APPENDIX H

OPERABLE UNIT NO. 1
DUAL PHASE EXTRACTION SYSTEM
OPERATION AND MAINTENANCE PLAN

FORMER EMERSON POWER TRANSMISSION FACILITY
TOMPKINS COUNTY
ITHACA, NEW YORK
NYSDEC SITE NO. 755010

EMERSON

PROJECT NO.: 31401545.001
DATE: AUGUST 2022

WSP
SUITE 300
13530 DULLES TECHNOLOGY DRIVE
HERNDON, VA 20171

TEL.: +1 703 709-6500
FAX: +1 703 709-8505
WSP.COM

TABLE OF CONTENTS

FIGURES

RECORD DRAWINGS

TABLES

APPENDICES

1 INTRODUCTION

This Operation & Maintenance (Plan) specifies the activities and procedures required for the operation, maintenance, and monitoring (O&M) of the Operable Unit 1 (OU-1) Dual-Phase Extraction System (System) currently operating at the former Emerson Power Transmission (EPT) facility located in Ithaca, New York (Site; Figures 1 and 2). This Plan is an updated version of the March 31, 2009 Plan that has been prepared in accordance with the Administrative Order on Consent (Index #A7-0125-87-09) entered into by the New York State Department of Environmental Conservation (NYSDEC) and EPT on July 13, 1987.

This Plan is not to be used as a stand-alone document, but as a component document of the Site Management Plan (SMP). A copy of this Plan, along with the complete SMP, is to be maintained at the Site. The document provides technical support and recommendations for the operation, maintenance, and monitoring of the System.

Major components of the Dual-Phase Extraction (DPE) System, aqueous and vapor, include:

- Aqueous Phase: 12 extraction wells (EWs), an equalization tank, bag filters, an air stripper, and aqueous carbon treatment;
- Vapor Phase: 12 shared dual-phase EWs, a blower, and vapor carbon treatment.

This entire Plan should be reviewed by personnel operating, maintaining, or monitoring the System. Unauthorized departure from these procedures is not permitted.

1.1 PLAN OBJECTIVES

The Plan includes a description of the manufacturer's recommendations for all equipment; pre-start-up inspection procedures; testing methods for checking seals, leaks, and backdrafts; pressure tests; System balancing; warning devices; and performance sampling. In addition, a complete description of System start-up and testing, System monitoring devices and alarms, and routine/non-routine operation and maintenance. Troubleshooting procedures, adjustments and repair procedures, schedules for operation and routine maintenance, and warning devices are also described.

The objectives of this Plan include the following:

- Provide an understanding of the System treatment objectives
- Provide instructions to safely start up, operate, and shut down the System
- Provide an accurate layout of the components of the System
- Explain key operational procedures and control logic
- Provide routine maintenance guidelines
- Provide component examples and guidelines for the replacement of worn equipment

1.2 RELATED DOCUMENTS

This Plan references and incorporates relevant site-specific permits and plans, including:

- State Pollutant Discharge Elimination System Permit Equivalent - DER Site No. 7-55-010, effective August 1, 2022 and lasting until July 31, 2027 (Appendix A).
- City of Ithaca Final Electrical Certificate – Receipt Number: 38873 – Issued: May 14, 2009 (Appendix B)

1.3 OPERATIONS TEAM

- Steve Clarke – Emerson Electric Co. (Emerson) representative

- Scott Haitz – WSP USA Inc. (WSP) Project and Client Manager. Project administration, supervision of project team and primary coordinator with Emerson
- Lisa Kelly – WSP Site Coordinator, liaison between Emerson and the New York State Department of Environmental Conservation (NYSDEC) and New York State Department of Health (NYSDOH)
- Amy Romano – WSP Project Compliance Officer. The Compliance Officer is responsible for the management of wastes generated from the System, review of the State Pollutant Discharge Elimination System (SPDES) Discharge Reports, review of the SPDES permit equivalents, and response to potential violations
- Dave Rykaczewski – WSP New York-licensed Professional Engineer. Reviews all Site documents prior to regulatory submittal
- Glen Rieger – WSP Technical Lead – System Operation. Review of any changes to the treatment system operations
- Nathaniel Winston – WSP Technical Lead – Groundwater Monitoring and Site Health & Safety Coordinator. The Technical Lead is responsible for the review of the current groundwater monitoring practices, any proposed changes to the plan, and coordination and implementation of the compliance sampling events
- Jeffrey Baker – WSP O&M Task Manager. Coordination and review of all System documentation, data evaluation, reporting, alarm response, remote System monitoring, and periodic field audits of O&M activities

2 HEALTH AND SAFETY EMERGENCY RESPONSE

2.1 WSP

Full-time employees of WSP conduct their work under the corporate health and safety guidance commensurate with their job duties. All employees that visit the Site shall have 40-hour certification in accordance with the Occupational Safety and Health Administration (OSHA) requirements for hazardous waste operations and emergency response (HAZWOPER; 29 Code of Federal Regulations [CFR] 1910.120) with a current annual 8-hour refresher certification.

2.2 SUBCONTRACTORS

Subcontractors are responsible for compliance with OSHA requirements, as applicable, and for supplying health and safety guidance and equipment for their employees who conduct work at the former EPT facility. Each subcontracted firm provides project support appropriate to its responsibilities, while WSP personnel provide technical and administrative oversight.

2.3 HAZARD COMMUNICATION PROGRAM

The objective of this requirement is to provide information concerning the physical and chemical hazards to all affected employees and subcontractors involved with O&M activities. This information will allow employees and subcontractors to participate in and support the protective measures instituted for this project. This Hazard Communication Program procedure is performed in accordance with OSHA 29 CFR 1910.120.

The site-specific health and safety plan (HASP) is maintained onsite in the treatment building. The main components of the HASP include:

- An introduction with the organization structure and personnel assignments
- A Site description, Site history, and chemicals of concern
- Proposed onsite activities
- Appropriate personal protective equipment (PPE)
- Monitoring devices and equipment that must be utilized by workers to ensure that all worker protection requirements are met and the rationale for the PPE selected
- Decontamination procedures
- Site control measures that will be maintained during remedial activities to restrict access (e.g. security guards, warning signage, and fences)
- WSP standard operating procedures
- Medical surveillance
- Communication procedures
- Emergency procedures and emergency contacts

2.4 SYSTEM MALFUNCTION

The System is equipped with a remote telemetry notification system (See Section 4.10), whereas System alarm conditions and daily System operational screenshots are automatically sent to WSP staff via electronic mail. The alarm conditions and

daily System operational screenshots are sent to Jeffrey Baker - WSP O&M Task Manager and at least two additional WSP staff. WSP staff will notify the Operations Team of System alarm conditions, as specified below.

In the event of a System malfunction, the individual that discovered the problem shall immediately notify Mr. Baker – WSP O&M Task Manager at the number provided below. Mr. Baker will evaluate the malfunction and notify the WSP project manager (Scott Haitz), if applicable. If Mr. Baker is not available, the individual shall contact Mr. Haitz at the number provided below. If neither Mr. Baker nor Mr. Haitz can be reached, the individual shall contact Mr. Winston and the malfunctioning System shall be shut down pending notification to the WSP project and task manager.

The contact information for the operations team is provided below:

Table 1 Malfunction Response Contact Information

Contact	Phone Number
Scott Haitz, WSP	+1 703 318-3951 (O) +1 571 217-3612 (M)
Jeffrey Baker, WSP	+1 724 882-9723 (M)
Nate Winston, WSP	+1 315 420-9973 (M)

In the event of a serious injury (beyond that of first aid), the individual shall contact the emergency services using 911. After contacting emergency services, the individual shall immediately notify WSP who will follow the emergency procedures outlined in this Plan.

2.5 WATER RELEASES

In the event of a release of any volume of untreated water from the treatment building, the individual that discovered the release shall shut the System down and immediately notify WSP following the sequential order described in Section 2.4. WSP malfunction response coordinators will evaluate the release (i.e., reportable quantity volume), notify Emerson, and notify the NYSDEC Spill Response using the 24-hour reporting number: +1 800 457-7362 if appropriate as determined by the NYSDEC Spill Reporting and Initial Notification Requirements Technical Field Guidance.

The following actions shall be taken in response to a spill of hazardous material in accordance with this Plan:

For small spills: If personnel can safely and effectively perform corrective action, the following steps are to be taken under the authorization of a WSP malfunction response coordinator:

1. Remotely shut the System down (Section 4.10).
2. Don the appropriate personal protective equipment.
3. Establish a barrier (caution tape or similar) to help prevent unauthorized personnel from entering the area.
4. Remove sources of ignition and leakage.
5. Immediately begin corrective action by placing absorbent material on the spill within the secondary containment area.
6. Set up a decontamination zone to ensure proper decontamination procedures.
7. Place contaminated absorbent into open-top Department of Transportation - (DOT) compliant drums.
8. The drummed cleanup materials are to be properly labeled and managed as hazardous waste pending analysis.

For large spills: If personnel cannot safely and effectively perform corrective action in the event of a spill, the WSP malfunction response coordinator must:

1. Remotely shut the System down (Section 4.10).
2. Assess possible risks to human health and the environment that may result from the spill.
3. Contact the local emergency services using 911.

For small or large spills, the WSP malfunction response coordinator must make the necessary reports as outlined in the Site Contingency Plan.

2.6 FIRST AID WITH EMERGENCY EYE WASH

As required by OSHA 29 CFR 1910.151(b), an ANSI Z308.1-2015-compliant first-aid kit is located at the entrance of the treatment building next to the control panel. In addition, while not required as specified in OSHA 29 CFR 1910.151(c), an ANSI Z358.1-compliant emergency eyewash station is located on the bookshelf in the treatment building. The eyewash is an Eyesaline® wall station with a sealed, sterile 16-ounce bottle for single use. The unit is designed for easy 'snap-out' access for emergency eye or body flushing. Each bottle has a 36- month shelf life from the date of manufacturing. The eye wash solution is not required since corrosive materials are not used in the treatment process; however, if a site-specific task requires that a corrosive material be used, WSP or the O&M contractor shall ensure the eye wash solution is available before the work begins.

2.7 FIRE EXTINGUISHERS

Two fire extinguishers in accordance with New York State Fire Code 906 and National Fire Protection Association 10 are located inside the treatment building for use in the event of a fire. The treatment building classification is U – Utility Building and is normally exempt from the fire extinguisher requirements. Due to the storage of combustible oils used for treatment equipment (air compressor and soil vapor extraction [SVE] blower), fire extinguishers are provided.

One 5-pound – Class C fire extinguisher is mounted near the control panel for electrical fires and the other 10-pound – Class B fire extinguisher is mounted near the manway door and is easily accessible. The Class B fire extinguisher is suitable for oil and grease fires. To use, pull the safety pin and squeeze the handle and lever together while aiming at the base of the fire and sweeping the extinguisher spray back and forth. Each fire extinguisher is inspected monthly by the O&M contractor and the inspection records are noted on the fire extinguisher inspection tag. Maintenance shall not be performed on the fire extinguishers. If maintenance is required, the fire extinguishers shall be replaced.

2.8 MAINTENANCE TOOLS AND LADDERS

Tools and ladders are stored in the treatment building for the maintenance of the process equipment. All tools are maintained in an acceptable condition and the correct tools shall be used appropriately. Damaged tools shall be properly disposed of and replaced. The treatment building has one stepladder onsite. The appropriate type of ladder shall be used based on each maintenance activity for safety purposes. The ladder shall be inspected in accordance with OSHA 29 CFR 1910.23(b)(9), before each use. Damaged or defective ladders shall not be used. Damaged or defective ladders shall be discarded and replaced.

2.9 SITE SECURITY

The System is enclosed in a treatment building that is locked at all times unless WSP or O&M contractor personnel are actively working onsite. The treatment building has a roll-up overhead door that can only be accessed (opened and closed) from inside the treatment building. The treatment building is located outside of the former EPT property fence line (Figure 2) and is protected by a security system described in Section 2.9.2.

The treatment building can be accessed using the key provided in the lock box mounted on the north side of the treatment building. The key shall be returned to the lock box when the user leaves the Site.

2.9.1 PRIVATE SECURITY SERVICE

All visitors to the Site including WSP staff and subcontractors shall check in at the facility guard shack at the main entrance of the Site (Figure 2). The visitor shall sign in and sign out of the visitor log each time they visit the Site. The guard shack is located at the physical address 620 S. Aurora Street, Ithaca, New York.

2.9.2 SECURITY SYSTEM

The System is protected by an ADT security system and closed-circuit television. The security system operation is discussed in detail in Section 3.1.12. The System has two modes: armed and disarmed. If the manway door is opened in the armed mode, and a security code is not entered within 30 seconds, the security system will send an alarm message to Mr. Baker and Mr. Winston via ADT security, and then to the Ithaca Police Department. Instructions to arm and disarm the security system are included in Appendix C. Mr. Baker and Mr. Winston must be notified before entry so that the user can be provided with a security code to disarm the security system.

3 OU-1 DPE SYSTEM DESCRIPTION

3.1 CURRENT DUAL PHASE EXTRACTION SYSTEM

The System consists of 12 DPE wells (Figure 3). Nine DPE wells are aligned in a north-south direction downgradient of, and below, the Fire Water Reservoir (FWR) to the west, two wells are immediately south of the FWR, and one well is located to the east of the FWR. Four DPE wells (EW-4-25B, EW-5-25B, EW-7-25B, and EW-10-25B) are installed in the highly fractured B-hydrogeologic zone (B-Zone) and the upper C-zone. Six DPE wells (EW-1-62C, EW-2-62C, EW-3-60C, EW-6-60C, EW-8-62C, and EW-9-86C) are installed in the C-zone primarily to intercept and contain impacted groundwater in the lower portion of the C-zone. Extraction wells EW-9R-72C (replaced EW-9-86C), EW-11-43C, and EW-12-45C were installed to intercept groundwater in one or more specific fracture zones identified in the immediate vicinity of the FWR (515, 544, or 550 feet above mean sea level).

The DPE wells are connected by a piping network including compressed air supply to the well pumps, SVE, and conveyance piping that conveys vapor and groundwater from each well to an enclosure housing the treatment equipment. The System consists of an air compressor, equalization tank, bag filtration units, air stripper, SVE vacuum blower, SVE air-water separator, liquid- and vapor-phase carbon units, and a programmable logic controller. As-built drawings of the System are provided as Sheets 1 through 9. The locations of System components and instrumentation (e.g., flow meters, valves, gauges) are shown on the process and instrumentation diagram and treatment building layout plan provided as Sheets 5A, 5B, and 6. Equipment manuals and product data sheets are provided in Appendix D (on a USB drive for the hard copy of this O&M Plan) as well as in a binder located in the treatment building on the storage shelving near the desk (shown on Sheet 6). A comprehensive parts list is provided in Table 2. A description of the main System components and operation, including the extraction wells, water, and vapor treatment processes, and Programmable Logic Controller (PLC) is presented in the following sections.

3.1.1 EXTRACTION WELLS AND VAULTS

Each of the 12 DPE wells contains a pneumatic pump to recover groundwater. An air compressor located in the treatment building supplies pressurized air to the pneumatic pumps for the removal of groundwater from each extraction well. The air exhaust tube for each pump is vented to the vapor recovery within each extraction well. Each extraction wellhead is housed in a pre-fabricated well vault constructed of steel with a sealed lid. Different sized vaults were installed depending on the number of piping entrance and exit points and whether the vault houses one or two extraction wells. Well pairs EW-3-60C and EW-4-25B, EW-5-25B and EW-6-60B, and EW-7-25B and EW-11-43C each share a 4-foot by 4-foot vault. EW-1-62C, EW-2-62C, EW-8-62C, EW-9R-72C, EW-10-25B, EW-12-45C are each housed separately by individual 3-foot by 3-foot vaults. Vaults housing EW-1-62C, EW-9R-72C, EW-11-43C, and EW-12-45C were constructed with additional reinforcements to meet incidental H20 highway loading traffic ratings.

The water conveyance piping in each well vault is connected to a header within each vault. A ball valve is located on the water conveyance piping for the isolation of each extraction well. A pressure indicator for each well is installed on the water conveyance laterals to monitor for pressure buildup indicative of a line obstruction and fouling.

Similar to the water conveyance piping header, there is a vacuum conveyance header that is connected to each vault. A ball valve is used to isolate the vacuum in each vault. A vacuum indicator for each well is installed on the vacuum conveyance piping in each vault to monitor the vacuum at each well.

The down well tubing at each extraction well is Nylon 12 material. Each set consists of 5/8-inch Outer Diameter (OD) discharge, 3/8-inch OD air supply, and 1/2-inch OD air exhaust. The down well air supply is isolated with a ball valve in each vault. The down well air supply ball valve is used to control which pumps are active.

3.1.2 EXTRACTION WELL PUMPS

Extraction well construction details are provided in Table 3. The pneumatic pumps located in each well are QED™ Environmental Systems Model AP2B 1.75-inch OD Bottom-Inlet (Long or Short depending upon water column conditions).

The pneumatic pumps are attached to the well caps using 1/4-inch diameter polypropylene coated, braided steel support wire. The bottom of each pump is positioned approximately 0.5 feet off the bottom of each well to minimize suspended solids and sediments from entering the pump intake. Each pump has a filter/regulator manufactured by QED™ Environmental Systems installed within the vault to control air pressure to the pneumatic pump. Flexible EPDM and nitrile air hose connect the down well air supply tubing to the regulator and a quick connection at the air supply header in each vault. Down well tubing for each pump connects to header pipes in each well vault via quick disconnect fittings (except for EW-9R-72C, EW-11-43C, and EW-12-45C which are hard piped together).

The pneumatic pumps are controlled by a 3-way ASCO® solenoid valve on the air supply line inside the treatment building near the air compressor. The solenoid valve is normally open and is wired to the PLC; the valve will discontinue airflow to the pumps if an alarm is triggered on the PLC.

3.1.3 CONVEYANCE PIPE NETWORK

Piping for conveying water and compressed air from the treatment building to the vaults are located in a 6-inch-diameter schedule 40 polyvinyl chloride (PVC) carrier pipe, which was installed approximately 3.5 to 4 feet below the ground surface.

Underground vapor conveyance piping consists of 2-inch outside diameter (OD) high-density polyethylene (HDPE) piping from EW-5-25B/EW-6-60C to EW-12-45C and 4-inch OD HDPE from EW-5-25B/EW-6-60C to the treatment building as shown on Sheet 2. Vapor conveyance piping at each well consists of butt-fused, 2-inch OD HDPE which transitions to Schedule 80 2-inch diameter PVC or 2-inch diameter 316 stainless steel inside each vault. Inside the vault, the vapor conveyance pipe connects directly to the well casing using a saddle connection around a vacuum-rated well cap. At each wellhead, a ball valve is present on the vapor conveyance piping for isolation purposes.

