFILL.**
- 5) Restart VTS in accordance with [Section 2.3 Normal Startup Procedures](#) and place pumps back into operation.

• **OIL RESERVOIR FILTER REPLACEMENTS (EVERY 10,000 HOURS OR ONCE PER YEAR)**

- 1) Follow SSHP and AHA's for maintenance activities.
- 2) Ensure VTS has been shut down in accordance with [Section 2.4 Normal Shutdown Procedures](#) and LRPs (B-101/B-102) are OFF.
- 3) Oil Reservoir filter replacements are made approximately every 6-12 months. This is verified by the oil indicator gauge on the reservoir which indicates back pressure across the elements. Normal pressure range is 0 to 3 psig. When the pressure exceeds 4 psig, the filters should be replaced. It is also a good practice to replace the filters when the oil is being replaced. Based on site conditions, earlier replacement may be necessary when the back pressure exceeds 4 psig. High back pressure is a result of dirt build-up on the separator due to oil varnish or contaminated inlet gas stream.
- 4) Reservoir must be opened to gain access to separator filter elements. Remove filters by hand. Do not apply heavy wrench or torque to filters to remove. Replace filters. Note: Thread-in filters are installed hand tight. **DO NOT OVERTIGHTEN** with a wrench. Check to see all filters are hand tight then close lid to reservoir.
- 5) Restart VTS and place pumps back into operation. Check gauge on side of reservoir. Gauge should be in normal operating range (green area 0 to 3 psig).

CONTINUED ON NEXT PAGE

EQUIP. ID:	B-101 & B-102	DESCRIPTION:	LIQUID RING VACUUM PUMP	MFG:	DEKKER VACUUM TECHNOLOGIES
		SPECIFICATIONS:	75-HP MOTOR, 460 VOLT, 3 PHASE	MODEL:	VMX1103K
MAINTENANCE PROCEDURES (CONT'D)					
<ul style="list-style-type: none">• <u>BEARING LUBRICATION- PUMPS AND MOTORS (EVERY 3,000 HOURS)</u><ol style="list-style-type: none">1) Follow SSHP and AHA's for maintenance activities.2) Ensure VTS has been shut down in accordance with Section 2.4 Normal Shutdown Procedures and LRPs (B-101/B-102) are OFF.3) Lubricate the pump bearings using the grease fittings located on top of each bearing housing at a minimum of <u>every 3,000 hours</u>. Extreme conditions may require more frequent lubrication. Use lithium based #2 grease, Texaco Premium RB or Chevron SR1 #2.4) Lubricate the motor bearings using one of the two grease inlet fittings installed on the motor <u>every 1 to 3 months</u>. One fitting should be a drain plug and one fitting should be a grease fitting. Open the drain plug fitting (located at the lower portion of the motor face) and add the required amount of new grease (~1.5 cubic inches) through the grease fitting (located higher on the motor face) pushing out the old grease through the drain plug fitting. Run the motor for two hours then replace the drain plug fitting. NOTE: The bearings may be lubricated with the motor running or stationary. Stationary with the motor warm is preferred.5) Roller bearings for V-Belt drive systems such as these pumps require Texaco Premium RB or Chevron Black Pearl EP#2.			<ul style="list-style-type: none">• <u>OIL COOLER CLEANING (IF SYSTEM OVERHEATS OR OPERATES > 200°F)</u><ol style="list-style-type: none">1) Follow SSHP and AHA's for maintenance activities.2) Ensure VTS has been shut down in accordance with Section 2.4 Normal Shutdown Procedures and LRPs (B-101/B-102) are OFF.3) Check oil cooler and fan. Clean cooler externally with compressed air ensure that 12" space is available in front of cooler and ambient temperature is below 110°F. Check if the oil isolation valve is open. Ensure the oil level is correct and that the pump is primed and filled with oil to the centerline of shaft only. Clean oil strainer. Check if cooler is blocked internally with solids passed through from the process, clean if necessary by flushing out the cooler from one end using compressed air and discharging fluids to a 55 gallon drum using a sealed connection (Cam Lok fitting).4) Restart VTS and check system temperature. Normal system operating temperature is between 140 to 185°F.		

EQUIP. ID:	B-301	DESCRIPTION:	ROTARY POSITIVE BLOWER	MFG:	MOTOR-BALDOR/BLOWER-ROOTS
		SPECIFICATIONS:	25-HP MOTOR, 1770 RPM, TEFC	MODEL:	MOTOR-EM4103T/BLOWER-615
OPERATING PARAMETERS:	1,000 SCFM	MAINTENANCE ITEMS:	1. LUBRICATION AND OPERATION OF BLOWER (EVERY 4,000 TO 8,000 HOURS)		
			2. SOUND ENCLOSURE MAINTENANCE (WEEKLY INSPECTION)		
			REFER TO MANUFACTURER MANUAL FOR ALL OTHER REQUIREMENTS.		

MAINTENANCE PROCEDURES

- **LUBRICATION AND OPERATION OF BLOWER (EVERY 4,000 TO 8,000 HOURS)**

- 1) Follow SSHP and AHA's for maintenance activities.
- 2) Ensure VTS has been shut down in accordance with [Section 2.4 Normal Shutdown Procedures](#) and B-301 is OFF.
- 3) Refer to ROOTS Installation Operation Maintenance Manual for lubrication and greasing intervals. Page 8 through 16 for grease lubricated drive end or splash lubricated drive end blowers.
- 4) Grease lubricated drive end bearings require NLGI #2 premium grade microgel grease with 250°F service temperature. (Shell Darina EP NLGI Grade 2 product code 71522 or Shell Darina SD 2 product code 506762B). **DO NOT USE** lithium based grease on ROOTS blowers.
- 5) Splash lubricated drive end bearings require ROOTS synthetic oil (ROOTS P/N 813-106). **DO NOT USE** Mobil SHC synthetic oil in ROOTS blowers. Normal life expectancy of ROOTS synthetic oil is 4000 to 8000 hours at oil temperature of 180°F. Increases by increments of 15 to 18°F in oil temperatures reduce life by half.
- 6) Restart VTS and place B-301 back into operation.

- **SOUND ENCLOSURE MAINTENANCE (WEEKLY INSPECTION)**

- 1) Check enclosure weekly for loose bolts. Tighten or replace as required. If enclosure must be removed for any reason, follow SSHP and AHA's for maintenance activities and shut down VTS in accordance with [Section 2.4 Normal Shutdown Procedures](#).
- 2) Make necessary repairs to enclosure and place back into position.
- 3) Restart VTS.

EQUIP. ID:	Building Exhaust Fans	DESCRIPTION:	BUILDING EXHAUST FANS FAN SHUTTERS	MFG:	DAYTON
		SPECIFICATIONS:	½ HP, 480 VOLT , 3 PHASE	MODEL:	1AHA 2 (EXHAUST FAN) 1C055 (FAN SHUTTER)
OPERATING PARAMETERS:	EXHAUST FAN 8500 CFM	MAINTENANCE ITEMS:	1. MAINTENANCE OF EXHAUST FAN		
			2. MAINTENANCE OF FAN SHUTTER		
			REFER TO DAYTON ELECTRIC MFG. CO. FOR ALL OTHER REQUIREMENTS.		
MAINTENANCE PROCEDURES					
<ul style="list-style-type: none"><u>MAINTENANCE OF EXHAUST FAN</u><ol style="list-style-type: none">Follow SSHP and AHA's for maintenance activities. NOTE: The exhaust fan components are located at the top section of the eastern building wall. Access to these fans will require an extension ladder and spotter to hold ladder in place. Refer to SSHP and AHA's for securing ladder to building and for securing worker to ladder.Ensure power to motor for exhaust fan is OFF. The power throw switches are located on the building wall below the exhaust fans and can be accessed with a step ladder. Turn power off at this location and check with voltmeter to verify ZERO voltage before working on exhaust fan. LOCKOUT/TAGOUT throw switch.The heavy duty ball bearings are re-greasable pillow block style and are rated for L10 – 100,000 hour schedule. Due to the dry and dusty conditions inside and outside of the building, ball bearings should be greased every 6 months at a minimum and should be inspected more frequently.Check all bolts, screws, set screws for tightness. These can become loose over time due to vibration. Rotate propeller by hand to be sure it turns freely and does not hang up on anything. Clean propeller blades of dust and dirt accumulation.Check pulleys for alignment.Check pulley set screws to shaft for tightness.			<ol style="list-style-type: none">Check belts for wear, cracks and tightness. Replace belts at any signs of cracking or wear. Tighten belts as required but DO NOT OVERTIGHTEN belts.Remove lockout/tagout, turn on power to exhaust fan and test unit.Any other maintenance required on motor or propellers refer to manufacturer Dayton Manufacturing. <ul style="list-style-type: none"><u>MAINTENANCE OF FAN SHUTTER</u><ol style="list-style-type: none">See Step 1 of Maintenance of Exhaust Fan. The fan shutter can be accessed from the outside of the building using an aerial platform (man lift) as the primary method.Check all mounting bolts for tightness.The tie rod attaches to the shutter blades and is mounted on the inside (fan side) of the shutter frame. It should be inspected during maintenance of the exhaust fan from inside the building. Check to see if the tie rod can be manually operated and that it is free from dust, dirt and other accumulated materials. Clean as required. Use low pressure compressed air to clean tie rod, linkage and shutter blades.Any other maintenance required on shutter refer to manufacturer Dayton Manufacturing.		

EQUIP. ID:	Chlorine Injection Pump	DESCRIPTION:	Chemical Metering Pump	MFG:	LMI
		SPECIFICATIONS:	MAX 1.0 GPH AND 250 PSI	MODEL:	LMI AA151-398HI
OPERATING PARAMETERS:	40% speed setting 40% stroke setting	MAINTENANCE ITEMS:	1. ROUTINE MAINTENANCE (ONCE PER YEAR)		
			2. CHANGING CHLORINE SOLUTION DRUM		
			REFER TO LMI INSTRUCTION MANUAL ELECTRONIC METERING PUMPS FOR ALL OTHER REQUIREMENTS.		

MAINTENANCE PROCEDURES

• ROUTINE MAINTENANCE

- 1) Follow SSHP and AHA's for maintenance activities. **NOTE: Always wear protective clothing, face shield, goggles and gloves when performing any maintenance on this pump due to chemical hazards of liquid chlorine.**
- 2) Unplug the 110V power cord for the LMI pump from the outlet located on wall.
- 3) Drain or depressurize discharge line into T-401 and disconnect discharge tubing from pump. Disconnect suction tubing and foot valve strainer from pump.
- 4) Remove pump and place on flat, clean working area.
- 5) Refer to LMI Instruction Manual Electronic Metering Pumps Sections for maintenance on items as follows:
Section 9.2 for Liquifram (Diaphragm) replacement.
Section 9.3 for Cartridge Valves, Seal Rings/Valve Balls and Injection Check Valve Spring replacement.
- 6) Check tubing for worn ends. Replace as required.
- 7) Check fittings for cracks. Replace as required.
- 8) Check seal rings for wear. Replace as required.
- 9) Check foot valve strainer to see if it is clogged. Clean or replaced as required.

- 10) Re-connect discharge and suction tubing to pump.
- 11) Refer to LMI Instruction Manual Electronic Metering Pumps Sections for priming pump as follows:
Section 6.2 for Start-Up Priming for pump supplied with multi function valve.
Section 6.3 for Start-Up Priming for pump supplied without multi function valve.
- 12) Plug power cord to pump in 110V outlet. Place unit back on line and check for leaks.

CONTINUED ON NEXT PAGE

EQUIP. ID:	Chlorine Injection Pump	DESCRIPTION:	Chemical Metering Pump	MFG:	LMI
		SPECIFICATIONS:	MAX 1.0 GPH AND 250 PSI	MODEL:	LMI AA151-398HI
MAINTENANCE PROCEDURES (CONT'D)					
<ul style="list-style-type: none">• <u>CHANGING CHLORINE SOLUTION DRUM</u><ol style="list-style-type: none">1) Follow SSHP and AHA's for maintenance activities. NOTE: Always wear protective clothing, face shield, goggles and gloves when performing any maintenance on this pump due to chemical hazards of liquid chlorine.2) Unplug the 110V power cord for the LMI pump from the outlet located on wall.3) Carefully remove suction tubing and foot valve strainer from the pump, then remove the suction tubing foot valve strainer from the empty chlorine solution drum. The tubing will have solution in it so care must be taken to minimize splashing the solution when removing.4) Place the suction tubing and foot valve strainer inside the new chlorine solution drum during the procedure of removing the empty drum.5) One technician can then remove the securing strap from the empty drum, and then remove the empty drum from the drum spill containment platform (skid). Two technicians will be required to lift the full drum of chlorine solution on to the drum spill containment platform (skid). Once new drum is in position secure the full drum with the securing strap.6) Connect the suction tubing to the LMI pump and repeat the pump priming procedures (if required). Refer to LMI Instruction Manual Electronic Metering Pumps Sections for priming pump as follows: Section 6.2 for Start-Up Priming for pump supplied with multi function valve. Section 6.3 for Start-Up Priming for pump supplied without multi function valve.7) Plug unit in and place back into service.					

EQUIP. ID:	Condensate Sumps (DPE-A thru DPE-C (VE-1 thru VE-4))	DESCRIPTION:	Condensate Sumps	MFG:	FABRICATED 12" PVC SUMP
		SPECIFICATIONS:	12" PVC SCHEDULE 40, 8' 4" DEEP	MODEL:	N/A
OPERATING PARAMETERS:	Sumps operate under vacuum in range of 15" to 18" Hg	MAINTENANCE ITEMS:	1. MAINTENANCE AND CLEANING, INCLUDING PUMP MAINTENANCE		
			(ONCE PER YEAR, MORE IF CONDENSATE WATER QUALITY IS POOR)		

MAINTENANCE PROCEDURES

• **MAINTENANCE AND CLEANING (ONCE PER YEAR)**

- | | |
|--|--|
| <ol style="list-style-type: none"> 1) Follow SSHP and AHA's for maintenance activities. 2) Ensure VTS has been shut down in accordance with Section 2.4 Normal Shutdown Procedures and the air supply to diaphragm pumps P-101 & P-102 is closed. 3) Open condensate sump steel vault and close air supply ball valve to QED filter/regulator. Close ball valve for GW discharge line inside vault. Remove quick disconnect fittings from air supply and GW discharge lines above the 12" flanged cover. 4) Loosen and remove all 12" top flanged cover bolts/nuts in an even pattern. Lift 12" flanged cover and remove air and GW supply quick disconnect fittings (if required). Remove float switch if installed, then remove the QED Low-Drawdown (LD) AP4B pump and place pump and bundled hoses (air supply and water discharge) on poly sheeting away from well vault. NOTE: Pumps are set at a shallow depth (less than 9 feet pump bgs) and can be pulled by one technician. If there are no quick disconnect fittings for air supply and GW discharge lines directly below the 12" top flange cover the flanged cover and pump assembly will require two technicians to remove pump, bundled hoses and 12" flanged cover as one unit. 5) Inspect, clean and perform maintenance on the QED LD AP4B pump as per Maintenance Procedures for pumps in Section 3.1 Pneumatic Submersible Pumps. | <ol style="list-style-type: none"> 6) Thoroughly clean out the 12" sump by filling with fresh water. Agitate the water with compressed air delivered through a stinger apparatus set at the bottom of the sump, then pump with a submersible or centrifugal pump to T-401 for treatment. 7) Repeat this process until the bottom 12" PVC cap can be seen with the naked eye. The 12" PVC pipe walls are then gently hosed down and sump lid is reinstalled and secured. 8) Re-install float switch and QED LD AP4B pump and hose bundle to original setting depth. Re-connect the quick disconnect fittings for the QED pump air supply and GW discharge lines below the top 12" flanged cover (if required) otherwise place 12" flanged cover with pump assembly back in place. 9) Re-connect the air supply and GW discharge lines within the well sump vault and open ball valves to air and GW lines inside vault. Tighten all 12" top flanged cover bolts/nuts in an even pattern. 10) Ensure VTS is restarted in accordance with Section 2.3 Normal Startup Procedures. Check system for leaks and tighten as required. |
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EQUIP. ID:	CT-201	DESCRIPTION:	COOLING TOWER	MFG:	AQUA-LOOP COOLING TOWER
		SPECIFICATIONS:	650 GPM, FRP CASING AND BASIN	MODEL:	MB-300
OPERATING PARAMETERS:	10 GPM (Est. Water Consumption Rate)	MAINTENANCE ITEMS:	1. MAINTENANCE OF COOLING TOWER COMPONENTS		
			2. CLEANING OF COOLING TOWER BASIN		
			IMPORTANT: BROMIDE TABLETS ARE REQUIRED TO BE ADDED TO THE COOLING TOWER WATER TO REDUCE THE FORMATION AND BUILD-UP OF ALGAE AND SCALE.		
MAINTENANCE PROCEDURES					
<ul style="list-style-type: none"><u>MAINTENANCE OF COOLING TOWER COMPONENTS</u><ol style="list-style-type: none">Follow SSHP and AHA's for maintenance activities.Ensure VTS has been shut down in accordance with Section 2.4 Normal Shutdown Procedures and P-201 is OFF.Refer to Aqua-Loop Operating Instructions and Service Manual for maintenance related to fan blades, fan motor, V-Belt system, sprinkler head, sprinkler pipes, and automatic float valve. Perform maintenance on above items as required by manufacturer.Restart VTS. Place P-201 and Cooling Tower CT-201 back into operation.<u>CLEANING OF COOLING TOWER BASIN</u><ol style="list-style-type: none">Follow SSHP and AHA's for maintenance activities.Ensure VTS has been shut down in accordance with Section 2.4 Normal Shutdown Procedures and P-201 is OFF.Remove the bromide tablet dispenser and shut off water supply to the automatic float valve that maintains the water level in cooling tower basin. Open sump drain valve on bottom of basin and drain water from basin. When basin has been emptied remove the mesh screen that encapsulates the cooling tower.			<ol style="list-style-type: none">Use potable water (boosted system pressure between 45 to 65 psi) and a garden hose nozzle to remove all sediment and scaling. In some areas, scrubbing with a brush may be required. Once basin surface has been cleaned and inspected for cracks, crazing, wear, and other surface defects. Step 5 lists other important inspections to complete while basin is open and available for inspection.Check sprinkler pipes and sprinkler heads to ensure smooth rotation, check V-belts (if applicable) to make sure they are tight, check for wear. Check fan motor electrical connections to prevent bad wiring (due to moist environment) and possible motor burn out. Check fan blade tips to make sure they are free and clear. Turn fan motor on briefly to verify air is blowing upwards and that there is not excessive vibration. Check to see if all nuts & bolts are fastened tightly.Make any repairs or adjustments according to inspection of items identified in Step 5. Close sump drain valve, open water supply valve to the automatic float valve and fill basin to the pre-set minimum level. Add bromide tablet dispenser to basin and place encapsulating mesh back in place.Restart VTS. Place P-201 and Cooling Tower CT-201 back into operation.Periodically check the water level in basin. Make sure the water level is being maintained at a sufficient level to prevent cavitation of the pump P-201 by proper functioning and adjustment of the automatic float valve.		

EQUIP. ID:	F-101 & F-102	DESCRIPTION:	INLET VACUUM PARTICULATE FILTERS	MFG:	SOLBERG MANUFACTURING
		SPECIFICATIONS:	4950 SCFM, (2) 485P Filter Elements 5 MICRONS	MODEL:	CSL-485P(2)-1200FS1
OPERATING PARAMETERS:	700 SCFM	MAINTENANCE ITEMS:	1. ELEMENT REPLACEMENT		
			2. MAINTENANCE RECOMMENDATIONS		
			REFER TO SOLBERG INLET VACUUM FILTERS MAINTENANCE MANUAL FOR ALL OTHER REQUIREMENTS.		

MAINTENANCE PROCEDURES

• ELEMENT REPLACEMENT

- 1) Follow SSHP and AHA's for maintenance activities.
- 2) Ensure VTS has been shut down in accordance with [Section 2.4 Normal Shutdown Procedures](#) and LRPs (B-101/B-102) are OFF.
- 3) With VTS turned off, disconnect canister top from canister base by loosening the wing nut or hex-head on T-bolts. Lift off canister top. Remove retaining hex head/wing-nut carefully, then remove element. Some elements may have a top plate which should also be removed.
- 4) Clean surfaces of housing, top & base plates and element end caps so that they are free from dirt or particulates. (Paper Elements can be lightly blown with low pressure air. It is disposable and in most cases should be replaced with a new element).
- 5) Place new or cleaned element evenly on base plate. Be sure element seats properly and there is no dirt or particulate present on sealing surfaces. Place top plate (if necessary) on element by centering on tap bolt.
- 6) Secure washer and wing-nut to end cap (or top plate) and tap bolt. Element must be tightly secured. **DO NOT over-tighten.**
- 7) Secure canister top to canister base. Make sure surfaces are clean and O-ring must rest evenly along canister/casting O-ring groove. Replace housing top plate and tighten T-bolts evenly around perimeter. **DO NOT over-tighten.**
- 8) Restart VTS in accordance with [Section 2.3 Normal Startup Procedures](#) and place pumps back into operation.

• MAINTENANCE RECOMMENDATIONS

- 1) Pressure drop readings are recommended to have an effective air filter. Always document initial pressure drop during start-up when element is new /clean. Replacement elements (cartridges) are needed when system reaches 10" to 15" H₂O or higher pressure drop above the initial reading.
- 2) Always check replacement element (cartridge) gaskets to insure they are adhered uniformly along the end caps during handling. If not contact Solberg manufacturing immediately.
- 3) Always check inlets/outlets, element base and its components when replacing element to insure cleanliness. Wipe clean if necessary.
- 4) Operate only when a proper seal exists.

EQUIP. ID:	F-103 & F-104	DESCRIPTION:	OIL MIST FILTERS	MFG:	SOLBERG MANUFACTURING
		SPECIFICATIONS:	1100 SCFM , 0 ~ 5 PSIG, 0.3 MICRONS	MODEL:	HDL-PSG474-2-600
OPERATING PARAMETERS:	700 SCFM	MAINTENANCE ITEMS:	1. ELEMENT REPLACEMENT		
			2. MAINTENANCE RECOMMENDATIONS		
			REFER TO SOLBERG INLET VACUUM FILTERS MAINTENANCE MANUAL FOR ALL OTHER REQUIREMENTS.		

MAINTENANCE PROCEDURES

• ELEMENT REPLACEMENT

- 1) Follow SSHP and AHA's for maintenance activities.
- 2) Ensure VTS has been shut down in accordance with [Section 2.4 Normal Shutdown Procedures](#) and LRPs (B-101/B-102) are OFF.
- 3) Note: Cleaning of oil mist filter element is not recommended by Solberg Manufacturing. Replacement is preferred.
- 4) With VTS turned off, disconnect the canister top from canister base by loosening hex-nut on T-bolt then lifting the canister top off of base.
- 5) Remove retaining bolt and washer, and then carefully remove top plate. **Ensure that nothing falls into piping when element is removed.** Remove element.
- 6) Clean sealing surfaces of housing, top plates and new element end-caps so that they are free of dirt or any other particulate.
- 7) Place new element evenly on base plate. Be sure element seats properly and there is no dirt or particulate present on sealing surfaces. Place top plate (if necessary) on element.
- 8) Secure washer and thumb/wing/hex bolt to element top plate and tap bolt. Element must be securely tightened. **DO NOT over-tighten.**
- 9) Secure canister top to canister base. Make sure all surfaces are clean and O-rings (where necessary) must rest evenly along canister/housing base O-ring groove. Replace housing top plate and tighten T-bolts evenly around perimeter. **DO NOT over-tighten.**

- 10) Restart VTS in accordance with [Section 2.3 Normal Startup Procedures](#) and place pumps back into operation.

• MAINTENANCE RECOMMENDATIONS

- 1) Initial back pressure readings are recommended to maintain an effective oil mist filter. Always document initial back pressure during start-up when element is new /clean and then two weeks later after element is saturated.
- 2) Always check replacement O-rings to insure they are sealed uniformly along the canisters/housings during installation. If O-rings do not seat properly or are damaged in some manner, contact Solberg Manufacturing immediately. Do not modify O-rings.
- 3) Always check inlets/outlets, element base and its components when replacing element to insure cleanliness. Wipe clean if necessary.
- 4) Operate only when a proper seal exists.

EQUIP. ID:	F-401	DESCRIPTION:	PARTICULATE MULTIPLE BAG FILTER	MFG:	HAYWARD/EATON FILTRATION
		SPECIFICATIONS:	150 PSI, 400 GPM, 316 SS HOUSING	MODEL:	VMBF-0402-AB10-040A-UT-11SE
OPERATING PARAMETERS:	2 ~ 5 PSI Four Size 2 Polyester Filter Bags 25/10 Micron	MAINTENANCE ITEMS:	1. FILTER BAG REPLACEMENT (PT-401 PRESSURE 10 ~ 35 PSI)		
			2. FILTER BAG BASKETS INSPECTION		
			REFER TO MANUFACTURER MANUAL FOR ALL OTHER REQUIREMENTS.		

MAINTENANCE PROCEDURES

• **FILTER BAG REPLACEMENT (PT-401 PRESSURE 10 ~ 35 PSI)**

- 1) Follow SSHP and AHA's for maintenance activities.
- 2) Filter bags need to be replaced when pressures across filter bags (measured at PT-401) are between 10 and 35 psi. Normal operating pressures of new, clean bags are between 2 and 5 psi.
- 3) Ensure GTS has been shut down in accordance with [Section 2.4 Normal Shutdown Procedures](#). Alternately filter bags can be changed with GTS on and with the liquid level within T-401 at the lowest level (when pump P-401 shuts off automatically after tank is pumped down). Close influent valves (V-416 and V-417) and effluent valves (V-418 and V-419). The process of replacing 4 filter bags takes approximately 7 to 10 minutes.
- 4) Move the safety interlock handle upwards (vents the vessel and unlocks the clamp for opening). Open the cover using the threaded spindle mechanism operated CCW by a hand wheel, which opens the clamp so that the cover can be raised with the help of a spring assisted hinge. Inspect O-Ring for defects and displacement from groove.
- 5) Allow water level within the bag filter vessel to equalize so that no water is splashed around perimeter of unit.
- 6) Place 4 replacement filter bags next to vessel to reduce time to change bags. Raise filter bag restrainer basket (one at a time) with clogged filters inside while keeping the basket above the vessel to catch escaping water.

- 7) Remove clogged filter bag from restrainer basket and insert new filter bag, then place entire restrainer basket w/filter back into position. Repeat process for remaining three bags.
- 8) Inspect O-ring gasket around vessel mounting surface where vessel cover seats to ensure it is not displaced from the groove.
- 9) Close vessel cover and move the safety interlock handle downwards (closes vent to vessel). Turn spindle mechanism hand wheel CCW until it cannot be turned anymore by hand.
- 10) Open Valves V-416, V-417, V-418 and V-419. Re-start GTS according to [Section 2.3 Normal Startup Procedures](#). Check vessel for leaks. Most leaks are due to O-Ring being pinched or not seated correctly in groove on top of vessel that seals the cover when closed. Observe pressure at PT-401. New bags should indicate a pressure of between 2 and 5 psi.

• **FILTER BAG BASKETS INSPECTION**

- 1) Follow SSHP and AHA's for maintenance activities.
- 2) Inspect filter bag baskets every time filter bags are replaced. Inspect baskets for holes, cracking, defects or other signs of unusual wear, scaling or corrosion.
- 3) Replace filter bag baskets per manufacturer's recommendations.

EQUIP. ID:	F-402	DESCRIPTION:	PARTICULATE BAG FILTER	MFG:	KRYSTIL KLEER FILTRATION
		SPECIFICATIONS:	100 PSI, 180 GPM, 316 SS HOUSING	MODEL:	L88302FB610
OPERATING PARAMETERS:	2 ~ 5 PSI One Size 2 Polyester Filter Bag 25/10 Micron	MAINTENANCE ITEMS:	1. FILTER BAG REPLACEMENT (PT-401 PRESSURE 10 ~ 35 PSI)		
			2. FILTER BAG BASKETS INSPECTION		
			3. TIGHTENING BOLTS AND LIDS		
			REFER TO MANUFACTURER MANUAL FOR ALL OTHER REQUIREMENTS.		
MAINTENANCE PROCEDURES					
<ul style="list-style-type: none"><u>FILTER BAG REPLACEMENT (PT-401 PRESSURE 10 ~ 35 PSI)</u><ol style="list-style-type: none">Follow SSHP and AHA's for maintenance activities.Replace filter bag at F-402 at the same time that filter bags at F-401 are being replaced. Filter bags need to be replaced when pressures across filter bag (measured at PT-401) is between <u>10 and 35 psi</u>. Normal operating pressures of clean bags are between 2 and 5 psi.Ensure GTS has been shut down in accordance with Section 2.4 Normal Shutdown Procedures. Alternately filter bags can be changed with GTS on and with liquid within T-401 at the lowest level possible. Close influent valves (V-416 and V-417) and effluent valves (V-418 and V-419). The process of replacing 1 filter bag takes approximately 5 minutes.OPEN VENT PORT and allow vessel to vent. Loosen the three swing bolts with eye-nuts on the vessel cover until the bolts are free to move away from lid. To start the process, a tool may needed to be placed within the eye of the bolt to obtain sufficient leverage to loosen the swing bolt until it can be turned more easily. DO NOT LOOSEN ONE BOLT COMPLETELY BEFORE MOVING TO THE OTHER TWO BOLTS. Loosen the bolts as you would loosen wheel lugs such that even tightness is maintained along the three bolts at any one time.Allow water level within the bag filter vessel to equalize so that no water is splashed around perimeter of unit. CLOSE VENT PORT.			<ol style="list-style-type: none">Place 1 replacement filter bag next to vessel to reduce time to change bag. Raise filter bag restrainer basket with clogged filter inside while keeping the basket above the vessel to catch escaping water.Remove clogged filter bag from restrainer basket and insert new filter bag, then place entire restrainer basket w/filter back into position.Inspect O-ring gasket around vessel mounting surface where vessel cover seats to ensure it is not displaced from the groove. Close vessel cover. Using the eye of the bolt tighten the swing bolts alternating between bolts so as to not over tighten one bolt until all are hand tight. Then tighten slightly more with tool. DO NOT OVERTIGHTEN. Bolt will start to deform.Open Valves V-416, V-417, V-418 and V-419. Re-start GW system according to Section 2.3 Normal Startup Procedures. Check vessel for leaks. Most leaks are due to O-Ring being pinched or not seated correctly in groove on top of vessel that seals the cover when closed. Observe pressure at PT-401. New bags should indicate a pressure of between 2 and 5 psi.		

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EQUIP. ID:	F-402	DESCRIPTION:	PARTICULATE BAG FILTER	MFG:	KRYSTIL KLEER FILTRATION
		SPECIFICATIONS:	100 PSI, 180 GPM, 316 SS HOUSING	MODEL:	L88302FB610
MAINTENANCE PROCEDURES (CONT'D)					
<ul style="list-style-type: none"><u>FILTER BAG BASKETS INSPECTION</u><ol style="list-style-type: none">Follow SSHP and AHA's for maintenance activities.Inspect filter bag baskets every time filter bags are replaced. Inspect baskets for holes, cracking, defects or other signs of unusual wear, scaling or corrosion.Replace filter bag baskets per manufacturer's recommendations.			<ul style="list-style-type: none"><u>TIGHTENING BOLTS AND LIDS</u><ol style="list-style-type: none">Follow SSHP and AHA's for maintenance activities.Inspect eye bolts and lids every time filter bags are replaced. Check threads for wear. Clean with wire brush and lubricate threads as needed. Inspect lid for wear. Replace lid if damaged or compromised.		

EQUIP. ID:	F-403 & F-404	DESCRIPTION:	PARTICULATE BAG FILTER	MFG:	KRYSTIL KLEER FILTRATION
		SPECIFICATIONS:	100 PSI, 180 GPM, 316 SS HOUSING	MODEL:	L88302FB610
OPERATING PARAMETERS:	6 ~ 15 PSI One Size 2 Polyester Filter Bag 5/1 Micron	MAINTENANCE ITEMS:	1. FILTER BAG REPLACEMENT (PT-403 PRESSURE 20 ~ 35 PSI)		
			2. FILTER BAG BASKETS INSPECTION		
			3. TIGHTENING BOLTS AND LIDS		
			REFER TO MANUFACTURER MANUAL FOR ALL OTHER REQUIREMENTS.		

MAINTENANCE PROCEDURES

• **FILTER BAG REPLACEMENT (PT-403 PRESSURE 20 ~ 35 PSI)**

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| <ol style="list-style-type: none"> 1) Follow SSHP and AHA's for maintenance activities. 2) Replace filter bags at F-403 and F-404 at the same time. Filter bags need to be replaced when pressures across filter bag (measured at PT-403) is between <u>20 and 35 psi</u>. Normal operating pressures of clean bags are between 6 and 15 psi. 3) Ensure GTS has been shut down in accordance with Section 2.4 Normal Shutdown Procedures. Alternately filter bags can be changed with GTS on and with liquid in T-402 at the lowest level possible. Close influent valves (V-425 and V-426) and effluent valves (V-427 and V-428). The process of replacing each filter bag takes approximately 3 to 5 minutes. Total time 6 to 10 minutes. 4) OPEN VENT PORT and allow vessel to vent. Loosen the three swing bolts with eye-nuts on the vessel cover until the bolts are free to move away from lid. To start the process, a tool may be needed to be placed within the eye of the bolt to obtain sufficient leverage to loosen the swing bolt until it can be turned more easily. DO NOT LOOSEN ONE BOLT COMPLETELY BEFORE MOVING TO THE OTHER TWO BOLTS. Loosen the bolts as you would loosen wheel lugs such that even tightness is maintained along the three bolts at any one time. 5) Allow water level within the bag filter vessel to equalize so that no water is splashed around perimeter of unit. CLOSE VENT PORT. | <ol style="list-style-type: none"> 6) Place 2 replacement filter bags next to vessel to reduce time to change bag. Raise filter bag restrainer basket with clogged filter inside while keeping the basket above the vessel to catch escaping water. 7) Remove clogged filter bag from restrainer basket and insert new filter bag, then place entire restrainer basket w/filter back into position. Repeat process for second filter bag. 8) Inspect O-ring gasket around vessel mounting surface where vessel cover seats to ensure it is not displaced from the groove. Close vessel cover. Using the eye of the bolt tighten the swing bolts alternating between bolts so as to not over tighten one bolt until all are hand tight. Then tighten slightly more with tool. DO NOT OVERTIGHTEN. Bolt will start to deform. Repeat process for second vessel. 9) Open Valves V-425, V-426, V-427 and V-428. Re-start GTS according to Section 2.3 Normal Startup Procedures. Check vessel for leaks. Most leaks are due to O-Ring being pinched or not seated correctly in groove on top of vessel that seals the cover when closed. Observe pressure at PT-403. New bags should indicate a pressure of between 6 and 5 psi. |
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EQUIP. ID:	F-403 & F-404	DESCRIPTION:	PARTICULATE BAG FILTER	MFG:	KRYSTIL KLEER FILTRATION
		SPECIFICATIONS:	100 PSI, 180 GPM, 316 SS HOUSING	MODEL:	L88302FB610
MAINTENANCE PROCEDURES (CONT'D)					
<ul style="list-style-type: none"><u>FILTER BAG BASKETS INSPECTION</u><ul style="list-style-type: none">1) Follow SSHP and AHA's for maintenance activities.2) Inspect filter bag baskets every time filter bags are replaced. Inspect baskets for holes, cracking, defects or other signs of unusual wear, scaling or corrosion.3) Replace filter bag baskets per manufacturer's recommendations.			<ul style="list-style-type: none"><u>TIGHTENING BOLTS AND LIDS</u><ul style="list-style-type: none">1) Follow SSHP and AHA's for maintenance activities.2) Inspect eye bolts and lids every time filter bags are replaced. Check threads for wear. Clean with wire brush and lubricate threads as needed. Inspect lid for wear. Replace lid if damaged or compromised.		

EQUIP. ID:	F-501 & F-502	DESCRIPTION:	PARTICULATE BAG FILTER	MFG:	KRYSTIL KLEER FILTRATION
		SPECIFICATIONS:	100 PSI, 180 GPM, 316 SS HOUSING	MODEL:	L88302FB610
OPERATING PARAMETERS:	3 ~ 5 PSI One Size 2 Polyester Filter Bag 5/1 Micron	MAINTENANCE ITEMS:	1. FILTER BAG REPLACEMENT (PT-501 PRESSURE 10 ~ 12 PSI)		
			2. FILTER BAG BASKETS INSPECTION		
			3. TIGHTENING BOLTS AND LIDS		
			REFER TO MANUFACTURER MANUAL FOR ALL OTHER REQUIREMENTS.		

MAINTENANCE PROCEDURES

• FILTER BAG REPLACEMENT (PT-501 PRESSURE 10 ~ 12 PSI)

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| <ol style="list-style-type: none"> 1) Follow SSHP and AHA's for maintenance activities. 2) Replace filter bags at F-501 and F-502 at the same time. Filter bags need to be replaced when pressures across filter bag (measured at PT-501) is between <u>10 and 12 psi</u>. Normal operating pressures of clean bags are between 3 and 5 psi. 3) Ensure VTS has been shut down in accordance with Section 2.4 Normal Shutdown Procedures. Alternately filter bags can be changed with VTS on and with liquid in T-101 at the lowest level possible and/or with P-501 in manual/ off position on the SMC. Close influent valves (V-506 and V-507) and effluent valves (V-508 and V-509). The process of replacing each filter bag takes approximately 3-5 minutes. Total time 6 to 10 minutes. 4) OPEN VENT PORT and allow vessel to vent. Loosen the three swing bolts with eye-nuts on the vessel cover until the bolts are free to move away from lid. To start the process, a tool may needed to be placed within the eye of the bolt to obtain sufficient leverage to loosen the swing bolt until it can be turned more easily. DO NOT LOOSEN ONE BOLT COMPLETELY BEFORE MOVING TO THE OTHER TWO BOLTS. Loosen the bolts as you would loosen wheel lugs such that even tightness is maintained along the three bolts at any one time. 5) Allow water level within the bag filter vessel to equalize so that no water is splashed around perimeter of unit. CLOSE VENT PORT. | <ol style="list-style-type: none"> 6) Place 2 replacement filter bags next to vessel to reduce time to change bag. Raise filter bag restrainer basket with clogged filter inside while keeping the basket above the vessel to catch escaping water. 7) Remove clogged filter bag from restrainer basket and insert new filter bag, then place entire restrainer basket w/filter back into position. Repeat process for second filter bag. 8) Inspect O-ring gasket around vessel mounting surface where vessel cover seats to ensure it is not displaced from the groove. Close vessel cover. Using the eye of the bolt tighten the swing bolts alternating between bolts so as to not over tighten one bolt until all are hand tight. Then tighten slightly more with tool. DO NOT OVERTIGHTEN. Bolt will start to deform. Repeat process for second vessel. 9) Open Valves V-506, V-507, V-508 and V-509. Re-start VTS (if required) according to Section 2.3 Normal Startup Procedures. Ensure P-501 is set back to automatic position on the SMC. Check vessel for leaks. Most leaks are due to O-Rings being pinched or not seated correctly in groove on top of vessel that seals the cover when closed. Observe pressure at PT-501. New bags should indicate a pressure between 3 and 5 psi. |
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EQUIP. ID:	F-501 & F-502	DESCRIPTION:	PARTICULATE BAG FILTER	MFG:	KRYSTIL KLEER FILTRATION
		SPECIFICATIONS:	100 PSI, 180 GPM, 316 SS HOUSING	MODEL:	L88302FB610
MAINTENANCE PROCEDURES (CONT'D)					
<ul style="list-style-type: none"><u>FILTER BAG BASKETS INSPECTION</u><ol style="list-style-type: none">Follow SSHP and AHA's for maintenance activities.Inspect filter bag baskets every time filter bags are replaced. Inspect baskets for holes, cracking, defects or other signs of unusual wear, scaling or corrosion.Replace filter bag baskets per manufacturer's recommendations.			<ul style="list-style-type: none"><u>TIGHTENING BOLTS AND LIDS</u><ol style="list-style-type: none">Follow SSHP and AHA's for maintenance activities.Inspect eye bolts and lids every time filter bags are replaced. Check threads for wear. Clean with wire brush and lubricate threads as needed. Inspect lid for wear. Replace lid if damaged or compromised.		