Air supply and water conveyance piping headers were extended through the vaults and connected to the wellhead via 316 stainless steel piping (EW-1-62C through EW-8-62C, and EW-10-25B) or Duratec® and nylon 12 piping (EW-9R-72C, EW-11-43C, and EW-12-45C), respectively. The carrier piping enters the bottom of the vaults through a 90-degree bend that was formed in the trench as shown on Sheet 8. The water conveyance piping inside each vault is 1-inch 316 stainless steel or 1.25-inch outer-diameter (OD) Nylon 12 tubing and compressed air conveyance piping is 1-inch 316 stainless steel or 1-inch ID Duratec® aluminum composite. To minimize fittings, the underground water conveyance piping and compressed air conveyance piping were bent to follow the 90-degree bend in the carrier pipe for entry into the vaults. A cleanout plug is located on the water line at the top of the entrance and exit of the header pipe for each vault. Swing gate check valves are installed inside each vault along the water conveyance lines to prevent backflow into the wells. Water conveyance piping inside each vault is connected to 120V, self-regulated heat trace (Raychem® W51-100P from the treatment building to EW-10-25B and Nelson™ LT25-J from Junction Box to EW-12-45C) to protect against freezing during the winter months.

3.1.4 AIR COMPRESSOR

A two-stage reciprocating air compressor (80 gallon, vertical tank, 115V, 60 Hz, auto drain, model: Ingersoll Rand 2475N7.5) located in the treatment building supplies pressurized air to the pneumatic pumps for removal of groundwater from each extraction well. The maximum operating pressure is 175 pounds per square inch (psi) and 24 cubic feet per minute (CFM). The compressor is powered by a 7.5 HP motor (208-230/460V, 18.6-17.2/8.6A, 60 Hz, 3 phase, model: Emerson e-LINE™ ELT7E1D).

A refrigerated air dryer (9.9 oz R134a, 115V, 60 Hz, 25 cfm, model: Ingersoll Rand D42IN), two 1 µm pre-filter and 1µm coalescing air filters in series (model: Gardner Denver FIL14C13) are used in conjunction with the compressor to reduce moisture and contaminants in the compressed air to reduce the potential for rust and scale. A relieving air pressure regulator (model: Norgen Excelon® R72G-2AS-007) is located after the above components.

3.1.5 EQUALIZATION TANK

Groundwater pumped from the wells is conveyed to a 1,000-gallon polyethylene equalization tank located inside the treatment building. An equalization tank effluent transfer pump is located adjacent to the tank to convey water through the bag filter units before treatment by the air stripper. The pump is controlled by a non-contact, ultrasonic level transmitter (Emerson Rosemount™ 3100) mounted to the top of the tank to facilitate automatic pump "on" and "off" control depending

on the water level in the tank. The tank will equalize the influent flow and minimize downstream cycling of System components by providing a reservoir of water to be treated. If the water level within the equalization tank reaches the "high" level alarm condition, the System will shut down. O&M personnel shall respond to this alarm either in person or by interfacing with the web-based Human Machine Interface (HMI). The tank is plumbed with piping that connects to the SVE blower to evacuate accumulated vapors from the tank. The tank is plumbed with a hose bib port for intermittent discharge from the floor sump and air compressor dryer. A small manway located on the top of the tank with an air vent allows ambient makeup air to enter the tank to avoid damaging the tank through the application of a vacuum.

3.1.6 BAG FILTRATION

Once the equalization tank fills to approximately 850 gallons, the water is pumped using a 1 ½-HP, stainless steel centrifugal pump (model: Goulds 1ST1F5D4 NPE Series) through a series of six bag filters (model: Pentek 2-inch FNPT aluminum; GP802AL2), configured in two sets of three in series to remove suspended solids that did not settle out in the equalization tank. Each filtration set contains a 25 µm polyester felt bag. The water influent line to the bag filtration units is outfitted with a local readout for water pressure to indicate when the bag filter needs replaced. The bag filter units are rated for 100 psi. A gate valve and flow meter are installed to balance the flow between the bag filters and air stripper.

3.1.7 AIR STRIPPER

Following the bag filtration units, the water is conveyed to a low profile, 4 tray air stripper (model: QED™ EZ Tray 4.4SS) equipped with a sump, discharge pump, and blower. The air stripper sump is outfitted with a series of high and low-level switches that will actuate the Gould's NPE 1st 1ST1F5D4 1- 1/2 hp effluent transfer pump, the 5 HP cast aluminum pressure blower (model: New York Blower 2204 ALUM), and provide shutdown capability in case of malfunction. In addition, if the blower shuts down or malfunctions, the System will discontinue operation.

The effluent water stream is pumped via the effluent transfer pump to the liquid phase granular activated carbon (GAC) units. Bypass piping was installed to route extracted groundwater directly to the liquid phase GAC units described below if the influent VOC mass loading over time diminishes to a point where the air stripper is not an efficient means of VOC removal. The effluent vapor stream from the air stripper blower is transferred to the vapor phase GAC units for treatment.

3.1.8 AQUEOUS PHASE CARBON TREATMENT

After treatment by the air stripper, the water is pumped through two 250-pound liquid phase GAC units. The high-pressure, polyethylene carbon units are outfitted with pressure indicators before and after each unit to monitor pressure. In addition, sample ports are located before, between, and after each unit. The GAC units are operated in a lead-lag configuration. Water is conveyed between the two vessels using a 1/2" diameter, reinforced, versigard® synthetic rubber hose. The GAC-treated effluent is then discharged via an aboveground 1-inch diameter schedule 80 PVC pipe and underground 4-inch OD HDPE pipe to the SPDES discharge Outfall 01A located near the end of Open Ditch 2 in accordance with the SPDES Permit Equivalent (Sheet 2). See Section 5.2 for additional details on aqueous sampling and discharge limits.

3.1.9 AIR-WATER SEPARATOR

The vapor stream from the extraction wells enters a 120-gallon air-water separator to facilitate the separation of moisture from the vapor stream. Liquids removed from the vapor stream are conveyed by a progressive cavity transfer pump (50 psi, 1750 max rpm, cast iron, model: Moyno® 35601) to the equalization tank for aqueous treatment. The air-water separator is outfitted with a series of high and low-level switches and alarms wired to the PLC that actuate the transfer pump or shutdown the System in case of malfunction. Upon exiting the air-water separator, the vapors pass through a combination filter silencer (model: Solberg® CSL-235P-400F and FS-31P-200) for noise suppression and removal of particulate from the vapor line and dilution air intake.

3.1.10 VAPOR EXTRACTION BLOWER

Vapors are conveyed by a positive displacement rotary lobe blower (model: Gardner Denver Sutorbilt Legend® 5LP-DSL with 20 HP motor [460V, 7.31/23A, 60 Hz, 3 phase, Teco-Westinghouse MAX-E2®/841 HB0204]). The blower is capable of producing 300 scfm at 10 inches of mercury (Hg) at the blower inlet. At the blower outlet, vapors enter a chamber silencer (model: Stoddard D13H4) for noise suppression.

Air flow and vacuum transmitters, sample ports, and pressure and vacuum gauges are installed on the separator and blower unit piping to allow for proper operation of the System. The blower is wired to shut off in case of high pressure or vacuum in the air line. Vacuum relief valves are located at the inlet of the vacuum blower and at vaults containing grouped wellheads to set the design vacuum and to prevent excessive vacuum if air flow is not present at a specific wellhead.

3.1.11 VAPOR CARBON TREATMENT

The recovered vapor stream from the air stripper and SVE are treated by two 1,000-pound vessels (ESD Model VVHV-1000) of vapor phase GAC in series before entering a heavy-duty blower exhaust silencer (model: Universal Silencer™ RD-8) and exiting the treatment building via a discharge stack to the atmosphere. In addition to the recovered vapor stream, the air stripper effluent vapor stream tees into the recovered vapor stream before the GAC vessels. See Section 5.1 and Appendix H for additional details on vapor sampling and discharge limits.

3.1.12 EQUIPMENT ENCLOSURE

The treatment enclosure consists of a lighted, climate-controlled treatment building constructed by Elmira Structures Inc. of Elmira, New York, manufactured by Kirby Building Systems of Portland, TN, and designed by KV Engineering P.L.L.C. of Horseheads, New York. Detailed drawings of the pre-engineered enclosure's foundation plan, floor plan, and exterior elevations can be found in Appendix E. The enclosure is 20 feet by 35 feet with a 14-foot eave height. Insulation and soundproofing consist of 6" thick sidewall and roof Poly-Scrim-Kraft reinforced face insulation. There are two 3-foot by 3-foot manually operated louvers and a thermostatically controlled roof fan with a louver for ventilation. There are also two electrically powered, ceiling-mounted thermostatically controlled, 34.1 BTU/Hr heaters to protect against freezing during the winter months. Ventilation consists of one exhaust fan centrally located in a 2-foot by 2-foot roof curb and two 3-foot by 3-foot louvers located on the north and south walls. Enclosure lighting consists of (6) 4-foot, T5 LED tube shop lights suspended by chains from the treatment building's structural members. The enclosure is equipped with a keyed manway door and a manually operated, insulated roll-up door. The enclosure has a secondary containment curb located along the perimeter of the epoxy-coated floor with a centrally located 2-foot by 2-foot by 2-foot sump. The sump is fitted with a sump pump that will transfer water to the equalization tank. If the sump pump cannot keep up with the flow of water, the sump is fitted with an alarm float, that when activated will shut down the System. The enclosure is equipped with rain gutters on two sides of the treatment building.

3.1.13 UTILITIES, SECURITY, AND GENERAL WASTE

The System uses several utility services to operate. The utilities for the DPE System include electricity, internet, security, and general waste/garbage. The following subsections provide account information for each of the services provided.

ELECTRICITY

Electricity for the System is provided by New York State Electric & Gas Corporation (NYSEG). The System is equipped with a 200A, 277/480V alternating current, and a 3-phase power source. The power drop for the enclosure is located on the exterior of the north side of the treatment building.

NYSEG Contact: +1 800 600-2275 (costumer service) or +1 800 572-1131 (power interruptions or emergencies)

INTERNET

The enclosure is equipped with wired internet service from Spectrum and has a 200 Mbps speed connection. A cable communication service was connected to the treatment building via the same mast that supplies the electrical power drop.

Router Information: Linksys Wireless-G Broadband Router (Model # WRT54)
Verizon Contact: Business.twc.com or +1 877 636-3278

SECURITY

The System is protected by an ADT security system and closed-circuit television as described in Section 2.9.2.

ADT Contact: +1 800 716-3640 (costumer service)
Instructions to arm and disarm the security system are included in Appendix C.

GENERAL WASTE/GARBAGE

General waste services for the treatment building are provided by Casella Waste Management of NY, Inc. An 8 cubic yard dumpster located next to the treatment building is rented monthly and is serviced on an on-call basis. Additional information on general trash and debris waste management can be found in Section 6.9.1.

Contact/Pick-Up Request: +1 888 485-1469 or +1 800 227-3552

3.1.14 PROCESS LOGIC CONTROL, AUTOMATED EQUIPMENT ACTUATIONS, AND ALARMS

The System is equipped with instrumentation designed to control and monitor various operating parameters of the System as previously indicated. A general summary of the performance control and monitoring equipment includes:

- PLC and HMI touch screen control panel (refer to the end of this section)
- Remote control of the System for startup, shutdown, and operational modifications
- View past and current alarms onsite or remotely using the data connection
- High-High, High, Low, and Low-Low level switches and alarms for the equalization tank
- Low-pressure switches at the air stripper unit
- High-High, High, and Low alarm within the air stripper sight tube
- Totalizing flow meters located at various stages in the System

The System is equipped with an Allen-Bradley 1769 Compact I/O™ module and programmable logic controller, interfaced with a C-more EA9-T15CL HMI touch screen control panel. The touchscreen is mounted on the control panel door. The touch screen control panel can be controlled onsite or offsite using a wired internet connection. Remote connection procedures are provided in Section 4.10. The HMI touch screen control panel provides real-time control and visual operation of the System.

4 SYSTEM OPERATION

This Section describes the operation of the System, including procedures for System startup, System shutdown, and remote connection to the System. These procedures shall be implemented to ensure proper operation of the System.

4.1 STARTUP PROCEDURES

This procedure applies to the startup of the System, including restarts after completion of maintenance activities.

1. Verify that all sample ports are closed.
2. Open all process valves (water and air) or pre-adjust to the normal operational position, ball valve handle will be in line with the pipe run or gate valves will open counter-clockwise when the valves are in the open position.
3. Check pipe connections – check the System influent and effluent pipes are properly connected.
4. Turn ON the main breaker – switch the main power circuit breaker and smaller service lines to the ON position.
5. Turn ON all breakers – turn on each circuit breaker in the master control panel.
6. Set System Control switches to AUTO position.
7. Clear any alarms on the control panel.
8. The air compressor should start and the well selenoid valve should open providing air to the well field for the pumps to begin pumping.
9. The vapor extraction should start.
10. Adjust the air regulators in each well vault for the desired pressure and adjust the dilution valve on the vapor extraction blower for the proper air flow.
11. Monitor the System for at least 1 hour to confirm proper operation.

4.2 OPTIMAL SYSTEM SETTINGS

This section provides the optimal System settings for the proper operation of the System.

Table 4 Summary of Optimal System Settings

Treatment Process	**Setting**
Extraction well regulator pressure setting	70 to < 100 psi
Equalization tank transfer pump (P-211)	Less than 50 gallons per minute (GPM). The actual rate shall be set slightly higher (2 to 4 GPM) than the equalization tank influent flow rate
Vapor extraction dilution valve (VI-202)	3.0 inches of mercury (in Hg)
Air compressor low-pressure alarm (PAL-101)	5 psi
SVE low-pressure alarm (VAL-201)	0.5 in Hg
Air stripper high-pressure alarm (PAH-601)	40 psi

4.3 CONTROL PANEL OPERATION

The main control panel is operated by physical switches with an HMI touch screen located on the control panel. The physical switches should be set in the AUTO position or ON if AUTO is not a selection. If the HMI screen on the touchscreen is

'black', touch anywhere on the screen to turn the screen saver off. After turning the screen saver off, the touch screen page will default to the last user screen operated.

4.3.1 BASIC OPERATION

The basic operation of the main control panel includes:

1. On the touch screen control panel, click on "MENU", in the top right corner (blue button). A dropdown list will appear and includes the following screens:
   a. RECOVERY – Used to view the status and control of the air compressor (AC-101) and solenoid valve (SV-101) associated with the aqueous phase, and vapor extraction blower (B-201) and condensate pump (P-201) associated with the vapor phase. In addition, the set points of the air compressor minimum pressure (PAL-101) and vapor extraction blower minimum vacuum (VAL-201) can be changed.
   b. TREATMENT – Used to view the status and control of the System pumps (P-211 and P-601), blower (B-601), and blower high pressure set point (PAH-601) associated with the aqueous phase. The equalization tank flow and carbon treatment flows can also be observed.
   c. ALARMS – Used to view and reset alarm conditions.
   d. VACUUM TREND – Graph of the SVE vacuum.
   e. AIR FLOW TREND – Graph of the SVE flow.
   f. WATER FLOW TREND– Graph of the aqueous phase water flow.
   g. PRESSURE TREND – Graph of the air stripper vapor pressure.

Click on each of the MENU tabs to select each screen for viewing.

4.3.2 CHANGING SETPOINTS

Changing the treatment System set points is used to change the treatment conditions of the System. Follow these instructions to access the set points screen:

1. On the HMI touch screen control panel, click on "MENU" in the top right corner (blue button). A dropdown list will appear and set points can be changed on the RECOVERY and TREATMENT screens.
2. Click on the value to be adjusted.
3. A popup screen will appear "Enter Security Code"
   a. Security Code: 12345
   b. Press the green "ENT" button
4. Enter the new value of the set point using the numerical touch pad and click on the green "ENT" button. Once the "ENT" button is selected the System will automatically start using the new set point value.

4.3.3 ALARM RESET

One of the basic functions is to view and reset alarms that were automatically activated by the System. To view the alarm history and clear any present alarms:

1. On the HMI touch screen control panel, click on "MENU" in the top right corner (blue button). A dropdown list will appear.
2. Click on "ALARMS".
3. A list of alarms will populate. Review the list and make any corrective actions that are necessary to ensure proper System operation.
4. Click on "ALARM RESET" in the top right corner (yellow button).
5. On the alarm screen, click on "Clear All" in the bottom right corner (grey button) to clear all alarms from the alarm log.

If an alarm condition is present that will prevent the System from re-starting, it will be highlighted in red on the alarm screen. A corrective action such as changing a level set point or replacing a motor is required before the System can be restarted. Once the corrective action is completed, use the alarm reset procedure for restarting the System.

4.4 NORMAL OPERATION

Once the System has been properly started as described in Section 4.1 and the pumps have been activated, the System operates in an automated mode. Groundwater from the extraction wells is pumped to the equalization tank, where level switches associated with the equalization tank control a transfer pump, and water is pumped from the equalization tank through the bag filters to the inlet at the top of the air strippers. Level switches associated with the bottom sump of the air strippers actuate a second transfer pump to send treated water through liquid carbon vessels before discharge. Additionally, the vapor is pulled from each extraction well using a blower. The exhaust of the blower is combined with the air stripper vapor effluent, where the vapor streams are treated with vapor phase carbon.

Aside from changing out the bag filters as needed, the groundwater treatment System is completely automated and requires little user input for normal operation. Once the System is started, user input is only required for upset conditions as described in Section 4.5.

4.5 UPSET CONDITIONS

During the operation of the System, there may be instances where sampling shows the System effluent exceeds the established concentration discharge limits. In these situations, the System process shall be evaluated immediately and actions shall be identified to correct the problem. If needed, the System shall be temporarily shut down until the problem(s) are corrected. WSP shall notify the appropriate agencies in accordance with the SPDES Permit Equivalent. **The WSP O&M Task Manager should be contacted regarding all upset conditions.**

In addition to exceedance of the discharge limits, upset conditions of the System may occur when a component of the System breaks or a leak forms resulting in a discharge from the treatment building enclosure.

System operating conditions are recorded at a minimum monthly, or when any work is completed on the System, to evaluate any potential problems within the piping network and to prevent upset conditions that are the result of mechanical failure. If a routine System check indicates the potential for a leak, the contributing equipment or component shall be shut down and repaired as soon as practical.

Note: The System is set up to operate in an automated mode. When the treatment rate is faster than the extraction rate, the air stripper feed pump will shut down until the equalization tank reaches a high level. This is NOT an upset condition and should be expected during normal operation.

4.6 SYSTEM JUMP START – SYSTEM SAMPLING

If the System is not processing water during a sample collection event or when reading gauges, the System will need to be "jumped." The System can be started by completing the following:

1. Open the front cover of the control panel.
2. Press and release the jump start momentary push button on the master control panel.
3. The System will begin the treatment of water.

The jump function simulates the equalization tank high-level switch activation, which crosses wires in electrical slot 201 and electrical slot 247 (The numbers are written on the bottom of the control panel in pen). Both electrical slots are located on the bottom right side of the control panel. This action mimics the "on" level of the equalization tank to run the System until the "off" level is triggered in the equalization tank. There needs to be approximately 200 gallons above the "off" level to provide enough time to complete the sampling before the System shuts down.

4.7 SHUTDOWN PROCEDURE

In the event the System needs to be shut down for cleaning or maintenance, follow the procedure below to avoid damaging equipment or injury to maintenance personnel.

1. Turn the air compressor (AC-101) and SVE blower (B-201) to the OFF position using the HMI touch screen control panel. If the System is automatically treating water, allow the System to automatically operate until the System automatically shuts down. This automatic process may take up to 30 minutes to complete.
2. Allow air compressor low-pressure alarm and transmitter (PAL-101) to decrease to 0 psi, at which point the water will stop being conveyed to the equalization tank.
3. Turn the solenoid valve (SV-101), transfer pumps (P-201, P-211, P-601), and air stripper blower (B-601) to the OFF position using the HMI touch screen control panel.
4. Turn the control panel switches to the OFF position.
5. Turn the control panel's main power switch to the OFF position.
6. Switch the main breaker to the OFF position.
7. Lockout and tag out the main power.
8. Ensure the discharge valves are in the closed position.

4.8 HMI REBOOT PROCEDURE

Power surges and power disruption may result in loss of alarm notification and System control logic, requiring a reboot of the control panel. Below is the procedure for rebooting the System control panel.

1. Turn on the personal computer with the most recent version of the C-more software previously installed.
2. Open the control panel door and access the backside of the touchscreen control panel.
3. Plug the USB cable into a personal (laptop) computer and into the back of the EA9 touch screen panel labeled USB Programing Port.
4. Open C-more Program.
5. Select “File” then “Read from Panel”.
6. In the pop-up screen, select “Read from Panel” then select “Read”.
7. Under the tab “Panel”, select “Reboot”.
8. Click “Yes”

Note: the entire reboot process takes approximately 15 to 20 minutes to complete once “Yes” in Step 8 is completed. Pressing cancel or any other buttons before the reboot process is complete will require restarting the reboot procedure.

4.9 HMI CONTROL PANEL UPDATE PROCEDURES

The firmware associated with the HMI touchscreen control panel is periodically updated by the manufacturers to correct issues and bugs found in the software.

The latest update (EA9-PGMSW) is found here: https://www.automationdirect.com/support/software-downloads?itemcode=C-more%20EA9%20Series

Below is the procedure for updating the HMI firmware.

1. Turn on the personal computer with the most recent version of the C-more software previously installed.
2. Open the control panel door and access the backside of the touchscreen control panel.
3. Plug the USB cable into a personal (laptop) computer and into the back of the EA9 touch screen panel labeled USB Programing Port.
4. Open C-more Program.
5. Select “File” then “Read from Panel”.
6. In the pop-up screen, select “Read from Panel” then select “Read”.
7. Save the program that is pulled from the HMI to the computer using the site name and date.
8. Under the tab “Panel”, select “Update Firmware”.
9. Click “Yes” – The HMI will popup a prompt to save the most recent version of the program (which was already completed in Step 7).
10. Finish procedure and reload the program.

4.10 REMOTE ACCESS

The HMI touch screen control panel can be accessed using a computer or a smartphone app. The procedures for using each method are provided below.

4.10.1 REMOTE ACCESS – LAPTOP OR DESKTOP COMPUTER

The System control panel (MAE12869) can be accessed remotely using port number 11102 to monitor the status of operations using the following procedure.

1. In an internet web browser copy and paste: http://208.105.252.250
2. Click on "Remote Access"
   a. Click on "2. With Firewall/Router Connection (IP: 208.105.252.250)"
   b. Click "Run"
3. In the popup screen:
   a. Enter Username: XXXX
   b. Enter Password: XXXX

The System can be accessed remotely to stop or start individual pumps or the entire System, change level set points, or monitor flow meters and alarms. The System can be remotely started or shut down only if the control panel switches are in the "AUTO" position.

4.10.2 REMOTE ACCESS – SMARTPHONE USING THE C-MORE APP

The System control panel (MAE12869) can be accessed remotely using port number 11102 to monitor the status of operations using the following procedure.

1. Download the C-more Remote HMI phone app
2. Select "Input IP Address"
3. Enter " 208.105.252.250" in the popup screen " Panel Address" and click on "OK"
4. In the popup screen:
   a. Enter Username: XXXX
5. Enter Password: XXXX
   a. Select "OK
6. Double-tap the "Unlock" square (it will turn blue) and touch anywhere on the screen to make the screen saver disappear.
7. To zoom in and move the screen around, tap the "Unlock" square once (it will turn grey).
8. Double-tap the "Unlock" square (it will turn blue) to turn a pump on or off or to select another menu screen.
9. To zoom in and move the screen around, tap the "Unlock" square once (it will turn grey).
10. Repeat steps 7 through 9 until the necessary changes are made. Changes are made in real-time. Once all the changes have been made, close the app.

In order to turn pumps on and off, or to change set points, the "Unlock" square must be double-clicked and blue. To move around the screen the "Unlock" square must be single clicked and grey. The System can be remotely started or shut down only if the control panel switches are in the "AUTO" position.

4.11 LOGIC CONTROL

The main control panel PLC operates the System automatically using a logic scheme. The logic scheme is provided below.

Note: Any 'Alarm' condition sends an automatic electronic mail notification to the WSP O&M Task Manager.

Table 5 Logic Control Summary

Operators and Indicators	Control Type	Operational Description
Air Compressor – AC-101 – OFF	Switch	Turns off the air compressor
Air Compressor – AC-101 – HAND	Switch	Turns on air compressor independent of all alarms
Air Compressor – AC-101 – AUTO	Switch	Turns on the air compressor only if no alarms are present
Solenoid Valve – SV-101 – OFF	Switch	Turns off solenoid valve (kept in normally closed position) and shuts off air to extraction pumps
Solenoid Valve – SV-101 – AUTO	Switch	Turns on automated intermittent solenoid valve operation only if no alarms are present
Solenoid Valve – SV-101 – HAND	Switch	Opens solenoid valve allowing air to extraction well pumps even if alarms are present
Vapor Extraction Blower – B-201 - OFF	Switch	Turns off vapor extraction blower
Vapor Extraction Blower – B-201 - AUTO	Switch	The vapor extraction blower will automatically turn on if the vacuum is above a set point (VT-201) or shut down if the vacuum dips below the set point. Turns on vapor extraction blower only if no alarms are present
Vapor Extraction Blower – B-201 - HAND	Switch	Turns on vapor extraction blower independent of all alarms
Air Water Separator Transfer Pump – P-201 - OFF	Switch	Turns off transfer pump
Air/Water Separator Transfer Pump – P-201 - AUTO	Switch	Turns on transfer pump when air-water separator level reaches the level switch high and will shut off when level switch low is reached. The transfer pump will only turn on if no alarms are present
Air/Water Separator Transfer Pump – P-201 - HAND	Switch	Turns on transfer pump independent of all alarms and level switches
Air Compressor Pressure – PAL-101	Readout	Remote and local readout of the pressure from the air compressor tank (psi)

Operators and Indicators	Control Type	Operational Description
Vapor Extraction Vacuum – VT-201	Readout	Remote and local readout of the vacuum between the air-water separator tank and the SVE blower (“ Hg)
Vapor Extraction Flow – FT-201	Readout	Remote and local readout of the vapor flow between the air-water separator tank and the SVE blower (scfm)
Air Water Separator Transfer Pump Flow – FT-202	Readout	Remote and local readout of the instantaneous water effluent flow from the air-water separator tank (GPM)
Air Water Separator Transfer Pump Total Flow – FT-202 TOTAL	Readout	Remote and local readout of the totalized water effluent flow from the air-water separator tank (gal)
Equalization Tank Transfer Pump – P-211 - OFF	Switch	Turns off transfer pump
Equalization Tank Transfer Pump – P-211 - AUTO	Switch	Turns on transfer pump when equalization level reaches the level switch high and will shut off when level switch low is reached. The transfer pump will only turn on if no alarms are present
Equalization Tank Transfer Pump – P-211 - HAND	Switch	Turns on transfer pump independent of all alarms and level switches
Air Stripper Blower – B-601 - OFF	Switch	Turns off the air stripper blower
Air Stripper Blower – B-601 - AUTO	Switch	The Air stripper blower will automatically turn on when the equalization transfer pump is turned on in AUTO mode and will shut down if blower pressure drops below an adjustable set point. The air stripper blower operates continuously.
Air Stripper Blower – B-601 - HAND	Switch	The air stripper blower will run continuously independent of all alarms and pressure switches
Discharge Pump – P-601 - OFF	Switch	Turns off discharge pump (System effluent)
Discharge Pump – P-601 - AUTO	Switch	The discharge transfer pump (System effluent) will turn on when the air stripper level reaches the level switch high and will shut off when the level switch low is reached. The discharge pump will only turn on if no alarms are present

Operators and Indicators	Control Type	Operational Description
Discharge Pump – P-601 - HAND	Switch	The discharge transfer pump (System effluent) will run continuously independent of all alarms and level switches
Air Stripper Pressure Switch – PAH-601	Switch	Adjustable setpoint switch that turns off the equalization tank transfer pump (air stripper influent) and air stripper blower when an air pressure reading is too high for the air stripper (clogged air stripper holes, indicates cleaning is required)
Equalization Tank Transfer Flow Meter – FT-221	Readout	Remote and local readout of the instantaneous water effluent flow from the equalization tank (GPM)
Equalization Tank Transfer Flow Totalizer – FT-221 TOTAL	Readout	Remote and local readout of the totalized water effluent flow from the equalization tank (gal)
Discharge Flow Meter – FT-601	Readout	Remote and local readout of the instantaneous water effluent flow from the liquid phase GAC units (GPM)
Discharge Flow Totalizer – FT-601 TOTAL	Readout	Remote and local readout of the totalized water effluent flow from the liquid phase GAC units (gal)
Emergency Stop	Alarm	Stops power from the external I/O circuits, stopping all machine motion (blowers, pump, air compressor, etc.)
Phase/Volt Fault	Alarm	Isolates the incoming power from the control panel during electrical surges. Protects pumps and blowers from being electrically overloaded.
Air Water Separator Low Level – LSLL201	Alarm	Turns off the air-water separator transfer pump when it is in the AUTO position
Air Water Separator High Level – LSHH201	Alarm	Turns on the air-water separator transfer pump when it is in the AUTO position
Equalization Tank High Level – LSHH211	Alarm	Turns on the equalization tank transfer pump when it is in the AUTO position
Equalization Tank Low Level – LSLL211	Alarm	Turns off the equalization tank transfer pump when it is in the AUTO position
Air Stripper High Level – LSHH601	Alarm	Turns on the air stripper transfer pump when it is in the AUTO position

Operators and Indicators	Control Type	Operational Description
Air Stripper Low Level – LSLL601	Alarm	Turns off the air stripper transfer pump when it is in the AUTO position
Air Stripper Low Pressure – PSLL601	Alarm	Adjustable setpoint switch that turns off the equalization tank transfer pump (air stripper influent) and air stripper blower when an air pressure reading is too low for the air stripper (not enough air flow for VOC stripping).
Aqueous GAC High Pressure	Alarm	Adjustable setpoint switch that turns off air stripper transfer pump (and preceding functions) when water pressure reading is too high inside vessels (not enough residence time for VOC adsorption)
Air Compressor Low Oil Level	Alarm	Turns off the air compressor
Floor Sump High Level – LSHH701	Alarm	Turns off all pumps and motors in the treatment enclosure
Air Compressor Low Pressure – PAL101	Alarm	If air compressor pressure dips below the preset lower limit, the air compressor will start. If the pressure rises to the upper limit set point, the compressor will shut down and the pressure relief valve will open
SVE Blower Low Vacuum – VAL201	Alarm	If the vacuum blower rises above the preset lower limit, the vacuum blower will start. If the vacuum dips below the upper limit set point, the vacuum blower will shut down and the vacuum relief valve will open

4.12 POWER FAILURES

An overall power failure to the System will result in the entire System shutting down. The groundwater extraction pumps will continue until the air compressor tank reservoir is emptied. The master control panel is equipped with a backup battery; the backup battery will ensure the proper control logic takes place before all power is lost. If various parts of the System experience a power failure, the control logic detailed in Section 4.11 will shut the System down to prevent a release from the System.

4.13 EFFECTIVENESS

The System shall routinely be evaluated for System effectiveness. Based on the evaluation the System operation may be modified or changed to increase the potential effectiveness of the System. Changes to System operations shall be provided in periodic progress reports (See Section 7.0 of the SMP).

5 SYSTEM MONITORING

5.1 AQUEOUS AND VAPOR SYSTEM SAMPLING AND ANALYSIS

Quarterly aqueous and vapor sampling shall be completed in accordance with WSP SOPs (Appendix F). The results of these samples are used to evaluate the effectiveness of the System in removing and treating VOC mass collected from the subsurface and to calculate the total mass removal.

For aqueous samples, approximately 1 gallon of water shall be purged from the sample tap and tubing before the sample is collected. Residual purge water is placed in the equalization tank.

Sampling locations required analytical parameters, and the schedule is provided in Table 6 below. Modification to the frequency or sampling requirements will require approval from the NYSDEC.

Table 6 Aqueous and Vapor Sampling Schedule

Sampling	Sample Port ID	Analytical Parameters		Schedule
		VOCs (EPA Method 8260C)	VOCs - Site Specific (TO-15)	
Influent Liquid Phase	WINF	X		Quarterly
Post Air-Stripper Liquid Phase	WAS	X		Quarterly
Between Carbon Filtration Tanks Liquid Phase	WmidGAC	X		Quarterly
Influent Vapor Phase	VINF		X	Quarterly
Effluent (mid GAC sample) Vapor Phase	VmidGAC		X	Quarterly

In addition to evaluating the System's effectiveness, aqueous and vapor discharge samples are used to determine carbon breakthrough.

Laboratory Contact Information:

Aqueous samples are analyzed by EPA 8260C VOCs standard list and vapor samples are analyzed by TO-15 VOCs, and submitted to SGS of Dayton, New Jersey. The laboratory contact information is:

SGS North America
2235 US Highway 130
Dayton, NJ 08810
Phone: +1 732 329-0200 ext 14562
Fax: +1 732 329-3499

5.2 DISCHARGE MONITORING

Treated groundwater from the System is discharged at Outfall 01A and routed to Outfall 001, located southeast of the treatment building, where it mixes with stormwater and groundwater seepage. Discharges from Outfall 01A and Outfall 001 shall be limited and monitored in accordance with the SPDES Permit Equivalent. Refer to Appendix J of the SMP for details on monitoring and sampling procedures.

5.3 PERFORMANCE TRACKING

WSP tracks System uptime and historic analytical results in a workbook located on the WSP Herndon, Virginia server.

The System performance is tracked by uptime, volume processed and estimated mass removal. The System performance parameters are reported to NYSDEC through periodic progress reports.

6 SYSTEM MAINTENANCE

Maintenance of the System shall be performed on a routine basis, as identified below. The treatment building and equipment shall be maintained in an acceptable condition and documented using the treatment building and equipment inspection checklist each month (Table 7). Modification to the frequency or sampling requirements will require approval from the NYSDEC. A visual inspection of the complete System shall be conducted during each maintenance event. Unscheduled inspections and/or sampling may take place when a suspected failure of the System has been reported or an upset occurs that is deemed likely to affect the operation of the System. The following operating parameters and maintenance tasks shall be documented on Table 8 – Operational Checklist. The operational checklist shall be completed and signed by the person filling out the form as directed below and e-mailed to the WSPs O&M Task Manager within one week of the inspection. Table 9 outlines the recommended maintenance schedule of the System which is further explained in more detail below.

6.1 MONTHLY MAINTENANCE

- Open each well vault and visually observe the vault interior, checking for vapor and aqueous leaks.
- Check all instrumentation.
- Check that adequate pressure is being provided to the pneumatic pumps by recording the air pressure gauge reading and the regulator gauge reading.
- Record the vacuum reading from the vacuum line header.
- Record the water pressure reading from the water pipe lateral to ensure there is no blockage in the water pipe.
- Adjust the air relief valve, if necessary, to maintain the design vacuum at the wellhead.
- Record the airline cycle flow counter associated with the pneumatic pump.
- Verify the heat tape is functioning and pipe insulation is intact (during the winter months).
- Remove any accumulated water from the vault and clear the weep drain if obstructed.
- Inspect each equipment skid and associated piping for leaks and disconnections.
- Check for cracks in the equalization tank and the potential for VOC vapors to migrate from the tank to the indoor air space.
- Manually turn the System ON to observe the transfer pumps and listen for unusual sounds.
- Observe the flow meters and sensors for proper operation by checking the instantaneous flow measurement. If the flow meters appear to be inoperable, clean the flow meter in accordance with Section 6.6.9.
- Record the pressure readings associated with the bag filter units.
- Observe the operation of the air stripper including the blower, transfer pump, and associated appurtenances.
- Record the pressure readings before and after each liquid and vapor phase activated carbon unit.
- Visually inspect the PLC to ensure it is functioning properly; check for any alarm conditions and address them as necessary. Ensure the proper electric breakers are in the on position and not tripped.
- Verify that the sump pump in the treatment building is operational.
- Ensure exhaust fans, heaters, or louvers are operational, depending on the season.
- Check piping entrance into the treatment building for damage or leaks.
- Inspect outside of treatment building for damage to vapor exhaust stack, gutters, doors, infrastructure, fencing, electric panel, etc.
- Check the satellite drum (i.e., personal protection equipment, bag filters, sludge) for leaks and verify that the drum lid is fastened tightly.
- Check the air compressor oil level in the sight glass, and add more oil if necessary. Inspect compressor inlet filter and compressor moisture separator.
- Inspect all magnehelic® differential pressure gauges; disconnect the magnehelic® pressure gauge to the atmosphere and set it to zero.

- Mop the floor, using clean water and an aqueous degreaser before departing the Site.

6.2 QUARTERLY MAINTENANCE

- Exercise all valves by opening and closing them.
- Visually observe and clean the inlet wye strainer to the transfer pump for the equalization tank and air stripper sump pump.
- Replace the bag filters, the first set are 100-micron and the second set are 25-micron, do not place any bag filters in the third set and ensure the baskets are removed.
- Clean each flow sensor paddle wheel with an aqueous degreaser, and test the paddle wheel to ensure proper operation.
- Check operating amps of the air stripper blower motor and transfer pump motors.
- Inspect the air stripper blower air inlet screen and clean.
- Lubricate and grease all motors that have a grease fitting using the appropriate grease and amount.
- Inspect and clean compressor motor TEFC air ventilation slots to prevent clogging and starving the motor of cooling air.
- Inspect the vacuum blower and clean the compartment vent guards, dampers, motors, and propellers to prevent decreased airflow and overheating of the motor.