EQUIP. ID:	FQI-201	DESCRIPTION:	WATER FLOW TOTALIZER	MFG:	McMASTER-CARR
		SPECIFICATIONS:	1” HOT WATER, 150 PSI, 33~220°F	MODEL:	9743K17 4115K42
OPERATING PARAMETERS:	0.22 to 50 GPM	MAINTENANCE ITEMS:	1. MAINTENANCE		
			REFER TO MANUFACTURER MANUAL FOR ALL OTHER REQUIREMENTS.		
MAINTENANCE PROCEDURES					
<ul style="list-style-type: none">• <u>MAINTENANCE</u><ol style="list-style-type: none">1) Follow SSHP and AHA's for maintenance activities.2) Remove flow totalizer when VTS is shut down or when maintenance is being performed on CT-201. The totalizer is threaded on both ends. Loosen threads on both ends to remove totalizer.3) When dirt and sediment accumulate in the display housing, remove totalizer display cover to access internal area of display and flush with water.4) Clean totalizer main case by running potable water through the threaded inlet to flush out sediments, sand, dirt and other small materials. Water should exit the meter through the threaded outlet.5) Refer to Manufacturer’s specifications for all other inspections, cleaning and maintenance required.					

EQUIP. ID:	P-101 & P-102	DESCRIPTION:	Air Operated Double Diaphragm Pump	MFG:	PRICE PUMP
		SPECIFICATIONS:	35 GPM Max, 125 PSI Max Air Inlet	MODEL:	AOD-1 PVVP
OPERATING PARAMETERS:	Manual Control of Air Inlet Pressures from 5 to 120 PSI Variable Flow Rate	MAINTENANCE ITEMS:	1. DISASSEMBLY FOR MAINTENANCE		
			2. REASSEMBLY		
			REFER TO MANUFACTURER MANUAL FOR ALL OTHER REQUIREMENTS.		

MAINTENANCE PROCEDURES

• DISASSEMBLY FOR MAINTENANCE

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| <ol style="list-style-type: none"> 1) Follow SSHP and AHA's for maintenance activities. 2) Ensure compressed air supply has been shut off to pump. Shut off, bleed down and disconnect the compressed air supply before doing any maintenance or repair to the pump. 3) The pump should be flushed before disassembly. The pump should be inverted (outlet at bottom) to drain properly. (Refer to Fig. 2, Page 14 in Price Pump Installation, Operating and Maintenance Manual). 4) Start disassembly by standing pump upright. Remove discharge manifold (23) by removing cap screws (52) hex nuts (32), and flat washers (31). 5) Remove O-rings (47), ball cages (57), balls (29), ball seats (28), and gaskets (58) from discharge end of pump chambers (1). Check O-ring, ball cages, balls, and ball seats. Replace any part that appears to be worn or damaged. NOTE: It is recommended that discharge seat gasket (58) automatically be replaced. 6) Remove suction manifold (24) and mounting feet (55) by removing cap screws (56), hex nuts (32) and flat washers (31). 7) Remove O-rings (47), ball seats (28), balls (29), and ball cages (57) from suction end of pump chambers (1). Check O-rings, ball seats, balls, and ball cages. Replace any parts that appear to be worn or damaged. NOTE: Mark pump chambers (1) and air chambers (86) with an index line 90° across the diaphragm (6) as well as an L and R (Left and Right). These marks will aid in proper alignment during reassembly. Remove both pump chambers by removing cap screws (30), hex nuts (32), and flat washers (31). | <ol style="list-style-type: none"> 8) While holding the hex head portion of one of the plastic outer diaphragm clamping plates (4), unscrew the other clamp plate. Either plate may come loose first. Completely remove outer clamp plate (4), diaphragm (6A), diaphragm O-ring (48), inner clamp plate (7A) and bumper (8). Slide shaft (16A), with opposing diaphragm and plates attached, out of air valve housing. Check clamping plates, diaphragms and bumpers for wear or damage. Replace if necessary. 9) Remove remaining diaphragm(s) and plates from shaft by putting shaft in vise between two blocks of wood or soft metal jaws and unscrewing the outer clamp plate. 10) Remove old Teflon tape (51) from both pump chambers (1). 11) Refer to Air Valve Disassembly Instructions on page 11 of the Price Pump Installation, Operating and Maintenance Manual. |
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EQUIP. ID:	P-101 & P-102	DESCRIPTION:	Double Diaphragm Pump	MFG:	PRICE PUMP
		SPECIFICATIONS:	35 GPM Max, 125 PSI Max Air Inlet	MODEL:	AOD-1 PVVP
MAINTENANCE PROCEDURES (CONT'D)					
<ul style="list-style-type: none"><u>REASSEMBLY</u><ol style="list-style-type: none">(Refer to Fig. 2, Page 14) Place pump shaft (16A) in vise with soft metal jaws or wooden blocks between the vise jaws and shaft. Place new rubber bumper (8) on end of shaft. Assemble new diaphragm (6A), new gasket (29) and inner diaphragm clamping plate (7A) onto 3/8" stud protruding from outer diaphragm clamping plate (4), concave side facing away from shaft. Apply Loctite #242 to thread and screw assembly into end of shaft. Tighten hex head portion of outer clamp to ISO-200 in lbs. (17-22nm).Push shaft through bore in air chamber/air valve assembly. Check for free movement of shaft, then bottom out diaphragm in air chamber. Invert assembly and assemble new bumper to shaft, new O-rings, new diaphragm, inner clamp plate to outer clamp plate and screw into end of shaft. Tighten outer clamp plate to 150-200 in-lbs (17-22 nm).Install new Teflon tape (51) on both pump chambers (1). Place pump chamber (1) marked either L or R on table and align proper index mark on respective air chamber (86). Diaphragm should be depressed into air chamber being assembled at this time. Place diaphragm outer bead into groove in pump chamber. If no index marks are present, visually align the air valve housing. The word "Top" appears on the outside portion of one of the large "cube-like" pump chamber sections.Install and tighten the cap screws (30), washers (31), and nuts (32) securing the pump chamber to the air chamber in several steps. Tighten cap screws and nuts in several steps to 70-80 inch lbs (8-9 nm) so as not to distort the non-metallic parts.Push opposing diaphragm and O-ring into its respective air chamber groove.Align and secure the other pump chamber to the air chamber following the procedure in Step 5.			<ol style="list-style-type: none">Place pump assembly on a table with the "top" of the pump chamber facing down.Into each of the pump chamber openings facing-up, insert ball cage (57), ball (29), ball seat (28) and O-ring gasket (47). Place suction manifold (24) on top of the pump assembly so that the flat surfaces of the square pads are against the O-ring gasket (47). Align the holes in the mounting feet (55) with the holes in the suction manifold (24) and pump chambers (1). Insert the eight 3/8" x 4 3/4" cap screws with flat washers through the mounting feet, manifold and pump chambers and secure with flat washer (31) and hex nuts (32). Torque cap screws and nuts to 115-125 in lbs (13-14 nm).Invert the pump so it is now resting on its feet.Into the top of each pump chamber, insert new gasket (58), ball seat (28), ball (29), ball cage (57) and O-ring gasket (47).Place discharge manifold (23) on top of the pump assembly so that the flat surfaces of the square pads are against the O-ring gaskets. Insert the eight 3/8" x 4 1/2" cap screws with flat washers through the manifold and pump chambers. Secure with flat washers & hex nuts. Torque cap screws and hex nuts to 115-125 in lbs (13-14 nm).Your pump is now ready to be placed back in service. Ensure compressed air supply has been turned back on to pump.		

EQUIP. ID:	P-201	DESCRIPTION:	COOLING TOWER TRANSFER PUMP	MFG:	SCOT MOTORPUMP
		SPECIFICATIONS:	20-HP TEFC MOTOR, 460 VOLT, 3 PHASE 1750 RPM	MODEL:	MOTORPUMP – 1750 RPM, 20-HP JP256 TEFC FRAME
OPERATING PARAMETERS:	375 GPM at 90” TDH	MAINTENANCE ITEMS:	1. CLEANING		
			2. TEMPERATURE		
			3. LUBRICATION		
			4. MECHANICAL SEAL REPLACEMENT		
			REFER TO MANUFACTURER MANUAL FOR ALL OTHER REQUIREMENTS.		
MAINTENANCE PROCEDURES					
<ul style="list-style-type: none"><u>CLEANING</u><ol style="list-style-type: none">Follow SSHP and AHA's for maintenance activities.Ensure VTS has been shut down in accordance with Section 2.4 Normal Shutdown ProceduresEnsure power to pump P-201 is turned off and LOCKOUT/TAGOUT procedures are in place.Remove oil, dust, dirt, water, chemicals from exterior of motor and pump. Keep motor air inlet and outlet open. Blow out interior of open motors with clean compressed air at low pressure. Regularly drain moisture from TEFC motors.Turn power on to P-201. Restart VTS in accordance with Section 2.3 Normal Startup Procedures. Put unit back into operation.<u>TEMPERATURE</u><ol style="list-style-type: none">Follow SSHP and AHA's for maintenance activities.Total temperature, not the rise, is the measure of safe operation for a motor. If temperature by thermometer or IR temperature gun exceeds limits for insulation class, investigate and change operating conditions.			<ul style="list-style-type: none"><u>LUBRICATION</u><ol style="list-style-type: none">Pumps should require no maintenance, other than the motor bearings, according to the following instructions:Single Shielded w/Grease Fitting Provisions. When single shielded bearings are furnished, periodic inspection, cleaning and re-lubrication is required. See motor manufacturer’s specific instructions for lubrication.<u>MECHANICAL SEAL REPLACEMENT</u><ol style="list-style-type: none">Follow SSHP and AHA's for maintenance activities.Ensure VTS has been shut down in accordance with Section 2.4 Normal Shutdown ProceduresEnsure power to pump P-201 is turned off and LOCKOUT/TAGOUT procedures are in place.Refer to Scot Motorpump Installation, Operation and Maintenance manual for details.Turn power on to P-201. Restart VTS in accordance with Section 2.3 Normal Startup Procedures. Put unit back into operation.		

EQUIP. ID:	P-202	DESCRIPTION:	Refrigerated Chiller Transfer Pump	MFG:	ITT GOULDS PUMPS
		SPECIFICATIONS:	3-HP, 460 V, 3 PHASE, 316 SS	MODEL:	2ST1H5B4
OPERATING PARAMETERS:	80 GPM at 80' TDH	MAINTENANCE ITEMS:	1. MAINTENANCE OF BEARINGS		
			2. DISASSEMBLY OF PUMP		
			3. REASSEMBLY OF PUMP		
			REFER TO MANUFACTURER MANUAL FOR ALL OTHER REQUIREMENTS.		

MAINTENANCE PROCEDURES

- **MAINTENANCE OF BEARINGS**

Ball Bearings are located in and are part of the motor. They are permanently lubricated therefore no greasing is required.

- **DISASSEMBLY OF PUMP**

- 1) Follow SSHP and AHA's for maintenance activities.
- 2) Ensure VTS has been shut down in accordance with [Section 2.4 Normal Shutdown Procedures](#) and P-202 is OFF.
- 3) Turn off and **LOCKOUT/TAGOUT** power to unit (the AHA will cover this). Drain system of fluid. Flush unit if necessary. Remove motor hold down bolts.
- 4) Disassembly of liquid end: Refer to figure on Page 7 of ITT Goulds Pumps G&L Series Model NPE/NPE-F Installation, Operation and Maintenance Instructions ([attached in Tab C](#)). See Steps 5 through 10 below for instructions.
- 5) Remove casing bolts (370).
- 6) Remove back pull-out assembly from casing (100).
- 7) Remove impeller locknut (304). **CAUTION: DO NOT USE SCREWDRIVER BETWEEN IMPELLER VANES** to prevent rotation of close-coupled units. Remove cap at opposite end of motor. A screwdriver slot or pair of flats will be exposed. Using them will prevent impeller damage.

- 8) Remove impeller (101) by turning counter-clockwise when looking at the front of the pump. Protect hand with glove or rag. **Failure to remove the impeller in a counter-clockwise direction may damage threads on the impeller, shaft or both.**
- 9) With two pry bars 180 degrees apart and inserted between the seal housing (184) and the motor adapter (108), carefully separate the two parts. The mechanical seal rotary unit (383) should come off the shaft with the seal housing.
- 10) Push out the mechanical seal stationary seat from the motor side of the seal housing.

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EQUIP. ID:	P-202	DESCRIPTION:	Refrigerated Chiller Transfer Pump	MFG:	ITT GOULDS PUMPS
		SPECIFICATIONS:	3-HP, 460 V, 3 PHASE, 316 SS	MODEL:	2ST1H5B4
MAINTENANCE PROCEDURES (CONT'D)					
<ul style="list-style-type: none"><u>REASSEMBLY OF PUMP</u><ol style="list-style-type: none">All parts should be cleaned before reassembly.Refer to parts list on Page 7 of manufacturer's manual to identify required replacement items. Specify pump index or catalog number when ordering parts.Reassembly is the reverse order of disassembly. Impeller and impeller locknut assembled onto motor shaft with 10- ft-lbs of torque. Observe the following Steps 4 through 8 when reassembling the liquid-end.All mechanical seal components must be in good condition or leakage may result. Replacement of complete seal assembly, whenever seal has been removed, is good standard practice. Glycerin may be used to facilitate assembly. Do not contaminate the mechanical seal faces with lubricant.Inspect casing O-ring (513) and replace if damaged. This O-ring may be lubricated with petroleum jelly.Inspect guidevane O-ring (349) and replace if worn. Do not lubricate guidevane O-ring.Check reassembled unit for binding.Tighten casing bolts in a star pattern to prevent O-ring binding. Place unit back into operation and turn power on. Ensure VTS is restarted in accordance with Section 2.3 Normal Startup Procedures					

EQUIP. ID:	P-203	DESCRIPTION:	Condensate Tank Transfer Pump	MFG:	PACER PUMPS
		SPECIFICATIONS:	½ HP, TEFC, 460 V, 3 P, 3450 RPM	MODEL:	Z-40
OPERATING PARAMETERS:	52 GPM at 45' TDH	MAINTENANCE ITEMS:	1. LUBRICATION		
			2. REPAIR AND REPLACEMENT PARTS		
			REFER TO PACER PUMPS FOR ALL OTHER REQUIREMENTS.		
MAINTENANCE PROCEDURES					
<ul style="list-style-type: none"><u>LUBRICATION</u> Bearings are located in and are part of the motor. They are permanently lubricated therefore no greasing is required.<u>REPAIR AND REPLACEMENT PARTS</u> Refer to Pacer Catalog Sheet for Z-40 parts drawing.					

EQUIP. ID:	P-401	DESCRIPTION:	BOOSTER TANK TRANSFER PUMP	MFG:	ITT GOULDS PUMPS
		SPECIFICATIONS:	3-HP, 460 V, 3 PHASE, 316 SS	MODEL:	2ST1H2B4
OPERATING PARAMETERS:	110 GPM at 55' TDH	MAINTENANCE ITEMS:	1. MAINTENANCE OF BEARINGS		
			2. DISASSEMBLY OF PUMP		
			3. REASSEMBLY OF PUMP		
			REFER TO MANUFACTURER MANUAL FOR ALL OTHER REQUIREMENTS.		
MAINTENANCE PROCEDURES					
<ul style="list-style-type: none"><u>MAINTENANCE OF BEARINGS</u> Ball Bearings are located in and are part of the motor. They are permanently lubricated therefore no greasing is required.<u>DISASSEMBLY OF PUMP</u><ol style="list-style-type: none">Follow SSHP and AHA's for maintenance activities.Turn off and LOCKOUT/TAGOUT power to unit (the AHA will cover this). Drain system of fluid. Flush unit if necessary. Remove motor hold down bolts.Disassembly of liquid end: Refer to figure on Page 7 of ITT Goulds Pumps G&L Series Model NPE/NPE-F Installation, Operation and Maintenance Instructions (attached in Tab C). See Steps 4 through 9 below for instructions.Remove casing bolts (370).Remove back pull-out assembly from casing (100).Remove impeller locknut (304). CAUTION: DO NOT USE SCREWDRIVER BETWEEN IMPELLER VANES to prevent rotation of close-coupled units. Remove cap at opposite end of motor. A screwdriver slot or pair of flats will be exposed. Using them will prevent impeller damage.Remove impeller (101) by turning counter-clockwise when looking at the front of the pump. Protect hand with glove or rag. Failure to remove the impeller in a counter-clockwise direction may damage threads on the impeller, shaft or both.			<ol style="list-style-type: none">With two pry bars 180 degrees apart and inserted between the seal housing (184) and the motor adapter (108), carefully separate the two parts. The mechanical seal rotary unit (383) should come off the shaft with the seal housing.Push out the mechanical seal stationary seat from the motor side of the seal housing.		

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EQUIP. ID:	P-401	DESCRIPTION:	GROUNDWATER BOOSTER PUMP	MFG:	ITT GOULDS PUMPS
		SPECIFICATIONS:	3-HP, 460 V, 3 PHASE, 316 SS	MODEL:	2ST1H2B4
MAINTENANCE PROCEDURES (CONT'D)					
<ul style="list-style-type: none">• <u>REASSEMBLY OF PUMP</u><ol style="list-style-type: none">1) All parts should be cleaned before reassembly.2) Refer to parts list on Page 7 of manufacturer's manual to identify required replacement items. Specify pump index or catalog number when ordering parts.3) Reassembly is the reverse order of disassembly. Impeller and impeller locknut assembled onto motor shaft with 10- ft-lbs of torque. Observe the following Steps 4 through 8 when reassembling the liquid-end.4) All mechanical seal components must be in good condition or leakage may result. Replacement of complete seal assembly, whenever seal has been removed, is good standard practice. Glycerin may be used to facilitate assembly. Do not contaminate the mechanical seal faces with lubricant.5) Inspect casing O-ring (513) and replace if damaged. This O-ring may be lubricated with petroleum jelly.6) Inspect guidevane O-ring (349) and replace if worn. Do not lubricate guidevane O-ring.7) Check reassembled unit for binding.8) Tighten casing bolts in a star pattern to prevent O-ring binding. Place unit back into operation and turn power on. Test unit for proper operation.					

EQUIP. ID:	P-402	DESCRIPTION:	HOLDING TANK TRANSFER PUMP	MFG:	ITT GOULDS PUMPS
		SPECIFICATIONS:	5-HP, 460 V, 3 PHASE, 316 SS	MODEL:	2ST1JSA4
OPERATING PARAMETERS:	100 GPM at 75' TDH	MAINTENANCE ITEMS:	1. MAINTENANCE OF BEARINGS		
			2. DISASSEMBLY OF PUMP		
			3. REASSEMBLY OF PUMP		
			REFER TO MANUFACTURER MANUAL FOR ALL OTHER REQUIREMENTS.		
MAINTENANCE PROCEDURES					
<ul style="list-style-type: none"><u>MAINTENANCE OF BEARINGS</u> Ball Bearings are located in and are part of the motor. They are permanently lubricated therefore no greasing is required.<u>DISASSEMBLY OF PUMP</u><ol style="list-style-type: none">Follow SSHP and AHA's for maintenance activities.Turn off and LOCKOUT/TAGOUT power to unit (the AHA will cover this). Drain system of fluid. Flush unit if necessary. Remove motor hold down bolts.Disassembly of liquid end: Refer to figure on Page 7 of ITT Goulds Pumps G&L Series Model NPE/NPE-F Installation, Operation and Maintenance Instructions (attached in Tab C). See Steps 4 through 9 below for instructions.Remove casing bolts (370).Remove back pull-out assembly from casing (100).Remove impeller locknut (304). CAUTION: DO NOT USE SCREWDRIVER BETWEEN IMPELLER VANES to prevent rotation of close-coupled units. Remove cap at opposite end of motor. A screwdriver slot or pair of flats will be exposed. Using them will prevent impeller damage.Remove impeller (101) by turning counter-clockwise when looking at the front of the pump. Protect hand with glove or rag. Failure to remove the impeller in a counter-clockwise direction may damage threads on the impeller, shaft or both.			<ol style="list-style-type: none">With two pry bars 180 degrees apart and inserted between the seal housing (184) and the motor adapter (108), carefully separate the two parts. The mechanical seal rotary unit (383) should come off the shaft with the seal housing.Push out the mechanical seal stationary seat from the motor side of the seal housing.		

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EQUIP. ID:	P-402	DESCRIPTION:	TRANSFER PUMP	MFG:	ITT GOULDS PUMPS
		SPECIFICATIONS:	5-HP, 460 V, 3 PHASE, 316 SS	MODEL:	2ST1JSA4
MAINTENANCE PROCEDURES (CONT'D)					
<ul style="list-style-type: none">• <u>REASSEMBLY OF PUMP</u><ol style="list-style-type: none">1) All parts should be cleaned before reassembly.2) Refer to parts list on Page 7 of manufacturer's manual to identify required replacement items. Specify pump index or catalog number when ordering parts.3) Reassembly is the reverse order of disassembly. Impeller and impeller locknut assembled onto motor shaft with 10- ft-lbs of torque. Observe the following Steps 4 through 8 when reassembling the liquid-end.4) All mechanical seal components must be in good condition or leakage may result. Replacement of complete seal assembly, whenever seal has been removed, is good standard practice. Glycerin may be used to facilitate assembly. Do not contaminate the mechanical seal faces with lubricant.5) Inspect casing O-ring (513) and replace if damaged. This O-ring may be lubricated with petroleum jelly.6) Inspect guidevane O-ring (349) and replace if worn. Do not lubricate guidevane O-ring.7) Check reassembled unit for binding.8) Tighten casing bolts in a star pattern to prevent O-ring binding. Place unit back into operation and turn power on. Test unit for proper operation.					

EQUIP. ID:	P-501	DESCRIPTION:	MOISTURE SEPARATOR TRANSFER PUMP	MFG:	AMT
		SPECIFICATIONS:	2-HP MOTOR, 460 VOLT, 3 PHASE, 3/8" MAXIMUM SEMI-SOLIDS PASSING	MODEL:	282B-98
OPERATING PARAMETERS:	30 GPM at 75' TDH Self Priming Centrifugal Pump	MAINTENANCE ITEMS:	1. MAINTENANCE OF BEARINGS		
			2. GENERAL MAINTENANCE		
			3. MECHANICAL SEAL REPLACEMENT		
			4. SHIM ADJUSTMENT		
			REFER TO MANUFACTURER MANUAL FOR ALL OTHER REQUIREMENTS.		

MAINTENANCE PROCEDURES

• MAINTENANCE OF BEARINGS

Bearings are located in and are part of the motor. They are permanently lubricated therefore no greasing is required.

• GENERAL MAINTENANCE

- 1) Follow SSHP and AHA's for maintenance activities.
- 2) Ensure VTS has been shut down in accordance with [Section 2.4 Normal Shutdown Procedures](#) or shut off power to P-501 using **LOCKOUT/TAGOUT** procedures.
- 3) The pump casing should be removed and inspected periodically to insure that any foreign material is not clogging the internal pump parts. This unit is equipped with a dual volute pump casing. One of the volutes runs 180 degrees, all the way from the side opposite the discharge into the discharge through a completely enclosed passageway. If foreign material clogs this area it can be dislodged by using a wire or long spring.
- 4) Re-start VTS in accordance with [Section 2.3 Normal Startup Procedures](#).

• MECHANICAL SEAL REPLACEMENT

- 1) Follow SSHP and AHA's for maintenance activities.
- 2) Ensure VTS has been shut down in accordance with [Section 2.4 Normal Shutdown Procedures](#).
- 3) Refer to Figure 1 of AMT Specifications Information and Repair Parts Manual. NOTE: Always replace both seal seat (Ref. No. 8) and seal head (Ref. No. 9) to ensure proper mating of components. Refer to Items 1 through 16 on Pages 1 and 2 of manual.

• SHIM ADJUSTMENT

- 1) Follow SSHP and AHA's for maintenance activities.
- 2) Ensure VTS has been shut down in accordance with [Section 2.4 Normal Shutdown Procedures](#).
- 3) Refer to Figure 1 of AMT Specifications Information and Repair Parts Manual. Note: Always replace both seal seat (Ref. No. 8) and seal head (Ref. No. 9) to ensure proper mating of components. Refer to Items 1 through 3 on Page 2 of manual.

EQUIP. ID:	P-502	DESCRIPTION:	Secondary Containment Sump Pump	MFG:	DAYTON
		SPECIFICATIONS:	1-HP, 460 VOLT 3 PHASE, 316 SS, 2" Solids Handling Capacity	MODEL:	DN2110070T
OPERATING PARAMETERS:	54 GPM at 25' TDH	MAINTENANCE ITEMS:	1. LUBRICATION		
			2. CLEANING OF PUMP		
			3. IMPELLER AND SEAL REPLACEMENT		
			4. CAPACITOR CHANGE /CORD REPLACEMENT		
			REFER TO DAYTON OPERATING INSTRUCTIONS AND PARTS MANUAL FOR ALL OTHER REQUIREMENTS.		

MAINTENANCE PROCEDURES

- **LUBRICATION**

No additional lubrication is required as unit is sealed in oil.

- **CLEANING OF PUMP**

- 1) Follow SSHP and AHA's for maintenance activities.
- 2) Ensure power to pump P-502 is turned off and **LOCKOUT/TAGOUT** procedures are in place.
- 3) Ensure discharge piping has been disconnected and wiring is free. Remove pump from sump using lifting handle.
- 4) Place pump in an area where it can be cleaned thoroughly. Submerge complete pump in a disinfectant solution/or Simple Green for one hour before disassembling pump.
- 5) The pump seal plate contains special lubricating oil which should be kept clean and free of water at all times.
- 6) Put pump back in place, connect discharge piping, remove lock out tag out devices, turn power back on and test out.

- **IMPELLER AND SEAL REPLACEMENT**

- 1) Repeat Items 1-5 from **Cleaning of Pump** procedures.

To replace the impeller, follow Steps 2 and 3. Reverse the steps to reassemble the pump.

To replace the mechanical shaft seal, follow Steps 2 through 9, reverse steps to reassemble pump.

To replace oil seal, follow steps 2 through 11.

See the Repair Parts Illustrations Figure 4 and Pages 10, 11.

- 2) Remove the base, diffuser, and O-Ring.
- 3) Remove the impeller nut and washer then pull the impeller off the shaft.
- 4) Remove the sand shield and washer from the shaft.
- 5) Remove the drain plug and drain oil out of the oil seal chamber.
- 6) Remove the rotating half of the mechanical seal from the pump shaft.
- 7) Remove the rotor/shaft assembly from the pump body.
- 8) Carefully tap the shaft out of the pump body.
- 9) Remove the stationary half of the mechanical seal from the pump body.

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EQUIP. ID:	P-502	DESCRIPTION:	Secondary Containment Sump Pump	MFG:	DAYTON
		SPECIFICATIONS:	1-HP, 460 VOLT 3 PHASE, 316 SS, 2” Solids Handling Capacity	MODEL:	DN2110070T
MAINTENANCE PROCEDURES (CONT'D)					
<div>10) Carefully tap the shaft out of the pump body.</div> <div>11) Remove the stationary half of the mechanical seal from the pump body.</div> <div>12) Slide the lower bearing holder off of the shaft and pop the oil seal out of lower bearing holder.</div> <div>13) Reverse steps 3 through 11 to reassemble the pump. Use 1.6 ounces of U197-8A oil to refill the oil chamber.</div> <div><div>•</div><div><div>CAPACITOR CHANGE/CORD REPLACEMENT</div><div>1) Repeat Items 1-5 from Cleaning of Pump procedures.</div><div>2) Refer to Dayton Operating Instructions and Parts Manual Page 4 for specific requirements.</div></div></div>					

EQUIP. ID:	T-101	DESCRIPTION:	MOISTURE SEPARATOR	MFG:	TETRASOLV FILTRATION
		SPECIFICATIONS:	3 PSIG, 250°F, 500 GAL, 316 SS	MODEL:	500 GAL
OPERATING PARAMETERS:	High Level – 40% of Tank Capacity Low Level – N/A	MAINTENANCE ITEMS:	1. CLEANOUT SEDIMENTS IN TANK (3" OR MORE)		
			2. REPAIR PIPING OR TANK LEAKS		
			3. SIGHT GLASS LEAKING OR DIRTY		
			4. LEVEL SWITCH LSHH-101 MAINTENANCE		
MAINTENANCE PROCEDURES					
<ul style="list-style-type: none"><u>CLEANOUT SEDIMENTS IN TANK (3" OR MORE)</u><ol style="list-style-type: none">Follow SSHP and AHA's for maintenance activities.Maintenance on T-101 should be scheduled at same time during maintenance of tanks T-401 and T-402 for maximum efficiency.Shut down VTS in accordance with Section 2.4 Normal Shutdown Procedures.With VTS shut down, manually pump down liquid contents of T-101 using P-501 while in hand operation in the SMC. Pump water through filters F-501 & F-502 to tank T-402.Loosen bolts on side cover plate and remove plate and gasket (large plate that is facing tank T-401).Remove sediments from inside the tank using a flat shovel and working from the outside. There are normally about 5 or 6 full shovels of sediment and sand during cleanout procedures.After sediments are removed, inspect tank interior visually with a flashlight for structural damage, cracks and other defects. Assuming there are no repairs required, flush tank with clean water, replace cover side plate and gasket. Place tank back into operation. At this time you should also inspect and replace gasket if required.Restart VTS in accordance with Section 2.3 Normal Startup Procedures.			<ul style="list-style-type: none"><u>REPAIR PIPING OR TANK LEAKS</u><ol style="list-style-type: none">Follow maintenance procedures 1 through 3 as outlined in Cleanout Sediments in Tank.Make repairs as required.Place tank back into operation.Restart VTS in accordance with Section 2.3 Normal Startup Procedures.<u>SIGHT GLASS LEAKING OR DIRTY</u><ol style="list-style-type: none">Follow maintenance procedures 1 through 3 as outlined in Cleanout Sediments in Tank.Disassemble sight glass from tank. Clean with potable water and Simple Green (or similar) solution.Reassemble sight glass to tank and place tank back into operation.Restart VTS in accordance with Section 2.3 Normal Startup Procedures.		

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EQUIP. ID:	T-101	DESCRIPTION:	MOISTURE SEPARATOR	MFG:	TETRASOLV FILTRATION
		SPECIFICATIONS:	3 PSIG, 250°F, 500 GAL, 316 SS	MODEL:	500 GAL
MAINTENANCE PROCEDURES (CONT'D)					
<ul style="list-style-type: none">• <u>LEVEL SWITCH LSHH-101 MAINTENANCE</u><ol style="list-style-type: none">1) Follow maintenance procedures 1 through 3 as outlined in Cleanout Sediments in Tank.2) Refer to manufacturer manual for replacement and installation instructions. Duplicate electrical requirements and use as equal or better materials of construction.3) Ensure electrical power supply switch is in LOCKOUT/ TAGOUT mode. Replace switch as required. Remove lockout/tagout devices, re-energize electric and place tank back into operation.4) Restart VTS in accordance with Section 2.3 Normal Startup Procedures.					

EQUIP. ID:	T-201	DESCRIPTION:	Condensate Tank	MFG:	POLY PROCESSING
		SPECIFICATIONS:	CROSS LINKED HDPE 60-GAL UPRIGHT	MODEL:	60 GAL
OPERATING PARAMETERS:	60 Gal Tank for Condensate from H-201	MAINTENANCE ITEMS:	1. MAINTENANCE AND CLEANING (ONCE PER YEAR, MORE IF CONDENSATE WATER QUALITY IS POOR)		
			REFER TO MANUFACTURER FOR ALL OTHER REQUIREMENTS.		

MAINTENANCE PROCEDURES

- **MAINTENANCE AND CLEANING (ONCE PER YEAR)**

- 1) Follow SSHP and AHA's for maintenance activities.
- 2) Pump T-201 down by hand using P-203 to the lowest level without running the pump dry. Then ensure VTS has been shut down in accordance with [Section 2.4 Normal Shutdown Procedures](#) and P-203 is OFF.
- 3) Install **TOCKOUT/TAGOUT** device on switch to P-203 unit. Drain the remaining water (a few gallons of condensate from H-201) to the secondary containment sump. Pump this water to T-402 for treatment using the secondary containment sump pump P-502.
- 4) Disconnect suction piping from tank. Remove float switches on sight glass. See Step 5 note in the event the float switches can not be removed easily without damage to the float switch or sight glass fittings.
- 5) Thoroughly clean out the interior of the tank and the sight glass located on the side of tank with mild soap and water. Pay careful attention to the sight glass as this area tends to become dirty quicker than the tank itself. If possible use some sort of swab inside the sight glass to wipe away any residue that may foul the float switches. **NOTE: If float switches do not unthread easily it is acceptable to clean the sight glass with water by flushing.**
- 6) Re-install float switches (if required) to sight glass and re-connect suction line of P-203 to tank.
- 7) Remove lockout/tagout device of P-203 and put back into auto operation.

- 8) Ensure VTS is restarted in accordance with [Section 2.3 Normal Startup Procedures](#)

EQUIP. ID:	T-202	DESCRIPTION:	Refrigerated Chiller Tank	MFG:	POLY PROCESSING
		SPECIFICATIONS:	CROSS LINKED HDPE 280-GAL UPRIGHT	MODEL:	280 GALLON
OPERATING PARAMETERS:	280 Gallon Reservoir for RC-201	MAINTENANCE ITEMS:	1. MAINTENANCE AND CLEANING (ONCE PER YEAR, MORE IF WATER QUALITY IN TANK IS VISIBLY POOR)		
			REFER TO RC-201 (COLD SHOT CHILLERS) MANUAL FOR ALL OTHER REQUIREMENTS.		
MAINTENANCE PROCEDURES					
<ul style="list-style-type: none"><u>MAINTENANCE AND CLEANING</u><ol style="list-style-type: none">Follow SSHP and AHA's for maintenance activities.Ensure VTS has been shut down in accordance with Section 2.4 Normal Shutdown Procedures and P-202 is OFF.Make sure the ball valve supplying water to the tank from the potable water supply is closed. Drain the water from T-202 by attaching a quick connect discharge hose and opening the side bottom plug on the tank. Discharge the water to the secondary containment sump inside the treatment compound then transfer water to T-401 with a portable sump pump. NOTE: If there is no valve located between the quick disconnect fitting and tank drain plug, the water inside the tank must be drained by pumping to T-401 using a portable submersible pump.Remove cover on tank then thoroughly clean out the interior of the tank using a garden hose nozzle with normal system pressure (40 to 50 psi). Allow the water to drain through the side bottom plug and discharge to secondary containment sump. Transfer water to T-401.When tank has been sufficiently cleaned, re-install the side bottom plug and place cover back on tank. Open potable water supply ball valve to fill tank to 2/3 full then close valve. Place pump P-202 back in auto start.Ensure VTS is restarted in accordance with Section 2.3 Normal Startup Procedures and check water level of T-202 after system has been running for a few hours.			<ol style="list-style-type: none">Add or remove water from T-202 as required to maintain level at 2/3 full using the potable water supply ball valve. Keep the water supply valve closed at all times to prevent tank from overflowing. Only open as necessary to fill tank to 2/3 full.NOTE: Refer to refrigerated chiller (RC-201) manufacturer's guidelines (Cold Shot Chillers) for the addition of glycol to the water tank during winter months.Try to schedule the maintenance of T-202 during the same time as maintenance is performed on other VTS components such as CT-201 to minimize VTS shut downs.		

EQUIP. ID:	T-301 & T-302	DESCRIPTION:	VAPOR PHASE GAC ADSORBERS	MFG:	TETRASOLV FILTRATION
		SPECIFICATIONS:	72" DIA. x 8' 3" HEIGHT, 4000 LBS GAC 28" Hg Vacuum or 8 psig Pressure 3000 CFM	MODEL:	VFV-5000
OPERATING PARAMETERS:	700 CFM 15" Hg Vacuum or 4 psig Pressure	MAINTENANCE ITEMS:	1. INSPECTION AND MAINTENANCE		
			REFER TO TETRASOLV FILTRATION PRODUCT DATA SHEET FOR ALL OTHER REQUIREMENTS.		
MAINTENANCE PROCEDURES					
<ul style="list-style-type: none"><u>INSPECTION AND MAINTENANCE</u><ol style="list-style-type: none">Follow SSHP and AHA's for maintenance activities.Inspection and maintenance on the interior portion of the vessels will be performed when GAC is replaced. Working on the interior portion of the vessels will require Confined Space Entry (CSE) methods. Maintenance on the exterior portion of vessels (valves, fittings, gaskets, etc.) will be conducted as required and be noted during routine weekly inspections.For interior inspection and maintenance, ensure VTS has been shut down in accordance with Section 2.4 Normal Shutdown Procedures and close all inlet and outlet valves for T-301 & T-304. Release pressure (and residual water) from each tank by opening the manual drain at the bottom of each tank. Make sure there is no pressure in tank and then proceed to Step 4.Access the top of the vessel and remove the bolts for the 18" circular cover (manway) on the top portion of the vessel.GAC being replaced by a specialty contractor will then be removed from the vessel to a point where the bottom 12" of GAC can be accessed and removed by hand. Once all of the GAC has been removed, the vessel can be accessed by an O&M technician in accordance with an approved CSE plan for the following:Visually inspect the interior of the vessel walls for cracking, corrosion, brittle appearance, holes or any other obvious defects.			<ol style="list-style-type: none">Once repairs are made, proper documentation of any repairs will aid the O&M technician during the next inspection. The specialty contractor will then add 4,000 lbs of new GAC as specified by the site engineer.Close cover (manway) on top of vessel and close drain on bottom of tank. Open inlet and outlet valves. (NOTE: When GAC is being replaced it is normally one vessel at a time. In this case, make sure the vessel receiving the new GAC becomes the second or polishing GAC vessel by changing inlet and outlet valves on both vessels accordingly).Fill vessels with water then restart VTS in accordance with Section 2.3 Normal Startup Procedures.For external maintenance during routine inspections, check all valves, pressure gauges, air release vents and sample ports for leaks or damage. Replace as required.For additional technical information concerning the vessel, consult with the Tetrasolv Filtration product data sheet and General Assembly Layout drawings.		

EQUIP. ID:	T-401	DESCRIPTION:	GROUNDWATER BOOSTER TANK	MFG:	POLY PROCESSING COMPANY
		SPECIFICATIONS:	905 GAL, CROSS LINKED HDPE	MODEL:	41100905
OPERATING PARAMETERS:	High Level – 80% of Tank Capacity Low Level – 10% of Tank Capacity	MAINTENANCE ITEMS:	1. CLEANOUT SEDIMENTS IN TANK (3" OR MORE)		
			2. REPAIR PIPING OR TANK LEAKS		
			3. SIGHT GLASS LEAKING OR DIRTY		
			4. LEVEL SWITCH LSLL-401 & LSHH-401 MAINTENANCE		
MAINTENANCE PROCEDURES					
<ul style="list-style-type: none"><u>CLEANOUT SEDIMENTS IN TANK (3” OR MORE)</u><ol style="list-style-type: none">Follow SSHP and AHA's for maintenance activities.Manually pump down liquid contents to T-402.Shut down GTS in accordance with Section 2.4 Normal Shutdown Procedures.Use drum vacuum method, from top of tank, to remove sediments.If additional sediment removal is required, implement confined space entry according to SSHP. Use shovel & bucket method and place sediments in 55 gallon drums.After sediments are removed, flush tank with clean water and place tank back into operation.Restart GTS in accordance with Section 2.3 Normal Startup Procedures.<u>REPAIR PIPING OR TANK LEAKS</u><ol style="list-style-type: none">Follow maintenance procedures 1 through 3 as outlined in Cleanout Sediments in Tank.Make repairs as required.Place tank back into operation.Restart GTS in accordance with Section 2.3 Normal Startup Procedures.			<ul style="list-style-type: none"><u>SIGHT GLASS LEAKING OR DIRTY</u><ol style="list-style-type: none">Follow maintenance procedures 1 through 3 as outlined in Cleanout Sediments in Tank.Disassemble sight glass from tank. Clean with potable water and Simple Green (or similar) solution.Reassemble sight glass to tank and place tank back into operation.Restart GTS in accordance with Section 2.3 Normal Startup Procedures.<u>LEVEL SWITCH LSLL-401 & LSHH-401 MAINTENANCE</u><ol style="list-style-type: none">Follow maintenance procedures 1 through 3 as outlined in Cleanout Sediments in Tank.Refer to manufacturer's manual for replacement and installation instructions. Duplicate electrical requirements and use as equal or better materials of construction.Ensure electrical power supply switch is in LOCKOUT/ TAGOUT mode. Replace switch as required. Remove lockout/tagout devices, re-energize electric and place tank back into operation.Restart GTS in accordance with Section 2.3 Normal Startup Procedures.		