6.3 SEMI-ANNUAL MAINTENANCE

- Change the vacuum blower oil based on the run time of the motor or a maximum of semi-annual operation, whichever is sooner.
- Inspect the exhaust piping and ducts for leaks, and replace the piping and ducts as necessary with in-kind materials.
- Wipe off and degrease (aqueous degreaser) the exterior of the equalization tank, bag filter housings, transfer pumps, air stripper, carbon vessels (aqueous and vapor), air stripper blower and motor, vacuum blower, air-water separator, air compressor, equipment skids, control panel, electrical conduits, and all piping.

6.4 ANNUAL MAINTENANCE

- Remove the extraction well pumps from the extraction wells, disassemble the pumps and clean the parts. Replace worn parts as required. After cleaning the pumps, reassemble and redeploy the pumps. Ensure the pumps cycle before departing the Site.
- Remove the bag filter housing strainer and clean the strainer with dilute acid. Clean the inside of the bag filter housing with dilute acid.
- Remove the air stripper trays; clean the inside of the air stripper walls, stripper trays, and sump of the air stripper with dilute acid. Vacuum out accumulated sediment and sludges from the air stripper sump. Remove the stainless-steel float switch assembly from the sump sight tube. Clean the floats and sight tube using dilute acid. Wipe off all residue on and around the floats, and stem.
- Upgrade the control panel firmware, and ensure all upgradeable control panel devices are up to date.
- Clean and degrease the sump and sump pump in the treatment building, and remove all water in the sump.
- Replace the vacuum blower inline particle filter.
- Replace the vacuum blower dilution air filter.
- Clean leaves and debris from the enclosure gutters.

6.5 BIENNIAL MAINTENANCE

- Drain and clean out the equalization tank. See Section 6.6.3 for cleaning procedures.

- Inspect the roof of the enclosure. Patch any rust spots on the roof to prevent holes from forming.
- Wipe down the interior walls of the treatment enclosure using a rag and aqueous degreaser.

6.6 SPECIFIC EQUIPMENT MAINTENANCE

6.6.1 EXTRACTION WELLS

An inspection of the pumps should be conducted when the pump is suspected of being compromised or during extraction well cleaning in accordance with Section 6.7. Flow and drawdown trend analysis are used as a primary benchmark for situations when pump performance is questionable. Sudden or significant changes in flow (i.e., decreased cycle count) and drawdown are symptomatic of a defective or clogged pump. Pump maintenance shall be performed in accordance with the manufacturer's instructions (Appendix D). Pumps that cannot be repaired in the field will be replaced if found underperforming, damaged, or defective. Pump replacement is conducted by WSP or its subcontractor (with prior authorization from WSP) in accordance with the manufacturer's instructions.

6.6.2 AIR COMPRESSOR

The air compressor and dryer require specific maintenance that shall be completed routinely. Below is a summary of the air compressor maintenance tasks to be completed: Note. Before any maintenance is performed, the air compressor shall be de-pressurized and turned off on the control panel.

MONTHLY MAINTENANCE

- Check for oil leaks.
- Check lubricant level. Fill as needed.
- Ensure the automatic draining device is operational.
- Check for unusual noise and vibration.
- Ensure belt guards and covers are securely in place.
- Ensure the area around the compressor is free from rags, tools, debris, and flammable or explosive materials.
- Observe the operation of safety/relief valves while the compressor is running. Replace safety/relief valves that do not operate freely.
- Inspect air filter element(s). Clean if necessary.
- Inspect for air leaks. Squirt soapy water around joints during compressor operation and watch for bubbles.
- Check the tightness of screws and bolts. Tighten as needed.
- Inspect drive belts. Adjust if necessary.
- Clean exterior.

QUARTERLY MAINTENANCE

- Change synthetic lubricant while the crankcase is warm.
- Replace the filter element.

SEMI-ANNUAL

- Replace the air compressor belt
- Replace air compressor coalescing filter element

6.6.3 EQUALIZATION TANK

The equalization tank shall be cleaned out every 2 years. Precipitate generated from the pumping activities will cause solids to accumulate in the bottom of the tank. This increases the risk of clogging the transfer pump intake pipe. To mitigate the risk, the solids in the equalization tank shall be cleaned out every 2 years. At no point shall any person enter the tank. Entry into the tank is a confined space entry and all applicable OSHA requirements shall be followed. The procedure to clean out the equalization tank includes:

1. Operate equalization transfer pumps P-211 in "HAND" until the pump begins to siphon air.
2. Complete the System shut down procedures.
3. Open the top access hatch by unscrewing the lid. Spray the sides of the equalization tank with a descaling acid to remove staining. Use a long soft bristle brush to wipe the sides of the tank.
4. Spray the sides of the equalization tank with a descaling base (sodium hydroxide or similar base) to remove staining.
5. A molar equivalent of descaling acid to descaling base is recommended to neutralize the pH of the cleaning water in the equalization to between 6 and 8.5 s.u.
6. Use a vacuum with a drum lid attachment to remove the remaining water and solids and containerize them in drums (multiple drums and shop-vac hose extensions are required for this activity).
7. Refill the equalization tank with water and prime the equalization transfer pump to remove air within the pump using the pump-priming set screw.
8. Complete re-start procedures in accordance with Section 4.1.
9. Solids and liquids generated from this activity shall be managed as a listed hazardous waste (Section 6.9).

6.6.4 BAG FILTERS

An inspection of the bag filter units shall be completed monthly to ensure each unit is operating within acceptable pressure limits. Any time the pressure is greater than 50 psi for any bag filter housing, the pressure drop is greater than 15 psi across any bag filter, or the pressure at PI226 is greater than 25 psi, the bag filters shall be changed. At a minimum, the bag filters shall be changed quarterly. The procedure for changing the bag filters includes:

1. Check the bag filter units for leaks and plan to repair any leaking components before restarting the System.
2. Record the pressure at each bag filter.
3. Close the influent and effluent valves to a single bag filter set.
4. Safely relieve the pressure of each unit by slowly opening the small ball valve at the top of each unit, then close once pressure is relieved.
5. Remove the top plate on each bag filter unit by unscrewing the 4 bolts on the top plate.
6. Pull out the used bag filter and place it in a labeled drum. Spent bag filters are considered a listed hazardous waste (Section 6.9).
7. Place a new bag filter inside the housing.
8. Replace the top plate and bolts on each unit.
9. Open the influent and effluent valves to the bag filter set.
10. Purge the air from the bag filters by opening and closing the small ball valve at the top of each bag filter housing.
11. Check the bag filter units for leaks, and tighten the top plates as necessary.

6.6.5 AIR STRIPPER

At a minimum, the air stripper unit shall be cleaned annually. The exterior shell, trays, gaskets, site tube, door, demister cone/demister element, and magnehelic gauge shall be inspected for any signs of deterioration, leaks, damage, or fouling. Before cleaning or maintenance, the water shall be shut off feeding the air stripper. Wait 5 minutes to allow the water in the aeration trays to completely drain to the collection sump. Completely shut down the System for cleaning. The unit's trays shall be cleaned to reduce fouling conditions (metal oxides, scale, bio-solids, etc.) using a descaling acid/base combined with mechanical scrubbing and/or pressure washing.

The air stripper's trays shall be cleaned by removing the front windows of the air stripper unit. The window can be removed by loosening the bolts around the face of the air stripper. Once the window is completely removed, each stripper tray can be removed from the air stripper housing. (Note: it is important to remember where each tray was removed from in the unit.).

After removing the trays, clean with molar equivalents of a descaling acid and a descaling base (descaling solution not mixed together, but applied separately) and a stiff bristle brush. Collect the cleaning solution and place it in the equalization tank. Rinse each tray and return the tray to its proper position, place the air stripper window back on the air stripper unit and hand tighten the bolts that hold the window in place.

If the air stripper gasket leaks, a replacement gasket can be ordered directly from QED™.

6.6.6 AQUEOUS PHASE CARBON UNITS

The aqueous discharge limits are based on the allowable discharge limits established by the SPDES Permit Equivalent as described in Section 5.2. The primary aqueous influent constituents of concern include TCE and cis-1,2-DCE. To eliminate an aqueous discharge exceedance, the limit shall be compared to the results of a sample collected from between the carbon vessels (i.e., WmidGAC sample). If a TCE concentration of 0.01 mg/l or cis-1,2-DCE concentration of 0.01 mg/l or greater is detected, then the lead-carbon vessel will be changed out with new virgin granular activated carbon, and the order of the carbon vessels are switched. The GAC is composed of 4 x 8 mesh sieved, steam activated, virgin carbon. Specifications are provided in Appendix G.

6.6.7 VAPOR BLOWER

The vapor blower should have its lubricant drained and replaced annually or after 6,000 hours of operation, whichever comes first. The procedure for changing the blower's lubricant is as follows:

1. At the drive end, the bearings are lubricated by the slinger. Remove the breather from the drive cover using appropriate tools.
2. Drain the current lubricant from the drive end as thoroughly as possible.
3. Add oil to the drive sump until the oil reaches the center of the oil level gauge, approximately 1.2 pints (19.1 ounces) of AEON® PD Synthetic Blower Lubricant. Add fresh oil as required to maintain the proper level. The oil level should be in the middle of the sight glass when the machine is not operating.
4. Secure breather in the drive cover.
5. At the gear end, the timing gear teeth are lubricated by being partially submerged in oil. The gear teeth serve as oil slingers for gear end bearings. Remove the breather from the gear cover.
6. Drain the current lubricant from the gear end as thoroughly as possible.
7. Add oil to the gear case until the oil reaches the center of the oil level gauge, approximately 2.5 pints (40 ounces) of AEON® PD Synthetic Blower Lubricant. Add fresh oil as required to maintain the proper level. The oil level should be in the middle of the sight glass when the machine is not operating. Do not overfill as this will potentially cause excessive heating of the gears and may damage the unit.
8. Secure breather in the gear cover.

6.6.8 VAPOR CARBON UNITS

Vapor carbon vessels are monitored for breakthrough by a combination of vapor samples collected before, between, and after the vessels (Section 5.1). When carbon change-out is necessary, the spent GAC in the vessels shall be removed by a vacuum or similar means (i.e., drum lid/shop-vac vacuum with an extended hose), containerized, and managed in accordance with Section 6.9.2. It is anticipated that each vapor carbon vessel will require five drums to store the waste material. Care shall be taken to not damage the vapor diffusers at the bottom of the vessels.

The vapor discharge limits are based on TCE which has the lowest discharge limit and is the highest concentration constituent associated with the vapor discharge. The average TCE concentration of vapor shall be equal to or less than 4.4 part per million by volume (ppmv) from the discharge stack of the System (after carbon treatment). To eliminate a vapor discharge exceedance, the limit shall be compared to the results detected from the sample collected between the carbon vessels (i.e., VmidGAC sample). If a TCE concentration of 4.4 ppmv is detected from this sample, then both vapor carbon vessels shall be changed out with new virgin granular activated carbon. If a TCE concentration of 44 ppmv is observed the System shall be immediately shut down and the carbon shall be changed. A detailed model and analysis of the vapor discharge limits are provided in Appendix H. The specifications of the virgin GAC are provided in Appendix G.

6.6.9 FLOW METER CLEANING

Preventative maintenance of System flow meters consists of periodic inspections and cleaning procedures. The procedures should be performed at a minimum, annually, and any defects discovered should be corrected before further operation of the meter. Note: the ERDCO® Armor-Flo™ extracted vapor flowmeter and transmitter (FI/FT 201) do not require preventative maintenance.

Process Flow Meters (FT202, FI/FT 221, FI/FT 601)

If the Georg Fischer 2537 flow sensor's paddlewheel becomes fouled, it can be cleaned with mild detergents and a small brush. During these tasks, care shall be taken to not wet electronic components or disturb transmitter wiring.

1. To access the paddlewheel, unscrew the sensor and connected Georg Fischer Signet 8550 or 9900 transmitter from the connecting fitting on the influent piping at the baghouse filters.
2. After cleaning the paddlewheel with a mild detergent and water mixture, inspect the sensor's O-rings for nicks and other damage that may compromise the seal. If necessary, replace the O-rings (Georg Fischer part number: 1220-0021). Lubricate O-rings with a non-petroleum-based, viscous lubricant (grease) compatible with the System.
3. To reinstall, lower the sensor back into the fitting, making sure the conduit ports on the yellow housing are pointing in the direction of flow.
4. Engage one thread of the sensor cap then turn the sensor until the alignment tab is seated in the fitting notch. The sensor should be hand-tight. Do not use tools. Do not use pipe sealant thread.

If the paddlewheel appears to be damaged, replace the rotor by following the steps below:

1. Complete step 1 above.
2. Remove the rotor by inserting a small screwdriver between the rotor and the ear of the sensor.
3. Twist the screwdriver blade to flex the ear outward enough to remove one end of the rotor and pin. Care shall be taken to not flex the ear any more than necessary. If the plastic ear breaks, the full unit will be required to be replaced.
4. Install the new rotor (George Fischer part number: 3-2536.320-1) by inserting one tip of the pin into the hole, then carefully flexing the opposite ear back enough to slip the rotor into place.
5. Complete steps 3 and 4 above.

Discharge Flow Meter (FI 602)

If the Dwyer Multi-Jet Water Meter (Model: 1" WM2-A-C-04) becomes fouled, typically indicated by a loss in pressure and a resulting flow rate decrease, the meter's screen requires cleaning.

1. Remove the inline flow meter by unscrewing it from the two connections on either side.
2. Pull out the internal strainer or back flush (see flow indicator on thread spuds) to loosen trapped particulates
3. After cleaning, visually inspect the meter for missing hardware, broken resistor glass, or other signs of wear or deterioration. If the resister glass has fogged or contains water, the magnetically driven, hermetically sealed register has been impacted with water and requires replacement or manufacturer repair.
4. To reinstall, place the meter back into place and tighten the two connecting fittings on either side making sure the meter spuds are pointed in the direction of flow. The meter should be hand-tight. Do not use tools. Do not use pipe sealant thread.

6.7 WELL CLEANING

Excessive bio-fouling and scaling can build up on the submersible pump, piping, and/or well boring fractures. If these accumulations become excessive, the well yield will decline and the well and down-well equipment will need to be cleaned. This procedure shall only be used as a last resort to improve the well's specific capacity and prevent clogging or damage to the submersible pumps.

The procedure for well cleaning is presented below. Note: Cleaning of any of the EWs requires authorization by the WSP Project Manager before proceeding, and WSP personnel must be present onsite for this O&M activity.

FIRST DAY

1. Collect a pH sample to establish a baseline value.

2. Shut down the respective extraction well and close the ball valve in the respective extraction well vault.
3. Remove the extraction well pump and associated piping from the well
4. Clean the well pump and associated piping with soap and water and brush. Rinse thoroughly. All wash and rinse water shall be collected for treatment through the System.
5. If necessary, agitate the solids in the extraction well using a down well stiff bristle brush for approximately 30 minutes to 1 hour to break up any compacted solids within the casing.
6. Confirm the bottom of the extraction well casing based on field measurements and well construction diagrams.
7. Use an appropriately sized brush (wire) or swab to remove material from the riser casing and well boring. The process shall be performed for approximately 30 minutes to 1 hour. Pump out the solids that may have accumulated in the well.
8. Determine the volume of water in the well.
9. Slowly pour the appropriate amount of BioClean® and Dry Acid Special® directly into the standing water column. The appropriate amount of each reagent shall be based on the following guidelines:
    a. 1 gallon of BioClean® per 20 gallons of water in the well
    b. 1 pound of Dry Acid Special® to 1 gallon of water in the well
10. After approximately 1 hour, agitate the solution in the well for 30 minutes to 1 hour using an appropriately sized surge block equipped with a wire brush or a pressure relief hole and flap (or a check valve).
11. Surge the well to create a negative pressure to keep the chemical mixture within the radius of the well.
12. Allow the well to 'rest' for approximately 1 hour, then repeat the agitation of well water for another 30 minutes using a surge block.
13. Install a temporary submersible pump and piping down the well, and pump for approximately 1 hour at a rate of not greater than 5 GPM. The solids-containing discharge shall be collected in an appropriately sized, portable container and, if deemed necessary, transported to the System enclosure for treatment. If placed into the onsite System, lime should be added to neutralize the recovered groundwater before it is transferred to the System equalization tank.
14. If deemed necessary, repeat the entire chemical treatment process (Steps 8 through 12) as described above. The maximum number of treatment cycles is two.
15. Allow well to stabilize overnight.

SECOND DAY

1. Use the temporary pumping setup to extract groundwater from the well at a rate of approximately 5 GPM and have the discharge placed into an appropriately sized, portable container. While pumping, monitor the pH of the water until the pH reading is within 1.0 standard units of the baseline value. Well pumping may be halted after the pH has returned to the baseline value.
2. Remove temporary submersible pump and piping and decontaminate the equipment in accordance with WSP's field standard operating procedures.
3. Re-install the dedicated well pump and drop pipe, open the ball valve in the well vault, restart the well pump, and verify proper System operation.
4. All groundwater extracted during the well rehabilitation process shall be placed in a temporary container (i.e., tank), neutralized, if necessary, and transferred to the onsite System equalization tank. All well pumps, piping placed down the well, and the temporary container shall be cleaned before exiting the site. Decontamination fluids shall be contained and placed in the onsite System equalization tank.

6.8 CORRECTIVE MAINTENANCE

Corrective maintenance primarily consists of unplanned repairs or replacement of System components after they have failed. Examples are defective pumps, leaking pipes and fittings, and malfunctioning electronic equipment. If a failure occurs, the System shall be evaluated to determine if there is an alternative operating configuration, determine the possible cause of the failure, and identify actions that should be taken to correct the problem and prevent a recurrence. The proper maintenance activities shall then be performed by WSP or its subcontractor at the direction of the WSP Task Manager. Records of corrective maintenance will be maintained by WSP.

In the event corrective maintenance requires deviation from this Plan or modification of equipment, the change shall be noted in Table 10 - Corrective Maintenance Log.

6.9 WASTE MANAGEMENT

The System generates several types of waste depending on the process operation. Wastes include general trash and debris, hazardous waste (drummed), and non-hazardous waste (drummed). All hazardous and non-hazardous waste that needs to be drummed shall be placed in a lined 55-gallon Department of Transportation-compliant open-top steel drum. All drums shall be properly labeled using an appropriate drum label at all times when stored in the designated satellite accumulation area inside the treatment building. Once drums are 90% of the maximum capacity, the drums shall be characterized and profiled, and then the drums shall be transferred from the treatment building to the designated 90-day storage area. Waste at the site shall be managed under the following generator information:

EMERSUB 15, LLC

620 S Aurora Street, Ithaca, NY 14850

EPA ID# NYD002228625

6.9.1 GENERAL TRASH AND DEBRIS

General trash generated during maintenance activities varies from the packaging of equipment to empty containers. This general trash is collected in a dedicated 8 cubic yard dumpster located in the parking lot adjacent to the System enclosure. Any non-hazardous disposable groundwater sampling equipment (i.e., tubing, gloves, other spent sampling equipment) shall be rinsed with potable water and disposed of in the general trash. Rinse water shall be placed directly into the equalization tank or slowly added to the sump and transferred to the equalization tank.

6.9.2 DRUM WASTE – PROCESS WASTE

Wastes generated from the maintenance of the System processes shall be placed in lined 55-gallon Department of Transportation-compliant open-top steel drums. The wastes will include hazardous and non-hazardous wastes. Below is a summary table of the type and quantity frequency of drummed wastes. Other non-routine wastes may be generated during the operation of the System and shall be managed properly.

Table 11 Drum Waste Management

Waste Description	Type of Waste	Estimated Quantity	Frequency of Disposal
Air Stripper Scale	Sampling Required	1 Drum per Year	1 Drum per Year
Equalization Tank Scale or Pre-Air Stripper Scale	Hazardous	1 Drum per Year	1 Drum per Year
Spent Bag Filters	Hazardous	16 Spent Filters per Year	1 Drum every 3 years
Aqueous Phase Carbon	Hazardous	400 Pounds Onsite	400 Pounds every 5 years
Vapor Phase Carbon	Hazardous	2,000 Pounds Onsite	2,000 Pound every 5 years
Other Solids (Equalization Tank Sediment, Sump Pump Sludge, etc.)	Hazardous	1 Drum per Year	1 Drum per Year
PPE/Tubing	Hazardous	1 Drum per Year	1 Drum per Year
Oil Sorbent Pads and Oil Filters	Non-Hazardous	1 Drum per Year	1 Drum per Year

Once the drums are at 90% of the maximum capacity, WSP or the subcontractor shall notify the WSP O&M Task Manager. The WSP O&M Task Manager shall coordinate the characterization and profiling of the drums with the WSP Project Compliance Officer, and coordinate the transfer of the drum by the subcontractor to the designated 90-day storage area.

FIGURES

DWG Name: 314P1545.001_Figure 1_A01.pub

Checked:

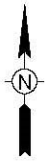
Approved:

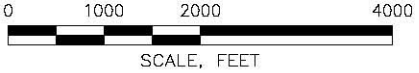
Drawn By: Ltb 09/16/20

A

REFERENCE:
7.5 MINUTE SERIES TOPOGRAPHIC QUADRANGLE
ITHACA EAST AND WEST, NEW YORK 2016
SCALE 1:24,000

QUADRANGLE LOCATION



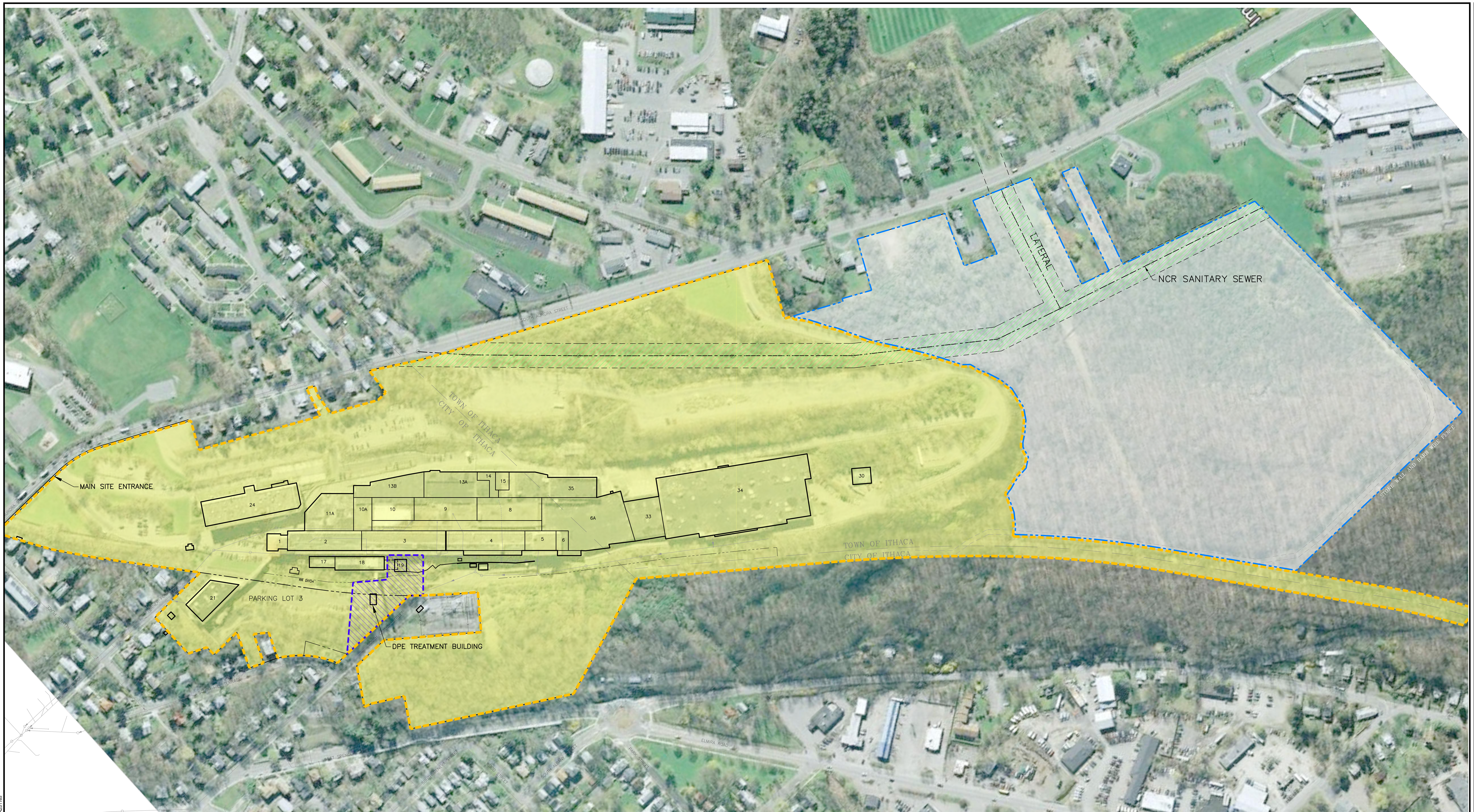


WSP USA Inc.
11 STANWIX STREET
SUITE 950
PITTSBURGH, PA 15222
TEL: +1 412.604.1040

FIGURE 1

SITE LOCATION

FORMER EMERSON POWER TRANSMISSION
ITHACA, NEW YORK
PREPARED FOR
EMERSON
ST. LOUIS, MISSOURI



LEGEND

34 BUILDING NUMBER

DEED RESTRICTION PLACED BY EMERSON

SANITARY SEWER

BOUNDARY FOR OU-1 (RETAINED PROPERTY)

BOUNDARY FOR OU-2

AREA REMOVED FROM SITE NO. 755010

150 0 150 300

SCALE, FEET

THE ORIGINAL VERSION OF THIS DRAWING IS IN COLOR. BLACK & WHITE REPRODUCTION MAY NOT ACCURATELY DEPICT CERTAIN INFORMATION.

D

REVISIONS

REV | DESCRIPTION

DRAWN BY

CHECKED

APPROVED

SEAL

DATE

PROPERTY OF WSP USA INC.

IMPORTANT: THIS DRAWING PRINT IS LOANED FOR MUTUAL ASSISTANCE AND AS SUCH IS SUBJECT TO RECALL AT ANY TIME. INFORMATION CONTAINED HEREON IS NOT TO BE DISCLOSED OR REPRODUCED IN ANY FORM FOR THE BENEFIT OF PARTIES OTHER THAN NECESSARY SUBCONTRACTORS & SUPPLIERS WITHOUT THE WRITTEN CONSENT OF WSP USA INC.

NOTICE: THIS DRAWING HAS BEEN PREPARED UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER. IT IS A VIOLATION OF STATE LAW FOR ANY PERSON, UNLESS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT IN ANY WAY.

SITE LAYOUT

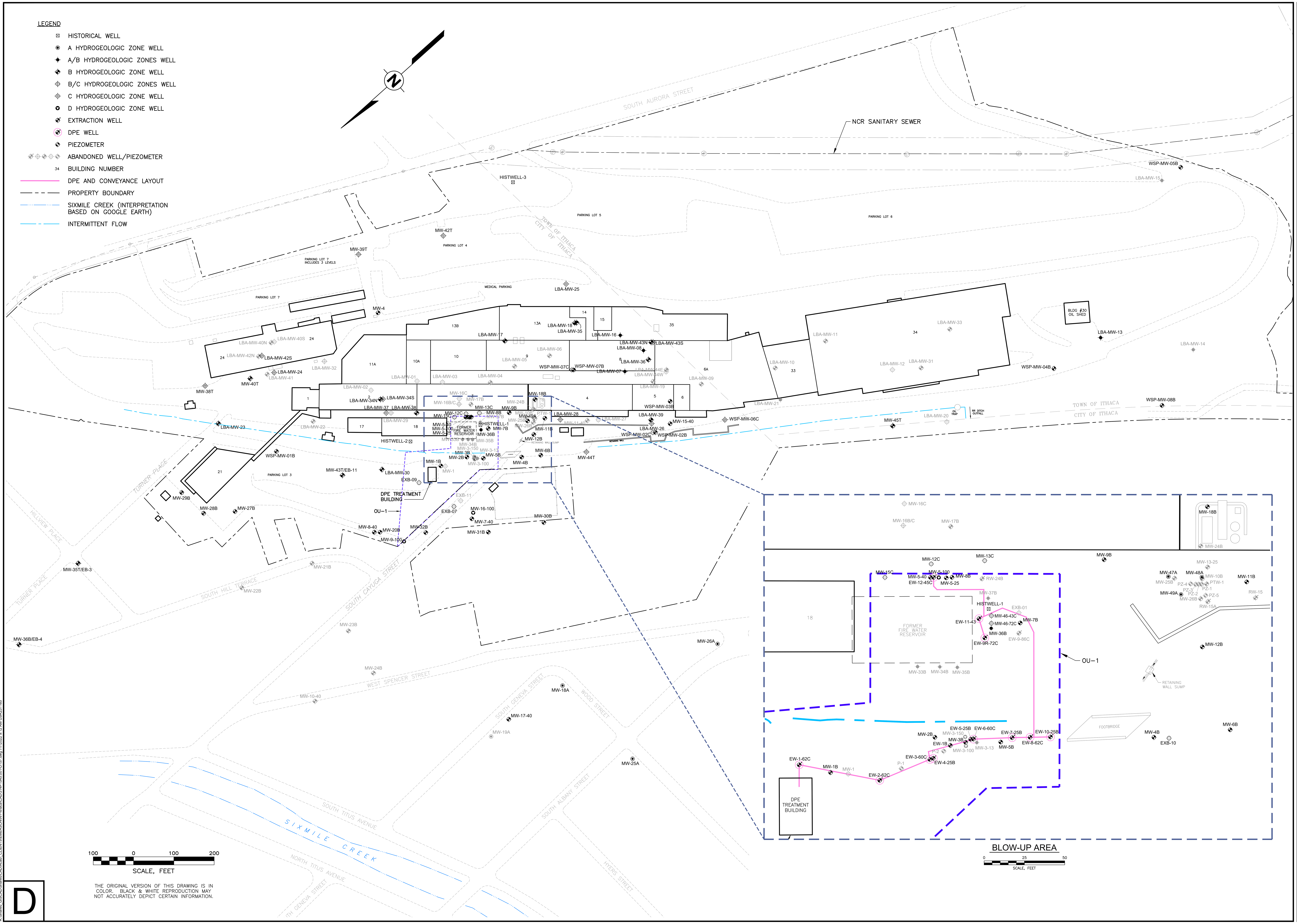
FORMER EMERSON POWER TRANSMISSION
ITHACA, NEW YORK

PREPARED FOR
EMERSON
ST. LOUIS, MISSOURI

WSP USA Inc.
11 STANWIX STREET, SUITE 950
PITTSBURGH, PA 15222
TEL: +1 412.604.1040

FIGURE 2

Drawing Number
314P1545.001-D116



LEGEND
HISTORICAL WELL
A HYDROGEOLOGIC ZONE WELL
A/B HYDROGEOLOGIC ZONES WELL
B HYDROGEOLOGIC ZONE WELL
B/C HYDROGEOLOGIC ZONES WELL
C HYDROGEOLOGIC ZONE WELL
D HYDROGEOLOGIC ZONE WELL
EXTRACTION WELL
DPE WELL
PIEZOMETER
ABANDONED WELL/PIEZOMETER
34 BUILDING NUMBER
DPE AND CONVEYANCE LAYOUT
PROPERTY BOUNDARY
SIXMILE CREEK (INTERPRETATION BASED ON GOOGLE EARTH)
INTERMITTENT FLOW
N
SOUTH AURORA STREET
NCR SANITARY SEWER
HISTWELL-3
PARKING LOT 5
PARKING LOT 6
TOWN OF ITHACA
CITY OF ITHACA
MW-42T
PARKING LOT 4
MW-39T
PARKING LOT 7 INCLUDES 3 LEVELS
MEDICAL PARKING
LBA-MW-25
PARKING LOT 7
MW-4
WSP-MW-05B
LBA-MW-15
BLDG #30 OIL SHED
LBA-MW-13
LBA-MW-14
WSP-MW-04B
WSP-MW-08B
LBA-MW-33
LBA-MW-11
LBA-MW-12
LBA-MW-31
LBA-MW-10
LBA-MW-21
LBA-MW-20
MW-45T
WSP-MW-06C
LBA-MW-18
LBA-MW-35
LBA-MW-16
LBA-MW-17
LBA-MW-43N
LBA-MW-43S
LBA-MW-08
LBA-MW-36
LBA-MW-07
LBA-MW-06
LBA-MW-05
WSP-MW-07C
WSP-MW-07B
LBA-MW-09
LBA-MW-19
LBA-MW-40N
LBA-MW-40S
LBA-MW-42N
LBA-MW-42S
LBA-MW-24
LBA-MW-41
LBA-MW-32
LBA-MW-01
LBA-MW-03
LBA-MW-04
LBA-MW-02
LBA-MW-34N
LBA-MW-34S
LBA-MW-37
LBA-MW-38
MW-38T
MW-40T
LBA-MW-23
LBA-MW-22
LBA-MW-29
HISTWELL-2
WSP-MW-01B
MW-43T/EB-11
LBA-MW-30
PARKING LOT 3
LBA-MW-28
LBA-MW-27
WSP-MW-03B
LBA-MW-39
LBA-MW-26
MW-15-40
WSP-MW-02C
WSP-MW-02B
MW-44T
EXB-09
DPE TREATMENT BUILDING
OU-1
EXB-11
EXB-07
MW-16-100
MW-7-40
MW-31B
MW-30B
MW-8-40
MW-20B
MW-9-100
MW-32B
MW-29B
MW-28B
MW-27B
MW-35T/EB-3
MW-21B
MW-22B
MW-23B
MW-36B/EB-4
MW-24B
MW-10-40
MW-26A
MW-18A
MW-17-40
MW-19A
MW-25A
TURNER PLACE
HILLVIEW PLACE
SOUTH HILL TERRACE
SOUTH CAYUGA STREET
WEST SPENCER STREET
SOUTH GENEVA STREET
WOOD STREET
SOUTH ALBANY STREET
SOUTH TITUS AVENUE
NORTH TITUS AVENUE
SIXMILE CREEK
MYERS STREET
MW-16C
MW-16B/C
MW-17B
MW-18B
MW-24B
MW-12C
MW-13C
MW-9B
MW-15C
MW-5-40
MW-5-100
MW-8B
EW-12-45C
MW-5-25
RW-24B
MW-37B
HISTWELL-1
EXB-01
EW-11-43
MW-46-43C
MW-46-72C
MW-7B
FORMER FIRE WATER RESERVOIR
MW-36B
EW-9-86C
EW-9R-72C
18
MW-33B
MW-34B
MW-35B
OU-1
MW-47A
MW-48A
MW-25B
PZ-4
PZ-3
MW-10B
PTW-1
MW-13-25
MW-11B
MW-49A
PZ-1
PZ-2
PZ-5
MW-26B
RW-15A
RW-15
MW-12B
RETAINING WALL SUMP
FOOTBRIDGE
EW-5-25B
EW-6-60C
MW-2B
MW-3-150
MW-3B
EW-1B
MW-3-100
MW-3-13
EW-7-25B
EW-10-25B
MW-5B
EW-8-62C
MW-4B
EXB-10
MW-6B
EW-1-62C
MW-1B
MW-1
EW-3-60C
EW-4-25B
P-1
EW-2-62C
DPE TREATMENT BUILDING
BLOW-UP AREA
0 25 50
SCALE, FEET
100 0 100 200
SCALE, FEET
THE ORIGINAL VERSION OF THIS DRAWING IS IN COLOR. BLACK & WHITE REPRODUCTION MAY NOT ACCURATELY DEPICT CERTAIN INFORMATION.
D

REV	DESCRIPTION
1	Revised: Chkd: Appr.:
2	Revised: Chkd: Appr.:
3	Revised: Chkd: Appr.:

SEAL

DATE

DRAWN BY RA 10052020
CHECKED ML 07072022
APPROVED

PROPERTY OF WSP USA INC.

IMPORTANT: THIS DRAWING PRINT IS LOANED FOR MUTUAL ASSISTANCE AND AS SUCH IS SUBJECT TO RECALL AT ANY TIME. INFORMATION CONTAINED HEREON IS NOT TO BE DISCLOSED OR REPRODUCED IN ANY FORM FOR THE BENEFIT OF PARTIES OTHER THAN NECESSARY SUBCONTRACTORS AND SUPPLIERS WITHOUT THE WRITTEN CONSENT OF WSP USA INC.

NOTICE: THIS DRAWING HAS BEEN PREPARED UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, IT IS A VIOLATION OF STATE LAW FOR ANY PERSONS, UNLESS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT IN ANY WAY.