EQUIP. ID:	T-402	DESCRIPTION:	GROUNDWATER HOLDING TANK	MFG:	POLY PROCESSING COMPANY
		SPECIFICATIONS:	4,900 GAL, CROSS LINKED HDPE	MODEL:	11004900
OPERATING PARAMETERS:	High Level – 80% of Tank Capacity Low Level – 10% of Tank Capacity	MAINTENANCE ITEMS:	1. CLEANOUT SEDIMENTS IN TANK (3" OR MORE)		
			2. REPAIR PIPING OR TANK LEAKS		
			3. SIGHT GLASS LEAKING OR DIRTY		
			4. LEVEL SWITCH LSLL-402 & LSHH-402 MAINTENANCE		
MAINTENANCE PROCEDURES					
<ul style="list-style-type: none"><u>CLEANOUT SEDIMENTS IN TANK (3” OR MORE)</u><ol style="list-style-type: none">Follow SSHP and AHA's for maintenance activities.Manually pump down liquid contents of T-401 into T-402.Shut down GTS in accordance with Section 2.4 Normal Shutdown Procedures.Manually pump down liquid contents of T-402 through liquid phase GAC vessels T-403 & T-404.Use drum vacuum method, from top of tank, to remove sediments.If additional sediment removal is required, implement confined space entry according to SSHP. Use shovel & bucket method and place sediments in 55 gallon drums.After sediments are removed, flush tank with clean water and place tank back into operation.Restart GTS in accordance with Section 2.3 Normal Startup Procedures.<u>REPAIR PIPING OR TANK LEAKS</u><ol style="list-style-type: none">Follow maintenance procedures 1 through 4 as outlined in Cleanout Sediments in Tank.Make repairs as required.Place tank back into operation.Restart GTS in accordance with Section 2.3 Normal Startup Procedures.			<ul style="list-style-type: none"><u>SIGHT GLASS LEAKING OR DIRTY</u><ol style="list-style-type: none">Follow maintenance procedures 1 through 4 as outlined in Cleanout Sediments in Tank.Disassemble sight glass from tank. Clean with potable water and Simple Green (or similar) solution.Reassemble sight glass to tank and place tank back into operation.Restart GTS in accordance with Section 2.3 Normal Startup Procedures.<u>LEVEL SWITCH LSLL-402 & LSHH-402 MAINTENANCE</u><ol style="list-style-type: none">Follow maintenance procedures 1 through 4 as outlined in Cleanout Sediments in Tank.Refer to manufacturer's manual for replacement and installation instructions. Duplicate electrical requirements and use as equal or better materials of construction.Ensure electrical power supply switch is in LOCKOUT/ TAGOUT mode. Replace switch as required. Remove lockout/tagout devices, re-energize electric and place tank back into operation.Restart GTS in accordance with Section 2.3 Normal Startup Procedures.		

EQUIP. ID:	T-403 & T-404	DESCRIPTION:	LIQUID PHASE GAC ADSORBERS	MFG:	TETRASOLV FILTRATION
		SPECIFICATIONS:	60" DIA. x 8' 11" HEIGHT, 3000 LBS GAC 19.5 SF BED AREA, 140 GPM AT 4 PSI DROP	MODEL:	HPAF-3000 AFD SERIES
OPERATING PARAMETERS:	40 to 120 GPM 3 – 5 psig	MAINTENANCE ITEMS:	1. INSPECTION AND MAINTENANCE		
			REFER TO TETRASOLV FILTRATION PRODUCT DATA SHEET FOR ALL OTHER REQUIREMENTS.		

MAINTENANCE PROCEDURES

• INSPECTION AND MAINTENANCE

- 1) Follow SSHP and AHA's for maintenance activities.
- 2) Inspection and maintenance on the interior portion of the vessels will be performed when GAC is replaced. Working on the interior portion of the vessels will require Confined Space Entry (CSE) methods. Maintenance on the exterior portion of vessels (valves, fittings, gaskets, etc.) will be conducted as required and be noted during routine weekly inspections.
- 3) For interior inspection and maintenance, ensure GTS has been shut down in accordance with [Section 2.4 Normal Shutdown Procedures](#) and close all inlet and outlet valves for T-403 & T-404. Release pressure from each tank by opening the manual drain at the bottom and vent at the top of each tank. Make sure there is no pressure in tank and then proceed to Step 4.
- 4) Access the top of the vessel using the non-skid steel platform and open the 12" x 16" manway on the top portion of the vessel.
- 5) GAC being replaced by a specialty contractor will then be removed from the vessel in a slurry form to a point where the bottom 12" of GAC can be accessed and removed by hand. Once all of the GAC has been removed, the vessel can be accessed by an O&M technician in accordance with an approved CSE plan for the following:
- 6) Visually inspect the interior of the vessel walls for cracking, corrosion, brittle appearance, holes or any other obvious defects.
- 7) Check the interior piping manifold (PVC screens) for cracks or holes. Pay particular attention to the areas where the steel fittings transition to the PVC screens. Make repairs as required.
- 8) Once repairs are made, proper documentation of any repairs will aid the O&M technician during the next inspection. The specialty contractor will then add 3,000 lbs of new GAC as specified by the site engineer.
- 9) Close manway, vent and drain. Open inlet and outlet valves. (NOTE: When GAC is being replaced, it is normally one vessel at a time. In this case, make sure the vessel receiving the new GAC becomes the second or polishing GAC vessel by changing inlet and outlet valves on both vessels accordingly.
- 10) Fill vessels with water then restart GTS in accordance with [Section 2.3 Normal Startup Procedures](#).
- 11) For external maintenance during routine inspections, check all PVC ball valves, pressure gauges, air release vents and sample ports for leaks or damage. Replace as required.
- 12) For additional technical information concerning the HPAF-3000 AFD Series vessel, consult with the Tetrasolv Filtration product data sheet and General Assembly Layout drawings

EQUIP. ID:	V-319 Silencer	DESCRIPTION:	AIR INTAKE FILTER WITH SILENCER	MFG:	SOLBERG MANUFACTURING
		SPECIFICATIONS:	520 SCFM, 220°F, 5 MICRON FILTER	MODEL:	FS-238P-400F
OPERATING PARAMETERS:	4" FLANGE CLASS 125/150	MAINTENANCE ITEMS:	1. ELEMENT REPLACEMENT (INSPECT AT LEAST TWO TIMES A YEAR)		
			REFER TO MANUFACTURER MANUAL FOR ALL OTHER REQUIREMENTS.		
MAINTENANCE PROCEDURES					
<ul style="list-style-type: none"><u>ELEMENT REPLACEMENT (INSPECT AT LEAST TWO TIMES A YEAR)</u><ol style="list-style-type: none">Follow SSHP and AHA's for maintenance activities.Ensure VTS has been shut down in accordance with Section 2.4 Normal Shutdown Procedures and PD blower (B-301) is OFF.Inspect nuts and bolts on 4" mounting flange at base of filter. Replace as required.Loosen wing-nut on top of silencer and remove the steel silencer. Check wing nut threads for wear. Replace as required.Inspect the polyurethane foam first-stage filter and inspect for holes, clogging, tears or other defects.Replace entire filter assembly as required with a 5-micron polyester replacement element (McMaster-Carr Part Number 4399K55).Re-install the steel silencer and tighten wing-nut until snug.Restart VTS in accordance with Section 2.3 Normal Startup Procedures and place B-301 back into operation.					

Appendix B

Pemaco System Controls and Operation, Rev D,
Aspect Electrical Engineering and MK Environmental

Pemaco System Controls Operation

Revision D

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Introduction

This document covers the requirements to effectively start, stop, reset, monitor, remotely access, download logged files, and monitor the control system.

The site is comprised of two systems: a vapor treatment system (VTS), and a groundwater treatment system (GWS).

The Vapor Treatment System is comprised of: a Motor Control Center, Flameless Thermal Oxidizer (FTO), Vapor Conditioning system, Liquid Ring Pump system, Air Compressor, and vapor carbon adsorber.

The Groundwater Treatment System is comprised of: a groundwater booster tank, holding tank, and liquid carbon adsorber.

Control System

The remediation equipment is controlled and monitored by a System Main Computer (SMC) located in the remediation control room. The SMC provides an interface between the equipment and the operator. This allows the operator to start, stop, reset, change set points, view alarms, and monitor the system. By using the mouse and the keyboard, the operator can navigate the screens and perform system operations.

The System Main Computer communicates via an Ethernet network to the Main Control Panel programmable logic controller (PLC). The Main Control Panel PLC monitors and controls the physical inputs and outputs (e.g. monitor level switches and turn on motors) of the system and holds all the logic that controls the system.

The control system is fitted with an uninterruptible power supply (UPS) that will give the PLC and System Main Computer about 1 hour of run time in the event of a power failure. This allows the system to autodial the necessary personnel that the system went offline.

NOTE: the remediation system will not function in the event of a power failure. The SMC and PLC only stay on for monitoring purposes.

Motor Control Center (MCC):

The Motor Control Center provides the main power distribution for the entire remediation system. One power feed is supplied to the main circuit breaker of the MCC. The MCC is comprised of “buckets” that provide branch circuit protection, variable frequency drives, and motor starter/overload assemblies for system components.

The MCC is located in its own room and interfaced with system equipment.

Table 1 - Motor Control Center (MCC) Bucket Assignments

T1/LC1 Transformer & Lighting 40A Circuit Breaker	VC Skid Vapor Conditioning Skid 200A Circuit Breaker	Blank
FTO 80A Circuit Breaker	P-402 Holding Tank VFD 15A Circuit Breaker	
Vent Fan #1 20A Circuit Breaker		
Vent Fan #2 20A Circuit Breaker		
K-601 Air Compressor 70A Circuit Breaker		
Spare 20A Circuit Breaker		
P-502 Secondary Containment Pump 3A Circuit Breaker w/ motor starter	H-401 Outdoor Heat Exchanger 15A Circuit Breaker motor starter w/ 2 overloads	Main Feed 800A Circuit Breaker
P-401 Groundwater Booster Pump 15A Circuit Breaker w/ motor starter		
P-501 Separator Pump 7A Circuit Breaker	Potable Booster Pump 20A Circuit Breaker	
LR Skid Liquid Ring Pump Panel 250A Circuit Breaker	Spare 20 Circuit Breaker	

Flameless Thermal Oxidizer (FTO):

The FTO provides vapor treatment for process air delivered by the dual phase extraction wells. The FTO is a stand alone unit with its own control panel and operating logic. The FTO is interfaced with the Main Control Panel for proper start-up and shutdown sequences.

The FTO is the primary vapor treatment system. In the event the FTO cannot operate, the process air can be delivered directly to the vapor carbon adsorber system.

Vapor Conditioning System (VC):

The Vapor Conditioning (VC) system is comprised of a Cooling Tower (CT-201), Cooling Tower Transfer Pump (P-201), Refrigerated Chiller (RC-201), refrigerated chiller transfer pump (P-202), heat exchanger (H-201A-201C), vapor heater (H-202), and condensate tank with pump (P-201).

RC-201 – Refrigerated Chiller: has it's own control panel but is interfaced with the Main Control Panel system for overall control.

Local control of RC-201 is possible by placing the "H-O-A" switch in the Hand position on the Vapor Conditioning P&ID screen on the SMC. There is also an ON/OFF switch behind the control panel cover of RC-201. This switch should always be in the "ON" position.

NOTE: the HOA switches must be in the "Auto" position for control by the MCP.

FAILURE TO KEEP THE HOA SWITCH IN THE "AUTO" CAN CAUSE SYSTEM DAMAGE!

A main disconnect switch located on the front of the VC panel will terminate power to all components of the Vapor Conditioning system.

Liquid Ring Pump Panel (LRP):

The Liquid Ring Pump (LRP) system is comprised of two 75hp liquid ring pump motors, 2 cooling radiators, and 2 oil pumps. The LRP system can run on one or both LRP's. Each motor can be operated locally by a Hand-Off-Auto switch located on the front of the LRP panel.

To operate only one LRP, place the LRP to remain offline in the "OFF" position from Vapor Treatment System Configuration & Set Points Screen. Level2 access required.

NOTE: the HOA switches must be in the “Auto” position for control by the MCP.

FAILURE TO KEEP THE HOA SWITCH IN THE “AUTO” CAN CAUSE SYSTEM DAMAGE!

Air Compressor (K-601)

The air compressor provides air for the ground well pumps and the FTO system. The air compressor has its own control panel and controls. The air compressor will start-up and shut down as needed determined by air load demand.

Computer & SCADA Passwords

The computer is configured with a username and password to prevent unwanted access to the computer.

If the computer has gone into “sleep” mode, the screen saver is running, the computer has been re-booted, or you attempt to gain remote access, you must enter the username and password to gain access to the computer.

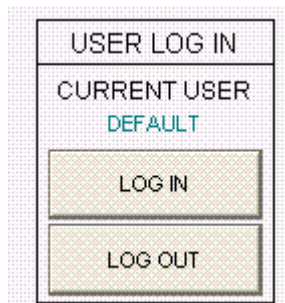
Computer

Username: _____

Password: _____

The SCADA package is configured with 2 levels of protection. Each level allows the user to access certain areas and functions of the SCADA system screens and settings.

The user name and password are entered on the “System Overview Screen”. Selecting the Login button will allow the user to enter the username and password. The currently logged in user is displayed under “current user”.

A screenshot of a user login interface. It features a title bar labeled 'USER LOG IN'. Below the title bar, the text 'CURRENT USER' is displayed, followed by 'DEFAULT' in blue. At the bottom of the interface, there are two buttons: 'LOG IN' and 'LOG OUT'.

Default Level (monitoring):

Default level is intended for non-operators to view and monitor the system, but does not allow any system control or operation. No password is required for the

Default login. When you gain access to the computer, everyone has Default access.

Level2 (Operator):

Level2 allows the user to view all screens, make system set point adjustments, and operate system components in manual mode. Level2 requires a user name and password. The user name and password are entered on the "System Overview Screen". Selecting the Login button will allow the user to enter the username and password. The currently logged in user is displayed in the Login button.

Level2 Username: _____
Level2 Password: _____

NOTE: LEVEL2 ACCESS PERSONNEL SHOULD BE TRAINED AND QUALIFIED TO OPERATE THE SYSETM. INCORRECT CHANGES TO THE SYSTEM CAN CAUSE PERMANENT SYSTEM DAMAGE.

The SCADA system automatically logs out the current user to the default status at 5:00PM, 12:00pm, and at 5:00AM everyday. The user must log back on to gain Level2 access.

Emergency Shutdown

Emergency shutdown switches are locate throughout the system and, when engaged, will immediately stop all system components. This is for emergency use only.

E-stops switches are located at the following locations:

Vapor Conditioning Panel: Pressing the E-Stop button removes power from all VC motor contactors, with the exception of the Refrigerated Chiller. A hard wired signal is sent to the Main Control Panel.

Liquid Ring Pump Panel: Pressing the E-Stop button removes power from all LRP motor contactors. A hard wired signal is sent to the Main Control panel and removes power to all system enable outputs.

Main Control Panel: Pressing the E-stop button removes power to all system enable signals.

FTO Panel: Pressing the E-stop button sends a hard wired signal to the Main Control Panel and removes power to all system enable outputs.

Building E-Stop: Located by Liquid Carbon Adsorber. Pressing the E-stop button sends a hard wired signal to the Main Control Panel and removes power to all system enable signals.

System Start:

The system is configured to run with the Groundwater Treatment System, the Vapor Treatment System, or Both simultaneously.

The systems can only started, stopped, and reset from the System Overview Screen.

NOTE: [automatic] = no operator intervention required.
 [manual] = operator intervention required

VTS Selection (FTO or Carbon)

The Vapor Treatment System (VTS) is comprised of a Flameless Thermal Oxidizer (FTO) and a carbon treatment system. A selector switch is located on the System Overview screen to select which VTS system is to be used.

Click on “FTO” to use the FTO as the primary vapor treatment system.

Click on “CARBON” to use the carbon system only (FTO will remain offline)

While the FTO mode is selected and running, the Carbon mode cannot be selected. While the Carbon mode is selected and running, the FTO mode cannot be selected. To change modes, the current operating mode must be off.

VTS Start

No critical system alarms may be present prior to starting the FTO or Carbon systems and all selector switches must be in the Auto position.

The system can only be started from the system main computer.

When FTO mode is selected, the operator must initiate a VTS “start” from the system main computer “System Overview Screen”, but must also physically start the FTO at the FTO control panel.

1) FTO Start:

- a) “FTO” selected on System Overview screen [manual]
- b) open compressed air solenoid V-606 [automatic]
- c) clear all FTO & system alarms (if present) [manual]
- d) VTS “start ” button is pressed [manual]
- e) start Vapor Conditioning components [automatic]
 - i) start cooling tower fan (CT-201)
 - ii) start cooling tower pump (P-201)

- iii) enable condensate transfer pump (P-203)
 - iv) enable secondary containment sump (P-502)
 - v) enable moisture separator tank transfer pump (P-501)
 - vi) start refrigerated chiller pump (P-202)
 - vii) deliver "FTO Permissive" signal from SMC to FTO control panel
 - f) wait 30 seconds [automatic]
 - i) start refrigerated chiller (RC-201)
 - g) at FTO panel: press "Clear Alarms & Start" on FTO operator interface [manual]
 - (1) allows FTO scrubber to start
 - h) receive "Scrubber Running" signal from FTO to SMC [automatic]
 - i) start carbon polish blower (B-301) [automatic]
 - (1) maintain negative pressure set point at VIT-201
 - (2) enable vapor heater (H-202)
 - j) wait 90 seconds
 - (1) allows process heater (H-202) time to cool down
 - k) deliver the "B-301 Running" signal from the SMC to FTO Panel [automatic]
 - i) FTO main fan starts
 - (1) FTO purges & pre-heats
 - (2) "Main Fan Running" signal delivered from FTO to SMC
 - ii) "FTO Ready" signal received from FTO to SMC [automatic]
 - iii) start liquid ring pump #1 (B-101) [automatic]
 - iv) wait 60 seconds [automatic]
 - v) start liquid ring pump #2 (B-102) [automatic]
 - l) normal operation
- 2) FTO Flying Re-Start
- a) VTS is currently in a normal shutdown with FTO cool down
 - b) press "Reset" button on SMC "System Overview Screen" [manual]
 - c) press VTS "Start" button on SMC "System Overview Screen" [manual]
 - d) remove "FTO Shutdown" signal from MCP to FTO [automatic]
 - e) press "Clear Alarms & Start" on FTO operator interface [manual]
 - f) go to step 1.k.i.1 of "FTO Start"
- 1) Carbon Start:
- a) "CARBON" selected on System Overview screen [manual]
 - b) clear system alarms [manual]
 - c) VTS "Start" button pressed on System Overview screen [manual]
 - d) start Vapor Conditioning components [automatic]
 - i) start cooling tower fan (CT-201)
 - ii) start cooling tower pump (P-201)
 - iii) enable condensate transfer pump (P-203)
 - iv) enable secondary containment sump pump (P-502)
 - v) start refrigerated chiller pump (P-202)
 - e) wait 30 seconds [automatic]
 - f) start refrigerated chiller (RC-201) [automatic]

- g) wait 40 seconds [automatic]
- h) start B-301 carbon polish blower [automatic]
 - (1) maintain negative pressure set point at VIT-201
 - (2) enable process heater (H-202)
- i) start liquid ring pump #1 (B-101) [automatic]
- j) wait 60 seconds [automatic]
- k) start liquid ring pump #2 (B-102) [automatic]
- l) normal operation

Groundwater System Start

No critical system alarms may be present prior to starting the groundwater treatment system and all selector switches must be in the Auto position.

- 1) GWS Start
 - a) GWS “start” button pressed on System Overview Screen [automatic]
 - b) open well field isolation valve (V-407) [automatic]
 - c) enable secondary containment sump pump (P-502) [automatic]
 - d) enable groundwater booster pump (P-401) [automatic]
 - e) start holding tank transfer pump (P-402) to maintain set point pressure on holding tank (T-402) at pressure transmitter PT-402. [automatic]
 - f) normal operation

NOTE: the groundwater system may be “on” with no pumps running depending on liquid levels in the tanks. Use extreme caution when servicing the groundwater system components as these will start automatically.

System Stop:

Each system, Groundwater and Vapor Treatment, can be stopped individually or both at the same time.

GWS Stop

Press the “Groundwater System Stop” button on the “System Overview” screen. The GWS system will perform a normal shutdown. All pumps stop and the isolation valve closes immediately.

VTS – Carbon Mode Stop

Press the “Vapor Treatment System Stop” button while “Carbon” is selected. The VTS system will perform a normal shutdown.

- a) All system components stop immediately

VTs – FTO Mode Stop

The VTS system can be stopped from the system main computer or the FTO operator interface display. The VTS system will perform a normal shutdown including the FTO when a VTS stop is initiated from either location.

- 1) VTS “Stop” button pressed on “System Overview Screen” [manual]
- 2) deliver “FTO Shutdown” signal from MCP to FTO [automatic]
- 3) FTO burner disabled [automatic]
- 4) FTO removes “FTO Ready” signal from FTO to MCP [automatic]
- 5) both liquid ring pumps (B-101 & B-102) are taken offline [automatic]
- 6) FTO performs cool down [automatic]
- 7) FTO cool down set points attained [automatic]
- 8) FTO removes “Scrubber Running” signal from FTO to MCP [automatic]
- 9) Vapor Conditioning system goes offline [automatic]
 - i) “B-301 Running” signal removed from MCP to FTO
 - ii) “FTO Permissive” signal removed from MCP to FTO
- 10) VTS system ready for re-start from “System Overview Screen” [automatic]

A VTS system “stop” can also be initiated from the FTO operator interface located on the FTO control panel. Pressing the “stop” button on the FTO operator interface display will take the system to step 4 of the “VTS-FTO Mode Stop”.

Table 2 FTO Interlock Signals (MCP & FTO)

Signal	Signal Type	MCP Terminal	Signal Direction	FTO Terminal	Description
FTO Permissive	hard wire (DI901 in FTO Panel)	TB1:161A TB1:161B	► ►	1 4080	Signal from MCP to FTO. Signal closes to allow FTO to Run. If this signal is open, the FTO performs an immediate shutdown. If the FTO quench inlet temperature is above 150°F, the scrubber will continue to run.

Signal	Signal Type	MCP Terminal	Signal Direction	FTO Terminal	Description
Scrubber Running	hard wire (DO903 in FTO Panel)	TB2:24E TB2:249	◀ ◀	2634 2635	<p>Signal from FTO to MCP.</p> <p>Closes to verify that FTO Scrubber is running normal (water flowing through system).</p> <p>Signal will start the Carbon Polish Blower (B-301).</p> <p>If this signal is open, the Carbon Polish Blower stops immediately.</p>
B-301 Running	hard wire (DI902 in FTO Panel)	TB1:166A TB1:166B	▶ ▶	2150 2240	<p>Signal from MCP to FTO.</p> <p>Indicates B-301 is running and has run long enough to cool down heater elements on H-202. (~ 90 seconds)</p> <p>When signal is open, the FTO main fan will shutdown.</p> <p>Without this signal there is no air path the FTO exhaust.</p>
FTO Fan Running	hard wire (DO904 in FTO Panel)	TB2:24E TB2:268	◀ ◀	2654 2655	<p>Signal from FTO to MCP.</p> <p>When signal is closed, the FTO main fan is running</p>

Signal	Signal Type	MCP Terminal	Signal Direction	FTO Terminal	Description
FTO Shutdown	PLC Tag "FTO Shutdown"	n/a	► ►	n/a	Signal from MCP to FTO. When signal closes, initiates normal shutdown for FTO.
FTO Ready	hard wire (DO900 in FTO Panel)	TB2:24E TB2:268	◄ ◄	2610 2611	Signal from FTO to MCP. When signal is closed, the FTO is ready for process air and has shifted the process isolation valves (CV-401 & CV-402) to the process position. This signal allows the Liquid Ring Pumps (LRP's) to start
FTO Alarm	hard wire (in FTO Panel)	TB2:24E TB2:285	◄ ◄		Signal from FTO to MCP. When signal is closed, the FTO is in alarm condition
pH Level	PLC Tag AE802	n/a	◄ ◄	n/a	pH Level (0-14)
Conductivity	PLC Tag AE803	n/a	◄ ◄	n/a	Conductivity Level (0-100 mS)
Chamber Inlet Temperature	PLC Tag TE122	n/a	◄ ◄	n/a	Chamber Inlet Temperature (F)
Chamber Temperature	PLC Tag TE121A	n/a	◄ ◄	n/a	Chamber Temperature (F)
Pre-Quench Temperature	PLC Tag Same as Chamber Temp TE121A	n/a	◄ ◄	n/a	Pre-Quench Temperature (F)
Post Quench Temperature	PLC Tag TE835	n/a	◄ ◄	n/a	Post Quench Temperature

Signal	Signal Type	MCP Terminal	Signal Direction	FTO Terminal	Description
FTO Air Flow	PLC Tag FIC102.PV	n/a	◀ ◀	n/a	FTO Air Flow (SCFM)

Network

The control system operates over an Ethernet network. The components on the network are: 1) DSL line to the Internet, the System Main Computer, the Main Control Panel PLC, the FTO PLC, and the FTO Display. All devices on the network must be configured correctly for the system to operate properly.

The remediation site is assigned a static IP address by the telephone company. This allows for secure and reliable remote access to the system components from a remote computer.

The following are the assigned network addresses:

System Main Computer (SMC)

IP Address: 75.61.210.193
 Subnet mask: 255.255.255.0
 Default Gateway: 75.61.210.198
 Primary DNS: 68.94.156.1

Main Control Panel PLC

IP Address: 75.61.210.55
 Subnet mask: 255.255.255.0
 Default Gateway: 75.61.210.198
 Primary DNS: 68.94.156.1

FTO Panel PLC

IP Address: 75.61.210.70
 Subnet mask: 255.255.255.0
 Default Gateway: 75.61.210.198
 Primary DNS: 68.94.156.1

FTO Panel Operator Interface

IP Address: 75.61.210.71
 Subnet mask: 255.255.255.0
 Default Gateway: 75.61.210.198
 Primary DNS: 68.94.156.1

FTO Panel Operator Chart Recorder

IP Address: 75.61.210.72

Subnet mask: 255.255.255.0
Default Gateway: 75.61.210.198
Primary DNS: 68.94.156.1

FTO Panel Modem Switch

IP Address1: 75.61.210.73
IP Address2: 75.61.210.74
Subnet mask: 255.255.255.0
Default Gateway: 75.61.210.198
Primary DNS: 68.94.156.1

FTO Panel VFD

IP Address1: 75.61.210.75
IP Address2: 75.61.210.74
Subnet mask: 255.255.255.0
Default Gateway: 75.61.210.198
Primary DNS: 68.94.156.1

The available FTO IP addresses are 75.61.210.70 through 75.61.210.80

Software

The remediation system comes complete with a licensed copy of programming software for the system PLC and System Main Computer. All software is pre-loaded on the computer and the CD version is located in the control room. All programming software is a product of Rockwell Automation.

The PLC software allows for modifications to the existing program. The PLC software consists of:

RSLogix 5000 Mini, ENU
Serial Number: 1635006927
Revision 15.02.00

RSLogix 5000 MLP
Serial Number: 1601002943
Revision 15.02.00

The System Main Computer software allows for modifications to the existing display program, data logging feature, and autodialing feature. The SMC software consists of:

RSView32 Messenger Pro (autodialer)
Serial Number: 1807000304
Revision: 2.12.00

RSView32 Works 150
Serial Number: 1280011450
Revision: 7.20.00

RSLinx Professional
Serial Number: 1008129820
Revision: 2.50.00

Remote Connection Overview

The system computer can be accessed over the internet by using the freeware software “Virtual Network Connection” (downloadable at www.realvnc.com – free version) or by Windows Remote Desktop connection. Connecting to the System Main Computer either way will allow the user full access to the computer just as if they were sitting at the console.

Logging onto and off of the system has no effect on system operation. All programs will continue to run normally unless changed by the logged in person.

RealVNC

benefits: allows local user to view what the remote user is doing. i.e. the local user (at the SMC) will see all the mouse movements, keyboard strokes, and programs that the remote user is using. Several users can be logged on at the same time.

restrictions: does not allow for file transfers from local to remote or remote to local computer. i.e. the remote user would not be able to retrieve a data log file or document from the SMC and copy it to the remote hard drive.

Remote Desktop Connection (Windows)

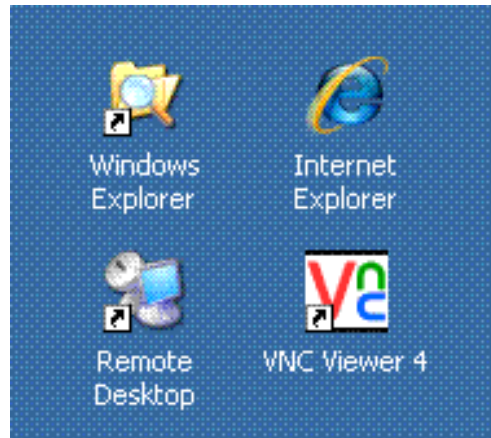
benefits: allows file sharing between site hard drive and users hard drive. (able to transfer files or copy & paste). Locks out other users if selected.

restrictions: local user cannot see what remote user is doing – the screen will remain blank or will have the screen saver running.

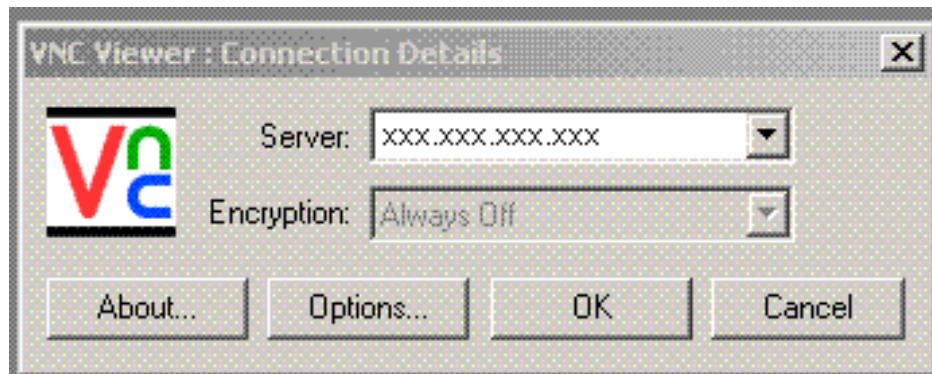
Remote Connection with VNC

Perform the following steps using a Windows based computer.

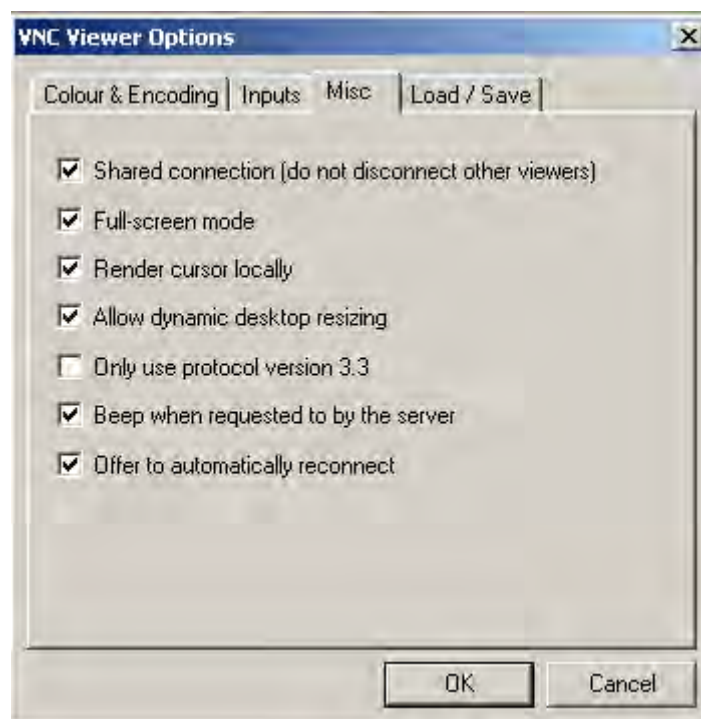
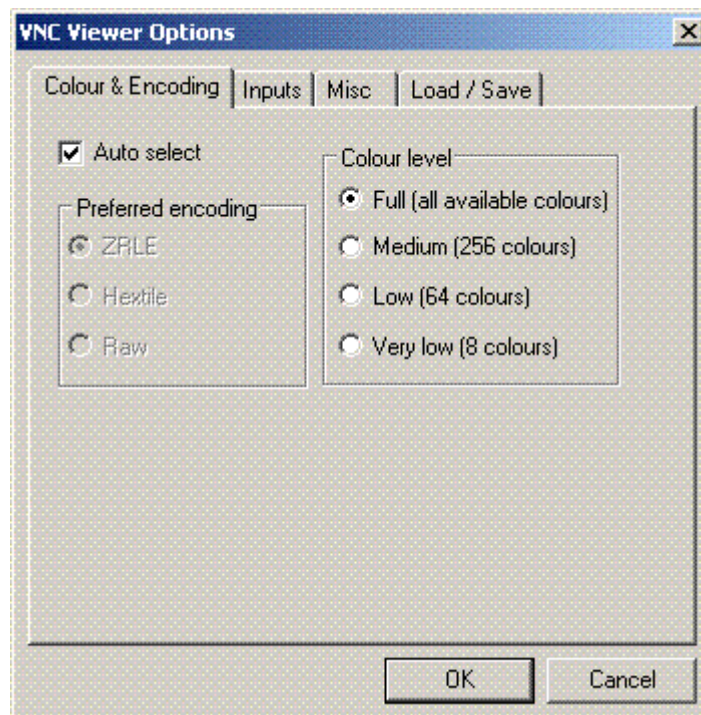
When VNC was installed on your computer, a desktop icon “VNC Viewer” was created. Select VNC Viewer

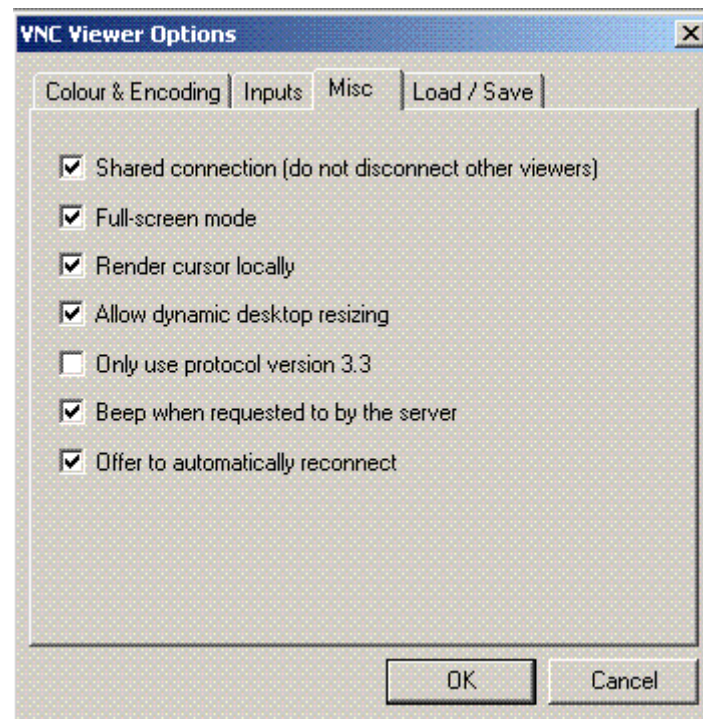


Type in the site computer IP address.
Select "Options"

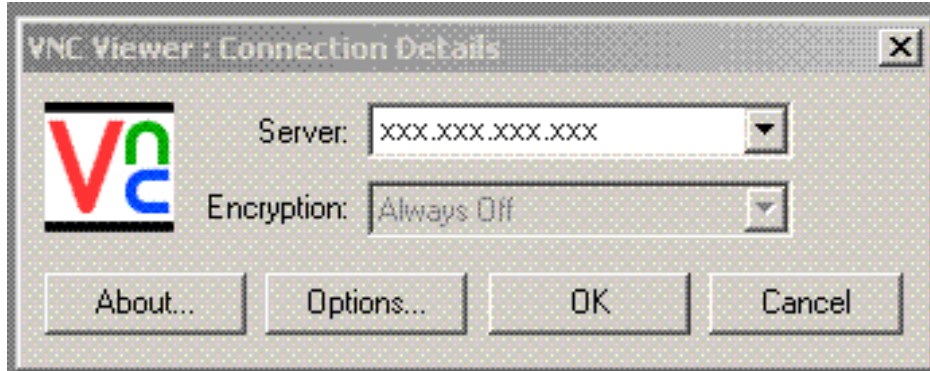


Set VNC Viewer "Options" as noted below.

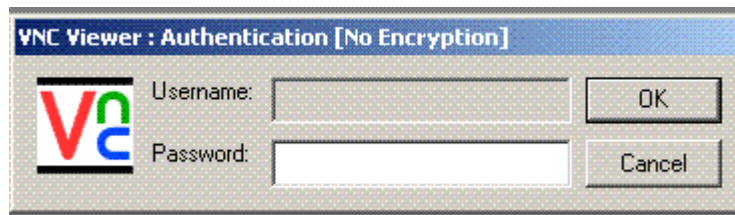




Select OK



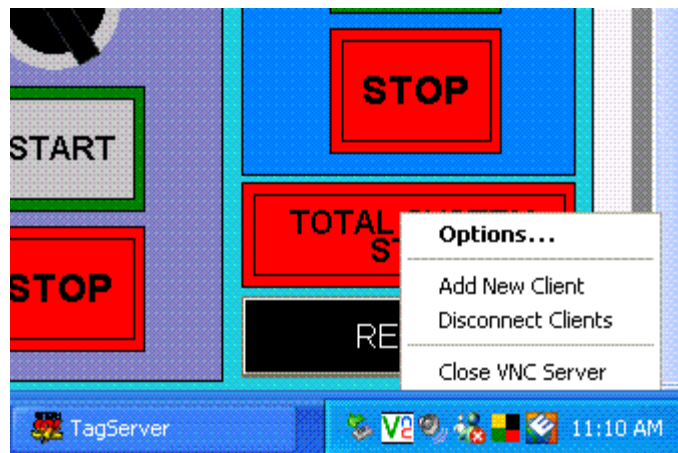
VNC will attempt a virtual connection. The following screen will appear. Enter password to log onto to site computer.



You now have full access to the site computer as if you were sitting at the console.

VNC Logoff

To end the remote VNC connection, select "Disconnect Client" by right clicking on the VNC icon in the tool bar.



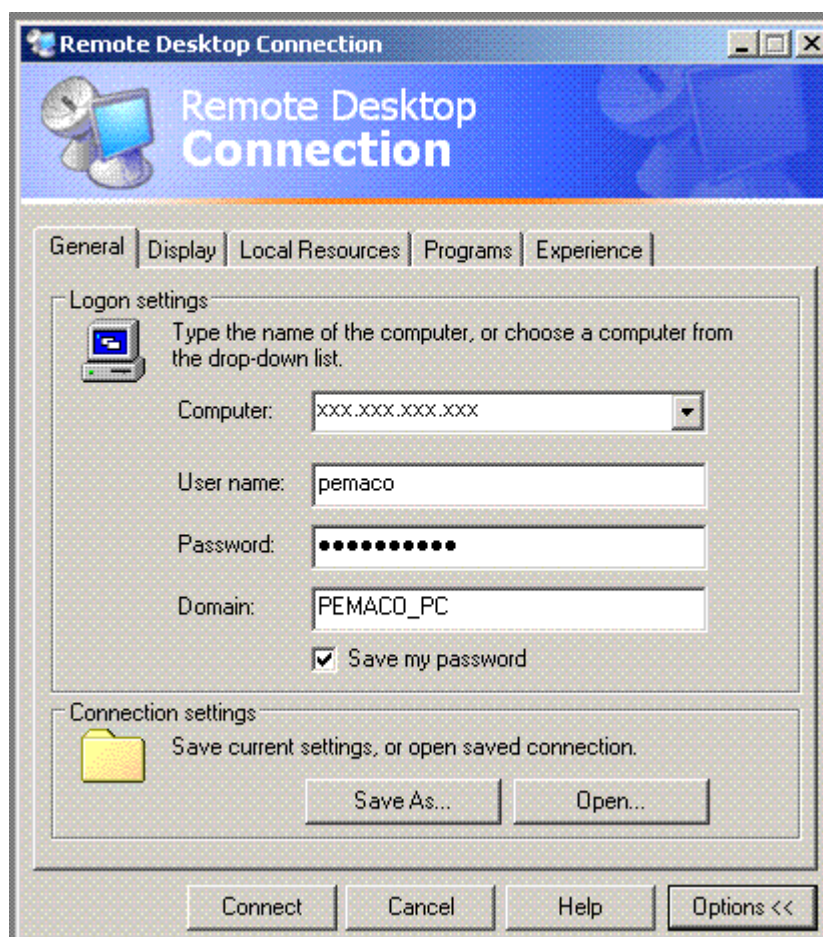
Remote Desktop Connection (Windows)

Perform the following using a Windows based computer.

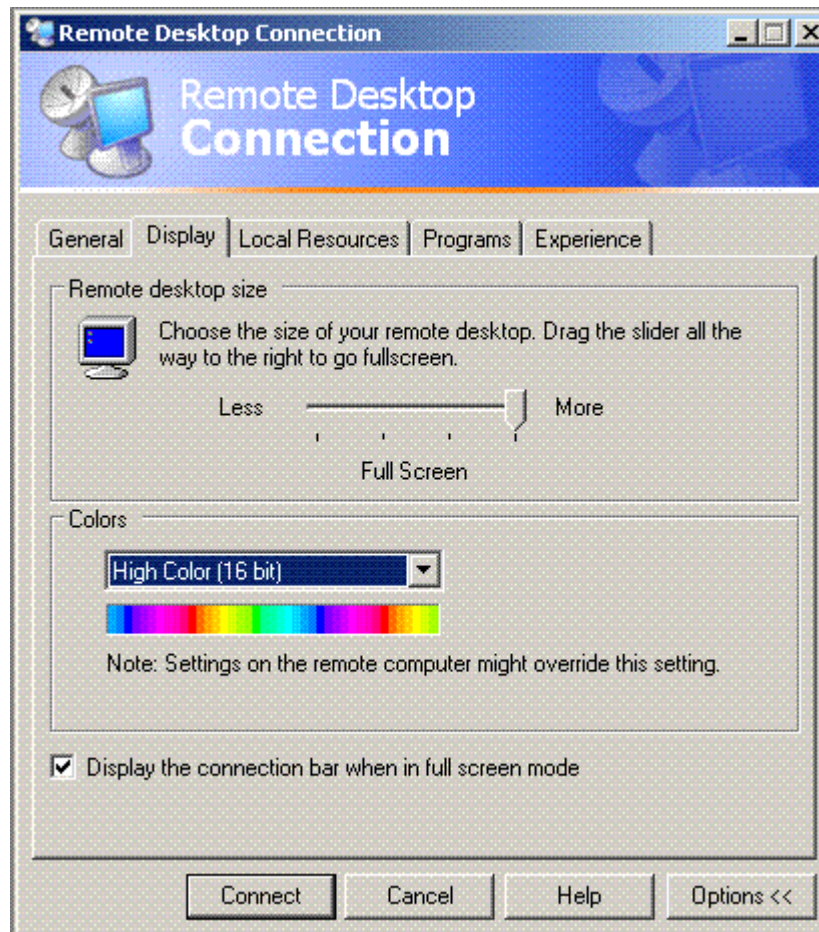
Open the Remote Desktop Program.

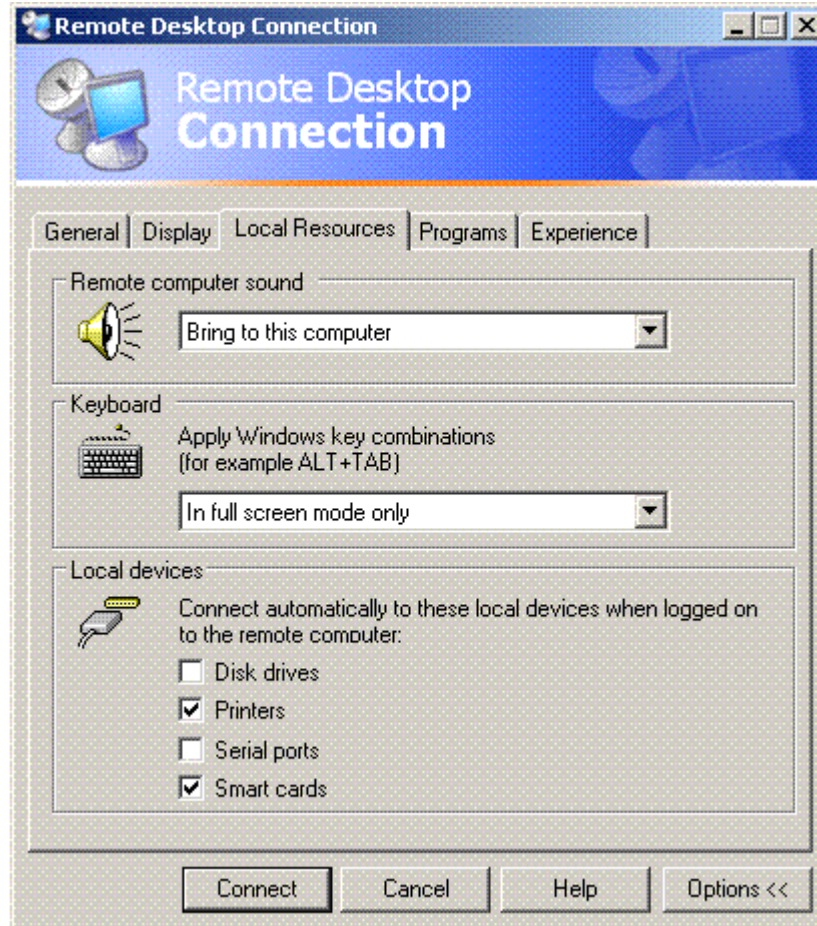
- Start
- Programs
- Accessories
- Communications
- Remote Desktop

Enter the site computer IP address, username, password, & domain:



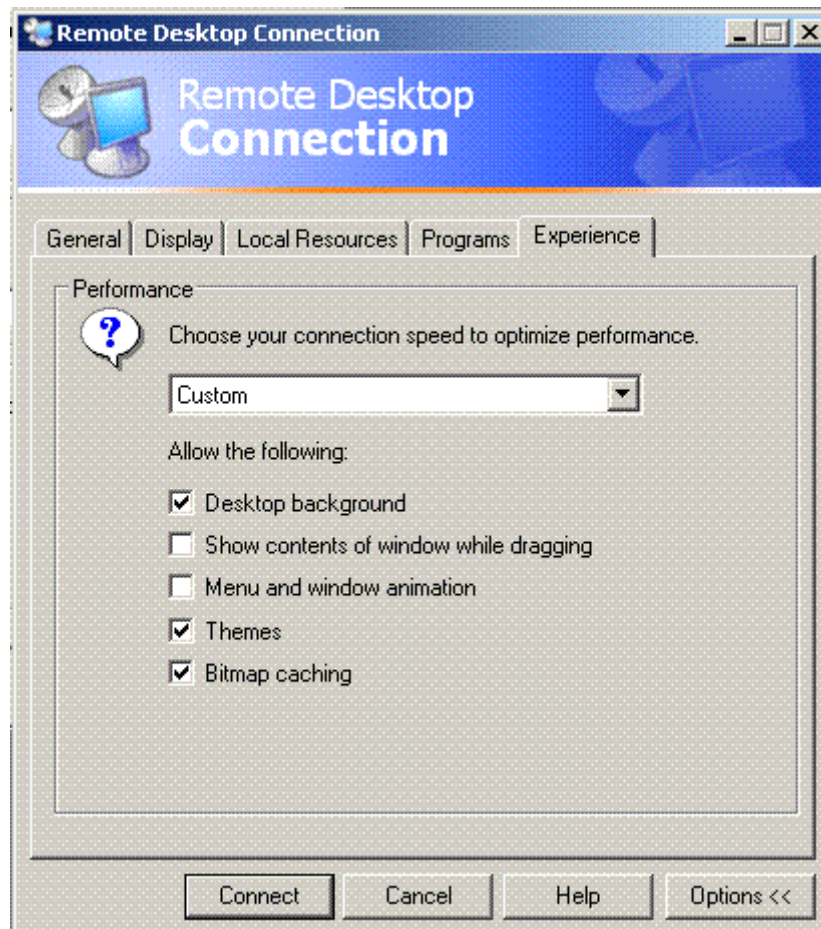
Configure the Remote Desktop Options as follows:





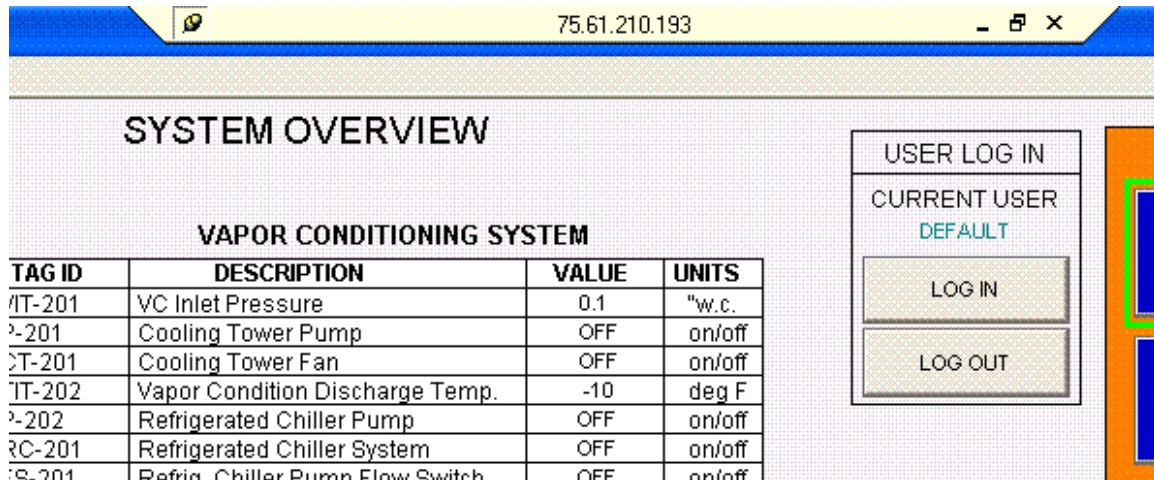
Select "Connect"

You are now connected to the site computer.

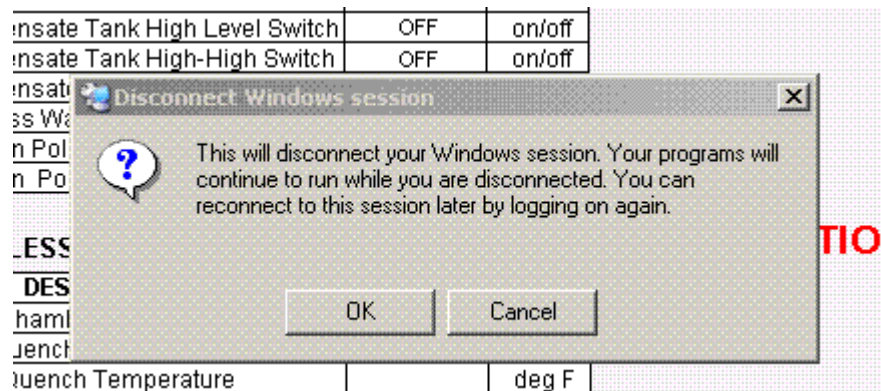


Remote Desktop Logoff

Select the “X” button in upper right of the screen



Select OK



System Alarm Overview

The system is designed with specific alarms to ensure the process and components are operating within specified limits. There are several types of alarms that trigger specific system responses. See the “Alarm List Table” for alarms and associated system response.

When an alarm condition occurs, the red flashing text “ALARM CONDITION” will appear on each screen notifying the operator that an alarm condition exists. The operator must go to the “System Overview Screen” to view the alarm conditions. On the System Overview Screen, the Alarm Banner will display the most current alarm condition as well as how many alarms are active. See “Alarm Reset” for details on resetting alarm conditions.

All alarms that occur must be acknowledged and reset before the alarm condition is cleared from the system. All alarms should be investigated to determine why they occurred.

Groundwater System Warning Alarm: the GWS has a process non-critical alarm. When a GWS Warning alarm occurs, the alarm is time and date stamped on the display and sent to the autodialer for notification. Groundwater system operation is unaffected by a GWS warning alarm.

Groundwater System Shutdown Alarm: the GWS has an alarm that will prevent the system from running within normal parameters. When a GWS Shutdown alarm occurs, all components within the Groundwater system shutdown. The alarm is time & date stamped and sent to the autodialer for notification. Other vapor system functions are not affected.

Vapor Treatment System Warning Alarm: The VTS has a process non-critical alarm. When the VTS system (Carbon or FTO mode) have a VTS Warning alarm, the alarm is time & date stamped and sent to the autodialer for notification. VTS operation is unaffected.

Vapor Treatment System Shutdown Alarm: The VTS has an alarm that will prevent the system from running within normal parameters. When a VTS Shutdown alarm occurs, the VTS system will perform a normal system shutdown. The alarm is time & date stamped and sent to the autodialer for notification. Groundwater system functions are not affected.

Critical Shutdown Alarm: A critical condition on the system has occurred and could cause possible equipment damage or flooding. All components (GWS & VTS) shutdown immediately. The alarm is time & date stamped and sent to the autodialer for notification.

Table 3 Alarm List Table

Alarms List	Device	Set Point	System	Response
Critical Shutdown Alarms				
MCP E-stop	ZSH-103	n/a	Universal	Total System Shutdown
LRP E-stop	ZSH-101	n/a	Universal	Total System Shutdown
VC E-stop	ZSH-104	n/a	Universal	Total System Shutdown
FTO E-stop	ZSH-102	n/a	Universal	Total System Shutdown
Building E-stop	ZSH-104	n/a	Universal	Total System Shutdown
Power Failure	Universal	n/a	Universal	Total System Shutdown
Air Compressor Low Pressure Alarm	PS-601	PSI	Universal	Total System Shutdown (10 second delay)
Holding Tank (T-402) High High Level	LSHH-402	n/a	Universal	Total System Shutdown (10 second delay)
Holding Tank VFD Fault (P-402)	P-402	n/a	Universal	Total System Shutdown (1 second delay)
FTO Critical Shutdown Condition (while in FTO Mode)	FTO	n/a	Universal	Total System Shutdown
Groundwater System Shutdown Alarms				
Groundwater Booster Pump Fail	P-401	n/a	GWS Shutdown	Groundwater System Offline (1 second delay)
Holding Tank Low-Low Level	LSLL-402	n/a	GWS Shutdown	Groundwater System Offline (10 second delay)
Groundwater Booster Tank High-High Level	LSHH-401	n/a	GWS Shutdown	Groundwater System Offline (10 second delay)
Groundwater Booster Tank Low-Low Level	LSLL-401	n/a	GWS Shutdown	Groundwater System Offline (10 second delay)
Secondary Containment Sump High-High Level	LSHH-501	n/a	GWS Shutdown	Groundwater System Offline (10 second delay)
Groundwater Filters High-High Pressure (F-401/402)	PT-401	25 PSI	GWS Shutdown	Groundwater System Offline (10 second delay)
Holding Tank Filters High-High Pressure (F-403/404)	PT-403	40 PSI	GWS Shutdown	Groundwater System Offline (10 second delay)
Liquid Carbon Adsorbers High-High Pressure (T-403/404)	PT-404	35 PSI	GWS Shutdown	Groundwater System Offline (10 second delay)

Alarms List	Device	Set Point	System	Response
Groundwater System Warning Alarms				
Secondary Containment Sump Pump Failure	P-502	n/a	GWS Warning	Display Only (1 second delay)
Groundwater Filters High Pressure (F-401/402)	PT-401	20 PSI	GWS Warning	Display Only (25 second delay)
Holding Tank Filters High Pressure (F-403/404)	PT-403	35 PSI	GWS Warning	Display Only (25 second delay)
Liquid Carbon Adsorbers High Pressure (T-403/404)	PT-404	30 PSI	GWS Warning	Display Only (25 second delay)
Vapor Treatment System Shutdown Alarms				
Liquid Ring Pumps Both Fail	B101/102	n/a	VTS Shutdown	Vapor Treatment System Offline (no delay)
Moisture Separator Pump Failure	P-501	n/a	VTS Shutdown	Vapor Treatment System Offline (1 second delay)
Chiller Pump Failure	P-202	n/a	VTS Shutdown	Vapor Treatment System Offline (1 second delay)
Moisture Separator Tank High-High Level	LSHH-101	n/a	VTS Shutdown	Vapor Treatment System Offline (10 second delay)
Moisture Separator Tank Filters High-High Pressure (F-501/502)	PT-501	PSI	VTS Shutdown	Vapor Treatment System Offline (25 second delay)
Vapor Conditioning Package Outlet High-High Temperature	TIT-202	150F	VTS Shutdown	Vapor Treatment System Offline Immediate shutdown in FTO Mode
Cooling Tower Fan Failure	CT-201	n/a	VTS Shutdown	Vapor Treatment System Offline (1 second delay)
Cooling Tower Pump Failure	P-201	n/a	VTS Shutdown	Vapor Treatment System Offline (1 second delay)
Condensate Tank High-High Level	LSHH-201	n/a	VTS Shutdown	Vapor Treatment System Offline (20 second delay)
Cooling Tower Low Level Alarm	LSL-2000	n/a	VTS Shutdown	Vapor Treatment System Offline (60 second delay)

Alarms List	Device	Set Point	System	Response
Oxidizer Exhaust High Negative Pressure	PS-101	7" w.c.	VT Shutdown	Vapor Treatment System Offline Immediate shutdown in FTO Mode
Vapor Treatment System Warning Alarms				
Liquid Ring Pump #1 Fail	B-101	n/a	VT Warning	Display Only
Liquid Ring Pump #2 Fail	B-102	n/a	VT Warning	Display Only
Caustic Tank Low Level	LSL-901	n/a	VT Warning	Display Only
Moisture Separator Tank Filters High Pressure	PT-501	PSI	VT Warning	Display Only
H-202 Exit High Temperature	TIT-202	140 F	VT Warning	Display Only
LRP #1 Low Oil Level	B-101	n/a	VT Warning	Display Only
LRP #1 High Oil Level	B-101	n/a	VT Warning	Display Only
LRP #1 High Temperature	B-101	n/a	VT Warning	Display Only
LRP #2 Low Oil Level	B-102	n/a	VT Warning	Display Only
LRP #2 High Oil Level	B-102	n/a	VT Warning	Display Only
LRP #2 High Temperature	B-102	n/a	VT Warning	Display Only
Condensate Pump Fail	P-203	n/a	VT Warning	Display Only

Alarm Reset

All system alarms must be cleared, acknowledged, and then reset to clear the alarm condition from the system.

To Reset an alarm, follow the steps below.

- 1) Determine which alarm occurred by observing the Alarm Banner line.
e.g. LSHH-101 Holding Tank High-High Level Alarm
a. the Alarm banner will display the alarm and how many current alarms are present. When no alarms are present, the Alarm Banner will be

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SYSTEM OVERVIEW

VAPOR TREATMENT SYSTEM

TAG ID	DESCRIPTION	VALUE	UNITS
VT-101	DPE Inlet Vacuum Pressure	0.0	"Hg
TIT-101	DPE Inlet Vacuum Temperature	73	deg F
TIT-102	DPE Vapor Outlet Temperature	72	deg F
PT-101	DPE Vapor Exhaust Pressure	0.2	"PSI
dPIT-101	DPE Vapor Differential Pressure	-0.1	"w.c.
FE-101	DPE Flow (LRP Exhaust)	0	SCFM
PT-501	Separator Water Discharge Press.	0.3	"Hg
TIT-501	Separator Water Discharge Temp.	72	"deg F
TIT-202	Carbon Vapor Inlet Temp.	73	"deg F
LSL-101	Separator Tank Low Level Switch	OFF	on/off
LSH-101	Separator Tank High Level Switch	OFF	on/off
LSHH-101	Separator Tank High-High Level Sw.	OFF	on/off
P-501	Separator Tank Transfer Pump	OFF	on/off
LSL-501	Containment Sump Low Level	ON	on/off
LSH-501	Containment Sump High Level	OFF	on/off
LSHH-501	Containment Sump High-High Level	OFF	on/off
B-101	Liquid Ring Pump #1	OFF	on/off
B-102	Liquid Ring Pump #2	OFF	on/off
V-407	FTO Compressed Air	OPEN	opn/cis

GROUNDWATER TREATMENT SYSTEM

TAG ID	DESCRIPTION	VALUE	UNITS
V-407	GW Isolation Valve	OPEN	opn/cis
TIT-401	GW Booster Pump Exhaust Temp	72	deg F
PT-401	GW Booster Pump Exhaust Press.	0.8	PSI
FQI-401A	GW Booster Pump Total Gallons	407220	gal
FQI-401B	GW Booster Pump Flow Rate	-0.1	gpm
LSLL-401	GW Booster Tank Low-Low Level	ON	on/off
LSL-401	GW Booster Tank Low Level	ON	on/off
LSH-401	GW Booster Tank High Level	OFF	on/off
LSHH-401	GW Booster Tank High-High Level	OFF	on/off
P-401	GW Booster Tank Transfer Pump	OFF	on/off
V-607	Wellfield Pump Compressed Air	OPEN	on/off
FQI-501A	Separator Exit Total Gallons	2700	gal
FQI-501B	Separator Exit Flow Rate	-0.1	gpm
PT-402	Holding Tank Pressure	1.6	ft.w.c.
P-402	Holding Tank Transfer Pump	ON	on/off
VFD-402	Holding Tank Pump VFD Output	0	%
LSLL-402	Holding Tank Low-Low Level	ON	on/off
LSH-402	Holding Tank High Level	OFF	on/off
FQI-402A	Sewer Drain Total Gallons	440980	gal
TIT-402	Condensate Water Discharge Temp	72	deg F
PT-403	Holding Tank Pump Exhaust Press.	1.4	PSI
PT-404	Water Carbon Inlet Pressure	1.3	PSI

VAPOR CONDITIONING SYSTEM

TAG ID	DESCRIPTION	VALUE	UNITS
VIT-201	VC Inlet Pressure	0.0	"w.c.
P-201	Cooling Tower Pump	OFF	on/off
CT-201	Cooling Tower Fan	OFF	on/off
TIT-201	H-202 Heater Inlet Temp.	73	deg F
TIT-202	Vapor Condition Discharge Temp.	73	deg F
P-202	Refrigerated Chiller Pump	OFF	on/off
RC-201	Refrigerated Chiller System	OFF	on/off
FS-201	Refrig. Chiller Pump Flow Switch	OFF	on/off
FS-202	Heater Flow Switch	OFF	on/off
LSL-201	Condensate Tank Low Level Switch	ON	on/off
LSH-201	Condensate Tank High Level Switch	OFF	on/off
LSHH-201	Condensate Tank High-High Switch	OFF	on/off
P-203	Condensate Tank Transfer Pump	OFF	on/off
V-452	Process Water Control Valve	TANK	tank/sew
B-301	Carbon Polish Blower	OFF	on/off
VFD-301	Carbon Polish Blower VFD Output	0	%
PS-101	FTO Exhaust Pressure Switch	OFF	on/off

FLAMELESS THERMAL OXIDIZER SYSTEM

TAG ID	DESCRIPTION	VALUE	UNITS
TE-122	FTO Chamber Inlet Temperature	72	deg F
TE-121A	FTO Chamber Temperature	72	deg F
TE-835	Quench Temperature	70	deg F
AE-803	Conductivity Level	0.65	mS
AE-802	pH Level	8.86	pH
FIC102.PV	FTO Air Flow	53	SCFM

FTO Permissive - FTO Main Fan Enable	MCP	FTO
FTO Scrubber Running	MCP	FTO
B-301 Running	MCP	FTO
FTO Main Fan Running	MCP	FTO
FTO Ready for Process Air from LRP's	MCP	FTO
FTO Shutdown (to FTO)	MCP	FTO
FTO Alarm Condition	MCP	FTO

AUXILIARY SYSTEMS

TAG ID	DESCRIPTION	VALUE	UNITS
K-601	Air Compressor Status	ON	on/off
PS-601	Compressed Air Low Pressure	ON	on/off
P-901	Caustic Pump Enable	OFF	on/off
PS-901	Caustic Tank Low Level	ON	on/off

ERH System Enable	MCP	ERH
ERH System Running	MCP	ERH

USER LOG IN

CURRENT USER
DEFAULT

LOG IN

LOG OUT

MENU

GROUNDWATER SCREEN

VAPOR TREATMENT SCREEN

VAPOR CONDITIONING SCREEN

FTO SCREEN

DATA SCREEN

ACTIVE ALARMS

ALARM HISTORY

SYSTEM CONTROL

VAPOR TREATMENT SYSTEM

CARBON FTO

START

STOP

GROUNDWATER TREATMENT SYSTEM

ON

STOP

TOTAL SYSTEM STOP

RESET

Alarm Banner 11:43:46 PM Alarms Reset Alm: 2

blank and there will be zero alarms.

- 2) Clear the alarm condition
e.g. if tank hits high-high level probe, pump the tank down manually until high-high level probe is cleared
- 3) Press the "ACTIVE ALARMS" button. This will change the display to the

“ACTIVE ALARMS” summary screen.

ALARM DATE	ALARM TIME	ACK DATE	ACK TIME	DESCRIPTION
4/3/2007	8:33:41 AM			PT-403 Holding Tank Filter High-High Pressure
4/3/2007	8:10:29 AM	4/3/2007	8:10:48 AM	Alarms Reset

Buttons: Ack Current, Ack All

- 5) Press the “Ack All” button to acknowledge the alarms.
 - the Alarm Banner clears and displays zero alarms
- 6) Go back to the “System Overview Screen”
- 7) Press the “Reset Button” on the “System Overview Screen”
 - the red flashing “ALARM CONDITION” text will disappear

Data logging

The system is configured to data log all process analog signals at 1 minute intervals. Data logging starts as soon as the SCADA program is started. Data logging can be stopped by a Level2 user and pressing the “DATALOG OFF” on the “DATA SCREEN”. The Level2 user can re-start the data logging by pressing the “DATALOG ON” button on the “DATA SCREEN”.

A new data log file is created once per month at the beginning of each month.

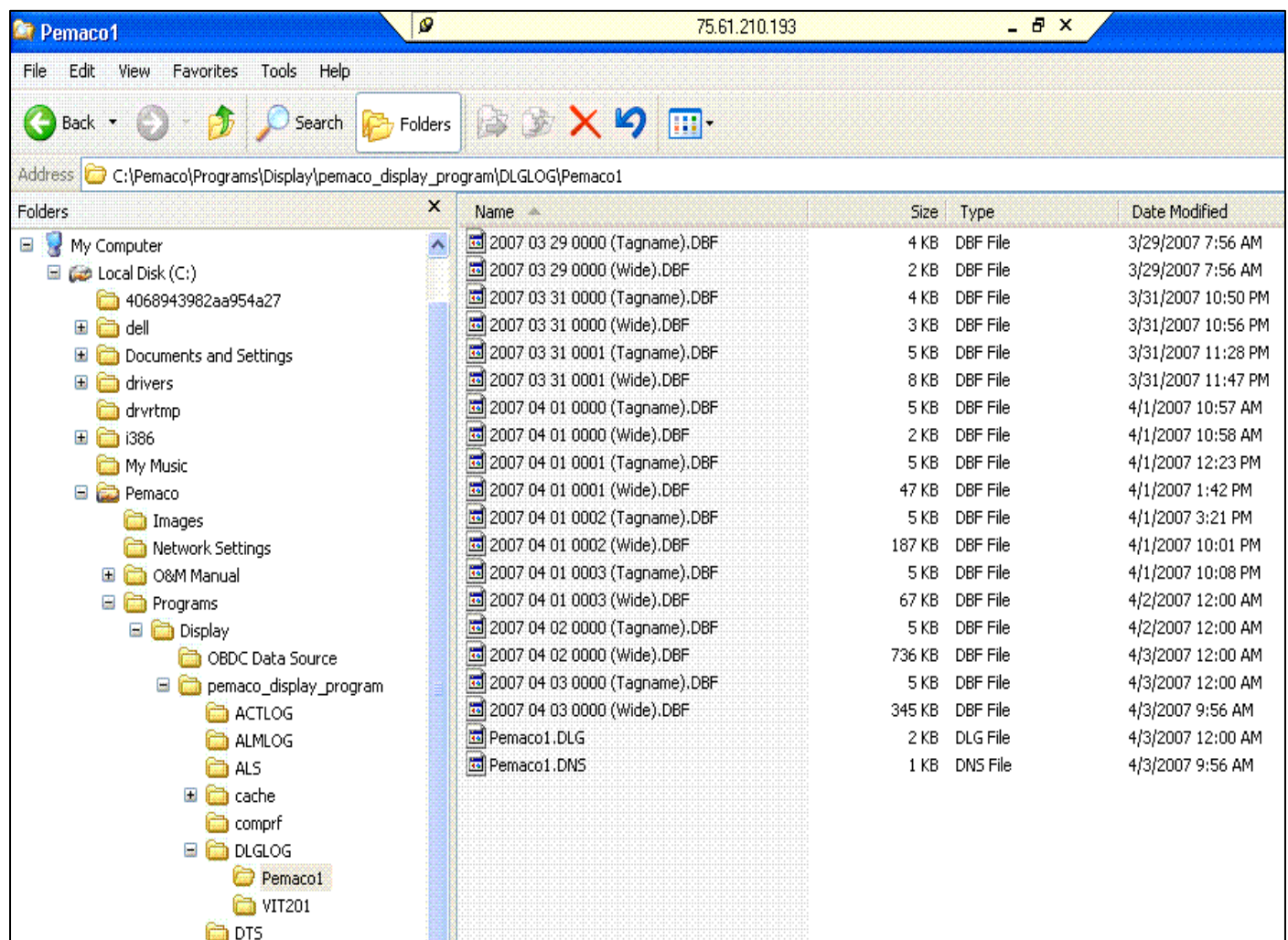
The Alarm History is automatically logged to an alarm log file.

Data is logged in the dBase IV format for integration into 3rd party software (MS Access, MS-Excel...etc)

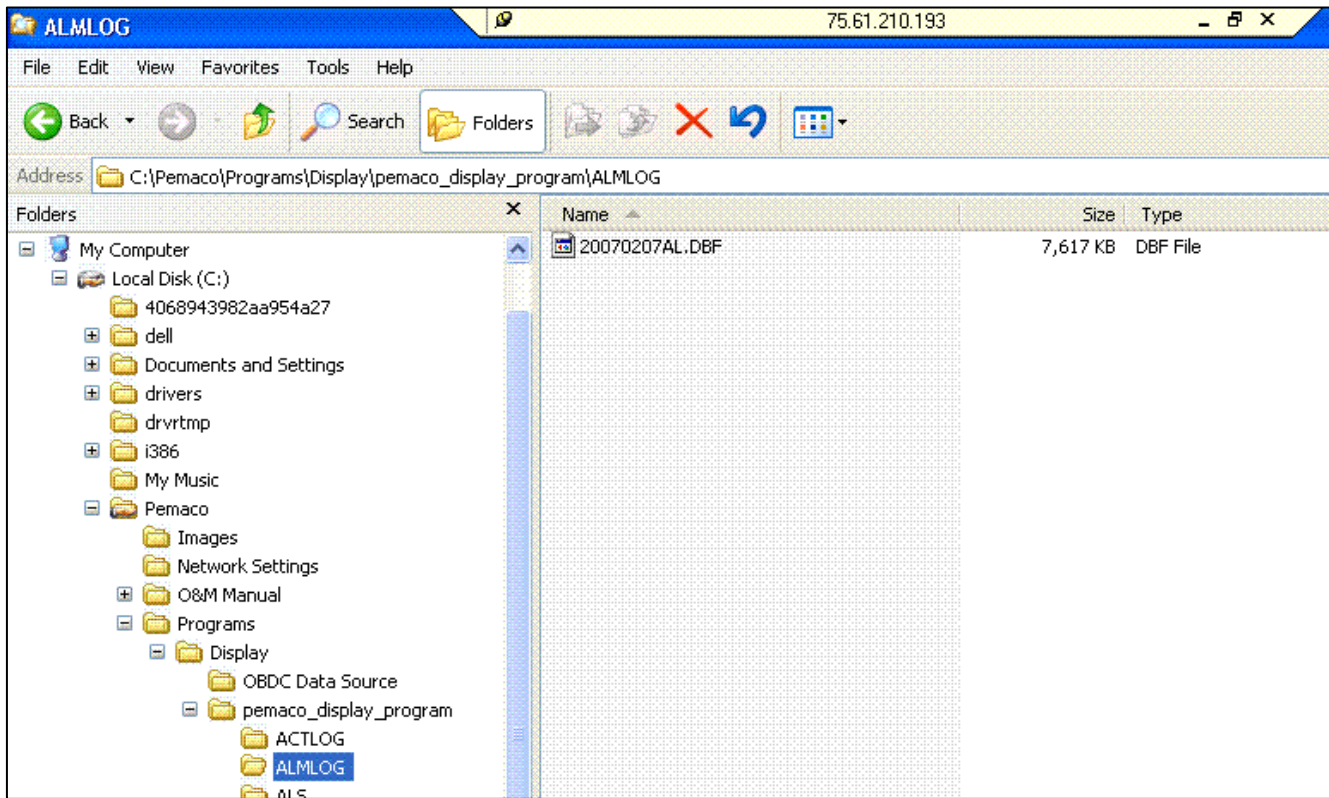
Data log & Alarm Log File Retrieval

Logged information can be remotely accessed by making a remote desktop connection ("enable disk drives" when setting up connection).

Process data is stored in at the following location and can be imported to a 3rd part software.



Alarm Log Information can be found at the following location:

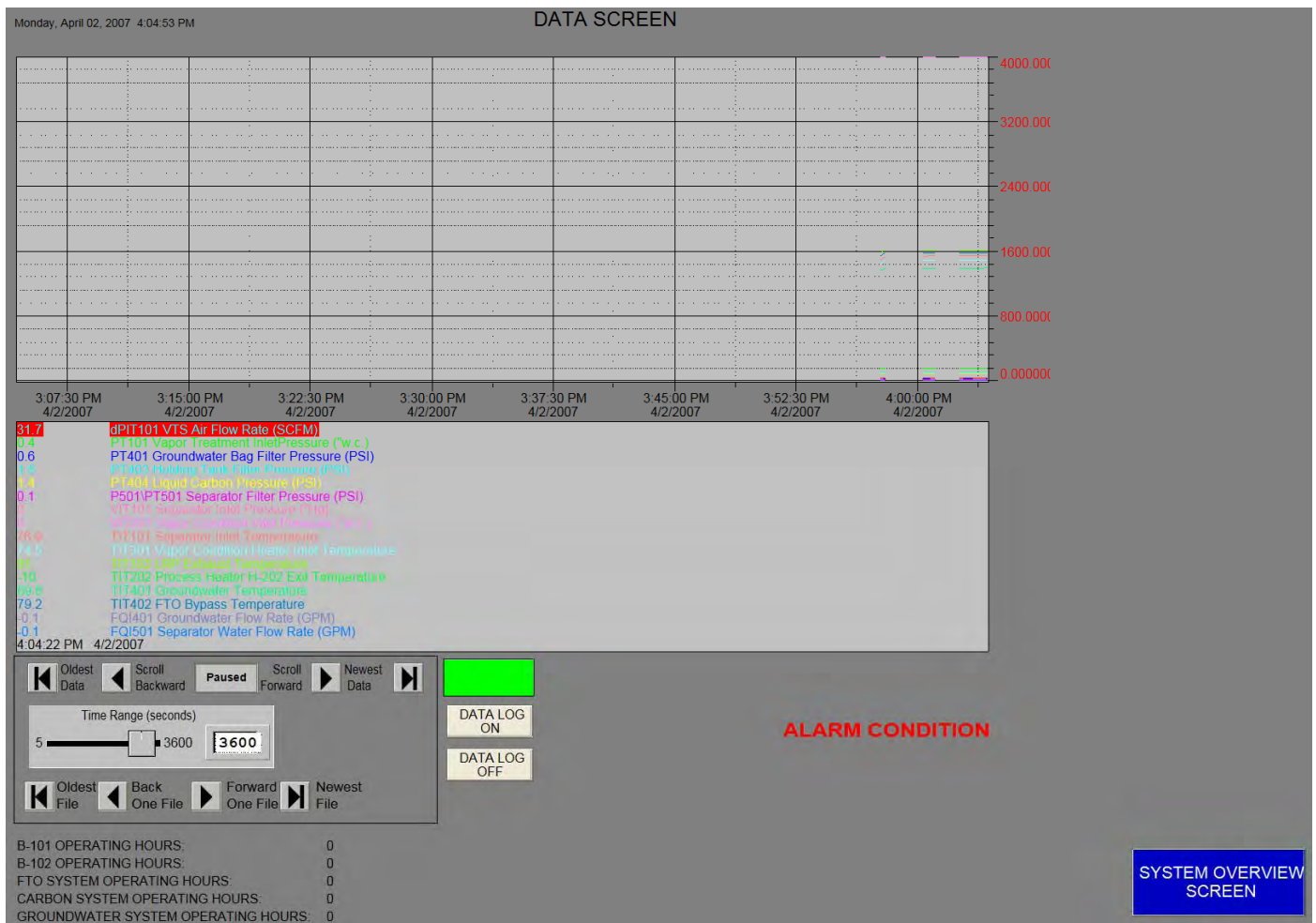


Trending

The system keeps a trends all the analog channels of the system. The trending data is taken directly from data log data files. The user can look at the most recent data or go back to retrieve the oldest data.

Trending can be observed by navigating to the "DATA SCREEN".

Since the trend data is taken directly from the data log data files, the oldest data available will be the oldest data log file available. This should be kept in mind when removing the data log files.



Autodialer

The SCADA system has a built-in autodialer that will phone or email selected personnel. The autodialer will dial out when any alarm occurs. Each recipient can be enabled or disabled to receive alarm messages.

When an alarm occurs and a person is selected as a phone recipient, an automated voice will inform that person of the specific alarms that are active.

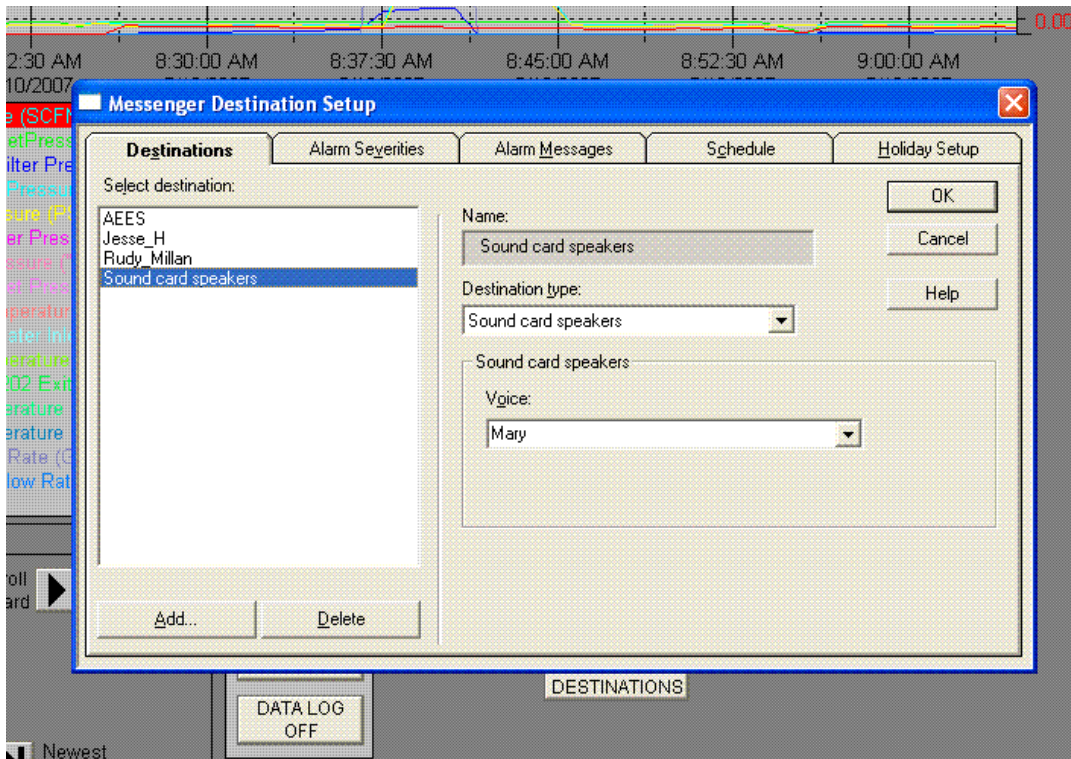
When an alarm occurs and a person is selected as an email recipient, an email will be generated and sent to that person indicating the specific alarm.

Microsoft Outlook Express must be running for email portion of the autodialer to function. The autodialer has a web-based email address that processes the automatic email requests.

Email Address: pemacoepa@gmail.com
 Username: _____
 Password: _____

The autodialer is enabled whenever the SCADA program runs. A Level2 operator can enable/disable the autodialer by selecting the "AUTODIALER ON/OFF" buttons on the DATA SCREEN.