WELL AND PIEZOMETER LOCATIONS

FORMER EMERSON POWER TRANSMISSION
ITHACA, NEW YORK

PREPARED FOR
EMERSON
ST. LOUIS, MISSOURI

WSP USA Inc.
11 STANWIX STREET, SUITE 950
PITTSBURGH, PA 15222
TEL: +1 412.604.1040

FIGURE 3

Drawing Number
314P1545.001–D157

TABLES

Table 2

System Parts List
Former Emerson Power Transmission
Ithaca, New York

Number	P&ID Label	Type of Equipment	Description and Specifications	Model or Manufacture Part Number
System Components				
1	**EW-**	**Well Pump**	Pneumatic groundwater extraction pump (2.3 gpm rated, 55" length, 0.14-0.17 gal volume per cycle, stainless steel body and fittings)	QED™ AP2B 1.75-inch OD Bottom-Inlet Long
2	**EW-**	**Well Pump**	Pneumatic groundwater extraction pump (2 gpm rated, 33" length, 0.05-0.08 gal volume per cycle, stainless steel body and fittings)	QED™ AP2B 1.75-inch OD Bottom-Inlet Short
3	**AC101**	**Air Compressor**	Two-stage reciprocating air compressor (80 gallon, vertical tank, 115V, 60 Hz, auto drain)	Ingersoll Rand 2475N7.5
4	**N/A**	**Motor**	Air compressor motor (7.5 HP, 208-230/460V, 18.6-17.2/8.6A, 50/60 Hz, 3 phase)	Emerson e-LINE™ ELT7E1D
5	**AD101**	**Air Dryer**	Refridgerated air drayer (9.9 oz R134a, 115V, 60 Hz, 25 cfm)	Ingersoll Rand D42IN
6	**AW201**	**Air Water Separator**	Air water separator (120 gallon)	N/A
7	**B201**	**Blower**	Positive displacement rotary lobe vacuum blower (rated for 300 scfm at 10 inches of Hg)	Sutorbilt Legend® 5LP-DSL
8	**N/A**	**Motor**	Vacuum blower motor (20 HP, 460V, 7.31/23A, 60 Hz, 3 phase)	Teco-Westinghouse MAX-E2®/841 HB0204
9	**P201**	**Transfer Pump**	Progressive cavity pump (50 psi, 1750 max rpm, cast iron)	Moyno® 35601
10	**T201 and T202**	**Vapor Phase Carbon Vessel**	250-lb liquid phase granular activated carbon vessel	N/A
11	**P211 and P601**	**Transfer Pump**	Centrifugal pump (1 ½ HP, 1" X 1.25"-6, 4.75" impeller, 316 stainless steel, 60 Hz, 208-230/460V, 3 phase, TEFC - Totally Enclosed Fan Cooled Motor)	Goulds 1ST1F5D4 NPE Series
12	**T211**	**Equalization Tank**	N/A	N/A
13	**PF221 through PF226**	**Bag House Filters**	Bag House Filters (2-inch FNPT aluminum, 25 µm or 100 µm polyester felt bag)	Pentek 4BB26
14	**AS601**	**Air Stripper**	Air stripper (Low profile, 4 tray)	QED™ EZ Tray 4.4SS
15	**B601**	**Blower**	Pressure Blower (5 HP, cast aluminum)	New York Blower 2204 ALUM
16	**T611 and T612**	**Liquid Phase Carbon Vessel**	1,000-lb vapor phase granular activated carbon vessel	ESD Model VVHV-1000
17	**N/A**	**Heating Unit**	N/A	N/A
18	**N/A**	**Thermostat**	N/A	N/A
19	**N/A**	**Ventilation Unit**	Exhaust fan (2500 cfm, 2'x2' roof curb mounted)	N/A
20	**N/A**	**Louver**	Wall louver (3'x3')	N/A
Performance Monitoring Instrumentation				
21	**N/A**	**Pressure Gauge (Extraction Well Vault)**		
22	**N/A**	**Vacuum Gauge (Extraction Well Vault**		
23	**PI101**	**Pressure Gauge**	(0-200 psi, backmount, liquid filled)	N/A
24	**PT101 and PT601**	**Pressure Transmitter**	Pressure transmitter (0-200 psi, piezo-resistive sensor, NEMA 4X stainless steel housing)	Dwyer® 626-12-GH-P1-E3-S1
25	**TI101**	**Temperature Gauge**	Bi-metal temperature gauge (50-300 °F, 2-1/2" Stem length, 1/2" MNPT)	Winters T30025-B9
26	**FI/FT201**	**Flow Sensor & Transmitter**	Vapor flowmeter and transmitter (aluminum, class 150 flanged, carbon steel shunt, Buna-n o-ring, 50-500 cfm rated, 4-20 mA output)	ERDCO® Armor-Flo™
27	**PI201, PI601, and PI602**	**Pressure Gauge**	Magnehelic® differential pressure gauge (0-50" w.c., 1/8" FNPT duplicate high and low pressure taps connections, aluminum case)	Dwyer® 2050
28	**PI202, PI211, PI221, PI222, PI223, PI224, PI225, PI603, PI611, and PI612**	**Pressure Gauge**	N/A	N/A
29	**PI203 and PI204**	**Pressure Gauge**	Pressure gauge (0-55" w.c., 1/4" NPT, steel case, center back mount)	Winters P342
30	**TI201**	**Temperature Gauge**	Bi-metal temperature gauge (50-500 °F, 2-1/2" Stem length, 1/2" MNPT)	Winters T30025-B11
31	**VT201**	**Vacuum Transmitter**	Differential pressure switch (4.0-20.0" w.c.)	Dwyer® 1910-20
32	N/A	**Vacuum Gauge**	Vacuum gauge (1/4" MNPT, -30-0" Hg, center back mount)	N/A
33	N/A	**Vacuum Gauge**	Vacuum gauge (1/4" MNPT, -15-0" w.c., steel housing)	N/A
34	**VI201**	**Vacuum Gauge**	N/A	N/A
35	**VI202**	**Vacuum Gauge**	N/A	N/A
36	**VI203**	**Vacuum Gauge**	N/A	N/A
37	**FI/FT221 and FI/FT601**	**Flow Sensor & Transmitter**	Flow sensor (0.3-20 ft/s rated, PVDF paddlewheel, 4-20 mA) with transmitter (LCD display, 12-45VDC, 4-20mA)	Georg Fischer 2537 with Georg Fischer Signet 8550 or 9900
38	**FI602**	**Flow Totalizer**	Multi-Jet Water Meter (1" NPT, 50 gpm rated, brass)	Dwyer® WM2-A-C-04
Ancillary Flow Control and Maintenance Components				
39	**N/A**	**Check Valve (Extraction Well Vault)**		
40	**N/A**	**Pressure Regulator (Extraction Well Vault)**		
41	**N/A**	**Ball Valve (Extraction Well Vault)**		
42	**BV101**	**Ball Valve**	N/A	N/A
43	**CF101**	**Coalescing Filter**	0.01 µm coalescing air filter	Ingersoll Rand IRHE19
44	**PCV101**	**Pressure Control Valve**	Relieving air pressure regulator	Norgen Excelon® R72G-2AS-007
45	**PF101**	**Particulate Filter**	5 µm pre-filter	Ingersoll Rand ARO® F25121-400
46	**SV101**	**Solenoid Valve**	N/A	N/A
47	**BV205, BV206, BV211, BV212, BV221, BV222, BV223, BV224, BV601, BV611, and BV612**	**Ball Valve**	Single union ball valve (1", Schedule 80 PVC with ASTM cement socket rated at 232 psi)	George Fischer 161 354 344
48	**CV201**	**Check Valve**	N/A	N/A
49	**CV202**	**Check Valve**	Single swing check valve (2", FNPT x FNPT, brass, inline)	Nibco® TI3 2"
50	**ES201**	**Exhaust Silencer**	Heavy-duty exhaust silencer	Universal Silencer™ RD-8
51	**FS201**	**Filter Silencer**	Dilution Air Inlet Filter Silencer (2" MPT Outlet, 7-1/4" Height, 10" Diameter, 135 scfm rated)	FS-31P-200
52	**GV201, GV202, and GV211**	**Gate Valve**	Gate valve (2", FNPT x FNPT, brass, full port)	Nibco® TI-8 2"
53	**GV203 and GV601**	**Gate Valve**	Gate valve (1", FNPT x FNPT, brass, full port)	Nibco® TI-8 1"
54	**PF201**	**Particulate Filter**	Vacuum Pump Air Filter, 4" Flange Inlet/Outlet, 27-1/2" Height, 14" Diameter, 520 scfm rated)	Solberg® CSL-235P-400F
55	**PSV201**	**Vacuum Relief Valve**	Adjustable vacuum relief valve (2", spring-type, set at 11" Hg)	Rotron® 523230
56	N/A	**Vacuum Relief Valve**	Vacuum breaking valve (1" FNPT, elbow-style, brass)	N/A
57	**S201**	**Inline Silencer**	Chamber silencer	Stoddard D13H4
58	**WS201, WS211, and WS601**	**Wye-Strainer**	Wye-Strainer (2", FNPT x FNPT, 20 mesh, 5-15/16" length, bronze)	Meuller Steam Specialty 2 777SI
59	**BFV211**	**Butterfly Valve**	N/A	N/A
60	**BV213**	**Ball Valve**	N/A	N/A
61	**BV214**	**Ball Valve**	N/A	N/A
62	**BV221**	**Ball Valve**	N/A	N/A
63	**BV222**	**Ball Valve**	N/A	N/A
64	**CV211**	**Check Valve**	N/A	N/A
65	**BFV601**	**Butterfly Valve**	Flanged butterfly valve (6", Schedule 80 PVC, EPDM seal)	Hayward® 5456-060
66	**BV601**	**Ball Valve**	N/A	N/A
67	**CV602**	**Check Valve**	Single swing check valve (1", FNPT x FNPT, brass, inline)	Nibco® TI3 1"
68	**CV603**	**Check Valve**	N/A	N/A
69	**GV601**	**Gate Valve**	N/A	N/A
Control Panel				
70	N/A	N/A	Module & Controller	N/A
71	N/A	N/A	Ethernet Switch	N/A
72	N/A	N/A	Ethernet Switch	N/A
73	N/A	N/A	Ethernet Switch	N/A
74	N/A	N/A	Module & Controller	N/A
75	N/A	N/A	Module & Controller	N/A
76	N/A	N/A	Controller	N/A
77	N/A	N/A	Operator Panel	N/A
78	N/A	N/A	Operator Panel Enclosure	N/A
79	N/A	N/A	Well Panel Enclosures	N/A
80	N/A	N/A	Power Supply Unit	N/A
81	N/A	N/A	Power Supply Unit	N/A
82	N/A	N/A	Voltage Monitor	N/A
83	N/A	N/A	Surge Protection	N/A
84	N/A	N/A	Filter Fan	N/A
85	N/A	N/A	Exhaust Filter	N/A

a/ N/A - Information Not Available

Table 3

Extraction Well Construction Details
Former Emerson Power Transmission
Ithaca, New York

Well ID		Installation Date	Top of Casing Elevation (ft amsl)	Ground Surface Elevation (ft amsl)		Total Borehole Depth **(ft bgs)**	Total Borehole Depth **(ft btoc)**	Cleaned Total Borehole Depth **(ft btoc)**	Well Type	Well Diameter	Casing Interval (ft bgs)	Grout Interval (ft bgs)	Betonite Plug Interval (ft bgs)	Filter Pack Interval (ft bgs)	Screen Type	Screened Interval (ft-bgs)	Pump depth **(ft-btoc)**	Pump Type
EW-1-62C		8/20/2007	565.34	566.59		62.0	60.8	60.8	4" Open Borehole	4	0-18	-	-	-	-	NA	59.8	1.75" OD Bottom-Inlet Pneumatic Pump (AP2B) - QED Environmental Systems
EW-2-62C		~1990 (Former EW-1)	563.93	565.33		62.7	61.3	61.4	6" Open Borehole	6	0-19	-	-	-	-	NA	60.3	Swapped with a 3" pump in 2013 (old pump couldn't keep up)
EW-3-60C		~1990 (Former EW-2)	563.28	565.12		60.0	58.2		6" Open Borehole	6"	0-19	-	-	-	-	NA	57.2	1.75" OD Bottom-Inlet Pneumatic Pump (AP2B) - QED Environmental Systems
EW-4-25B		10/31/2008	562.9	564.04	(b)	25.0	23.9		Type 304 Stainless Steel Well and Screen	4"	0 - 15	0 - 11	11 - 13	13 - 25	SS	15 - 25	22.9	1.75" OD Bottom-Inlet Pneumatic Pump (AP2B) - QED Environmental Systems
EW-5-25B		9/16/2008	563.37	564.49	(b)	25.0	23.9		Type 304 Stainless Steel Well and Screen	4"	0 - 15	0 - 10	10 - 13	13 - 25	SS	15 - 25	22.9	1.75" OD Bottom-Inlet Pneumatic Pump (AP2B) - QED Environmental Systems
EW-6-60C		~1990 (Former EW-3)	563.84	564.49		60.6	60.0	60.1	6" Open Borehole	6"	0-19	-	-	-	-	NA	59	1.75" OD Bottom-Inlet Pneumatic Pump (AP2B) - QED Environmental Systems
EW-7-25B		9/19/2008	561.76	563.28	(b)	25.0	23.5	23.5	Type 304 Stainless Steel Well and Screen	4"	0 - 15	0 - 11	11 - 13	13 - 25	SS	15 - 25	22.5	1.75" OD Bottom-Inlet Pneumatic Pump (AP2B) - QED Environmental Systems
EW-8-62C		8/29/2007	561.82	562.94		61.5	60.4	60.4	4" Open Borehole	4"	0-23	-	-	-	-	NA	59.4	1.75" OD Bottom-Inlet Pneumatic Pump (AP2B) - QED Environmental Systems
EW-9R-72C		6/2/2015	585.19	586.13		79.3	79.3	79.0	4" Open Borehole	4"	0-54.3	0-53	53-54.3	NA	NA	NA		1.75" OD Bottom-Inlet Long Pneumatic Pump
EW-10-25B		9/18/2008	561.82	563.04	(b)	25.0	23.8		Type 304 Stainless Steel Well and Screen	4"	0 - 13	0 - 12	12 - 13	13 - 25	SS	15 - 25	22.8	1.75" OD Bottom-Inlet Pneumatic Pump (AP2B) - QED Environmental Systems
EW-11-43C		3/15/2011	585.07	586.80		45.0	43.3		4" Open Borehole	4"	0 - 14	0 - 13	13 -14	NA	NA	NA	42.3	1.75" OD Bottom-Inlet Long Pneumatic Pump
EW-12-45C	(d)	8/16/2007 modified: 2015 (grouted up 45-80' interval)	586.47	587.07		45.0	44.4		4" Open Borehole	4"	0 - 25	0 - 25	NA	NA	NA	NA	43.4	1.75" OD Bottom-Inlet Short Pneumatic Pump

a/ ft = feet, " = inch, ~ = approximate, NA = data not available, bgs = below ground surface, amsl = above mean sea level, btoc = below top of casing, OD = outer diameter
total depth and all well interval measurements are approximate, no piezometers in well vaults
b/ 4 corner evelations of the well vault averaged to represent the ground surface elevation
c/ EW - 9 is an angled well, angled approximately 60 degrees from ground plane. The top loading electric pump was placed with the inlet at approximately 90.5 ft btoc and total length of angled borehole is about 99.65 ft
d/ EW - 12 was drillled on 8/16/2007 but then converted into an extraction well on 6/3/15

Table 7

Treatment Building and Equipment Maintenance Inspection Checklist
Former Emerson Power Transmission
Ithaca, New York

Date: _____ Inspector: _____
Arrival Time _____
Departure Time: _____

TREATMENT BUILDING AND EQUIPMENT MAINTENANCE INSPECTION CHECKLIST

At Risk Conditions and Equipment	Mark applicable box (X)		Comments
	Acceptable	Unacceptable	
Housekeeping/Building			
Evacuation Route/Doors Clear			
Floors Clean and Free from Slip Hazards			
Work Areas Clean and Equipment Correctly Stored			
Lighting			
Condition of Lights			
Emergency Equipment			
First Aid Box			
Eye Wash Station			
Fire Extinguisher #___ **Class (A, B, C, or D):** **Brand/Manufacturer and Model:** **Serial Number:** **Last Service Date:**			
Fire Extinguisher #___ **Class (A, B, C, or D):** **Brand/Manufacturer and Model:** **Serial Number:** **Last Service Date:**			
Ladders			
Ladder Storage (away from passageways, doorways, or any location it may interfere with our work)			
Ladder #___ **Type (step, extension, platform etc.):** **Brand/Manufacturer:** **Date of Manufacture:**			

Table 8

Operational Checklist
Former Emerson Power Transmission
Ithaca, New York

Date: _____ **Inspector:** _____

Arrival Time: _____ **Weather Conditions:** _____

Departure Time: _____

Reason for Visit (check all that apply):

Bi-Weekly O&M _____ Collect influent/effluent samples _____

Monthly O&M _____ Assist with carbon changeout _____

Other _____

_____

System Alarms Active Upon Arrival _____

TREATMENT SYSTEM CHECKLIST

Soil Vapor Extraction Skid

Motor Run Time (hrs.):	

Nomenclature	*Description*	*Reading*	*Units*
VI201	Vapor Liquid Separator Inlet Vacuum		"Hg
VLSSG	Vapor Liquid Separator Site Glass		gal.
VI202	Particulate Filter Inlet Vacuum		"Hg
VI203	Particulate Filter Outlet Vacuum		"Hg
FI201	Soil Vapor Extraction Flow (Manual)		scfm
TI201	Soil Vapor Extraction Discharge Temperature		°F
PI201	Soil Vapor Extraction Discharge Pressure		"W.C.
FT202	Vapor Liquid Separator Water Transfer Pump Totalizer		gal.

***Reading taken from newly installed Anemometer Port**

Table 8

Operational Checklist
Former Emerson Power Transmission
Ithaca, New York

Maintenance Items:

Oil Level:	
Oil Change (yes/no every 6000hrs.):	
Grease Lubrication Added (yes/no):	
Transfer Water Out of Vapor Liquid Separator (yes/no)	
Particulate Filter Changeout (yes/no)	

Oil change Needed Every 6,000 hrs.

Replacement Blower Filter is a Solberg 235 P

Replacement Bleed Filter is a Solberg 31 P

Additional Maintenance Needed:

Description of Maintenance Actives Completed:

Vapor Phase Carbon

Nomenclature	*Description*	*Reading*	*Units*
PI203	Pressure After Carbon Vessel T201		"W.C.
PI204	Pressure After Carbon Vessel T202		"W.C.
TI202	Inlet Temperature of 1st Carbon Unit		°F
TI203	Temperature Between the Carbon Units		°F

Description of Maintenance Actives Completed:

Equalization Tank

Nomenclature	*Description*	*Reading*	*Units*
EQSG	Equalization Tank Site Glass		gal
PI701	Equalization Tank Vacuum		" W.C.