A Level2 operator can edit, add, or delete autodialer recipients by pressing the "Autodialer Destination" butt on the Data Screen



System Overview Screen

The System Overview Screen allows the operator or user to view the status of all system devices and signals. The System Overview Screen is the only screen where the system can be started, stopped, and reset. This screen also allows for navigation to other screens.

The System Overview Screen is the default screen when the SCADA system program starts

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SYSTEM OVERVIEW

USER LOG IN
 CURRENT USER
 DEFAULT

LOG IN

LOG OUT

VAPOR TREATMENT SYSTEM

TAG ID	DESCRIPTION	VALUE	UNITS
VT-101	DPE Inlet Vacuum Pressure	0.0	"Hg
TIT-101	DPE Inlet Vacuum Temperature	73	deg F
TIT-102	DPE Vapor Outlet Temperature	72	deg F
PT-101	DPE Vapor Exhaust Pressure	0.2	"PSI
dPIT-101	DPE Vapor Differential Pressure	-0.1	"w.c.
FE-101	DPE Flow (LRP Exhaust)	0	SCFM
PT-501	Separator Water Discharge Press.	0.3	"Hg
TIT-501	Separator Water Discharge Temp.	72	"deg F
TIT-202	Carbon Vapor Inlet Temp.	73	"deg F
LSL-101	Separator Tank Low Level Switch	OFF	on/off
LSH-101	Separator Tank High Level Switch	OFF	on/off
LSHH-101	Separator Tank High-High Level Sw.	OFF	on/off
P-501	Separator Tank Transfer Pump	OFF	on/off
LSL-501	Containment Sump Low Level	ON	on/off
LSH-501	Containment Sump High Level	OFF	on/off
LSHH-501	Containment Sump High-High Level	OFF	on/off
B-101	Liquid Ring Pump #1	OFF	on/off
B-102	Liquid Ring Pump #2	OFF	on/off
V-407	FTO Compressed Air	OPEN	opn/cls

GROUNDWATER TREATMENT SYSTEM

TAG ID	DESCRIPTION	VALUE	UNITS
V-407	GW Isolation Valve	OPEN	opn/cls
TIT-401	GW Booster Pump Exhaust Temp	72	deg F
PT-401	GW Booster Pump Exhaust Press.	0.8	PSI
FQI-401A	GW Booster Pump Total Gallons	407220	gal
FQI-401B	GW Booster Pump Flow Rate	-0.1	gpm
LSLL-401	GW Booster Tank Low-Low Level	ON	on/off
LSL-401	GW Booster Tank Low Level	ON	on/off
LSH-401	GW Booster Tank High Level	OFF	on/off
LSHH-401	GW Booster Tank High-High Level	OFF	on/off
P-401	GW Booster Tank Transfer Pump	OFF	on/off
V-607	Wellfield Pump Compressed Air	OPEN	on/off
FQI-501A	Separator Exit Total Gallons	2700	gal
FQI-501B	Separator Exit Flow Rate	-0.1	gpm
PT-402	Holding Tank Pressure	1.6	ft.w.c.
P-402	Holding Tank Transfer Pump	ON	on/off
VFD-402	Holding Tank Pump VFD Output	0	%
LSLL-402	Holding Tank Low-Low Level	ON	on/off
LSL-402	Holding Tank Low Level	OFF	on/off
LSHH-402	Holding Tank High-High Level	OFF	on/off
FQI-402A	Sewer Drain Total Gallons	440980	gal
TIT-402	Condensate Water Discharge Temp	72	deg F
PT-403	Holding Tank Pump Exhaust Press.	1.4	PSI
PT-404	Water Carbon Inlet Pressure	1.3	PSI

VAPOR CONDITIONING SYSTEM

TAG ID	DESCRIPTION	VALUE	UNITS
VIT-201	VC Inlet Pressure	0.0	"w.c.
P-201	Cooling Tower Pump	OFF	on/off
CT-201	Cooling Tower Fan	OFF	on/off
TIT-201	H-202 Heater Inlet Temp.	73	deg F
TIT-202	Vapor Condition Discharge Temp.	73	deg F
P-202	Refrigerated Chiller Pump	OFF	on/off
RC-201	Refrigerated Chiller System	OFF	on/off
FS-201	Refrig. Chiller Pump Flow Switch	OFF	on/off
FS-202	Heater Flow Switch	OFF	on/off
LSL-201	Condensate Tank Low Level Switch	ON	on/off
LSH-201	Condensate Tank High Level Switch	OFF	on/off
LSHH-201	Condensate Tank High-High Switch	OFF	on/off
P-203	Condensate Tank Transfer Pump	OFF	on/off
V-452	Process Water Control Valve	TANK	tank/sew
B-301	Carbon Polish Blower	OFF	on/off
VFD-301	Carbon Polish Blower VFD Output	0	%
PS-101	FTO Exhaust Pressure Switch	OFF	on/off

FLAMELESS THERMAL OXIDIZER SYSTEM

TAG ID	DESCRIPTION	VALUE	UNITS
TE-122	FTO Chamber Inlet Temperature	72	deg F
TE-121A	FTO Chamber Temperature	72	deg F
TE-835	Quench Temperature	70	deg F
AE-803	Conductivity Level	0.65	mS
AE-802	pH Level	8.86	pH
FIC102.PV	FTO Air Flow	53	SCFM
FTO Permissive - FTO Main Fan Enable		MCP	FTO
FTO Scrubber Running		MCP	FTO
B-301 Running		MCP	FTO
FTO Main Fan Running		MCP	FTO
FTO Ready for Process Air from LRP's		MCP	FTO
FTO Shutdown (to FTO)		MCP	FTO
FTO Alarm Condition		MCP	FTO

AUXILIARY SYSTEMS

TAG ID	DESCRIPTION	VALUE	UNITS
K-601	Air Compressor Status	ON	on/off
PS-601	Compressed Air Low Pressure	ON	on/off
P-901	Caustic Pump Enable	OFF	on/off
PS-901	Caustic Tank Low Level	ON	on/off
ERH System Enable		MCP	ERH
ERH System Running		MCP	ERH

ALARM

ALARM CONDITION

ACKNOWLEDGE

MENU

GROUNDWATER SCREEN

VAPOR TREATMENT SCREEN

VAPOR CONDITIONING SCREEN

FTO SCREEN

DATA SCREEN

ACTIVE ALARMS

ALARM HISTORY

SYSTEM CONTROL

VAPOR TREATMENT SYSTEM

CARBON
FTO

START

STOP

GROUNDWATER TREATMENT SYSTEM

ON

STOP

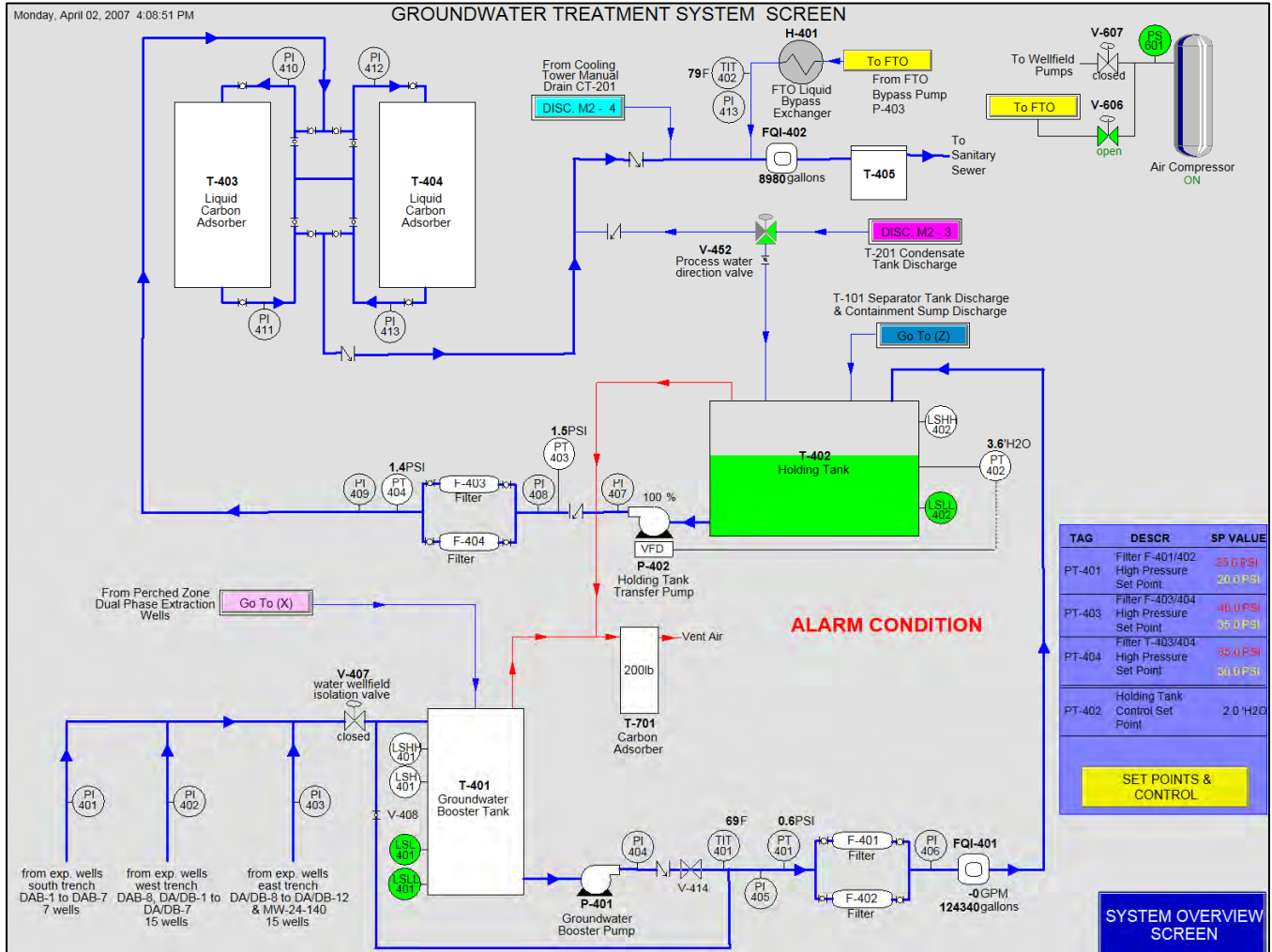
TOTAL SYSTEM STOP

RESET

Alarm Banner 11:43:46 PM Alarms Reset
Alm: 2.

Groundwater Treatment System Screen

The Groundwater Treatment System Screen allows the user to view a graphic representation of the groundwater system. A Level2 operator can access the groundwater system Configuration pop up screen from this screen.



Groundwater Configuration Screen & Set Points


The Groundwater Configuration Screen allows a Level2 operator to operate system components in Hand mode (manually) and to change set point values. This screen can be selected from the Groundwater Treatment System Screen. When selected the screen will pop up over the Groundwater Treatment System Screen.

TAG	DESCR	SP VALUE	
PT-401	Filter F-401/402	25.0	PSI
	High Pressure Set Point	20.0	PSI
PT-403	Filter F-403/404	40.0	PSI
	High Pressure Set Point	35.0	PSI
PT-404	Filter T-403/404	35.0	PSI
	High Pressure Set Point (PSI)	30.0	PSI
PT-402	Holding Tank Control Set Point	2.0	'w.c

P-401 GROUNDWATER BOOSTER PUMP

OFF


HAND AUTO



H-401 FTO BYPASS HEAT EXCHANGER

OFF


HAND AUTO



P-402 HOLDING TANK TRANSFER PUMP

OFF

HAND AUTO



PI LOOP CONTROL

0.01 GAIN

0.01 INTEGRAL


100.0 MANUAL OUTPUT%

2.0 SP (PSI)

3.6 PV (PSI)


V-407 WELLFIELD ISOLATION VALVE

OPEN AUTO




V-606 FTO COMPRESSED AIR SOLENOID

OPEN AUTO




V-452 PROCESS WATER DIRECTION VALVE

DRAIN TANK



V-607 WELLFIELD COMPRESSED AIR SOLENOID

OPEN AUTO



CLOSE

Vapor Treatment Configuration Screen & Set Points

The Vapor Treatment Configuration Screen allows a Level2 operator access to operate system components in HAND mode. They can also adjust system set points from this screen. This screen is accessible only from the Vapor Treatment System Display Screen.

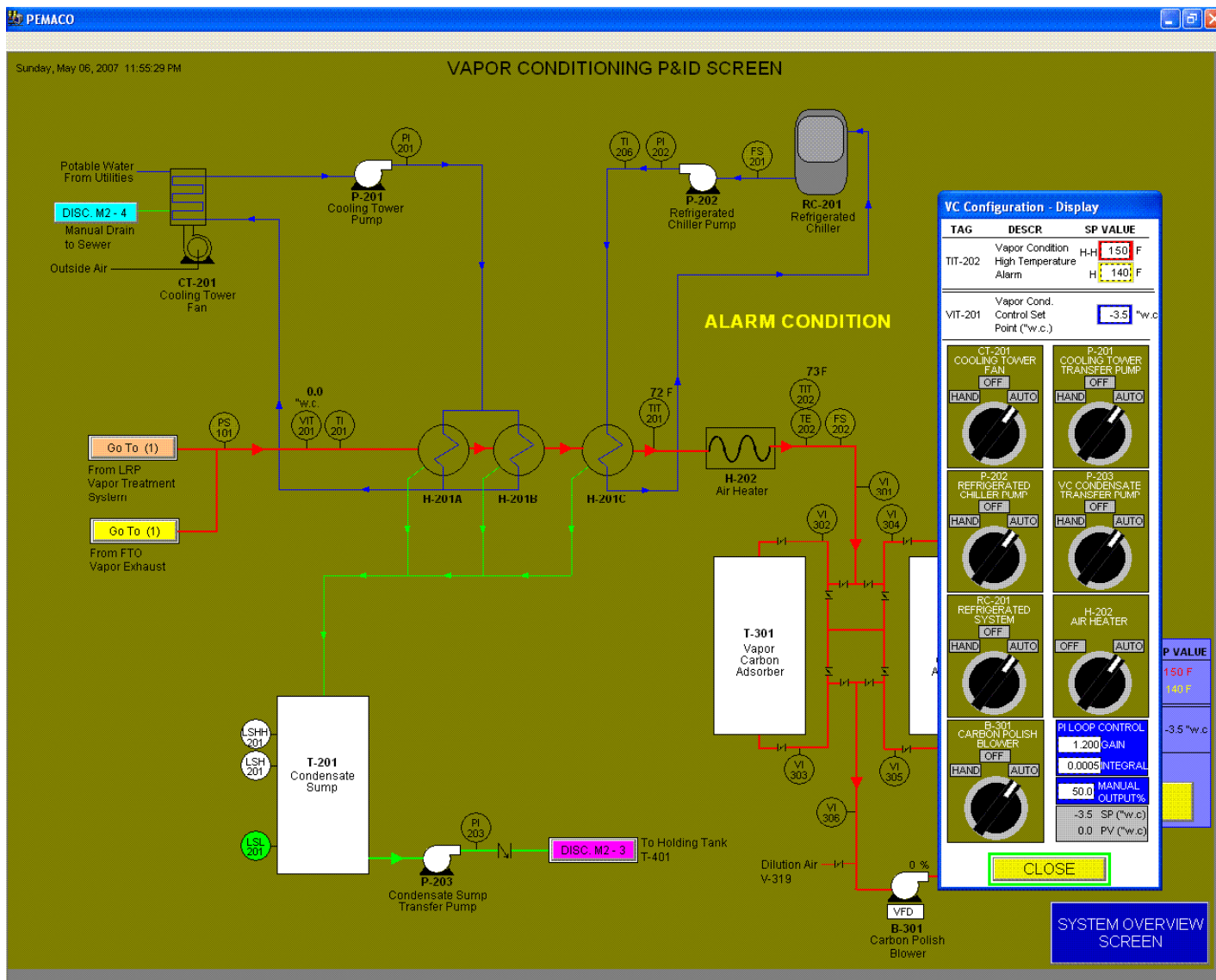
TAG	DESCR	SP VALUE
PT-501	Filter F-501/502 High Pressure	H-H 0.0 PSI
	Set Points	H 22.2 PSI

<p>P-501 SEPARATOR TANK TRANSFER PUMP</p> <p>OFF</p> <p>HAND AUTO</p> 	<p>P-502 SECONDARY CONT TRANSFER PUMP</p> <p>OFF</p> <p>HAND AUTO</p> 
<p>B-101 LIQUID RING PUMP #1</p> <p>OFF</p> <p>HAND AUTO</p> 	<p>B-102 LIQUID RING PUMP #2</p> <p>OFF</p> <p>HAND AUTO</p> 
<p>P-901 CAUSTIC PUMP</p> <p>OFF</p> <p>HAND AUTO</p> 	<p>FTO FAN ONLY OR RUN CONTROL</p> <p>FAN RUN</p> 

CLOSE

Vapor Conditioning Screen

The Vapor Condition Screen allows the user to view a graphical representation of the vapor conditioning system. A Level2 operator can navigate to the Vapor Conditioning Configuration screen to operate the VC system in HAND mode and to adjust set points.



Vapor Conditioning Configuration Pop-Up Screen

The Vapor Conditioning Configuration Screen allows a Level2 operator to operate system components in Hand mode (manually) and to change set point values. This screen can be selected from the Vapor Conditioning System Screen. When selected the screen will pop up over the Vapor Conditioning System Screen.

VC Configuration - Display

TAG	DESCR	SP VALUE
TIT-202	Vapor Condition	H-H 150 F
	High Temperature	H 140 F
	Alarm	
VIT-201	Vapor Cond. Control Set Point ("w.c.)	-3.5 "w.c.

CT-201 COOLING TOWER FAN

OFF

HAND AUTO



P-202 REFRIGERATED CHILLER PUMP

OFF

HAND AUTO



RC-201 REFRIGERATED SYSTEM

OFF

HAND AUTO



B-301 CARBON POLISH BLOWER

OFF

HAND AUTO



P-201 COOLING TOWER TRANSFER PUMP

OFF

HAND AUTO



P-203 VC CONDENSATE TRANSFER PUMP

OFF

HAND AUTO



H-202 AIR HEATER

OFF AUTO



PI LOOP CONTROL

1.200 GAIN

0.0005 INTEGRAL

50.0 MANUAL OUTPUT%

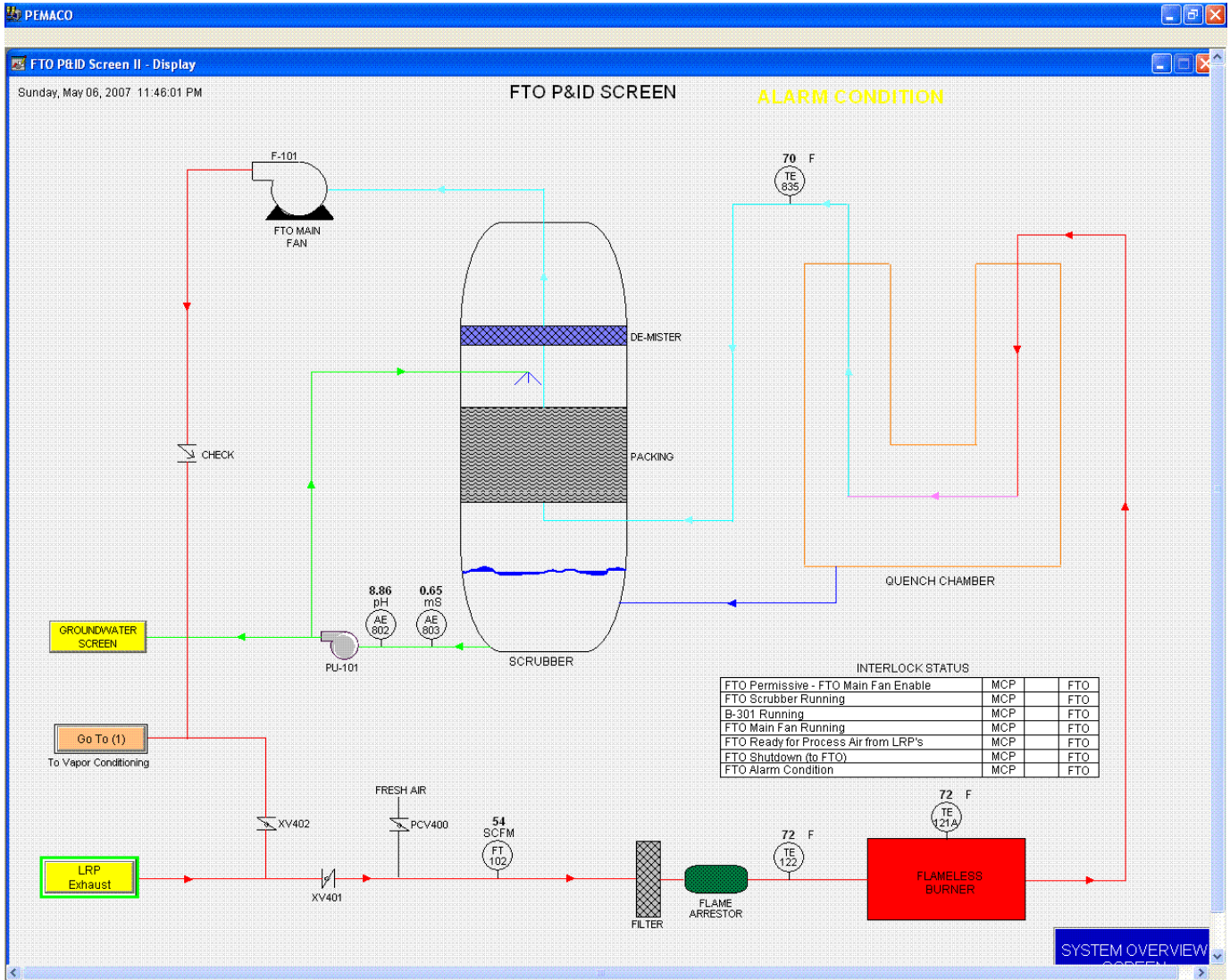
-3.5 SP ("w.c.)

0.0 PV ("w.c.)

CLOSE

FTO Screen

The FTO screen gives a visual representation of the current status of the FTO system. The FTO screen is a view only screen with now operational control. FTO system interlocks can be viewed on the FTO screen.



As-Built Drawings

U.S. ENVIRONMENTAL PROTECTION AGENCY
REGION IX
San Francisco, California

SAFETY PAYS

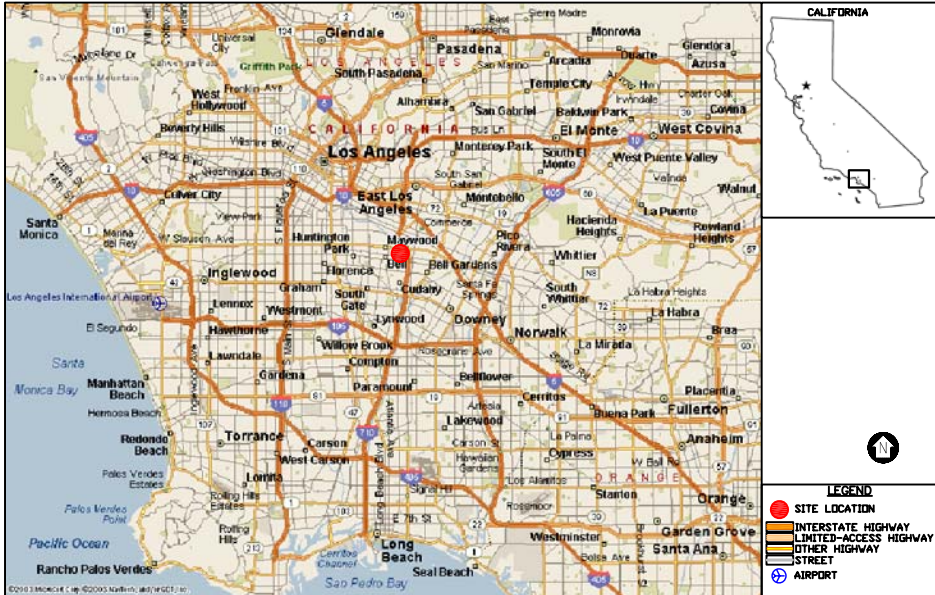


REMEDIAL DESIGN

PEMACO SUPERFUND SITE

5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

DRAWING INDEX			
SHEET NO.	DRAWING NO.	REV. NO.	TITLE
1	G-1	AB	TITLE SHEET: DRAWING INDEX, AREA MAP, AND VICINITY
2	M-1	AB	GENERAL PIPING AND INSTRUMENTATION DIAGRAM
3	M-1A	AB	GENERAL PIPING AND INSTRUMENTATION DIAGRAM (VAPOR CONDITIONING PACKAGE & COMPRESSED AIR SYSTEM)
4	M-4	AB	TREATMENT COMPOUND PROCESS LAYOUT
5	C-2	AB	TRENCH LOCATION PLAN
6	C-5	AB	PIPE/TRENCH ELEVATION PROFILES
7	C-5A	AB	PIPE/TRENCH ELEVATION PROFILES - BRANCH LINES
8	C-8	AB	EXPOSITION ZONE WELL SECTION AND DETAILS
9	C-9	AB	MISCELLANEOUS PIPE DETAILS
10	C-10A	AB	CONDENSATE SUMP DETAIL
11	C-10C	AB	CONDENSATE SUMP MANIFOLD DETAIL
12	C-18	AB	REMOTE CONDENSATE SUMP DETAILS
13	E-1	AB	ELECTRICAL LEGEND
14	E-2	AB	ELECTRICAL SINGLE LINE DIAGRAM
15	E-3	AB	TREATMENT COMPOUND ELECTRICAL PLAN
16	E-4	AB	MISCELLANEOUS ELECTRICAL SECTIONS
17	E-5	AB	ELECTRICAL DETAILS




AREA MAP
NOT TO SCALE

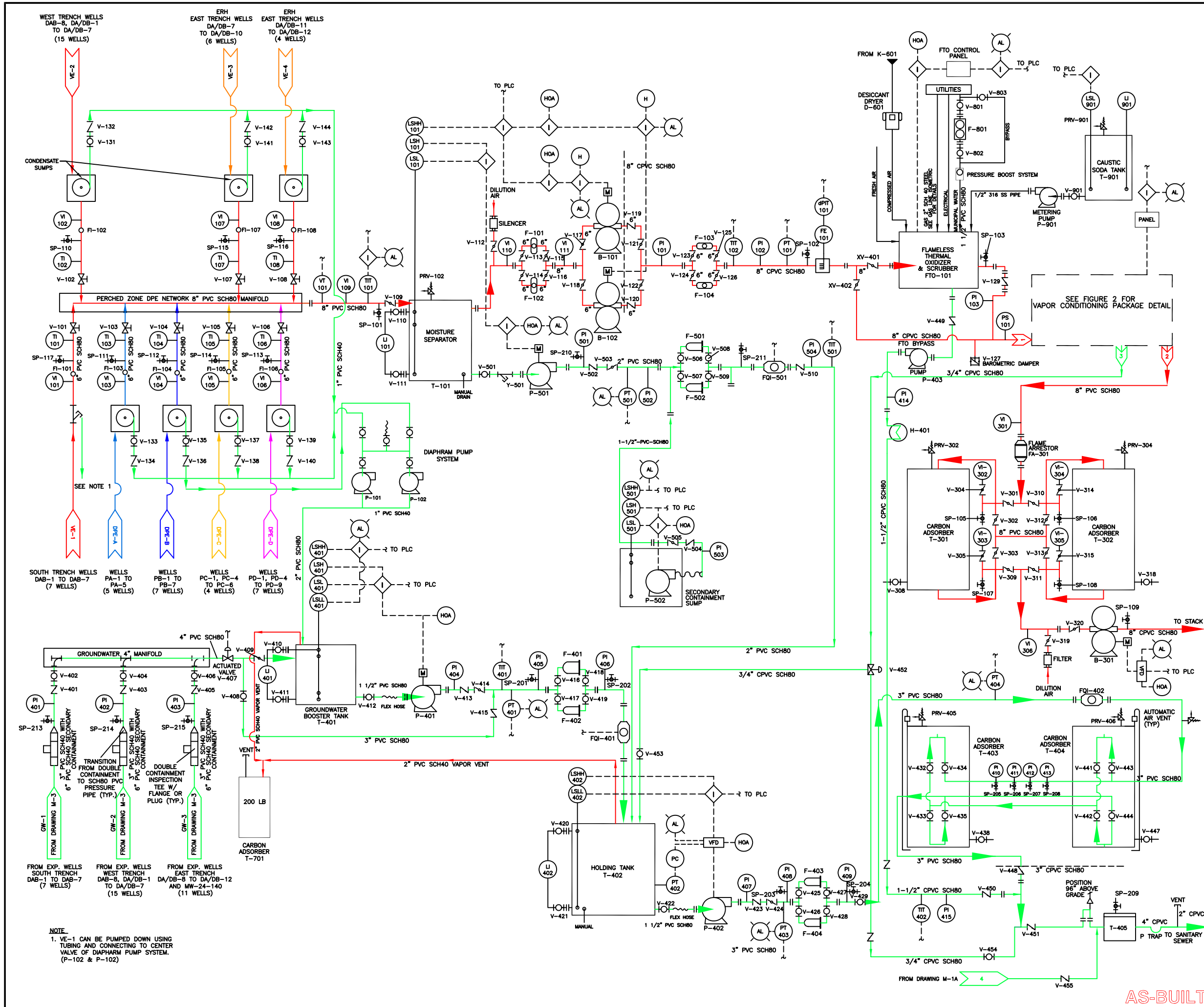


VICINITY MAP

NOT TO SCALE

<p align="center">TITLE SHEET</p> <p align="center">PEMACO SUPERFUND SITE 5050 EAST SLAUSON AVENUE MAYWOOD, CALIFORNIA</p>	
<p>PREPARED FOR: U.S. Environmental Protection Agency Region IX San Francisco, California</p>	<p>PREPARED BY:</p> <div align="center">  </div>
<p>SCALE: AS SHOWN</p> <p>DESIGNED: JW</p> <p>DRAWN: CPL & JBP</p> <p>CHECKED: JW</p>	<p align="center">AS BUILT</p>
	<p>DATE: 08/23/2010</p> <p>DRAWING</p> <p align="center">G-1</p>

AS-BUILT



LEGEND:

	BUTTERFLY VALVE		FLEX HOSE
	BALL VALVE		AIR FILTER
	CHECK VALVE		REGULATOR W/ PRESSURE GAUGE
	DIAPHRAGM VALVE		ALARMS
	VALVE WITH ACTUATOR		HEATING COIL
	VALVE WITH SOLENOID		COOLING FANS
	PRESSURE RELIEF VALVE		FLANGE
	VACUUM RELIEF VALVE		UNION
	VACUUM BREAKER (ANTI-SIPHON)		HEAT EXCHANGER
	ELECTRIC MOTOR		CAM AND GROOVE COUPLINGS-ALUMINUM
	FLOW TOTALIZER & INDICATOR		CLEAN-OUT WYE
	VALVED SAMPLE PORT		AVERAGING PITOT TUBE
	SYSTEM INTERLOCK/FAILSAFE		FLAME ARRESTOR
	ELECTRICAL REPORTING TO PLC		AUTOMATIC AIR VENT
	VENT		MULTIPLE BAG FILTER HOUSING
	LONG TURN TEE WYE		SINGLE BAG FILTER HOUSING
			CALCIUM FILTER

ABBREVIATIONS:

AL	ALARM	LSHH	LEVEL SWITCH HIGH-HIGH
CV	CONTROL VALVE	LSL	LEVEL SWITCH LOW
dPIT	DIFFERENTIAL PRESSURE INDICATING TRANSMITTER	LSLL	LEVEL SWITCH LOW-LOW
FE	FLOW ELEMENT	PI	PRESSURE INDICATOR
FI	FLOW INDICATOR	PT	PRESSURE TRANSMITTER
FM	FLOW METER	PS	PRESSURE SWITCH
FQI	FLOW TOTALIZER	SP	SAMPLE PORT
GALV	GALVANIZED	SS	STAINLESS STEEL
HOA	HAND-OFF AUTO	TI	TEMPERATURE INDICATOR
LACSD	LOS ANGELES COUNTY SANITATION DIVISION	TIT	TEMPERATURE INDICATOR TRANSMITTER
LI	LEVEL INDICATOR	VI	VACUUM INDICATOR
LSH	LEVEL SWITCH HIGH	VT	VACUUM TRANSMITTER
		VFD	VARIABLE FREQUENCY DRIVE

NOTES:

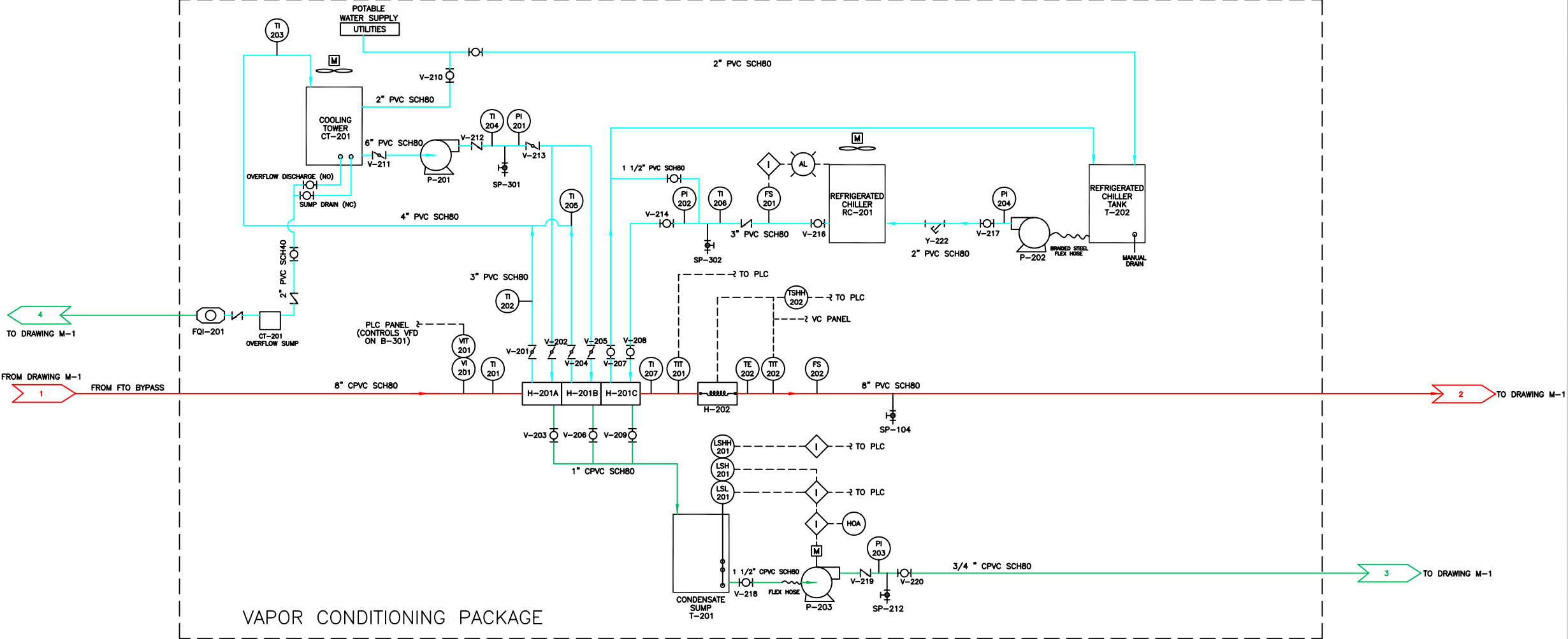
- A SUMMARY OF PROCESS EQUIPMENT DESCRIPTIONS AND SPECIFICATIONS ARE SHOWN ON THIS FIGURE. REFER TO TABLE 1- TREATMENT SYSTEM EQUIPMENT SUMMARY FOR MORE DETAILS ON FANS, BLOWERS, PUMPS, VAPOR-PHASE CARBON ADSORPTION UNITS, AND FILTRATION SYSTEMS.
- REFER TO FINAL REMEDIAL DESIGN REPORT, PEMACO SUPERFUND SITE (TNA& 2006) FOR JUSTIFICATION OF DESIGN PLANS AND SPECIFICATIONS FOR THE INSTALLATION AND IMPLEMENTATION OF SOIL VAPOR AND GROUNDWATER TREAT SYSTEMS.

GENERAL PIPING AND INSTRUMENTATION DIAGRAM

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

PREPARED FOR: U.S. Environmental Protection Agency Region IX San Francisco, California	PREPARED BY: OTIE On-Time Integrated Enterprises
SCALE: AS SHOWN	APPROVED: AS BUILT
DESIGNED: MB, JW & LL DRAWN: DC & JBP CHECKED: JW	DATE: 08/23/2010 DRAWING M-1

AS-BUILT



LEGEND:

BUTTERFLY VALVE

BALL VALVE

CHECK VALVE

DIAPHRAGM VALVE

VALVE WITH ACTUATOR

VALVE WITH SOLENOID

PRESSURE RELIEF VALVE

VACUUM RELIEF VALVE

VACUUM BREAKER (ANTI-SIPHON)

ELECTRIC MOTOR

FLOW TOTALIZER & INDICATOR

VALVED SAMPLE PORT

SYSTEM INTERLOCK/FAILSAFE

ELECTRICAL

VENT

LONG TURN TEE WYE

FLEX HOSE

AIR FILTER

REGULATOR W/ PRESSURE GAUGE

ALARMS

HEATING COIL

COOLING FANS

FLANGE

UNION

HEAT EXCHANGER

CAM AND GROOVE COUPLINGS-ALUMINUM

CLEAN-OUT WYE

AVERAGING PITOT TUBE

FLAME ARRESTOR

AUTOMATIC AIR VENT

MULTIPLE BAG FILTER HOUSING

SINGLE BAG FILTER HOUSING

ABBREVIATIONS:

AL

ALARM

CV

CONTROL VALVE

dPIT

DIFFERENTIAL PRESSURE INDICATING TRANSMITTER

FE

FLOW ELEMENT

FI

FLOW INDICATOR

FM

FLOW METER

FQI

FLOW TOTALIZER

GALV

GALVANIZED

HOA

HAND-OFF AUTO

LAH

LEVEL ALARM HIGH

LACSD

LOS ANGELES COUNTY SANITATION DIVISION

LI

LEVEL INDICATOR

LSH

LEVEL SWITCH HIGH

LSHH

LEVEL SWITCH HIGH-HIGH

LSL

LEVEL SWITCH LOW

LSLL

LEVEL SWITCH LOW-LOW

PI

PRESSURE INDICATOR

PT

PRESSURE TRANSMITTER

PS

PRESSURE SWITCH

SP

SAMPLE PORT

SS

STAINLESS STEEL

TI

TEMPERATURE INDICATOR

TIT

TEMPERATURE INDICATOR TRANSMITTER

VI

VACUUM INDICATOR

VT

VACUUM TRANSMITTER

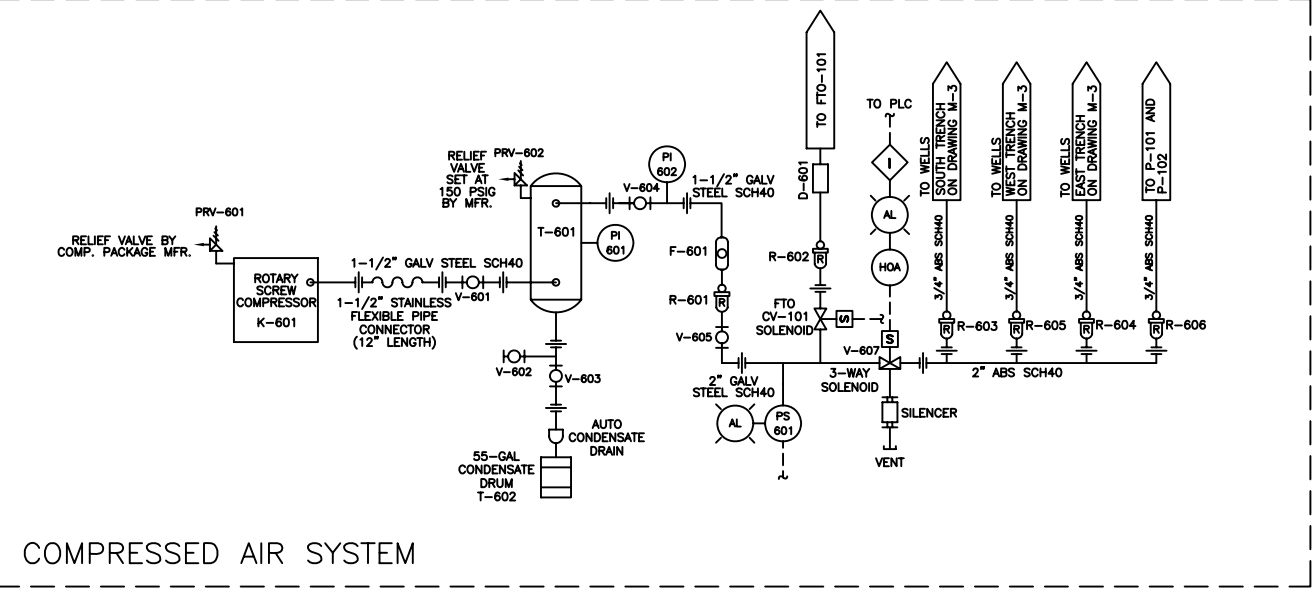
VFD

VARIABLE FREQUENCY DRIVE

NOTES:

1. A SUMMARY OF PROCESS EQUIPMENT DESCRIPTIONS AND SPECIFICATIONS ARE SHOWN ON THIS FIGURE. REFER TO TABLE 1- TREATMENT SYSTEM EQUIPMENT SUMMARY FOR MORE DETAILS ON FANS, BLOWERS, PUMPS, VAPOR-PHASE CARBON ADSORPTION UNITS, AND FILTRATION SYSTEMS.

2. REFER TO FINAL REMEDIAL DESIGN REPORT, PEMACO SUPERFUND SITE (TN&A 2006) FOR JUSTIFICATION OF DESIGN PLANS AND SPECIFICATIONS FOR THE INSTALLATION AND IMPLEMENTATION OF SOIL VAPOR AND GROUNDWATER TREAT SYSTEMS.



AS-BUILT

GENERAL PIPING AND INSTRUMENTATION DIAGRAM
VAPOR CONDITIONING PACKAGE & COMPRESSED AIR SYSTEM

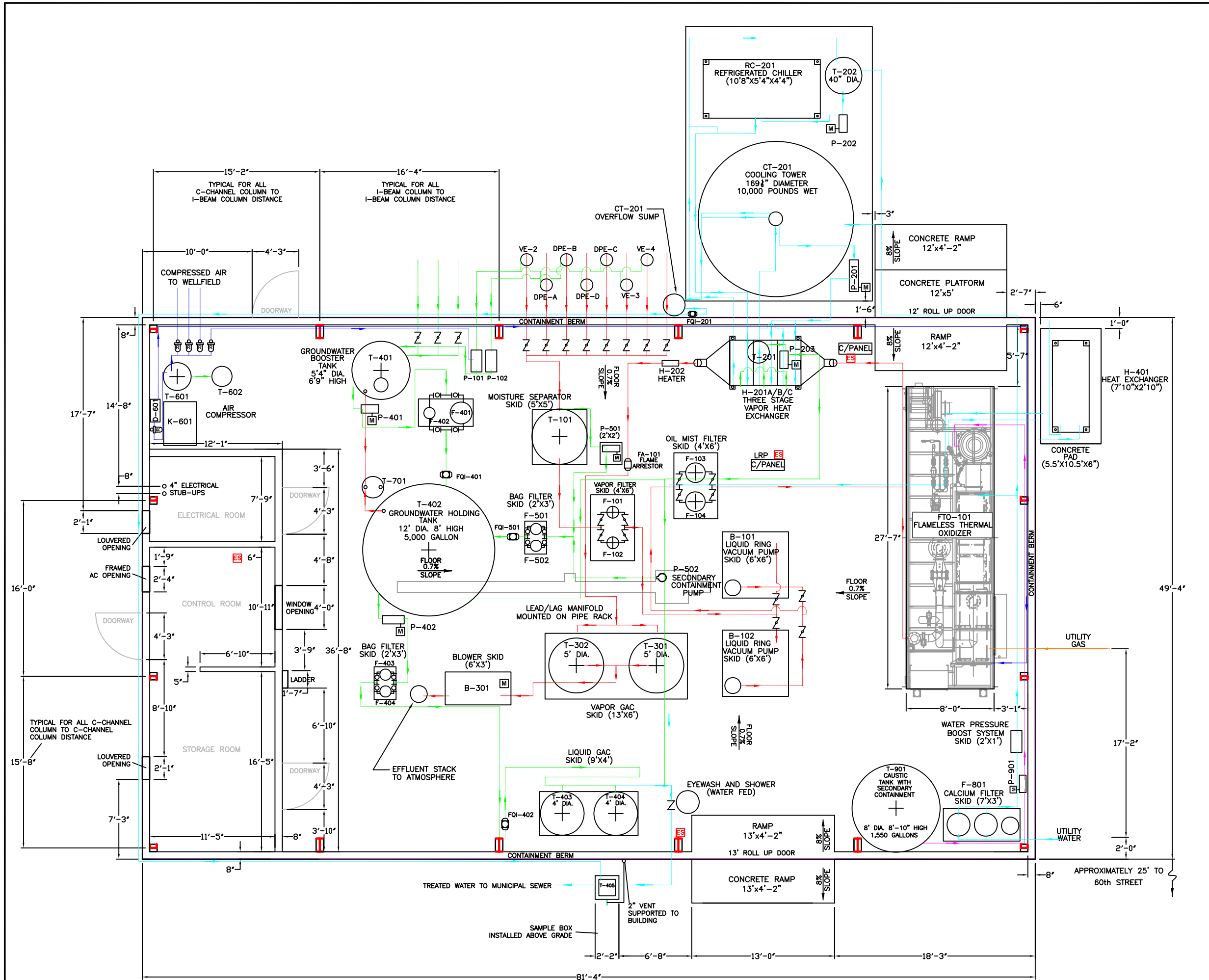
PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

PREPARED FOR:
U.S. Environmental
Protection Agency
Region IX
San Francisco, California

APPROVED
AS BUILT

DATE: 08/23/2010
DRAWING
M-1A

DESIGNED: MB, JW & LL
DRAWN: DC & JBP
CHECKED: JW



LEGEND:

- I-BEAM COLUMN
- C-CHANNEL COLUMN
- UTILITY GAS
- UTILITY WATER/DRAINAGES
- TREATED WATER
- ES EMERGENCY STOP

NOTES:

- A SUMMARY OF PROCESS EQUIPMENT DESCRIPTIONS AND SPECIFICATIONS ARE SHOWN ON THIS FIGURE. REFER TO TABLE 1 - TREATMENT SYSTEM EQUIPMENT SUMMARY FOR MORE DETAILS ON FANS, BLOWERS, PUMPS, VAPOR-PHASE CARBON ADSORPTION UNITS, AND FILTRATION SYSTEMS.
- REFER TO FINAL REMEDIAL DESIGN REPORT, PEMACO SUPERFUND SITE (TNSA 2006) FOR JUSTIFICATION OF DESIGN PLANS AND SPECIFICATIONS FOR THE INSTALLATION AND IMPLEMENTATION OF SOIL VAPOR AND GROUNDWATER TREAT SYSTEMS.

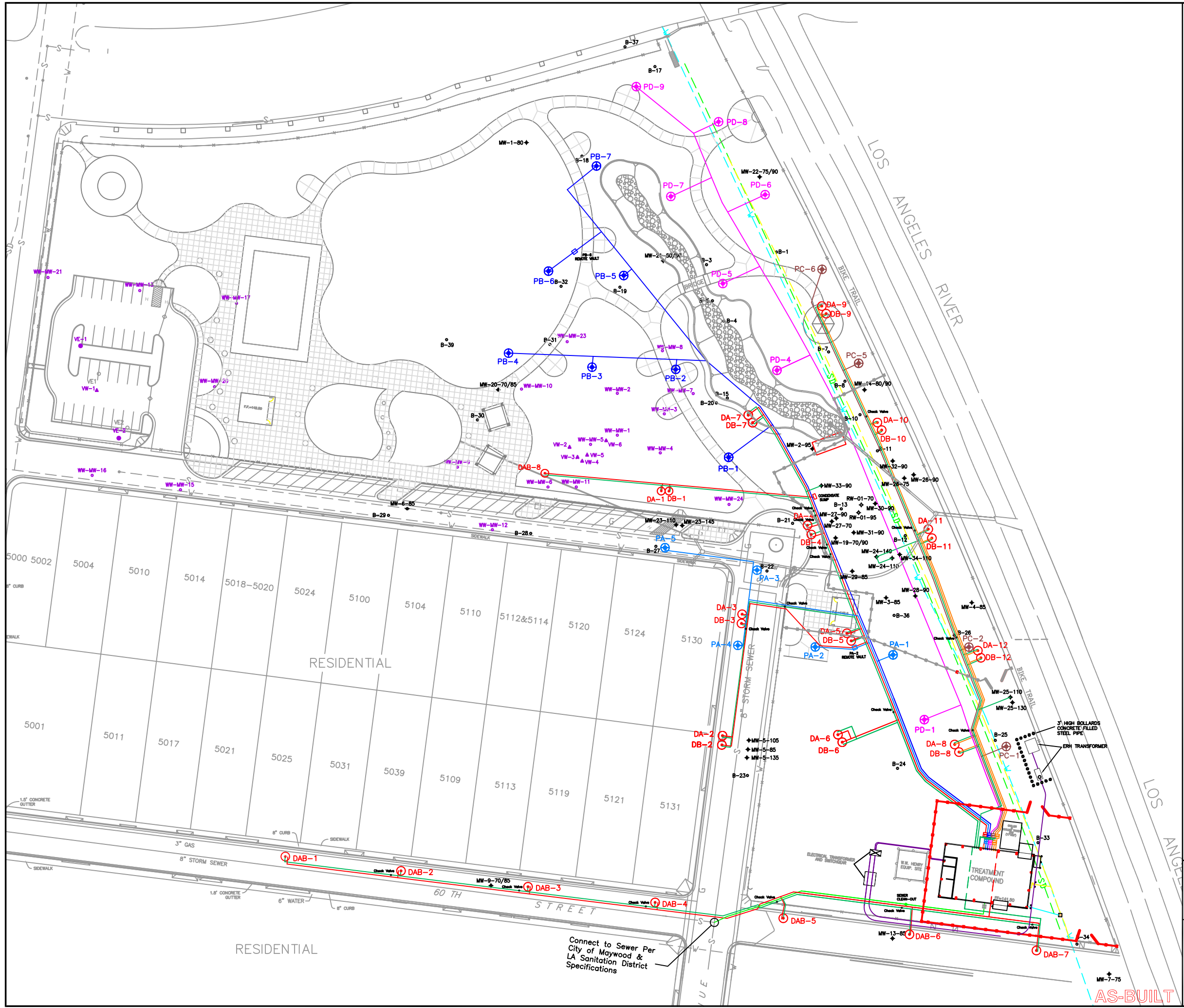


TREATMENT COMPOUND PROCESS LAYOUT

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

PREPARED FOR: U.S. Environmental Protection Agency Region IX San Francisco, California		PREPARED BY: OTIE Orinda Total Integrated Enterprises	
SCALE: AS SHOWN	APPROVED AS BUILT	DATE: 08/23/2010	DRAWING
DESIGNED: JW & DC DRAWN: DC & JBP CHECKED: JW			M-4

AS-BUILT



LEGEND:

- DAB-5 EXTRACTION WELL SCREENED THROUGH BOTH 'A' AND 'B' ZONES
- DA-1 DB-1 EXTRACTION WELL WITH INDIVIDUAL SCREENS FOR THE 'A' AND 'B' ZONES
- P15-0 PERCHED ZONE WELL
- B-0 PEMACO WELL, MONITORING WELL, PERCHED ZONE (<35 FEET BGS.)
- MW-2 PEMACO WELL, MONITORING WELL, EXPOSITION AQUIFER
- RW-01 PEMACO WELL, RECOVERY WELL LOCATION
- WW-MW-5 W.W. HENRY WELL, EXISTING GROUNDWATER MONITORING WELL
- VW-6 W.W. HENRY WELL, EXISTING DPE WELL - DEEP, INTERMEDIATE AND SHALLOW
- VE-3 W.W. HENRY WELL, EXISTING SVE WELL
- Check Valve CHECK VALVE LOCATION
- ELECTRICITY LINE
- SEWER DISCHARGE

EXISTING UTILITIES:

- WATER LINE
- SEWER LINE
- GAS LINE

PERCHED ZONE PIPING:

- LIGHT BLUE DPE-A 5 WELLS (PA-1 TO PA-5) WEST TRENCH
- DARK BLUE DPE-B 7 WELLS (PB-1 TO PB-7) WEST TRENCH
- BROWN DPE-C 4 WELLS (PC-1, PC-4 TO PC-6) WEST TRENCH
- PURPLE DPE-D 7 WELLS (PD-1, PD-4 TO PD-9) EAST TRENCH

EXPOSITION ZONE PIPING:

- GREEN 1 GW-1 7 WELLS (DAB-1 TO DAB-7) SOUTH TRENCH
- GREEN 2 GW-2 16 WELLS (DAB-8, DA/DB-1 TO DA/DB-7, MW-33-90) WEST TRENCH
- GREEN 3 GW-3 13 WELLS (DA/DB-8 TO DA/DB-12, MW-24-110/140, MW-25-110) EAST TRENCH
- RED 1 VE-1 7 WELLS (DAB-1 TO DAB-7) SOUTH TRENCH
- RED 2 VE-2 15 WELLS (DAB-8, DA/DB-1 TO DA/DB-7) WEST TRENCH

ERH AREA PIPING:

- ORANGE ERH, VE-3 EAST TRENCH 6 DEEP WELLS (DA/DB-8 TO DA/DB-10)
- ORANGE ERH, VE-4 EAST TRENCH 4 DEEP WELLS (DA/DB-11 TO DA/DB-12)

NOTES:

- THE TRENCH NETWORK IS COMPRISED OF THREE MAIN TRENCHES REFERRED TO IN THE DRAWINGS AND SPECIFICATIONS AS THE EAST, WEST AND SOUTH TRENCHES. DRAWING C-5 SHOWS THE PIPE/TRENCH ELEVATION PROFILE.
- HORIZONTAL CONTROL IS REFERENCED TO THE CALIFORNIA COORDINATE SYSTEM, ZONE 5, NAD83. VERTICAL CONTROL IS REFERENCED TO NAVD88. SEVERAL CONTROL POINT LOCATIONS HAVE BEEN ESTABLISHED FOR THE PARK CONSTRUCTION WHICH WILL BE ADOPTED FOR THE REMEDIAL ACTION. VERTICAL CONTROL SHALL BE ESTABLISHED TO AN ACCURACY OF 0.01 FEET. HORIZONTAL CONTROL SHALL BE ESTABLISHED TO AN ACCURACY OF 0.1 FEET.
- ALL SUBSURFACE EXCAVATION LOCATIONS SHALL BE MARKED AND CLEARED BY UNDERGROUND SERVICE ALERT PRIOR TO EXCAVATION. A GEOPHYSICAL SURVEY SHALL BE PERFORMED TO BETTER IDENTIFY POTENTIAL UNDERGROUND UTILITIES AND OBSTACLES. TRENCHES AND PIPELINES SHALL BE MOVED TO ACCOMMODATE EXISTING LINES FOLLOWING APPROVAL FROM THE PROJECT ENGINEER.

0 40 80
APPROXIMATE SCALE IN FEET

TRENCH LOCATION PLAN

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

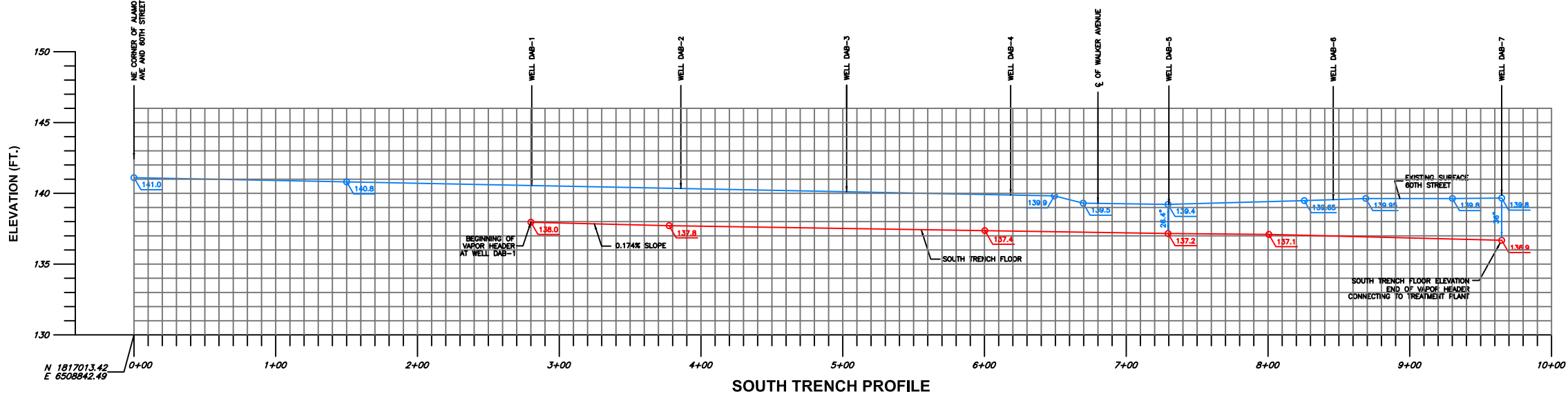
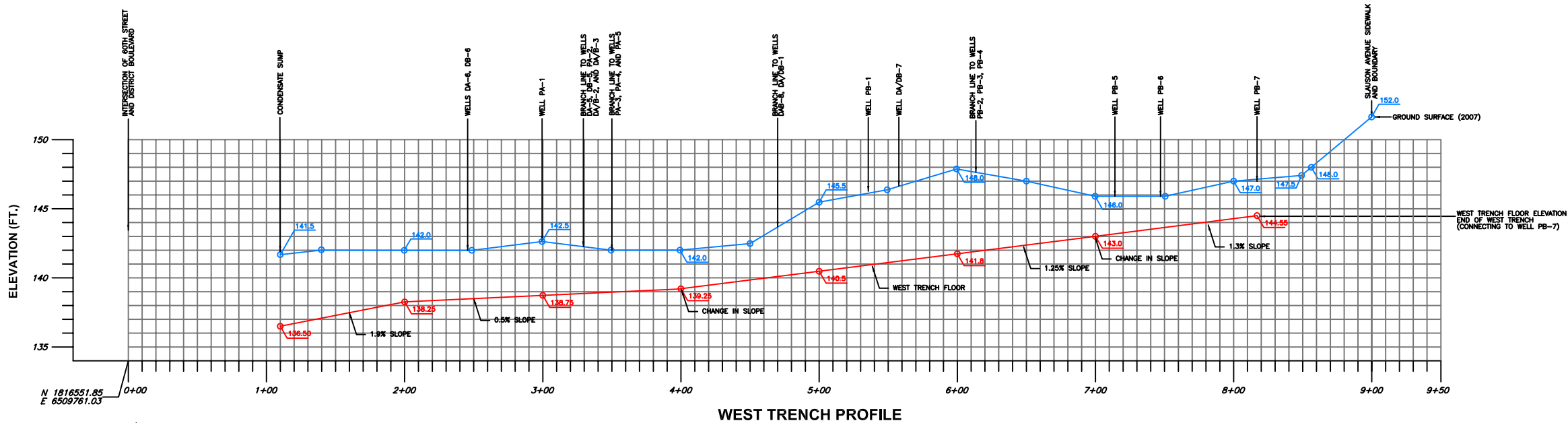
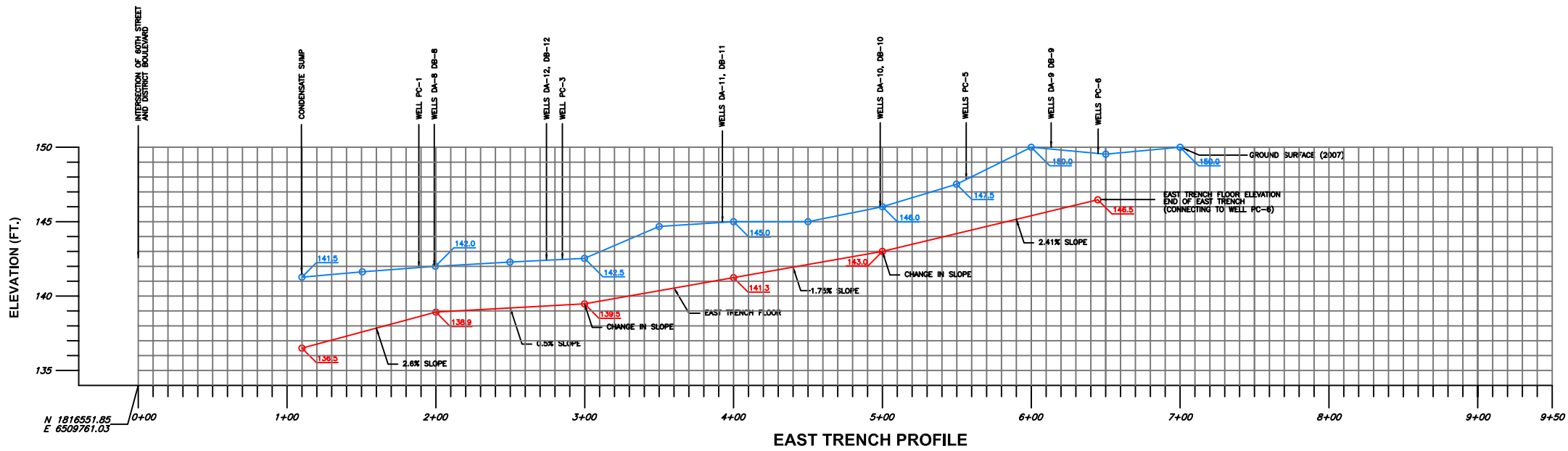
PREPARED FOR:
U.S. Environmental
Protection Agency
Region IX
San Francisco, California

DESIGNED: JW & GN
DRAWN: DC
CHECKED: JW

APPROVED
AS BUILT

DATE: 08/23/10
DRAWING
C-2

PREPARED BY:
OTIE
On The Edge Environmental Solutions



AS-BUILT

LEGEND:

- GROUND SURFACE (2007)
- TRENCH FLOOR PROFILE
- N 1816551.85
E 6509761.03
1+00
- COORDINATE OF ORIGIN
- STATION MARK (=100 FEET)

NOTES:

- THE PIPE/TRENCH PLAN VIEW IS SHOWN ON DRAWING C-2.
- THE INTENT OF THE PROFILE IS TO PROVIDE THE PIPELINE ELEVATIONS FOR THE MAIN TRENCH FLOOR (EAST, WEST AND SOUTH) AND THE FINAL GRADE OF THE MAYWOOD RIVERFRONT PARK IN 2007 (TREATMENT PLANT COMPLETED).
- SLOPES ARE SHOWN ON TRENCH PROFILE DETAILS.
- TRENCH AND WELL LOCATIONS HAVE BEEN POSITIONED SO AS TO NOT INTERFERE WITH MAYWOOD PARK CONSTRUCTION LINES, GRADES AND DRAINAGE STRUCTURES. REPOSITIONING OF WELLS, PIPES OR TRENCHES SHALL BE COORDINATED WITH THE CITY OF MAYWOOD AND THE PARK CONTRACTOR. REFER TO "CITY OF MAYWOOD, CALIFORNIA CONSTRUCTION PLANS FOR RIVERFRONT PARK" (DATED 12-20-2004), FOR ADDITIONAL SUBSURFACE STRUCTURE DETAILS.

PIPE/TRENCH ELEVATION PROFILES

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

PREPARED FOR:
U.S. Environmental
Protection Agency
Region IX
San Francisco, California

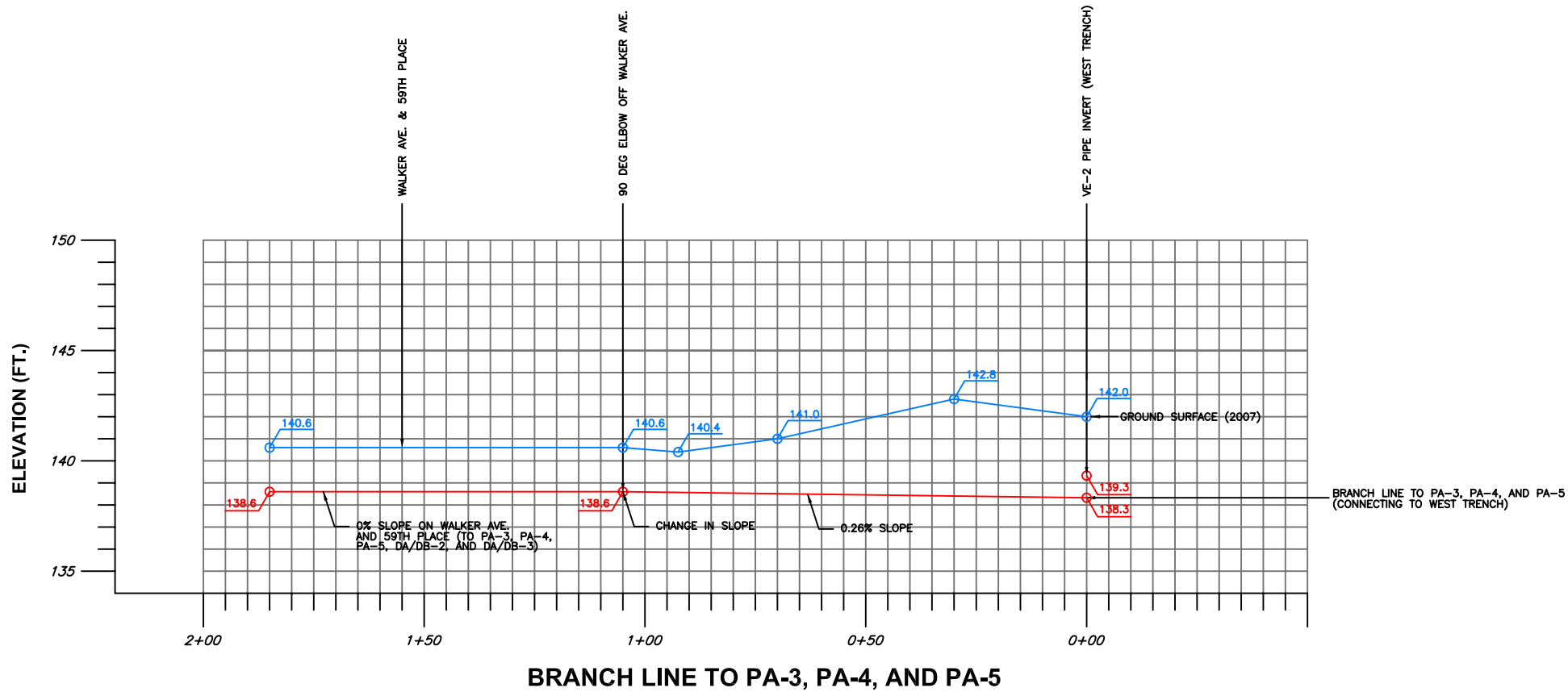
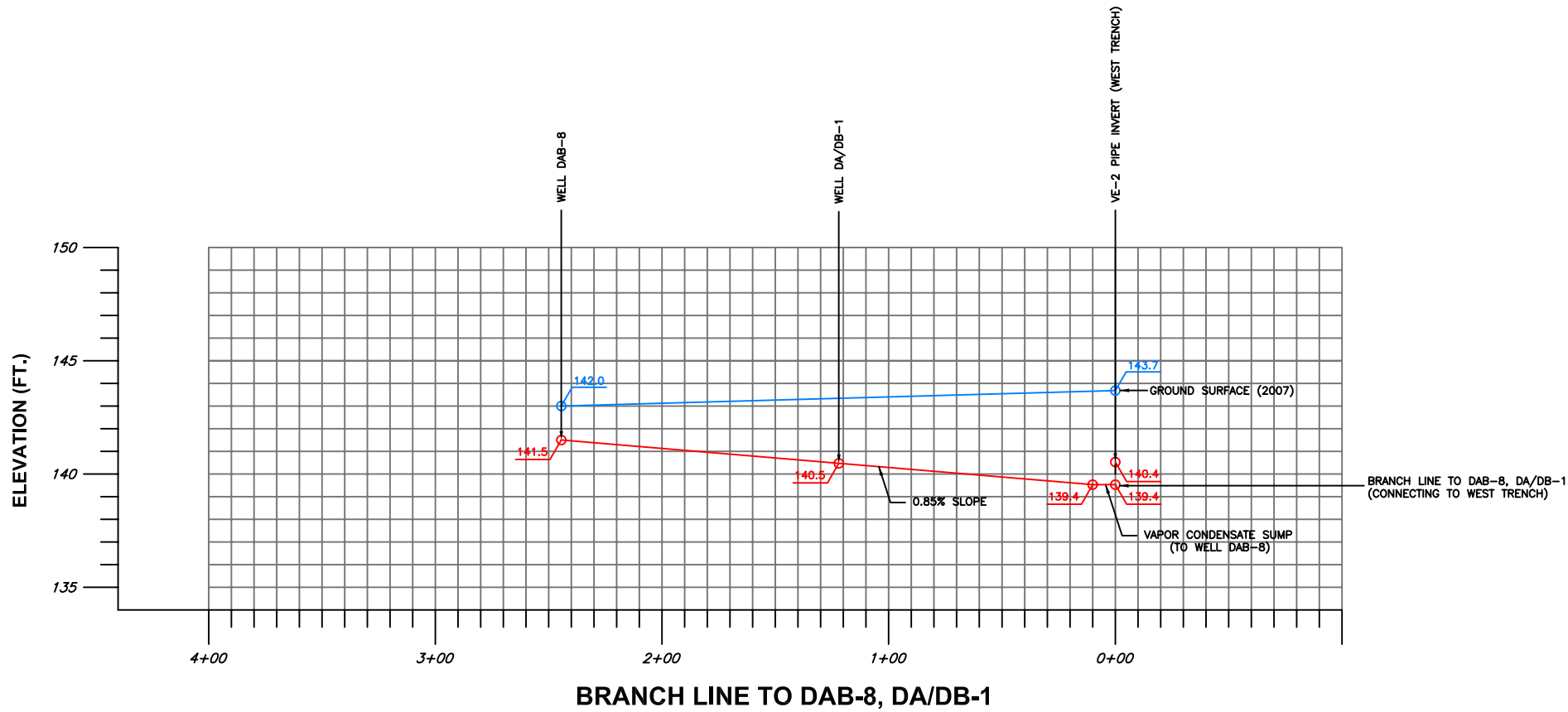
SCALE: AS SHOWN
DESIGNED: JW & GN
DRAWN: DC
CHECKED: JW

APPROVED

DATE: 10/12/10
DRAWING
C-5

PREPARED BY:
OTIE
On-Time Total Project Management

REV
7



LEGEND:

- GROUND SURFACE (2007)
- TRENCH FLOOR PROFILE
- $N 1816551.85$
 $E 6509761.03$ COORDINATE OF ORIGIN
- 1+00 STATION MARK (=100 FEET)

NOTES:

- THE PIPE/TRENCH PLAN VIEW IS SHOWN ON DRAWING C-2.
- THE INTENT OF THE PROFILE IS TO PROVIDE THE PIPELINE ELEVATIONS FOR THE MAIN TRENCH FLOOR (EAST, WEST AND SOUTH) AND THE FINAL GRADE OF THE MAYWOOD RIVERFRONT PARK IN 2007 (TREATMENT PLANT COMPLETED).
- SLOPES ARE SHOWN ON TRENCH PROFILE DETAILS.
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PIPE/TRENCH ELEVATION PROFILES - BRANCH LINES

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

PREPARED FOR:
U.S. Environmental
Protection Agency
Region IX
San Francisco, California

PREPARED BY:


SCALE: AS SHOWN
DESIGNED: JW & GN
DRAWN: DC
CHECKED: JW

APPROVED
AS BUILT

DATE: 10/12/10

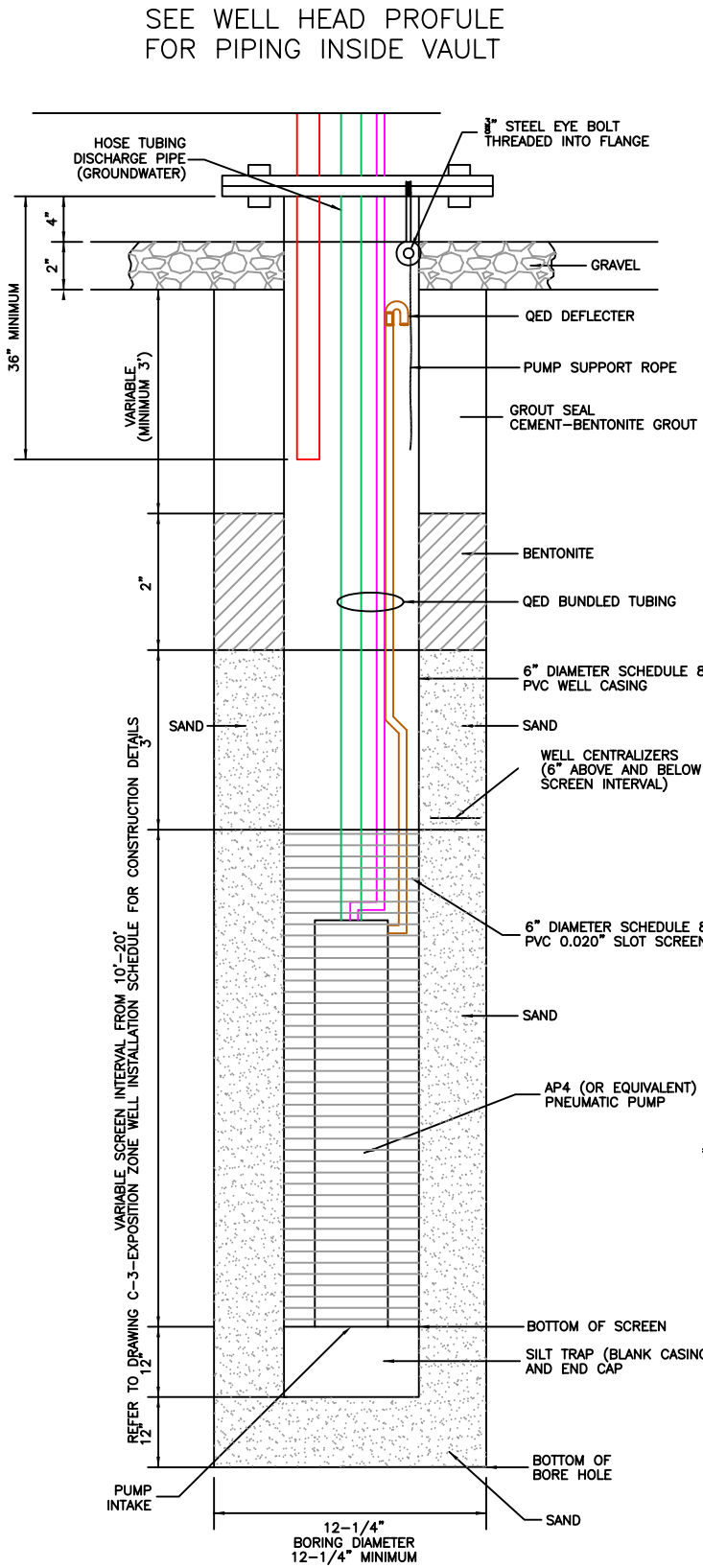
DRAWING

REV

C-5A

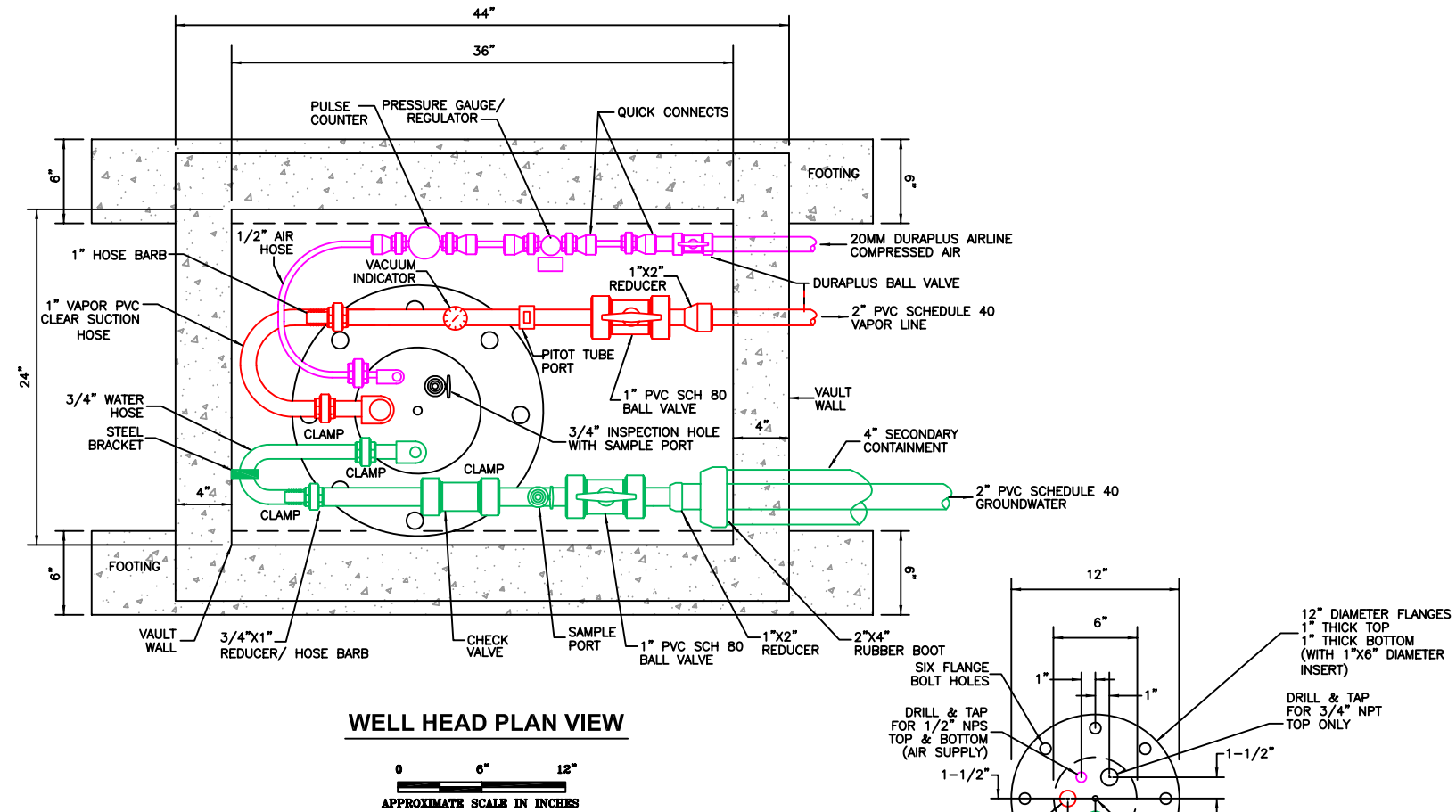
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AS-BUILT



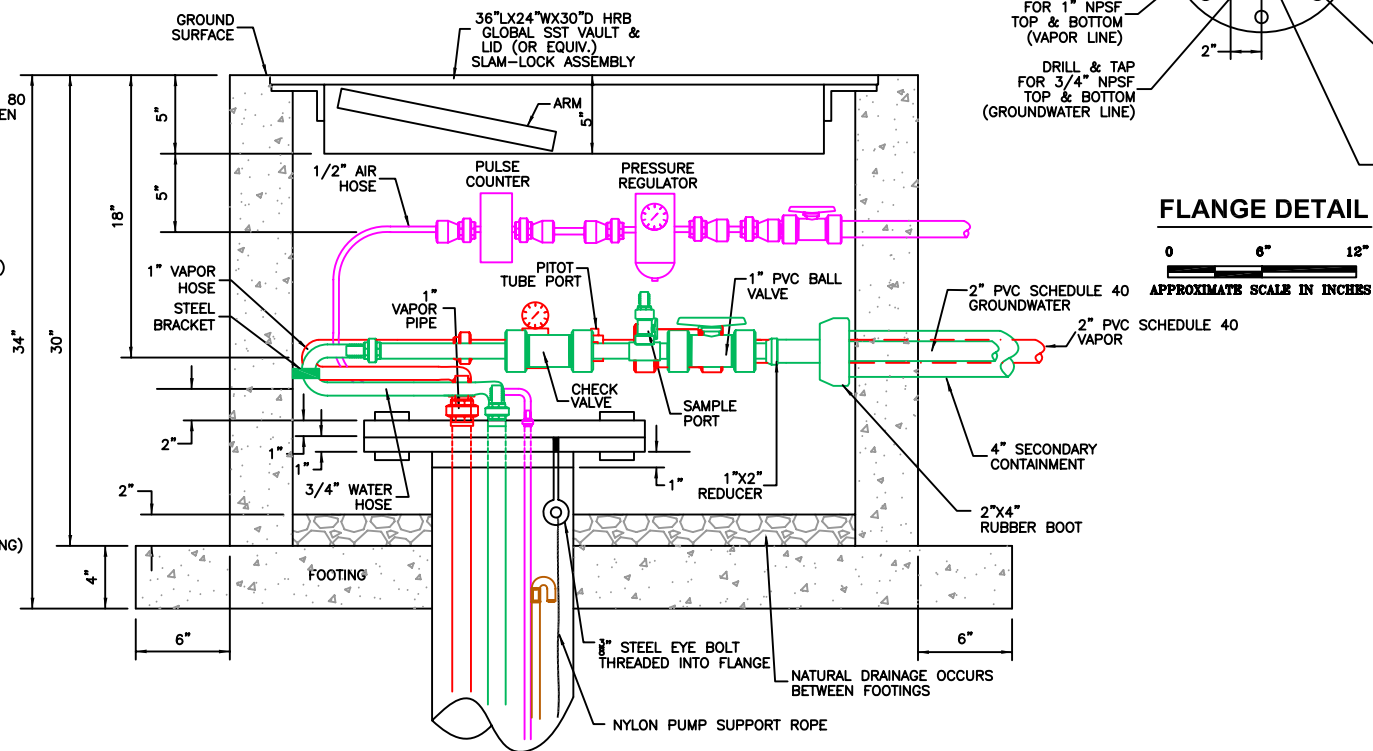
**TYPICAL EXPOSITION
ZONE EXTRACTION WELL**

NOT TO SCALE



WELL HEAD PLAN VIEW

0 6" 12"
APPROXIMATE SCALE IN INCHES



WELL HEAD PROFILE

0 6" 12"
APPROXIMATE SCALE IN INCHES

LEGEND:

RED VAPOR LINE
GREEN GROUNDWATER
PURPLE COMPRESSED AIR
BROWN DISCHARGE AIR

NOTES:

1. THE EXPOSITION WELLS, WELLHEADS, VAULTS AND APPURTENANCES SHALL BE CONSTRUCTED IN ACCORDANCE WITH THE SPECIFICATION DIVISION 1-GENERAL REQUIREMENTS, DIVISION 2-SITE WORK AND DIVISION 3-CONCRETE.
2. REFER TO DRAWING C-3 FOR THE EXPOSITION ZONE WELL INSTALLATION SCHEDULE, WHICH DETAILS MATERIALS AND DIMENSIONS.
3. WELL VAULTS SHALL BE CONSTRUCTED TO H-10 AND H-20 LOADING REQUIREMENTS IN THE PARK AREA AND IN THE ROADWAYS, RESPECTIVELY.
4. WELL VAULTS MAY BE CONSTRUCTED OF CONCRETE OR METAL. WELL VAULT LIDS SHALL BE CONSTRUCTED OF METAL, BE FLUSH TO GRADE AND BE SPRING OR GAS SHOCK ASSISTED. WELL VAULT FOOTINGS SHALL BE CONSTRUCTED OF CONCRETE AND ARE ONLY REQUIRED BENEATH ROADWAYS.
5. EXCAVATION AND BACKFILL OF VAULTS SHALL BE PERFORMED IN ACCORDANCE WITH SPECIFICATION SECTION 02211-EARTHWORK AND SECTION 02205-SOIL MATERIALS.
6. WELLHEAD PLUMBING MAY BE CONSTRUCTED AS DESIGN/BUILD IN ORDER TO REDUCE VAULT SIZE REQUIREMENTS, IMPROVE WORKING AREA/ACCESS OR ACCOMMODATE IMPROVED MATERIALS OR EQUIPMENT; WITH APPROVAL FROM THE PROJECT ENGINEER.
7. PIPE SUPPORTS AND BRACKETS (NOT SHOWN) SHALL BE USED ACCORDING TO PIPE MANUFACTURER'S RECOMMENDATIONS.