Description of Maintenance Activities Completed

Table 8

Operational Checklist
Former Emerson Power Transmission
Ithaca, New York

Bag Filter Skid

EQ Pump Run Time (hrs.):	

Arrival / Depature / Adjusted

Nomenclature	*Description*	*Reading*	*Units*
PI211	Transfer Pump Discharge Water Pressure		psi
PI221	Bag Filter Influent Water Pressure		psi
PI222	Water Pressure Between PF-221 and PF-222		pis
PI223	Water Pressure Between PF-222 and PF-223		psi
PI224	Water Pressure Between PF-224 and PF-225		psi
PI225	Water Pressure Between PF-225 and PF-226		psi
PI226	Bag Filtration Exit Water Pressure		psi
FT221	Bag Filtration Water Totalizer		gal
FT221	Bag Filtration Water Flow		gpm

Maintenance Items:

Changed Bag Filter(s) (yes/no)		If yes, which filters?
Cleaned Bag Filter(s) (yes/no)		If yes, which filters?

Additional Maintenance Needed:

Description of Maintenance Actives Completed:

Air Stripper Skid

AS Blower Run Time (hrs.)		
AS Transfer Pump Run Time (hrs.)		check again next visit

Nomenclature	*Description*	*Reading*	*Units*
PI601	Differential Pressure Before the Butterfly Valve		"W.C.
PI602	Pressure After the Butterfly Valve		"W.C.
PI603	Back Pressure After Transfer Pump		psi
PI604	Sump Pressure		"W.C.
FT601	Flow Totalizer		gal
FT601	Flow Transmitter		gpm

Table 8

Operational Checklist
Former Emerson Power Transmission
Ithaca, New York

Maintenance Items:

Cleaned Stripper Trays (yes/no)	

Additional Maintenance Needed:

Description of Maintenance Actives Completed:

Liquid Phase Carbon

Nomenclature	*Description*	*Reading*	*Units*
PI611	Pressure Before Carbon Vessel T611		psi
PI612	Pressure After Carbon Vessel T611		psi
Effluent Flow	Totalizer		gal
Effluent Flow	Flow		gpm

Additional Maintenance Needed:

Description of Maintenance Actives Completed:

Air Compressor

Motor Run Time (hrs.)	

Nomenclature	*Description*	*Reading*	*Units*
PCV101	Pressure Regulator Valve Replaced with filter		psi
PI-101	Conveyance Line Pressure		psi
TI-101	Compressed Air Temperature		°F

Maintenance Items:

Oil Level:	
Oil Change (yes/no)	
Belt Condition:	
Coalescing Filter Condition:	

Oil Change needed every 2000 hrs. OR every 12 Months (Which ever comes first)

Table 8

Operational Checklist
Former Emerson Power Transmission
Ithaca, New York

Additional Maintenance Needed:

Description of Maintenance Actives Completed:

Miscellaneous Tasks

Maintenance Items:

Snow Removal (yes/no)	
Grass/Weed Removal (yes/no)	
Is Shed Clean and Organized on Arrival (yes/no)	
Is Shed Clean and Organized on Departure (yes/no)	

Other (please specify in detail):	

WELL VAULT CHECKLIST

Checked Heat Trace Breakers (yes/no):		
NYSEG Meter Reading (kwh)		

EW-1-62C

Checked Sample Port (yes/no):		
Checked Compressed Air Line Drain (yes/no):		

Vapor Line	***Reading***	***Units***
Vacuum Gauge		inHg

Water Line	***Reading***	***Units***
Pressure Gauge		psi
Cycle Count		# of cycles

Air Line	***Reading***	***Units***
Pressure Gauge		psi
Regulator Gauge		psi

Description of Maintained Activities Completed:

Table 8

Operational Checklist
Former Emerson Power Transmission
Ithaca, New York

EW-2-62C

Checked Sample Port (yes/no):		
Checked Compressed Air Line Drain (yes/no):		

Vapor Line	***Reading***	***Units***
Vacuum Gauge		inHg

Water Line	***Reading***	***Units***
Pressure Gauge		psi
Cycle Count		# of cycles

Air Line	***Reading***	***Units***
Pressure Gauge		psi
Regulator Gauge		psi

Description of Maintained Activities Completed:

EW-3-60C

Checked Sample Port (yes/no):		
Checked Compressed Air Line Drain (yes/no):		

Vapor Line	***Reading***	***Units***
Vacuum Gauge		inHg

Water Line	***Reading***	***Units***
Pressure Gauge		psi
Cycle Count		# of cycles

Air Line	***Reading***	***Units***
Pressure Gauge		psi
Regulator Gauge		psi

Description of Maintained Activities Completed:

Table 8

Operational Checklist
Former Emerson Power Transmission
Ithaca, New York

EW-4-25B		
Checked Sample Port (yes/no):		
Checked Compressed Air Line Drain (yes/no):		

Vapor Line	***Reading***	***Units***
Vacuum Gauge		inHg

Water Line	***Reading***	***Units***
Pressure Gauge		psi
Cycle Count		# of cycles 3

Air Line	***Reading***	***Units***
Pressure Gauge		psi
Regulator Gauge		psi

Description of Maintained Activities Completed:

EW-5-25B		
Checked Sample Port (yes/no):		
Checked Compressed Air Line Drain (yes/no):		

Vapor Line	***Reading***	***Units***
Vacuum Gauge		inHg

Water Line	***Reading***	***Units***
Pressure Gauge		psi
Cycle Count		# of cycles

Air Line	***Reading***	***Units***
Pressure Gauge		psi
Regulator Gauge		psi

Description of Maintained Activities Completed:

Table 8

Operational Checklist
Former Emerson Power Transmission
Ithaca, New York

EW-6-60C		
Checked Sample Port (yes/no):		
Checked Compressed Air Line Drain (yes/no):		

Vapor Line	***Reading***	***Units***
Vacuum Gauge		inHg

Water Line	***Reading***	***Units***
Pressure Gauge		psi
Cycle Count		# of cycles

Air Line	***Reading***	***Units***
Pressure Gauge		psi
Regulator Gauge		psi

Description of Maintained Activities Completed:

EW-7-25B		
Checked Sample Port (yes/no):		
Checked Compressed Air Line Drain (yes/no):		

Vapor Line	***Reading***	***Units***
Vacuum Gauge		inHg

Water Line	***Reading***	***Units***
Pressure Gauge		psi
Cycle Count		# of cycles

Air Line	***Reading***	***Units***
Pressure Gauge		psi
Regulator Gauge		psi

Description of Maintained Activities Completed:

Table 8

Operational Checklist
Former Emerson Power Transmission
Ithaca, New York

EW-8-62C

Checked Sample Port (yes/no):		
Checked Compressed Air Line Drain (yes/no):		

Vapor Line	***Reading***	***Units***
Vacuum Gauge		inHg

Water Line	***Reading***	***Units***
Pressure Gauge		psi
Cycle Count		# of cycles

Air Line	***Reading***	***Units***
Pressure Gauge		psi
Regulator Gauge		psi

Description of Maintained Activities Completed:

EW-10-25B

Checked Sample Port (yes/no):		
Checked Compressed Air Line Drain (yes/no):		

Vapor Line	***Reading***	***Units***
Vacuum Gauge		inHg

Water Line	***Reading***	***Units***
Pressure Gauge		psi
Cycle Count		# of cycles

Air Line	***Reading***	***Units***
Pressure Gauge		psi
Regulator Gauge		psi

Description of Maintained Activities Completed:

Table 8

Operational Checklist
Former Emerson Power Transmission
Ithaca, New York

EW-9R-72C

Checked Sample Port (yes/no):		
Checked Compressed Air Line Drain (yes/no):		

Vapor Line	***Reading***	***Units***
Vacuum Gauge		inHg

Water Line	***Reading***	***Units***
Pressure Gauge		psi
Cycle Count		# of cycles

Air Line	***Reading***	***Units***
Pressure Gauge		psi
Regulator Gauge		psi

Description of Maintained Activities Completed:

EW-11-43C

Checked Sample Port (yes/no):		
Checked Compressed Air Line Drain (yes/no):		

Vapor Line	***Reading***	***Units***
Vacuum Gauge		inHg

Water Line	***Reading***	***Units***
Cycle Count		# of cycles

Air Line	***Reading***	***Units***
Regulator Gauge		psi

Description of Maintained Activities Completed:

EW-12-45C

Checked Sample Port (yes/no):		
Checked Compressed Air Line Drain (yes/no):		

Vapor Line	***Reading***	***Units***
Vacuum Gauge		inHg

Water Line	***Reading***	***Units***
Pressure Gauge		psi
Cycle Count		# of cycles

Air Line	***Reading***	***Units***
Regulator Gauge		psi

Description of Maintained Activities Completed:

Table 9

Maintenance Schedule
Former Emerson Power Transmission
Ithaca, New York

	January	February	March	April	May	June	July	August	September	October	November	December
Routine Monthly Maintenance	X	X	X	X	X	X	X	X	X	X	X	X
Specific Equipment Monthly Maintenance	X	X	X	X	X	X	X	X	X	X	X	X
Routine Quarterly Maintenance	X			X			X			X		
Routine Semi-Annual Maintenance		X						X				
Routine Annual Maitenance			X									
Routine Biennial Maintenance					X							
Specific Equipment Maintenance												
Air Compressor Quarterly			X			X			X			X
Air Compressor Semi-Annual	X						X					
Replace Bag Filters		X			X			X			X	
Vacuum Blower Semi-Annual					X						X	
Vacuum Blower Annual					X							
Equalization Tank Annual		X										
Equalization Tank Biennial		X										
Process and Discharge Flow Meters			X							X		
Clean Bag Filter Housing									X			
Clean Air Stripper Trays and Housing								X				
Well Vault Maintenance						X						
Building and Equipment Cleaning Semi-Annual												
Building Cleaning Biennial		X										

Table 10

Corrective Maintenance Log
Former Emerson Power Transmission
Ithaca, New York

Corrective Maintenance Log

Date	Inspector	Description of Work Performed

RECORD DRAWINGS

INDEX OF DRAWINGS

DRAWING NUMBER	SHEET NUMBER	DESCRIPTION
314P1545.001-D161	1	TITLE SHEET
314P1545.001-D162	2	SITE PLAN
314P1545.001-D163	3	PIPING LAYOUT
314P1545.001-D164	4	REMEDIAL SYSTEM HYDRAULIC GRADE LINE
314P1545.001-D165	5A	PROCESS AND INSTRUMENTATION FLOW DIAGRAM
314P1545.001-D165	5B	PROCESS AND INSTRUMENTATION FLOW DIAGRAM
314P1545.001-D166	6	BUILDING EQUIPMENT LAYOUT
314P1545.001-D167	7	EXTRACTION WELL DETAILS
314P1545.001-D168	8	EXTRACTION WELL DETAILS
314P1545.001-D169	9	TRENCHING AND RETAINING WALL FACE INSTALLATION CROSS SECTION

TITLE SHEET

RECORD DRAWINGS
OU-1 DPE SYSTEM
FORMER EMERSON POWER TRANSMISSION
ITHACA, NEW YORK

PREPARED FOR

EMERSON ELECTRIC CO.
ST. LOUIS, MISSOURI

D

REVISIONS

REV | DESCRIPTION

DRAWN BY

CHECKED

APPROVED

SEAL

DATE

TITLE SHEET

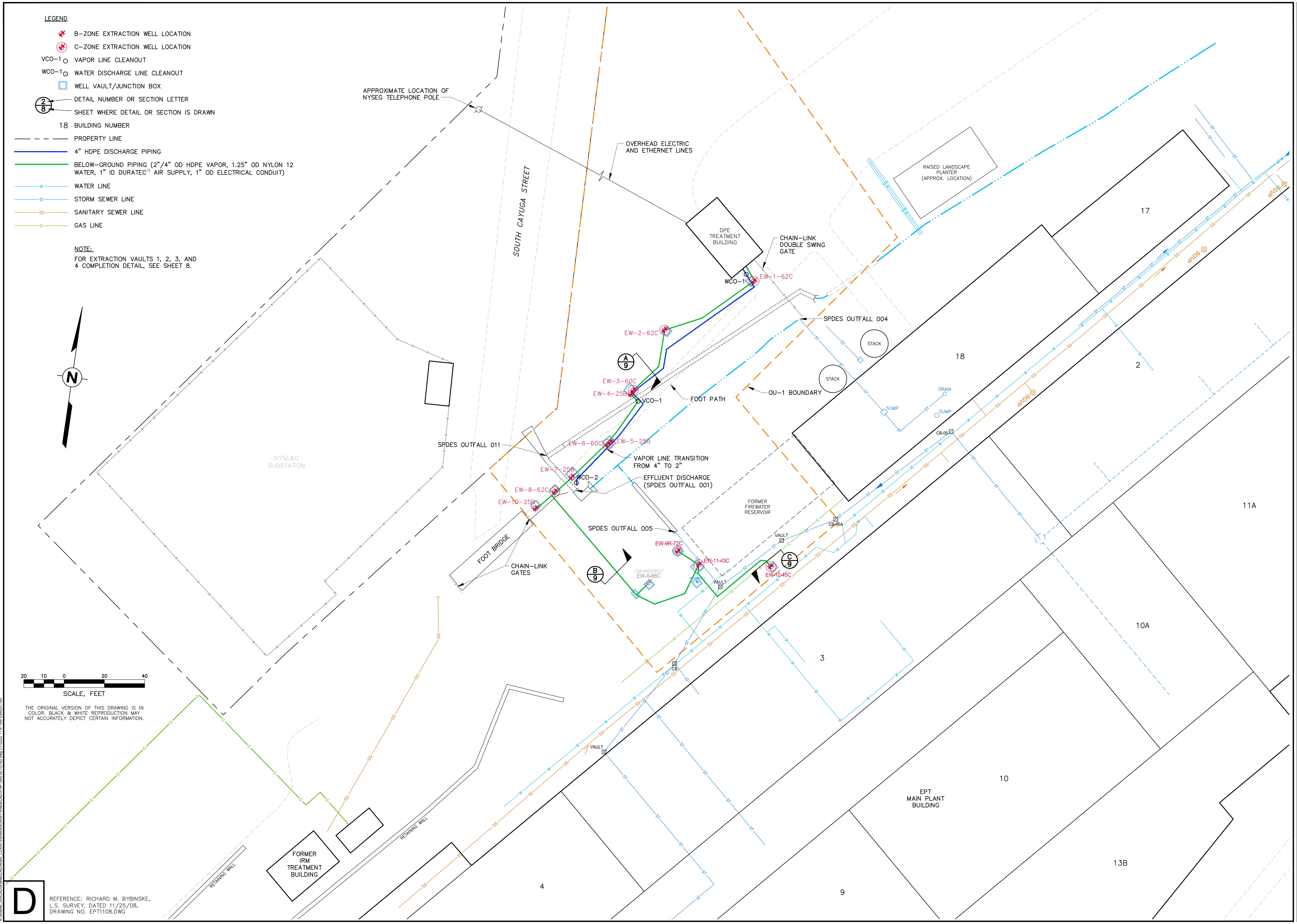
RECORD DRAWING – OU-1 DPE SYSTEM
FORMER EMERSON POWER TRANSMISSION
ITHACA, NEW YORK

PREPARED FOR
EMERSON – ST. LOUIS, MISSOURI

13530 DULLES TECHNOLOGY DR, SUITE 300
HERNDON, VA 20171
TEL: +1 703.709.6500

SHEET 1

Drawing Number
314P1545.001–D161


LEGEND
B-ZONE EXTRACTION WELL LOCATION
C-ZONE EXTRACTION WELL LOCATION
VCO-1 VAPOR LINE CLEANOUT
WCO-1 WATER DISCHARGE LINE CLEANOUT
WELL VAULT/JUNCTION BOX
DETAIL NUMBER OR SECTION LETTER
SHEET WHERE DETAIL OR SECTION IS DRAWN
18 BUILDING NUMBER
PROPERTY LINE
4" HDPE DISCHARGE PIPING
BELOW-GROUND PIPING (2"/4" OD HDPE VAPOR, 1.25" OD NYLON 12 WATER, 1" ID DURATEC® AIR SUPPLY, 1" OD ELECTRICAL CONDUIT)
WATER LINE
STORM SEWER LINE
SANITARY SEWER LINE
GAS LINE
NOTE:
FOR EXTRACTION VAULTS 1, 2, 3, AND 4 COMPLETION DETAIL, SEE SHEET 8.
APPROXIMATE LOCATION OF NYSEG TELEPHONE POLE
OVERHEAD ELECTRIC AND ETHERNET LINES
SOUTH CAYUGA STREET
DPE TREATMENT BUILDING
CHAIN-LINK DOUBLE SWING GATE
RAISED LANDSCAPE PLANTER (APPROX. LOCATION)
17
WCO-1
EW-1-62C
SPDES OUTFALL 004
STACK
STACK
18
2
EW-2-62C
EW-3-60C
EW-4-25B
VCO-1
FOOT PATH
OU-1 BOUNDARY
DRAIN
SUMP
SUMP
CB-06
SPDES OUTFALL 011
EW-6-60C
EW-5-25B
VAPOR LINE TRANSITION FROM 4" TO 2"
NYSE&G SUBSTATION
EW-7-25B
WCO-2
EFFLUENT DISCHARGE (SPDES OUTFALL 001)
EW-8-62C
EW-10-25B
FORMER FIREWATER RESERVOIR
11A
SPDES OUTFALL 005
FOOT BRIDGE
EW-9R-72C
VAULT
CB-06A
EW-11-43C
CHAIN-LINK GATES
(ABANDONED) EW-9-86C
VAULT
EW-12-45C
10A
3
SCALE, FEET
THE ORIGINAL VERSION OF THIS DRAWING IS IN COLOR. BLACK & WHITE REPRODUCTION MAY NOT ACCURATELY DEPICT CERTAIN INFORMATION.
VAULT
10
EPT MAIN PLANT BUILDING
RETAINING WALL
FORMER IRM TREATMENT BUILDING
RETAINING WALL
13B
4
9
D
REFERENCE: RICHARD M. BYBINSKE, L.S. SURVEY, DATED 11/25/08, DRAWING NO. EPT1108.DWG

REVISIONS

REV	DESCRIPTION

SEAL

DATE

DRAWN BY PA 04202020
CHECKED DCC 07072022
APPROVED

PROPERTY OF WSP USA INC.

IMPORTANT: THIS DRAWING PRINT IS LOANED FOR MUTUAL ASSISTANCE AND AS SUCH IS SUBJECT TO RECALL AT ANY TIME. INFORMATION CONTAINED HEREON IS NOT TO BE DISCLOSED OR REPRODUCED IN ANY FORM FOR THE BENEFIT OF PARTIES OTHER THAN NECESSARY SUBCONTRACTORS AND SUPPLIERS WITHOUT THE WRITTEN CONSENT OF WSP USA INC.

NOTICE: THIS DRAWING HAS BEEN PREPARED UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, IT IS A VIOLATION OF STATE LAW FOR ANY PERSONS, UNLESS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT IN ANY WAY.