EXPOSITION ZONE WELL SECTION AND DETAILS

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

PREPARED FOR:
U.S. Environmental
Protection Agency
Region IX
San Francisco, California

PREPARED BY:
OTIE
On-Time Integrated Enterprises

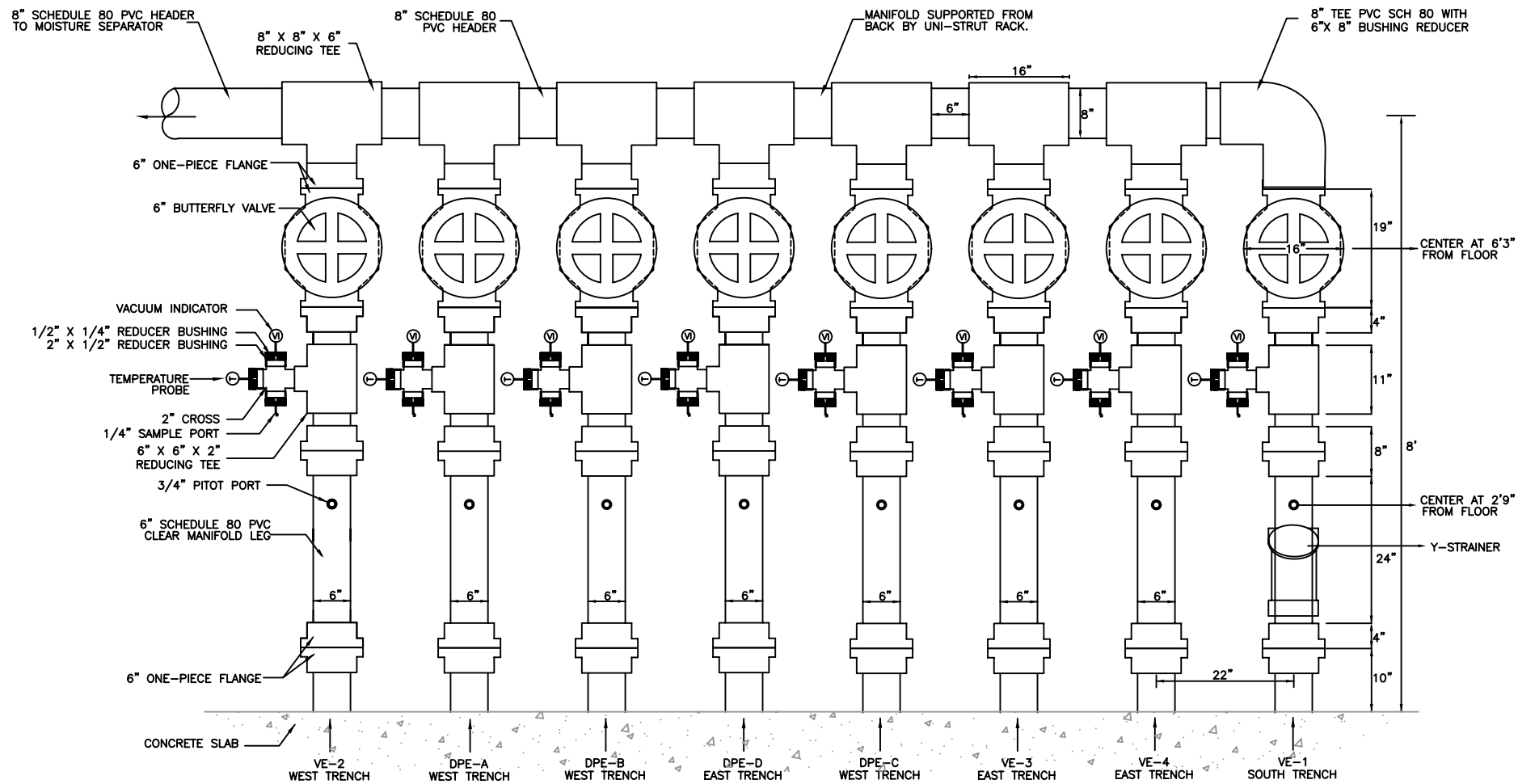
SCALE: AS SHOWN
DESIGNED: JW & GN
DRAWN: CBG & JRP
CHECKED: JW

APPROVED
AS BUILT

DATE: 08/23/2010
DRAWING

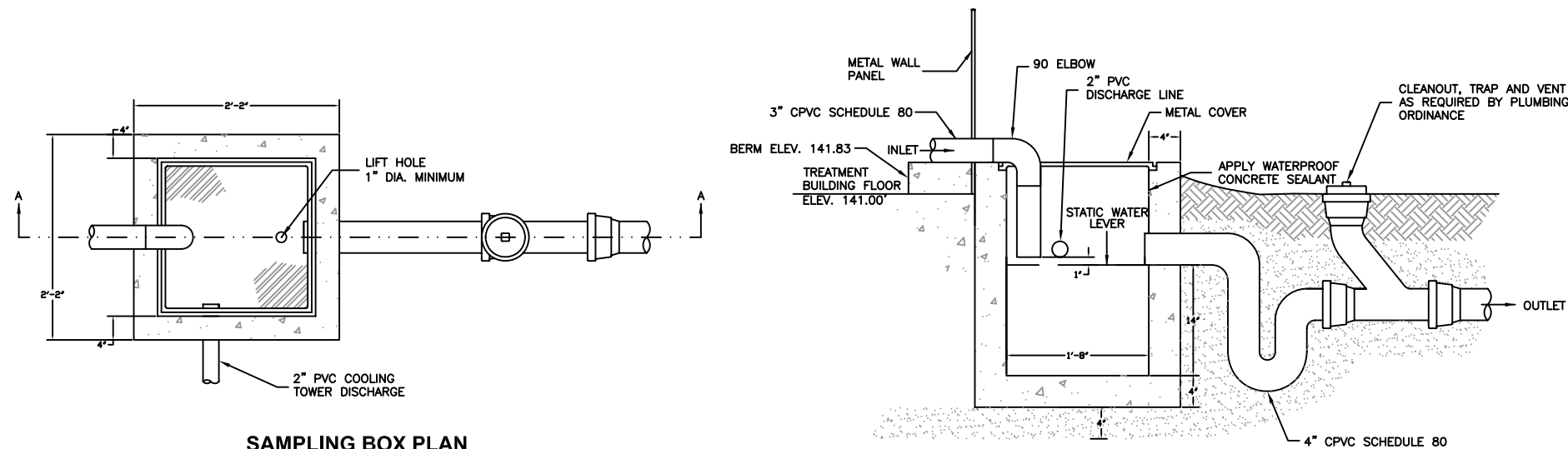
C-8

AS-BUILT



DUAL PHASE AND VAPOR EXTRACTION MANIFOLD DETAIL

0 0.5' 1.0'
APPROXIMATE SCALE IN FEET



SAMPLING BOX PLAN
NOT TO SCALE

SECTION A - A
NOT TO SCALE

LEGEND:

- PROPOSED CONCRETE SLAB AND FOOTINGS
- PROPOSED SAND BACKFILL OR APPROVED NATIVE MATERIAL
- PROPOSED SURFACE COMPLETION PER DRAWING C-15A AND C-16

NOTES:

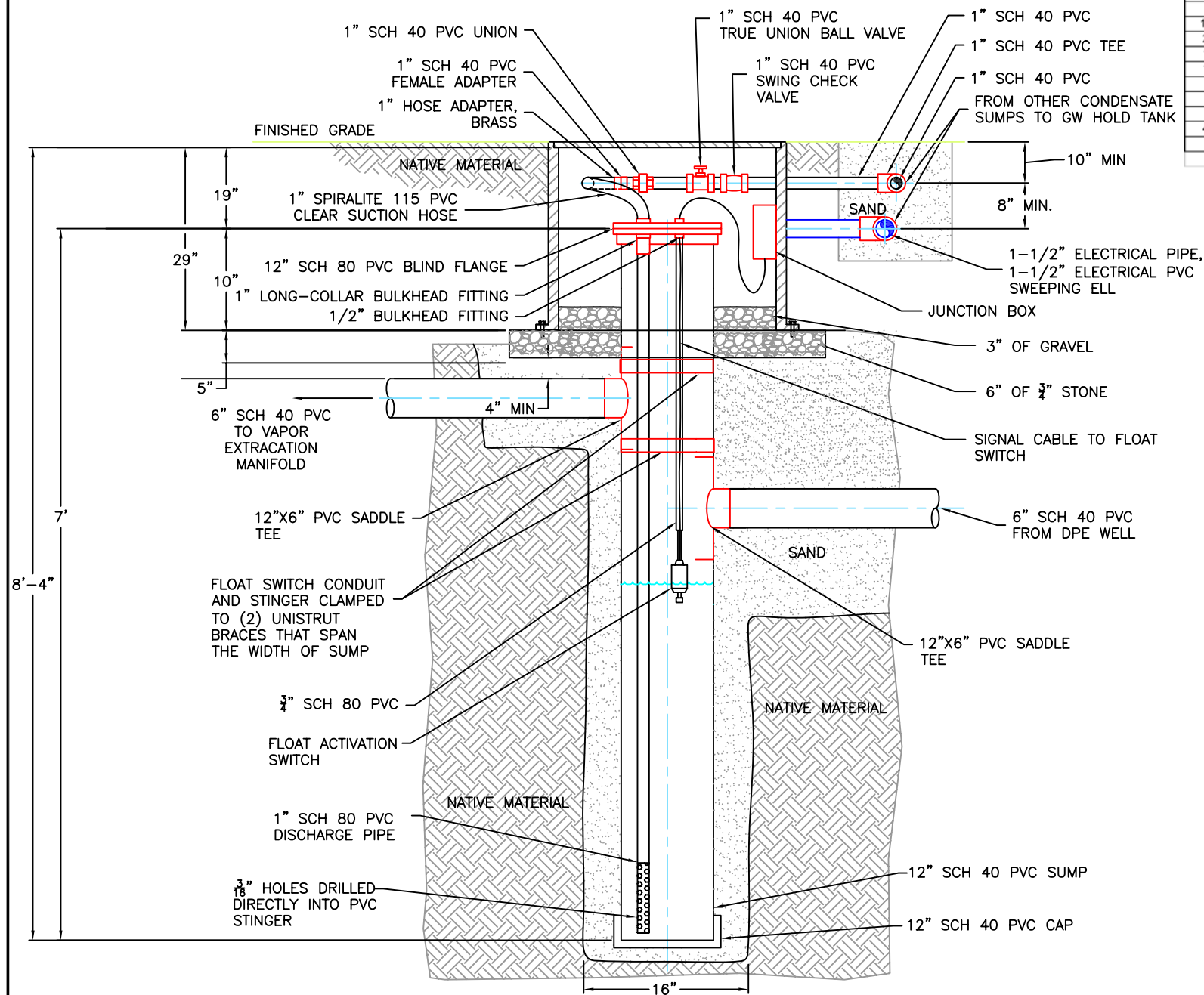
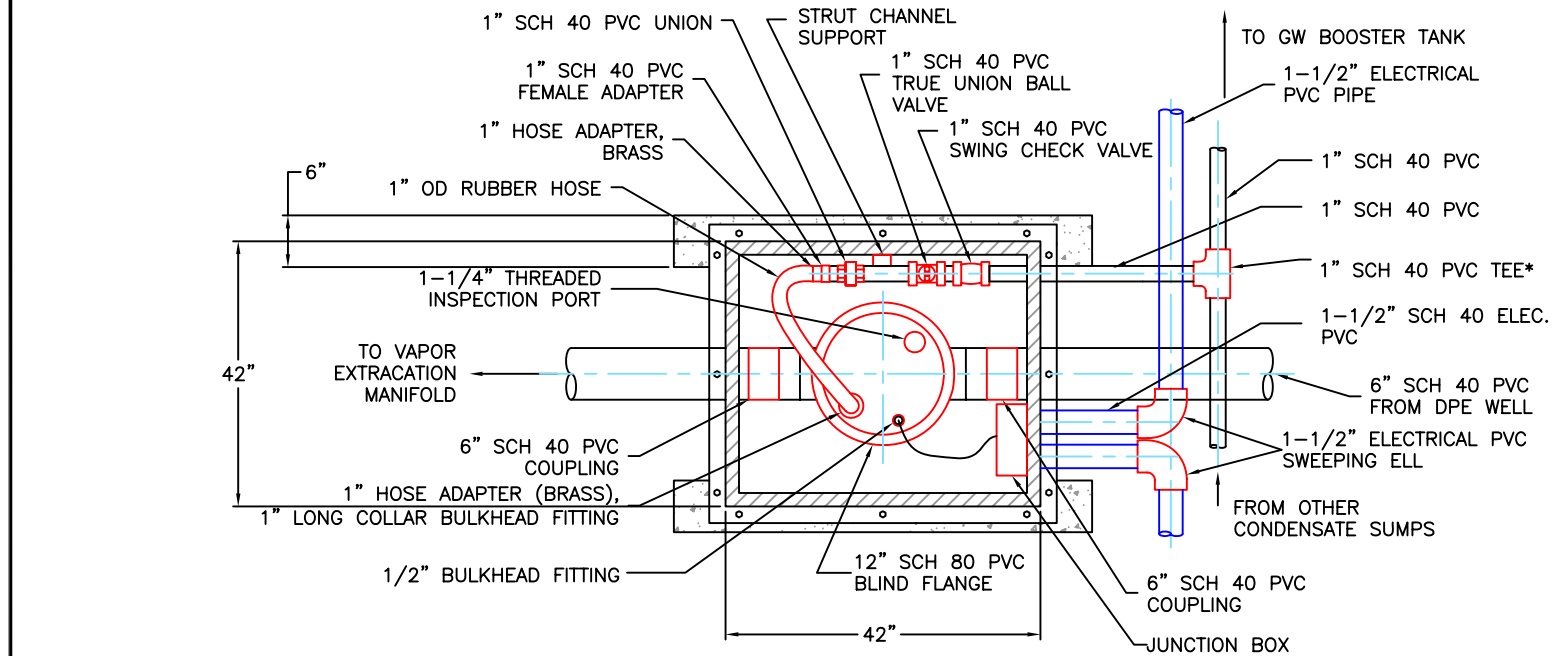
1. THE MANIFOLD SYSTEM SHALL BE SUPPORTED BY A UNI-STRUT RACK SYSTEM THAT IS BRACED TO THE BUILDING COLUMNS. THE RACK SYSTEM SHALL BE INSPECTED IN ACCORDANCE WITH SPECIFICATION SECTION 13080-SEISMIC PROTECTION FOR MISCELLANEOUS EQUIPMENT.
2. THE ENTIRE MANIFOLD SYSTEM SHALL BE CONSTRUCTED FROM SCHEDULE 80 PVC TO WITHSTAND HIGH VACUUM AND HIGH CONTAMINANT CONCENTRATION EXTRACTED FROM ERH TREATMENT AREA.
3. PIPE SUPPORTS AND BRACKETS (NOT SHOWN) SHALL BE USED ACCORDING TO PIPE MANUFACTURER'S RECOMMENDATIONS.
4. PITOT PORT TO CONSIST OF A 3/4" NPT SWAGE LOCK BORE THROUGH CLEAR MANIFOLD LEG AND PLUG.
5. THE APPROVAL OF THE COUNTY ENGINEER FOR SAMPLING BOX MUST BE OBTAINED BEFORE INSTALLATION. ELEVATE THE SIDE WALLS ABOVE THE SURROUNDING GROUND SURFACE TO EXCLUDE STORM WATER.

MISCELLANEOUS PIPE DETAILS

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

PREPARED FOR: U.S. Environmental Protection Agency Region IX San Francisco, California		PREPARED BY: OTIE On-Time Total Integrated Enterprises	
SCALE: AS SHOWN	APPROVED AS BUILT	DATE: 08/23/2010	DRAWING
DESIGNED: JW & PV			
DRAWN: CBG & JBP			
CHECKED: JW			C-9

AS-BUILT



UNIT		ITEM DESCRIPTION	MATERIAL/SCHEDULE	CONNECTIONS
7	EA	42x42x29-IN VAULT BOX WITH COVER	STEEL	--
80	FT	12-IN PIPE	SCH40 PVC	--
30	FT	6-IN PIPE	SCH40 PVC	--
60	FT	1-1/2-IN PIPE	SCH40 PVC	--
60	FT	1-IN PIPE	SCH40 PVC	--
80	FT	1-IN DISCHARGE PIPE	SCH80 PVC	--
16	EA	12x6-IN SADDLE	SCH80 PVC	SxSxS
8	EA	12-IN VAN STONE FLANGE	SCH80 PVC	--
8	EA	12-IN BLIND FLANGE	SCH80 PVC	--
32	EA	6-IN VAN STONE FLANGE	SCH80 PVC	--
24	EA	FLANGE BOLT PACK KITS WITH GASKET	ZINC BOLTS, VITON GASKET	--
7	EA	1-IN FEMALE ADAPTER	SCH40 PVC	SxFT
7	EA	1-IN LONG-COLLAR BULKHEAD FITTING	SCH80 PVC	FTxFT
7	EA	1/2-IN BULKHEAD FITTING	SCH80 PVC	FTxFT
7	EA	1-IN UNION (VITON O-RINGS)	SCH40PVC	S
7	EA	1-IN TRUE UNION BALL VALVE (VITON O-RINGS)	SCH80 PVC	S
8	EA	1-IN SWING CHECK VALVE	SCH40 PVC	S
7	EA	1-1/2x1-1/2x1-IN REDUCING TEE	SCH40 PVC	SxSxS
2	EA	1-1/2-IN 90 DEGREE ELBOW	SCH40 PVC	S
1	EA	1-1/2x1-IN REDUCER BUSHING	SCH40 PVC	S
7	EA	1-1/4-IN THREADED INSPECTION PORT	--	--
1	EA	QUART OF SCH40 PVC PRIMER	--	--
1	EA	QUART OF SCH40 PVC CEMENT	--	--
1	EA	PINT OF SCH80 PVC PRIMER	--	--
1	EA	PINT OF SCH80 PVC CEMENT	--	--
100	FT	1-1/2-IN ELECTRICAL PVC PIPE	SCH40 PVC	--
15	EA	1-1/2-IN ELECTRICAL SWEEPING ELL	SCH40 PVC	SxS
7	EA	ELECTRICAL JUNCTION BOX	--	--
7	EA	5-FT LENGTH, 1-IN OD COMPRESSED AIR RUBBER HOSE	EPDM	SOCKET QUICK-CONNECT x SWIVEL MT
21	EA	1-IN HOSE ADAPTER	BRASS	HOSExMT
21	EA	1-IN HOSE BARB ADAPTER	BRASS	MT x HOSE BARB
7	EA	FLOAT SWITCH	--	--
100	FT	2 OR 3 CONDUCTOR 16 AWG WIRE	SJOW OIL RESISTANT CPE	--
20	FT	1-5/8-IN STRUT CHANNEL	STEEL	--
14	EA	1-IN PIPE CLAMP	STEEL	--
14	EA	PLASTIC WHITE END CAP	--	--
5	CF	GRAVEL	2-IN BASE AGGREGATE	--
7	EA	1-1/2-IN STABILIZING SLEEVE	SCH40 PVC	--
1	EA	WELD ON 810 A&B ADHESIVE	--	--
42	EA	ANCHOR BOLT	1/2"x2.5" EXPANSION BOLT	--
6	CF	3/4" CRUSHED ROCK	6" BASE BELOW GRAVEL	--

NOTE:


* DPE-B HAS A DEDICATED LINE TO DIAPHRAM PUMP, P-102.

NOTES:

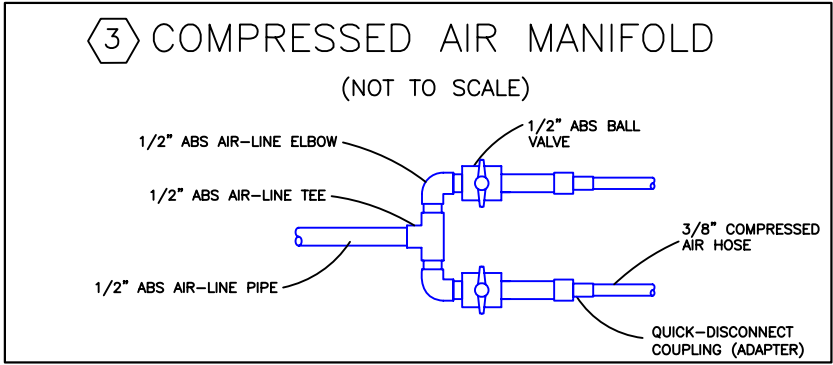
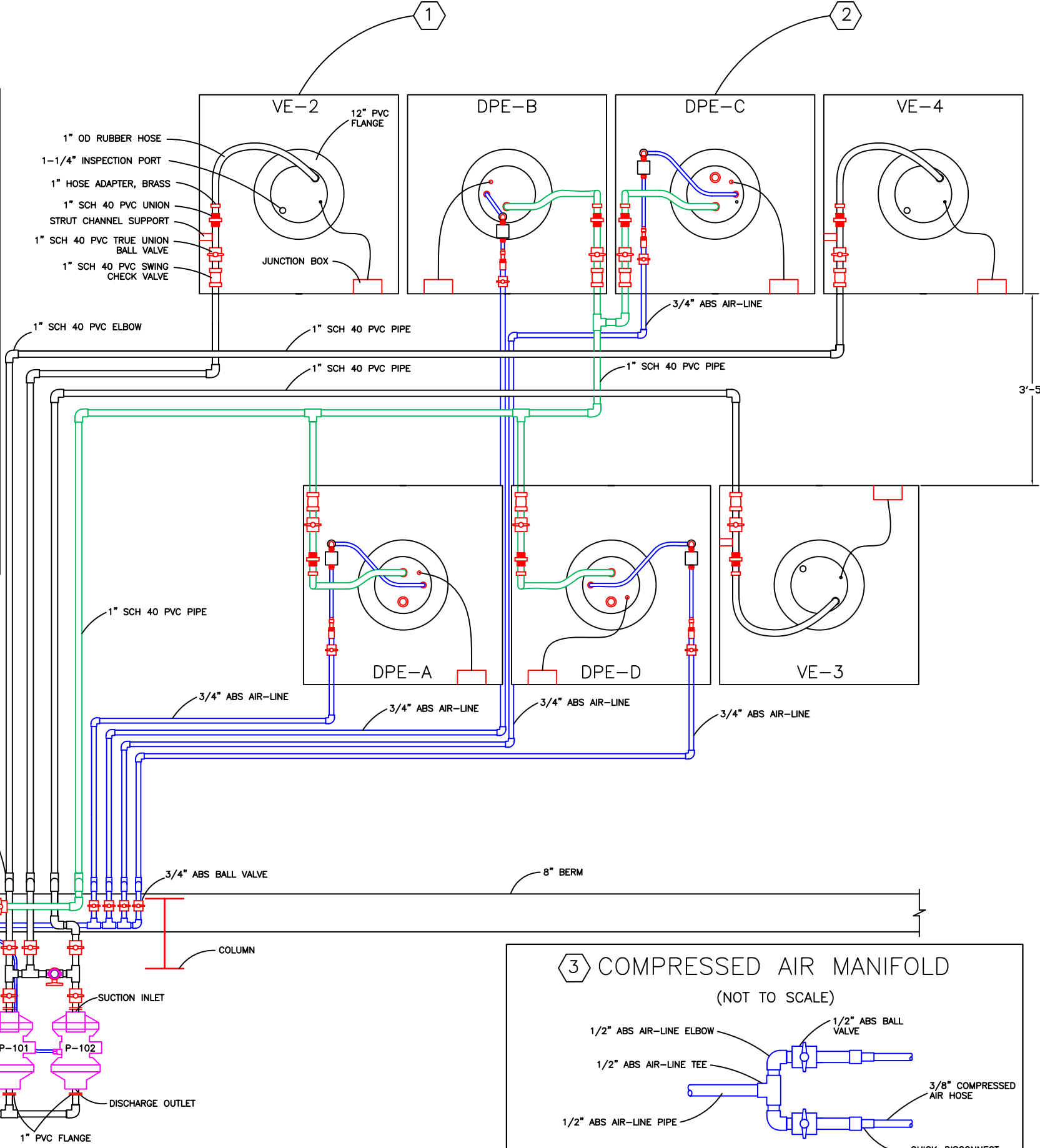
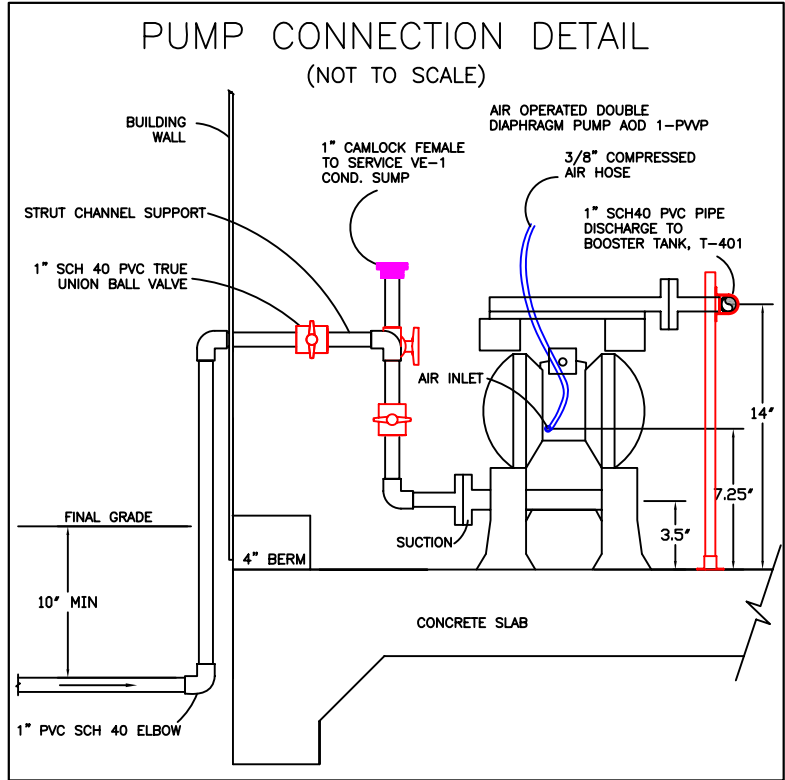
- THE INTENT OF THE CONDENSATE SUMPS IS TO COLLECT LIQUID CONDENSATE FROM "DESIGNED" LOW ELEVATION POINTS WITHIN THE DUAL PHASE EXTRACTION AND VAPOR EXTRACTION PROCESS PIPING.
- DESIGNED PIPING LOW POINTS FOR ALL MAIN TRENCHES OCCUR JUST PRIOR TO ENTRY TO THE TREATMENT COMPOUND. ONE CONDENSATE SUMP IS LOCATED IN THE FIELD TO COLLECT CONDENSATE FROM THE BRANCH LINE TO DAB-8.
- INSTALLATION OF ALL PIPING SYSTEMS SHALL BE PERFORMED IN ACCORDANCE WITH SPECIFICATION SECTION 15400-PROCESS PIPING.
- CONDENSATE SUMP VAULTS SHALL BE CONSTRUCTED TO H-10 AND H-20 LOADING REQUIREMENTS IN THE PARK AREA AND IN THE ROADWAYS, RESPECTIVELY.
- CONDENSATE SUMP VAULTS MAY BE CONSTRUCTED OF CONCRETE OR METAL. CONDENSATE SUMP VAULT LIDS SHALL BE CONSTRUCTED OF METAL, BE FLUSH TO GRADE AND BE SPRING OR GAS SHOCK ASSISTED. CONDENSATE SUMP VAULT FOOTINGS SHALL BE CONSTRUCTED OF CONCRETE AND ARE ONLY REQUIRED BENEATH ROADWAYS.
- EXCAVATION AND BACKFILL OF VAULTS SHALL BE PERFORMED IN ACCORDANCE WITH SPECIFICATION SECTION 02211-EARTHWORK AND SECTION 02205-SOIL MATERIALS.
- PIPE SUPPORTS AND BRACKETS SHALL BE USED ACCORDING TO PIPE MANUFACTURER'S RECOMMENDATIONS.
- FLANGE SEAL AND FLANGE PENETRATION MUST BE RATED FOR 25 IN HG VACUUM.
- PLUMBING AND ELECTRICAL INSIDE VAULT MUST BE CONFIGURED FOR "QUICK REMOVAL AND MAINTENANCE OF DROP TUBE AND LEVEL SENSOR.

CONDENSATE SUMP DETAIL

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

PREPARED FOR: U.S. Environmental Protection Agency Region IX San Francisco, California		PREPARED BY: 	
SCALE: AS SHOWN	APPROVED AS BUILT	DATE: 08/23/2010	DRAWING
DESIGNED: JW & DC	DRAWN: DC & JBP	CHECKED: JW	C-10A

AS-BUILT



NOTES:

- 1 PLEASE REFER TO C-10A FOR CONDENSATE SUMP DETAIL, TYPICAL FOR VE-2, VE-3, AND VE-4 CONDENSATE SUMPS.
- 2 PLEASE REFER TO C-10D FOR CONDENSATE SUMP RETROFIT DETAIL, TYPICAL FOR DPE-A, DPE-B, DPE-C, AND DPE-D CONDENSATE SUMPS.

CONDENSATE SUMP MANIFOLD DETAIL

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

PREPARED FOR:
U.S. Environmental
Protection Agency
Region IX
San Francisco, California

PREPARED BY:
OTIE
On-Time Total Integrated Enterprises

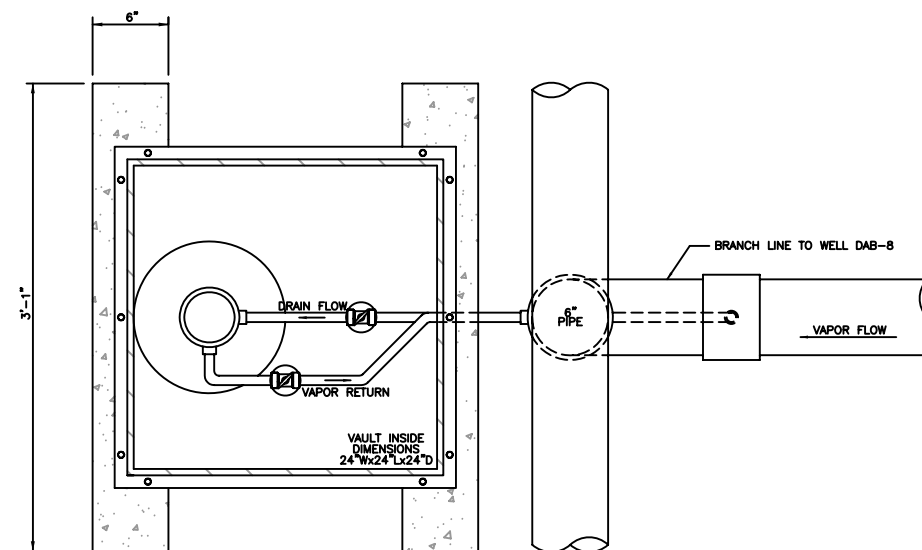
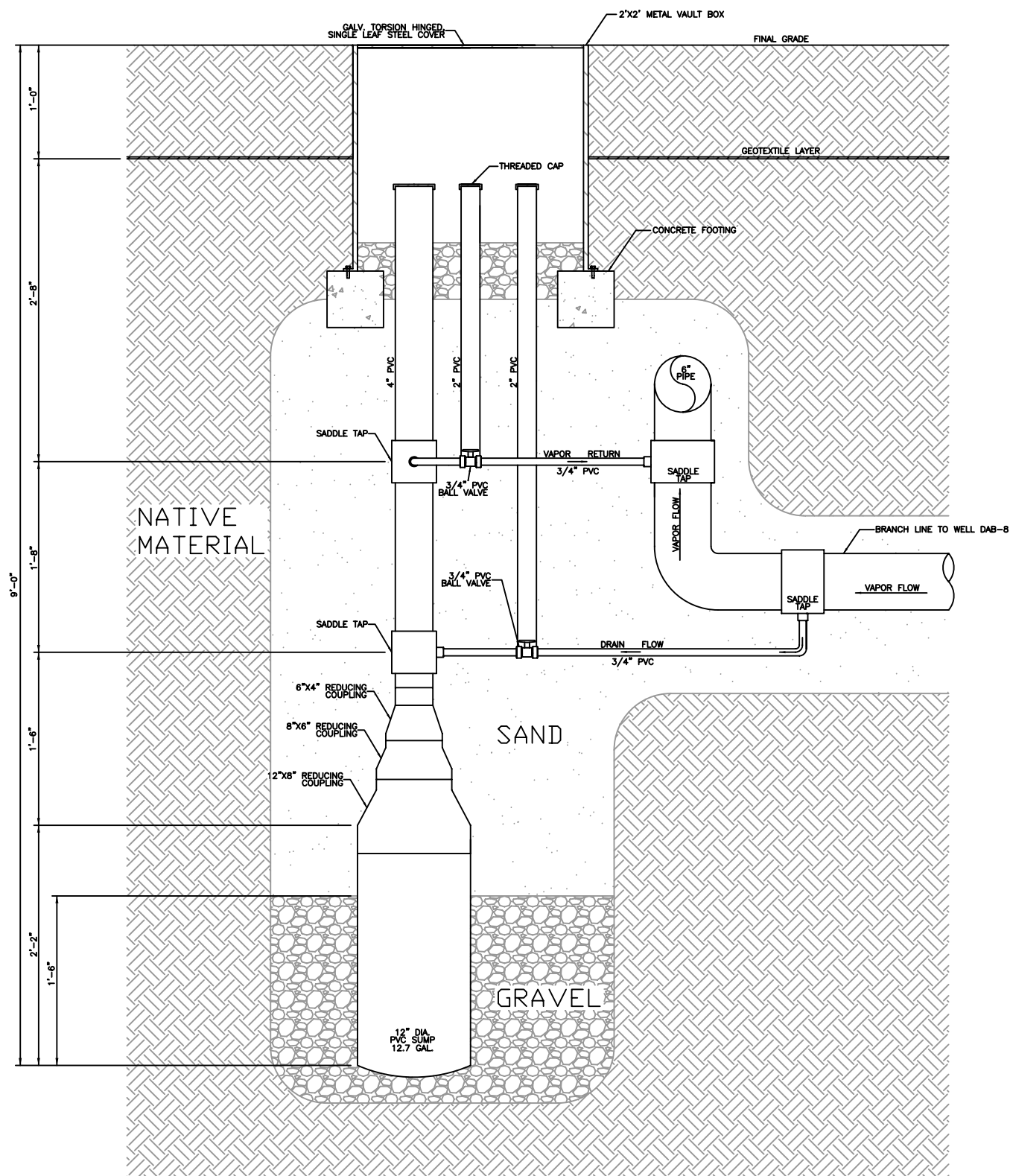
SCALE: AS SHOWN
DESIGNED: JW & DC
DRAWN: DC
CHECKED: JW

APPROVED
AS-BUILT

DATE: 08/23/10
DRAWING

C-10C

AS-BUILT



NOTES:

1. THE INTENT OF THE CONDENSATE SUMPS IS TO COLLECT LIQUID CONDENSATE FROM "DESIGNED" LOW ELEVATION POINTS WITHIN THE DUAL PHASE EXTRACTION AND VAPOR EXTRACTION PROCESS PIPING.
2. DESIGNED PIPING LOW POINTS FOR ALL MAIN TRENCHES OCCUR JUST PRIOR TO ENTRY TO THE TREATMENT COMPOUND. ONE CONDENSATE SUMP IS LOCATED IN THE FIELD TO COLLECT CONDENSATE FROM THE BRANCH LINE TO DAB-8.
3. ADDITIONAL CONDENSATE SUMPS SHALL BE INSTALLED AT DPE OR VE PIPELINE LOW POINTS AS DESIGN/BUILD ITEMS AT THE DISCRETION OF THE PROJECT ENGINEER, BASED ON THE CONTRACTOR'S ABILITY TO MEET THE DESIRED SLOPES, SHOWN IN DRAWING C-12.
4. INSTALLATION OF ALL PIPING SYSTEMS SHALL BE PERFORMED IN ACCORDANCE WITH SPECIFICATION SECTION 15400-PROCESS PIPING.
5. CONDENSATE SUMP VAULTS SHALL BE CONSTRUCTED TO H-10 AND H-20 LOADING REQUIREMENTS IN THE PARK AREA AND IN THE ROADWAYS, RESPECTIVELY.
6. CONDENSATE SUMP VAULTS MAY BE CONSTRUCTED OF CONCRETE OR METAL. CONDENSATE SUMP VAULT LIDS SHALL BE CONSTRUCTED OF METAL, BE FLUSH TO GRADE AND BE SPRING OR GAS SHOCK ASSISTED. CONDENSATE SUMP VAULT FOOTINGS SHALL BE CONSTRUCTED OF CONCRETE AND ARE ONLY REQUIRED BENEATH ROADWAYS.
7. EXCAVATION AND BACKFILL OF VAULTS SHALL BE PERFORMED IN ACCORDANCE WITH SPECIFICATION SECTION 02211-EARTHWORK AND SECTION 02205-SOIL MATERIALS.
8. CONDENSATE SUMP PLUMBING MAY BE CONSTRUCTED AS DESIGN/BUILD IN ORDER TO REDUCE VAULT SIZE REQUIREMENTS, IMPROVE WORKING AREA/ACCESS OR ACCOMMODATE IMPROVED MATERIALS OR EQUIPMENT; WITH APPROVAL FROM THE PROJECT ENGINEER.
9. PIPE SUPPORTS AND BRACKETS (NOT SHOWN) SHALL BE USED ACCORDING TO PIPE MANUFACTURER'S RECOMMENDATIONS.

REMOTE CONDENSATE SUMP DETAILS

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

PREPARED FOR:
U.S. Environmental
Protection Agency
Region IX
San Francisco, California

PREPARED BY:

 **OTIE**
Oneida Total Integrated Enterprises

SCALE: AS SHOWN

DESIGNED: JW & PV

DRAWN: CBG

CHECKED: JW

APPROVED
AS-BUILT

DATE:	03/14/2005
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

















































DRAWING







































































REV



















































C-18 7

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AS-BUILT

SYMBOL	DESCRIPTION
	CEILING OUTLET AND INCANDESCENT OR H.I.D. TYPE LUMINAIRE "3" INDICATES BRANCH CIRCUIT NUMBER, "o" INDICATES CONTROLLING SWITCH
	CEILING FIXTURE, OUTLET AND FLUORESCENT LUMINAIRE, NOTATIONS SAME AS ABOVE.
	WALL OUTLET AND INCANDESCENT OR H.I.D. LIGHTING FIXTURE.
	EMERGENCY LIGHTING BATTERY UNIT WITH TWO LAMP HEADS
	REMOTE ADJUSTABLE EMERGENCY LAMP HEAD
	HID OR INCANDESCENT LUMINAIRE ON EMERGENCY CIRCUIT
	WALL OUTLET AND EXIT SIGN, DIRECTIONAL ARROWS AS NOTED
	SHORT DASH FOR EACH PHASE CONDUCTOR, LONG DASH FOR NEUTRAL CONDUCTOR, NO. 12 AWG, 3/4\"
	CONDUIT TURNING UP
	CONDUIT TURNING DOWN
	CONDUIT STUBBED OUT AND CAPPED
	CONDUIT RUN EXPOSED, (2)#12, 1/#20, 3/4\"
	CONDUIT RUN CONCEALED, (2)#12, 1/#20, 3/4\"
	LIQUIDTIGHT FLEXIBLE CONDUIT
	1\"
	HOMERUN TO LIGHTING PANEL LP-1 SHALL BE 1\"
	HOMERUN TO BATTERY UNIT BU-1 SHALL BE 1\"
	HOMERUN TO MOTOR CONTROL CENTER MCC SHALL BE 1\"
	JUNCTION BOX
	DISTRIBUTION PANELBOARD
	LIGHTING PANELBOARD
	CONDUIT, SIZE AND FILL AS NOTED.
	THREE (3) NO.12 AND CONDUCTORS AND ONE (1) NO.12 EQUIPMENT GROUNDING CONDUCTOR
	MULTI-CONDUCTOR, JACKETED POWER OR CONTROL CABLE, NUMBER AND SIZE OF CORE CONDUCTORS AS NOTED, QUANTITY AS NOTED IF MORE THAN ONE.
	INSTRUMENT CABLE, TWISTED PAIR OR TRIPLEX AS NOTED WITH OVERALL SHIELD AND JACKET, CONDUCTOR SIZE AND QUANTITY AS NOTED
	SINGLE POLE SWITCH, \"o\" INDICATES CONTROL OF LIGHTS \"o\"
	THREE WAY SWITCH, \"o\" INDICATES CONTROL OF LIGHTS \"o\"
	DUPLEX RECEPTACLE, 120V, 3W, SINGLE PHASE \"o\" - MOUNTED ABOVE COUNTER TOP \"o\" - GROUND FAULT INTERRUPTER TYPE \"o\" - WEATHERPROOF 3 - BRANCH CIRCUIT NUMBER
	SINGLE RECEPTACLE, 240V, 3W, SINGLE PHASE, AMPERE RATING AS NOTED \"o\" - LOCKING TYPE \"o\" - WEATHERPROOF
	SINGLE RECEPTACLE, 480V, 4W, THREE PHASE, AMPERE RATING AS NOTED IF OTHER THAN 20 \"o\" - WEATHERPROOF
	DUPLEX RECEPTACLE AND FLOOR BOX
	ANALOG TERMINAL BOX PROVIDED BY DIVISION 11
	DISCRETE TERMINAL BOX PROVIDED BY DIVISION 11
	POWER (480 VOLT) TERMINAL BOX PROVIDED BY DIVISION 11
	TELEPHONE CABINET OR BACKBOARD AS SPECIFIED
	LIGHTING CONTACTOR, MECHANICALLY HELD TYPE
	ELECTRIC HEAT TRACE CONNECTION NOT REFER TO DETAIL
	PHOTOCELL
	MANUAL FIRE ALARM STATION
	HEAT ACTUATED FIRE DETECTOR (* INDICATES TEMPERATURE RATING)
	SMOKE DETECTOR
	FIRE ALARM HORN
	FIRE ALARM HORN AND LIGHT COMBINATION
	SPRINKLER FLOW ALARM SWITCH
	VALVE SUPERVISORY SWITCH
	WEATHER PROOF HI-INTENSITY FIRE ALARM STROBE LIGHT
	DOOR SWITCH
	ELECTRIC DOOR STRIKE
	SECURITY MOTION DETECTOR
	SOLID STATE METERING & PROTECTION MODULE

ONE LINE OR ELEMENTARY DIA.	PLAN	DESCRIPTION
		LOW VOLTAGE CIRCUIT BREAKER, THREE POLE UNLESS NOTED OTHERWISE
		COMBINATION MOTOR CIRCUIT PROTECTOR AND MAGNETIC MOTOR STARTER, FULL VOLTAGE NON-REVERSING UNLESS NOTED OTHERWISE * FVR - FULL VOLTAGE REVERSING * FVRH - REDUCED VOLTAGE NON-REVERSING * 2S1W - TWO SPEED, ONE WINDING * 2S2W - TWO SPEED, TWO WINDING NUMERICAL INDICATES STARTER SIZE IF OTHER THAN SIZE 1
		NON-FUSIBLE DISCONNECT SWITCH, 600 VOLT, 3 POLE * AMPERE RATING NOTED IF OTHER THAN 30A
		FUSIBLE DISCONNECT SWITCH, 600 VOLT, 3 POLE AMPERE RATING AND FUSE SIZE AS NOTED
		MANUAL MOTOR STARTER WITH THERMAL OVERLOAD HEATER \"R\" INDICATES RED RUNNING LIGHT
		TRANSFORMER, RATING AND CONNECTIONS AS NOTED
		CURRENT TRANSFORMER * QUANTITY AND CURRENT RATIO
		POTENTIAL TRANSFORMER * QUANTITY AND VOLTAGE RATIO
		LIGHTNING ARRESTER
		CAPACITOR
		GROUND OR GROUND ROD
		FUSE, AMPERE RATING AS NOTED
		MOTOR, NUMERAL INDICATES HORSEPOWER
		GENERATOR, RATINGS AND CONNECTIONS AS NOTED
		TACHOMETER GENERATOR
		VOLTMETER WITH SWITCH, 3 PHASE * RANGE AS NOTED
		AMMETER WITH SWITCH, 3 PHASE * RANGE AS NOTED
		METER - INDICATING/RECORDING TYPE * WM - WATTMETER * WMH - WATTHOUR METER * WMH - WATTHOUR DEMAND METER * PF - POWER FACTOR METER * RT - RUNNING TIME METER TRANSDUCER * AX - CURRENT TRANSDUCER * WX - WATT TRANSDUCER * WMH - WATT/WATTHOUR TRANSDUCER
		PROTECTIVE RELAY, NO. AS INDICATED: 22 - UNDERVOLTAGE RELAY 38 - BEARING PROTECTIVE DEVICE 42 - RUNNING CIRCUIT BREAKER OR CONTACTOR 46 - REVERSE PHASE, OR PHASE BALANCE, CURRENT RELAY 47 - PHASE SEQUENCE VOLTAGE RELAY 49 - MACHINE OR TRANSFORMER THERMAL RELAY 50 - INSTANTANEOUS OVERCURRENT, OR RATE-OF-RISE RELAY 500 - INSTANTANEOUS GROUND RELAY, ZERO SEQUENCE B1 - AC TIME OVERCURRENT RELAY S1H - AC TIME OVERCURRENT RELAY , NEUTRAL GROUND 68 - LOCKING-OUT RELAY 87 - DIFFERENTIAL PROTECTIVE RELAY
		UNIT HEATER - ELECTRIC HEATING COIL AND FAN
		UNIT HEATER - STEAM OR WATER HEATING COIL AND FAN
		KEY RESET STATION
		VOLTAGE OR CURRENT TEST BLOCK
		MECHANICAL CONNECTION OR INTERLOCK
		CONDUCTORS OR CONDUITS CROSSING PATHS BUT NOT CONNECTED
		CONDUCTORS ELECTRICALLY CONNECTED
		INDICATES LIMITS OF EQUIPMENT OR WIRING ENCLOSURE
		PUSHBUTTON, MOMENTARY CONTACT, SPRING RETURN , NORMALLY CLOSED
		PUSHBUTTON, MOMENTARY CONTACT, SPRING RETURN NORMALLY OPEN
		EMERGENCY STOP PUSHBUTTON WITH RED MUSHROOM HEAD OPERATOR , MAINTAINED CONTACT, PUSH-TO-STOP PULL TO RESET.
		START-STOP PUSHBUTTON CONTROL STATION
		START-STOP PUSHBUTTON CONTROL STATION WITH LOCKOUT DEVICE ON STOP
		START-STOP PUSHBUTTON CONTROL STATION, MAINTAINED CONTACT WITH LOCKOUT DEVICE ON STOP
		TWO POSITION SELECTOR SWITCH, MAINTAINED CONTACT POSITION 1-CONTACT 2-CONTACT A X O X-CLOSED B O X O-OPEN
		THREE POSITION SELECTOR SWITCH, MAINTAINED CONTACT POSITION 1-CONTACT 2-CONTACT 3-CONTACT A X O X-CLOSED B O G X O-OPEN C O X - * NAMEPLATE (A/B/C) HOA - HAND/OFF/AUTO LOR - LOCAL/OFF/REMOTE RSL - RAISE/STOP/LOWER

ONE LINE OR ELEMENTARY DIA.	PLAN	DESCRIPTION
		LIQUID LEVEL (FLOAT) SWITCH NORMALLY OPEN, CLOSSES ON RISING LEVEL NORMALLY CLOSED, OPENS ON RISING LEVEL
		PRESSURE OR VACUUM SWITCH NORMALLY OPEN, CLOSSES ON LOW PRESSURE SET POINT NORMALLY CLOSED, OPENS ON RISING PRESSURE
		TEMPERATURE ACTUATED SWITCH (THERMOSTAT) NORMALLY OPEN, CLOSSES ON RISING TEMPERATURE NORMALLY CLOSED, OPENS ON RISING TEMPERATURE
		FLOW SWITCH (AIR, WATER, ETC.) NORMALLY OPEN, CLOSSES ON INCREASED FLOW NORMALLY CLOSED, OPENS ON INCREASED FLOW
		POSITION (LIMIT) SWITCH NORMALLY OPEN NORMALLY OPEN - HELD CLOSED NORMALLY CLOSED NORMALLY CLOSED - HELD OPEN
		SOLENOID OPERATED VALVE
		STRIP HEATER OR HEATING ELEMENT
		SURGE CONTROL VALVE
		PILOT LIGHT, COLOR AS NOTED * R - RED * G - GREEN * B - BLUE * W - WHITE
		PILOT LIGHT, PUSH TO TEST TYPE * COLOR AS NOTED ABOVE
		RELAY COIL, NUMBER AS INDICATED
		MOTOR STARTER COIL, NUMBER AS INDICATED
		CONTACT, NORMALLY OPEN (NO)
		CONTACT, NORMALLY CLOSED (NC)
		OVERLOAD RELAY HEATER (OL)
		TIME DELAY RELAY, RANGE AS NOTED NOTC - NORMALLY OPEN, TIMED CLOSE WHEN ENERGIZED NCTO - NORMALLY CLOSED, TIMED OPEN WHEN ENERGIZED NOTO - NORMALLY CLOSED, TIMED OPEN WHEN DE-ENERGIZED NCTC - NORMALLY CLOSED, TIMED CLOSE WHEN DE-ENERGIZED
		RESISTANCE TEMPERATURE DETECTOR
		MOTOR OPERATED VALVE, SERIAL LOOP CONNECTED
		FIELD INSTRUMENT, TAG NO. AS INDICATED ## - INDICATES LOOP NO. # - INDICATES INSTRUMENT TYPE AE - ANALYZING ELEMENT (PH, ORP, DO, ETC.) AT - ANALYZING TRANSMITTER DT - DENSITY TRANSMITTER FE - FLOW ELEMENT FS - FLOW SWITCH FT - FLOW TRANSMITTER FY - FLOW TRANSDUCER LE - LEVEL ELEMENT LS - LEVEL SWITCH LT - LEVEL TRANSMITTER PDS - PRESSURE DIFFERENTIAL SWITCH PT - PRESSURE TRANSMITTER SI - SPEED INDICATOR TE - TEMPERATURE ELEMENT TS - TEMPERATURE SWITCH TT - TEMPERATURE TRANSMITTER ZS - POSITION SWITCH HS - HAND SWITCH
		DAMPER MOTOR
		INDICATES THAT ALL LUMINAIRES WITHIN THE ROOM OR AREA IN WHICH THIS NOTATION APPEARS SHALL BE TYPE \"A\" UNLESS OTHERWISE NOTED
		INDICATES THAT ALL ELECTRICAL EQUIPMENT AND MATERIALS INSTALLED WITHIN THE ROOM OR AREA IN WHICH THIS NOTATION APPEARS SHALL BE OF NEMA 12 CONSTRUCTION AND SUITABLE FOR USE IN A DAMP OR WET LOCATION
		INDICATES THAT ALL ELECTRICAL EQUIPMENT AND MATERIALS INSTALLED WITHIN THE ROOM OR AREA IN WHICH THIS NOTATION APPEARS SHALL BE OF NEMA 4X CONSTRUCTION SUITABLE FOR USE IN A WET LOCATION, UNLESS NOTED OTHERWISE
		INDICATES THAT ALL ELECTRICAL EQUIPMENT AND MATERIALS INSTALLED WITHIN THE ROOM OR AREA IN WHICH THIS NOTATION APPEARS SHALL BE OF NEMA 4X CONSTRUCTION SUITABLE FOR USE IN A WET LOCATION, UNLESS NOTED OTHERWISE
		INDICATES THAT ALL ELECTRICAL EQUIPMENT AND INSTALLATION WITH THE ROOM OR AREA IN WHICH THIS NOTATION APPEARS SHALL CONFORM TO N.E.C. REQUIREMENTS FOR THE HAZARDOUS AREA CLASSIFICATION SHOWN

SHEET NO. WHERE
DETAIL IS DRAWN

SYMBOL WHERE THERE IS A DETAIL

SUBTITLE
DETAIL
1\" = 1\"
SHEET NO. WHERE
THERE IS A DETAIL

SYMBOL WHERE DETAIL IS DRAWN

DETAIL SYMBOL

SHEET NO. WHERE
SECTION IS DRAWN

SYMBOL WHERE THERE IS A DETAIL

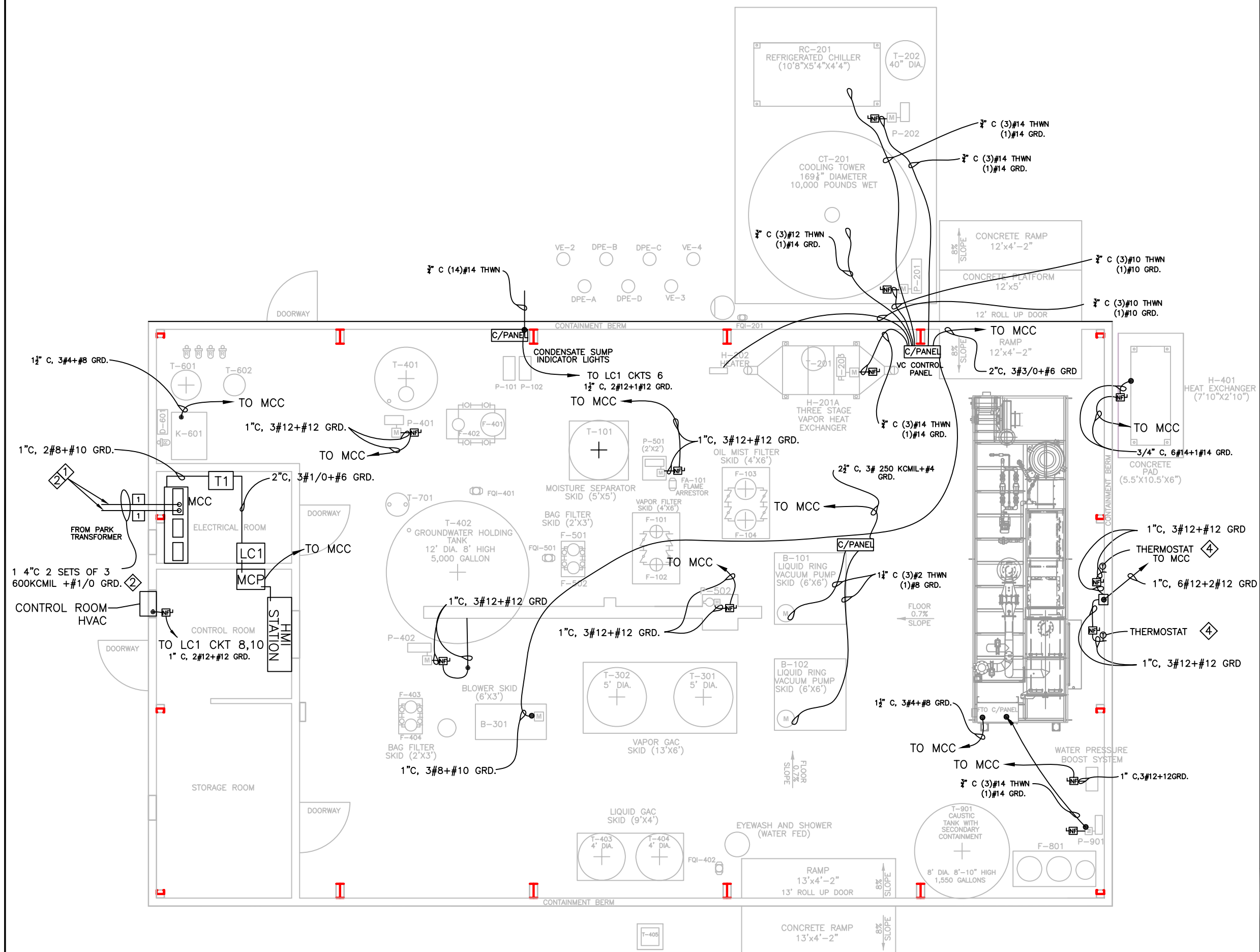
SUBTITLE
SECTION
1\" = 1\"
SHEET NO. WHERE
SECTION IS TAKEN

SYMBOL WHERE SECTION IS DRAWN



SECTION SYMBOL

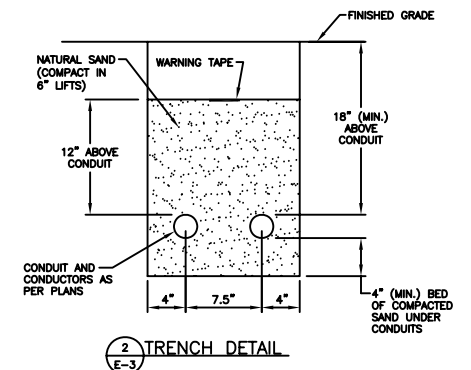
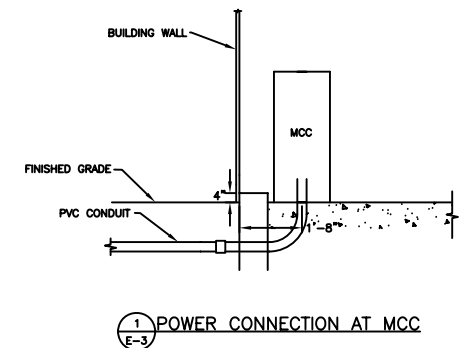
ABBREVIATIONS

AL	ALTERNATING CURRENT
AF	ABOVE FINISHED FLOOR
AG	ABOVE GRADE
ALUM	ALUMINUM
AMP	AMPERE
ATS	AUTOMATIC TRANSFER SWITCH
AUTO	AUTOMATIC
AUX	AUXILIARY
AWG	AMERICAN WIRE GAUGE
C	CONDUIT
CB	CIRCUIT BREAKER
CKT	CIRCUIT
CLF	CURRENT LIMITING FUSE
CPT	CONTROL POWER TRANSFORMER
CR	CONTROL RELAY
CS	CONTROL SWITCH
CT	CURRENT TRANSFORMER
CU	COPPER
DC	DIRECT CURRENT
DI	DOOR INTERLOCK
DN	DOWN
EC	EMPTY CONDUIT
ELEC	ELECTRICAL
ELEV	ELEVATION
EM	EMERGENCY
EO	ELECTRICALLY OPERATED
FB	FURNISHED BY OTHERS
FO	FIBER OPTIC
FRP	FIBERGLASS REINFORCED POLYESTER
GU	GENERATOR
GCP	GENERATOR CONTROL PANEL
GEN	GENERATOR
G, GND	GROUND
GF	GROUND FAULT INTERRUPTER
GRS	GALVANIZED RIGID STEEL
H	HANDHOLE
HT	HEIGHT
HZ	HERTZ
INST	INSTANTANEOUS
INTR	INSTRUMENT
IR	IRRADIATING ARRESTER
LTS	LIGHTS
L.P.	LIGHTING PANEL
MCC	MOTOR CONTROL CENTER
MFR	MANUFACTURER
MF	MULTIFUNCTION METER
MH	MANHOLE
MTG	MOUNTING
MTD	MOUNTED
MS	MANUAL SWITCH
NC	NORMALLY CLOSED
NO	NORMALLY OPEN OR NUMBER
NTS	NOT TO SCALE
OL	OVERLOAD
PF	POWER FACTOR CORRECTION CAPACITOR
PH	PHASE
PR	PAIR
PT	POTENTIAL TRANSFORMER
PVC	POLYVINYL CHLORIDE
QTY	QUANTITY
RK	RACK
SC	SURGE CAPACITOR
SEC	SECONDS OR SECONDARY
SH	SHIELDED OR SHEET
SN	SOLID NEUTRAL
SS	STAINLESS STEEL
SV	SOLENOID VALVE
SW	SWITCH
SWGR	SWITCHGEAR
TC	TIME DELAY ON CLOSING
TEL	TELEPHONE
TO	TIME DELAY ON OPENING
TRW	TRUSTED
TYP	TYPICAL
UG	UNDERGROUND
V	VOLTS
VF	VARIABLE FREQUENCY DRIVE
W	WIRE
WP	WEATHERPROOF
XP	EXPLOSION PROOF
FMFR	TRANSFORMER



PLAN NOTES:

1. SEE DETAIL 
2. SEE DETAIL 
3. CONNECTION IS TO BE MADE DIRECTLY TO THE DISCONNECT SWITCH AT EACH SUMP. SEE DWG C-10.
4. INSTALL THERMOSTAT SWITCH WITH ADJUSTABLE SET POINT BETWEEN 80 AND 110°F



0 4 8
APPROXIMATE SCALE IN FEET

TREATMENT COMPOUND ELECTRICAL PLAN

PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

PREPARED FOR:
U.S. Environmental
Protection Agency
Region IX
San Francisco, California

PREPARED BY:



SCALE: AS SHOWN

APPROVED

DATE: 08/23/2010

DESIGNED: J.S.

AS BUILT

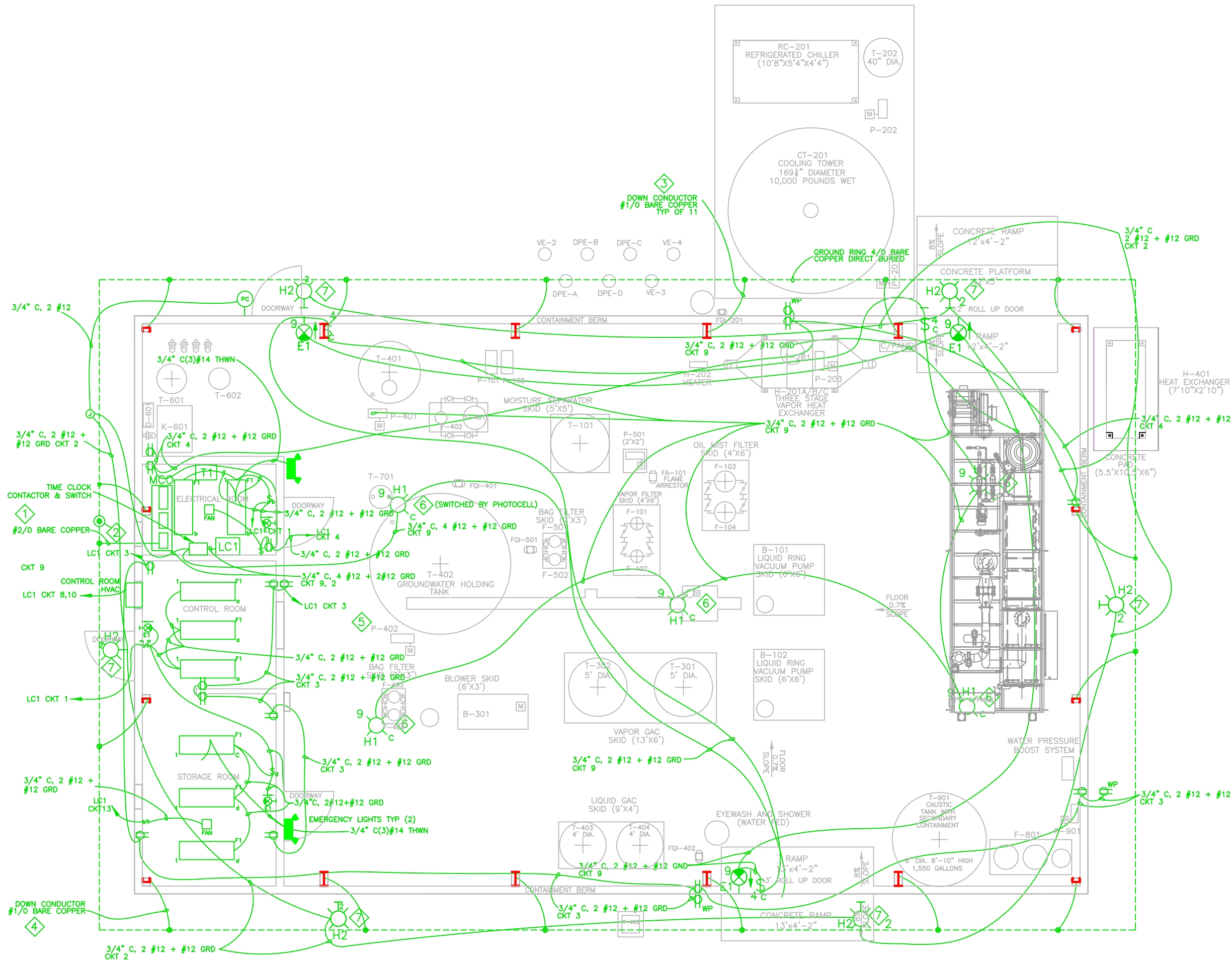
DRAWING

DRAWN: CPL

53

E-3

AS-BUILT

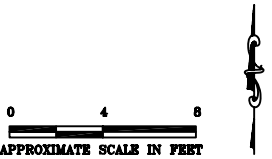


GENERAL NOTES:

1. FIXTURES F1 ARE TO BE MOUNTED 8' AFF.
2. FIXTURES H1 ARE TO BE MOUNTED 12' AFF.
3. LOCATE EXIT LIGHTS AT AN ELEVATION OF 8' ABOVE CURB.
4. CONTRACTOR TO PROVIDE FOR SEISMIC PROTECTION OF ELECTRICAL EQUIPMENT IN ACCORDANCE WITH SPECIFICATION SECTION 16070A.
5. THE DOOR TO THE ELECTRICAL AND CONTROL ROOM SHOULD BE PROVIDED WITH LOUVERS OR CUT FOR A 1" GAP AT THE BOTTOM.
6. CONNECTIONS MADE TO THE GROUND RING AND ALL OTHER CONNECTIONS, BONDS, AND SPLICER SHALL BE DONE BY EXOTHERMIC WELDS OR BY HIGH COMPRESSION FITTINGS THAT ARE LISTED FOR THE PURPOSE. REFER TO SPECIFICATION SECTION 13100 FOR MORE DETAIL.


PLAN NOTES:

1. CONNECTION TO MCC GROUND BUS TO BE PROTECTED IN CONDUIT WHILE THE CONDUCTOR IS ABOVE GRADE. ROUTE VIA SHORTEST PATH OVER THE CONTAINMENT BERM. SEE DETAIL
2. GROUNDING ELECTRODE AND TEST STATION SEE DETAIL
3. SEE DETAIL
4. SEE DETAIL
5. SEE DETAIL
6. SEE DETAIL
7. LOCATE OUTDOOR FIXTURES AT AN ELEVATION OF 8' ABOVE CURB SEE DETAIL
8. CONTRACTOR TO PROVIDE 2 SPEED EXHAUST FAN, DAYTON MODEL 2D067 OR APPROVED EQUAL.
9. CONTRACTOR TO PROVIDE THERMOSTAT, TS, HONEYWELL MODEL T4039M1004 OR APPROVED EQUAL. SET THE FAN FOR LOW SPEED OPERATION IN THE ELECTRICAL ROOM AND IN THE STORAGE ROOM.

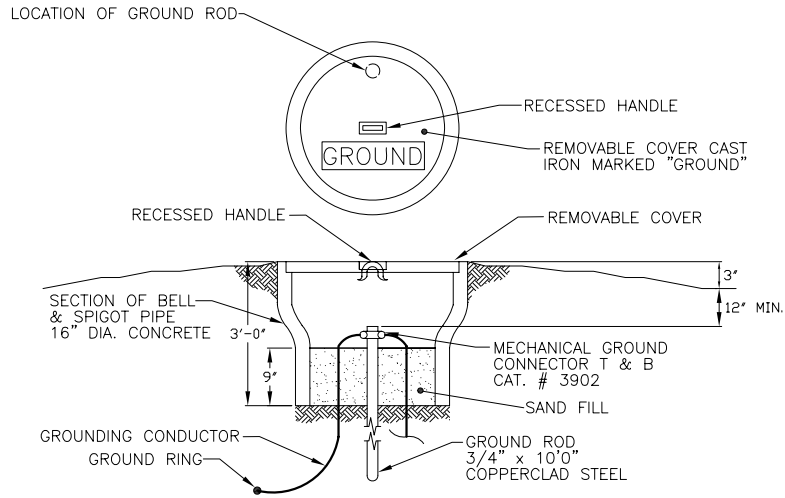


MISCELLANEOUS ELECTRICAL SECTIONS

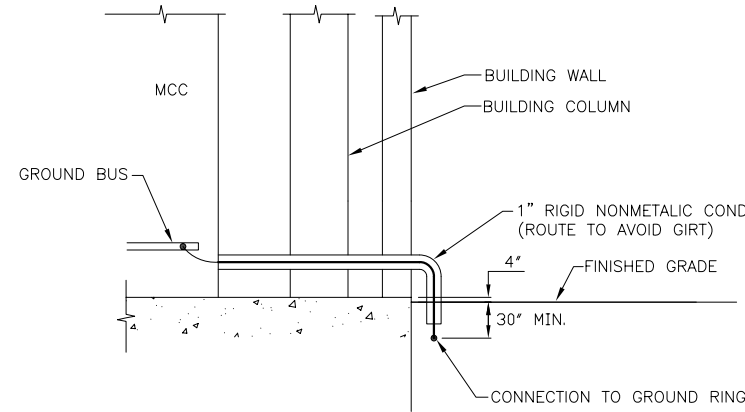
PEMACO SUPERFUND SITE
5050 EAST SLAUSON AVENUE
MAYWOOD, CALIFORNIA

PREPARED FOR: U.S. Environmental Protection Agency Region IX San Francisco, California		PREPARED BY:  OTIE On-Time Total Integrated Enterprises	
SCALE: AS SHOWN	APPROVED AS BUILT		DATE: 08/23/2010
DESIGNED: J.S.			DRAWING E-4
DRAWN: CPL			
CHECKED: J.W.			

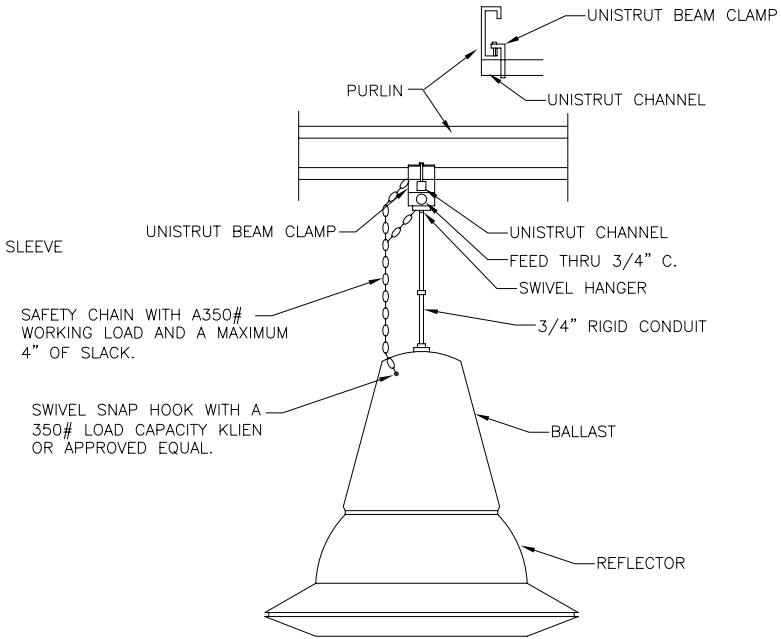
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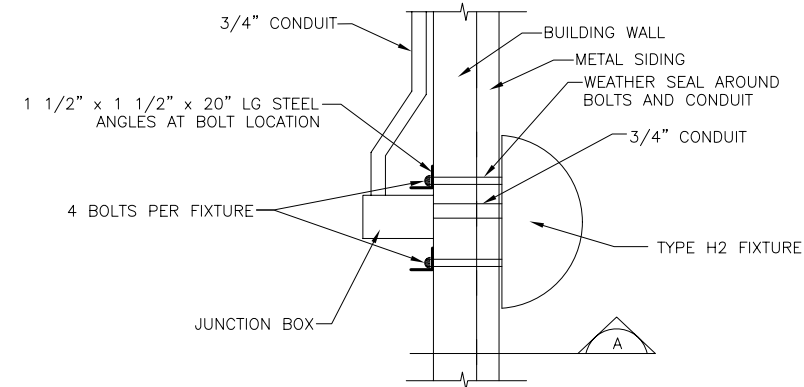
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E-5 GROUNDING TEST STATION DETAIL



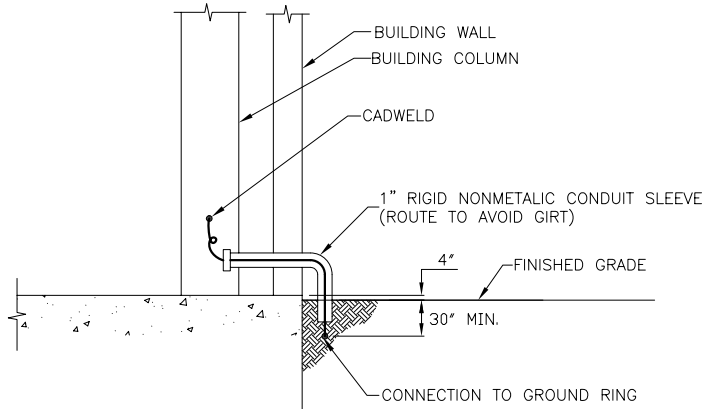
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E-5 MCC OR EQUIPMENT
GROUND CONNECTION



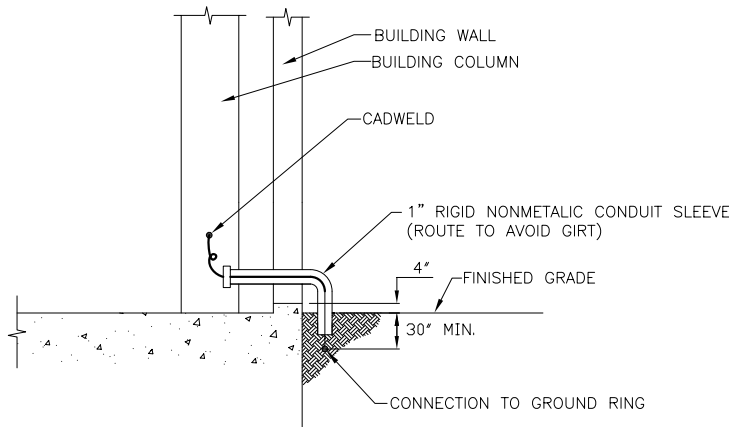
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E-5 FIXTURE TYPE H1 MOUNTING DETAIL



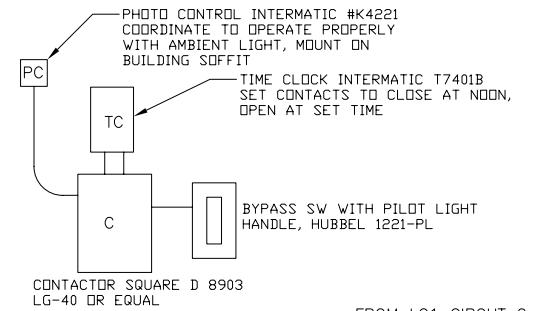
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E-5 FIXTURE TYPE H2 MOUNTING DETAIL



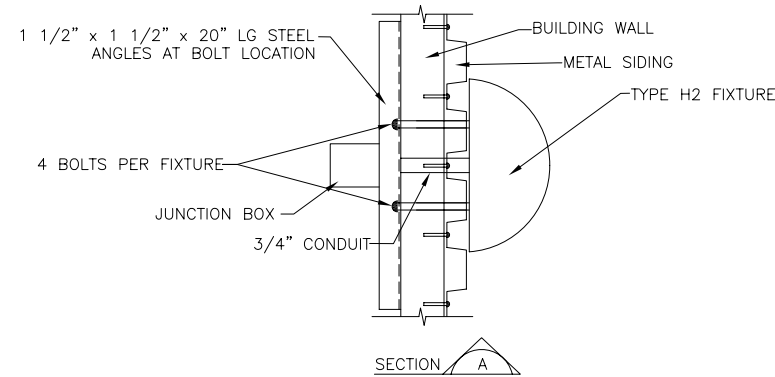
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E-5 STEEL COLUMN OR METAL BUILDING
GROUND CONNECTION



3
E-5 STEEL COLUMN OR METAL BUILDING
GROUND CONNECTION



5
E-5 PHOTO/TIME CLOCK LIGHTING
CONTROL WIRING DIAGRAM



SECTION A

NOTES:

1. SPECIFIC NOTES ARE CALLED OUT ON INDIVIDUAL DRAWING DETAILS.

ELECTRICAL DETAILS

PEMACO SUPERFUND SITE
5050 EAST Slauson Avenue
Maywood, California

PREPARED FOR:
U.S. Environmental
Protection Agency
Region IX
San Francisco, California

PREPARED BY:



SCALE: AS SHOWN

APPROVED

DATE: 08/23/2010

DESIGNED:

AS BUILT

DRAWING

DRAWN: DC #CRBP

CHECKED: J.W.

E-5

AS-BUILT