SITE PLAN

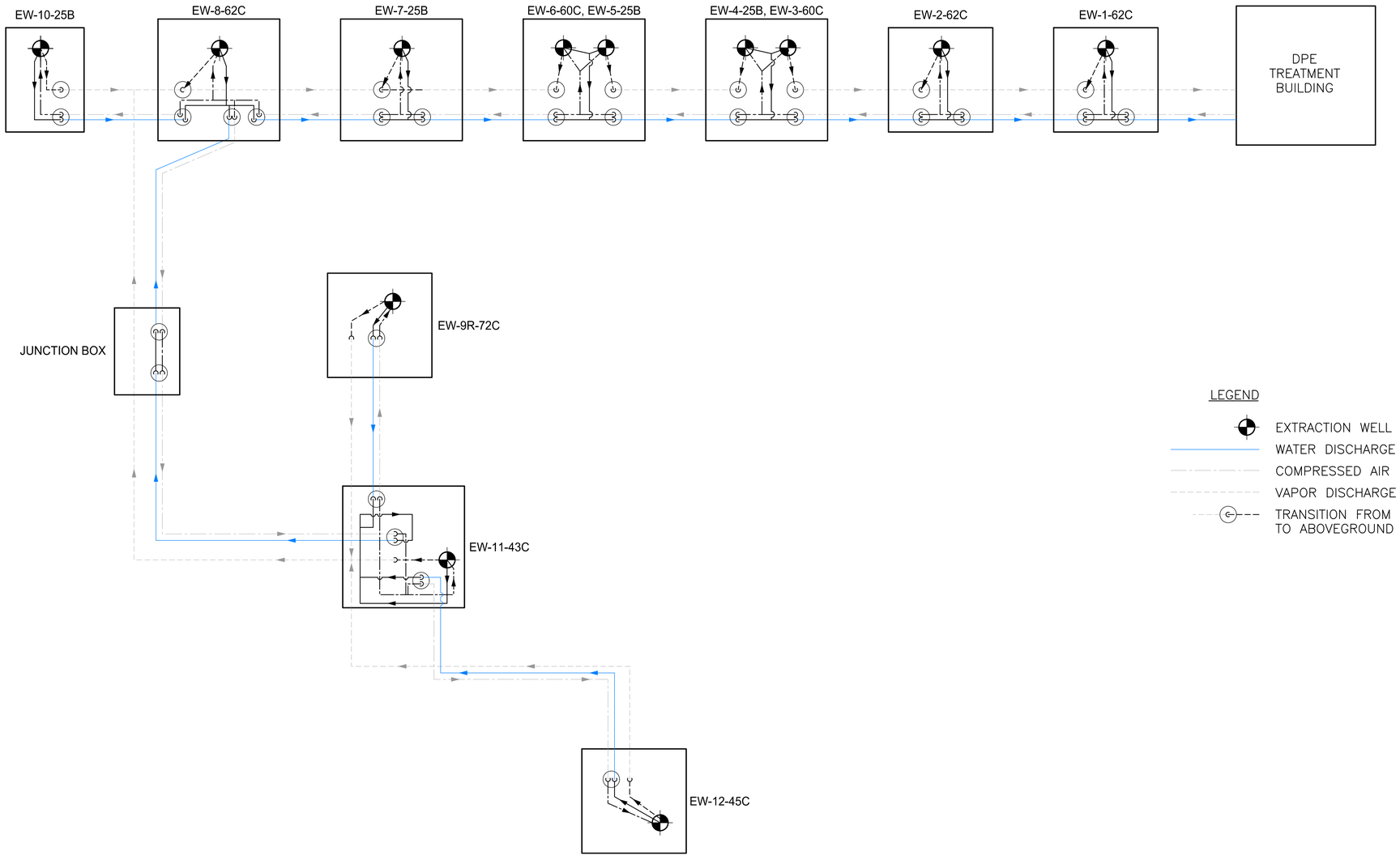
RECORD DRAWING – OU-1 DPE SYSTEM
FORMER EMERSON POWER TRANSMISSION
ITHACA, NEW YORK

PREPARED FOR
EMERSON – ST. LOUIS, MISSOURI

WSP USA Inc.
11 STANWIX STREET, SUITE 950
PITTSBURGH, PA 15222
TEL: +1 412.604.1040

SHEET 2

Drawing Number
314P1545.001–D162



LEGEND

- EXTRACTION WELL
- WATER DISCHARGE
- COMPRESSED AIR
- VAPOR DISCHARGE
- TRANSITION FROM UNDERGROUND TO ABOVEGROUND PIPING

REVISIONS				
REV	DESCRIPTION			
1	Revised	Chkd	Appr.	
2	Revised	Chkd	Appr.	
3	Revised	Chkd	Appr.	

SEAL

DATE

DRAWN BY RK 12/07/2022
CHECKED DC 12/07/2022
APPROVED

PIPING LAYOUT

RECORD DRAWING – OU-1 DPE SYSTEM
FORMER EMERSON POWER TRANSMISSION
ITHACA, NEW YORK

PREPARED FOR
EMERSON – ST. LOUIS, MISSOURI

13530 DULLES TECHNOLOGY DR, SUITE 300
HERNDON, VA 20171
TEL: +1 703.709.6500

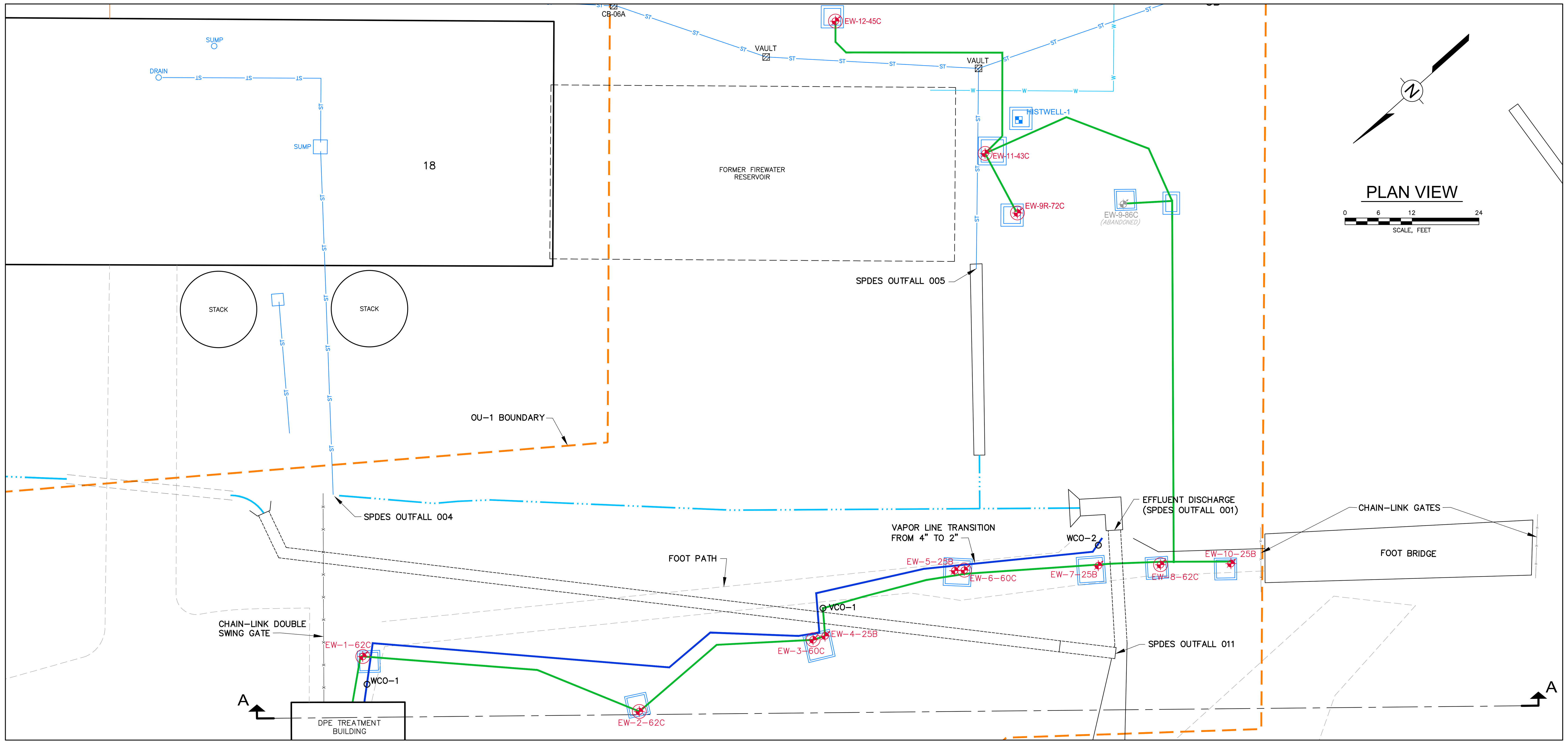
SHEET 3

Drawing Number
314P1545.001–D163

D

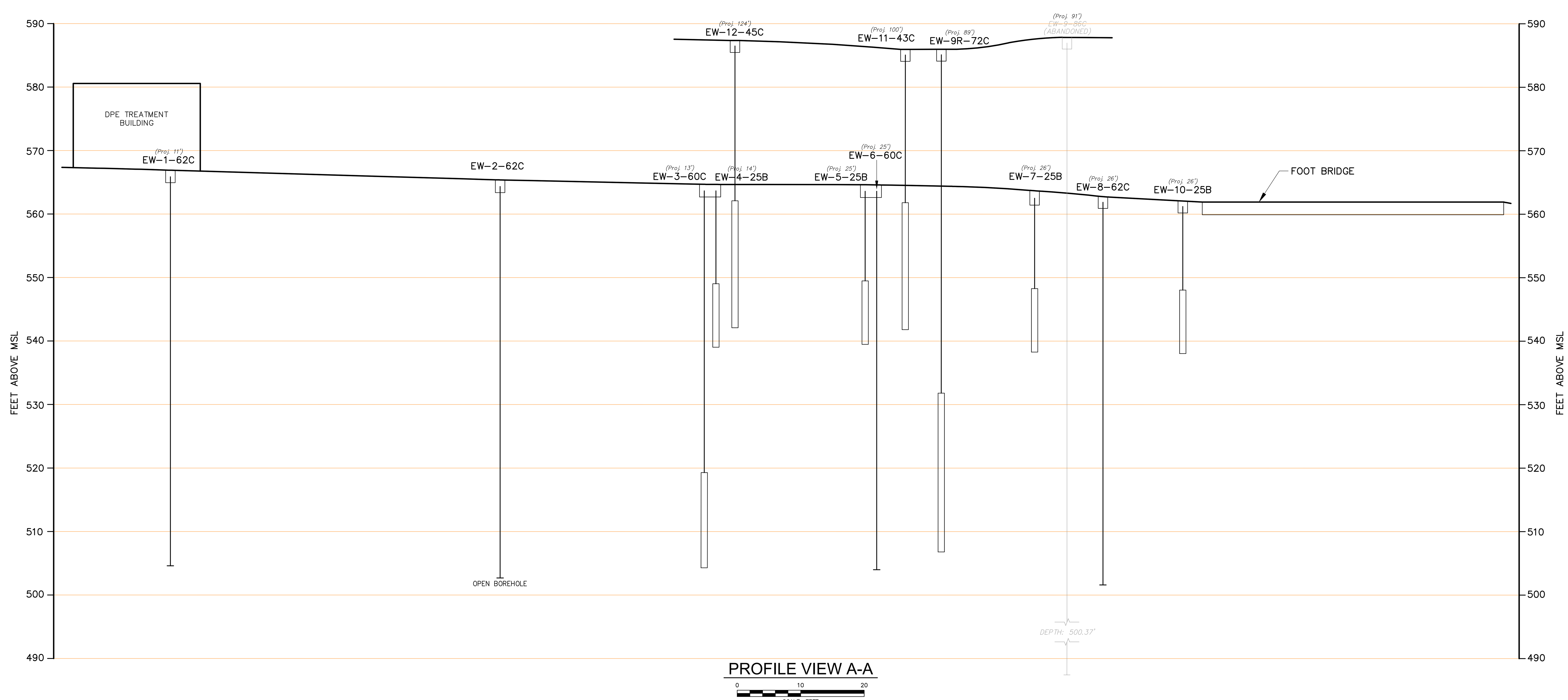
LEGEND

- B-ZONE EXTRACTION WELL LOCATION
- C-ZONE EXTRACTION WELL LOCATION
- VCO-1 VAPOR LINE CLEANOUT
- WCO-1 WATER DISCHARGE LINE CLEANOUT
- WELL VAULT/JUNCTION BOX
- 18 BUILDING NUMBER
- PROPERTY LINE
- 4" HDPE DISCHARGE PIPING
- BELOW-GROUND PIPING (2"/4" OD HDPE VAPOR, 1.25" OD NYLON 12 WATER, 1" ID DURATEC™ AIR SUPPLY, 1" OD ELECTRICAL CONDUIT)
- WATER LINE
- STORM SEWER LINE
- SANITARY SEWER LINE
- GAS LINE



PLAN VIEW

0 6 12 24
SCALE, FEET



PROFILE VIEW A-A

0 10 20
SCALE, FEET

LEGEND

- (Proj. #') DISTANCE PROJECTED ONTO PROFILE
- EW-# BORING DESIGNATION
- GROUND SURFACE
- TOP OF CASING
- STEEL WELL VAULT/JUNCTION BOX
- OPEN BOREHOLE
- SCREENED INTERVAL

THE ORIGINAL VERSION OF THIS DRAWING IS IN COLOR. BLACK & WHITE REPRODUCTION MAY NOT ACCURATELY DEPICT CERTAIN INFORMATION.

REV	DESCRIPTION
REVISIONS	

SEAL

DATE

DRAWN BY
CHECKED
APPROVED

REMEDIAL SYSTEM HYDRAULIC GRADE LINE

RECORD DRAWING – OU-1 DPE SYSTEM
FORMER EMERSON POWER TRANSMISSION
ITHACA, NEW YORK

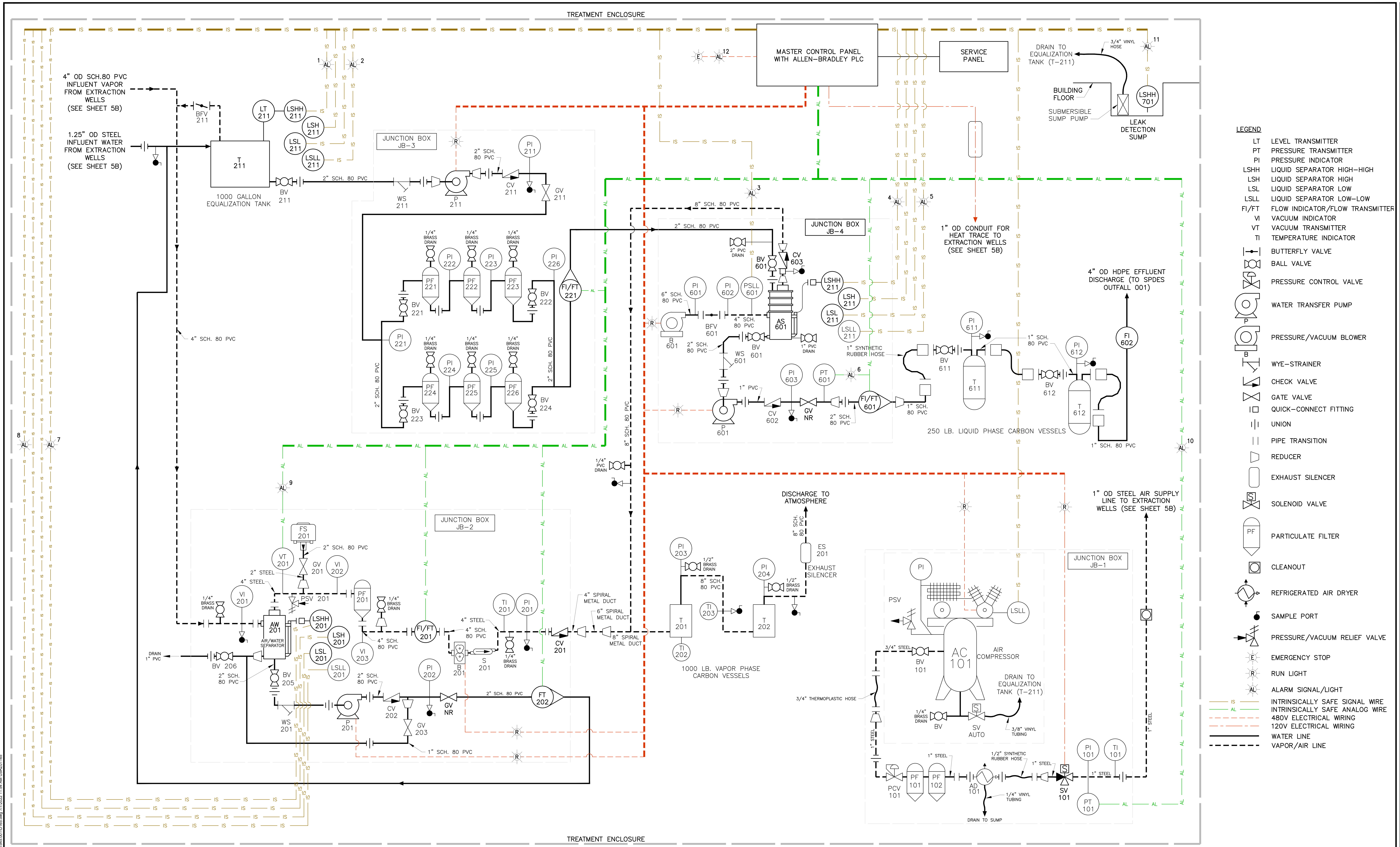
PREPARED FOR
EMERSON – ST. LOUIS, MISSOURI

WSP USA Inc.
11 STANWIX STREET, SUITE 950
PITTSBURGH, PA 15222
TEL: +1 412.604.1040

SHEET 4

Drawing Number
314P1545.001–D164

D



DESIGNATION	DESIGNATION	SPECIFICATIONS	MANUFACTURER
T-211	EQUALIZATION TANK	1,000 GALLON POLYETHYLENE, DOME TOP, ROUND STORAGE TANK	DEN HARTOG
P-211	EQ TANK TRANSFER PUMP	1.5 HP MODEL: 1ST1F5D4	GOULDS
PF-221 to PF-226	BAG FILTERS	SIX - ALUMINUM WATER FILTER HOUSINGS, MAX 200 GPM/100 PSI, MODEL: GP802AL2	PENTEK
AS-601	AIR STRIPPER	4-TRAY, LOW PROFILE, MODEL: 4.4SS	QED
B-601	AIR STRIPPER BLOWER	5 HP, 210 CFM, STATIC FAN PRESSURE: 40.7" WC, MODEL: 2204	THE NEW YORK BLOWER CO./BALDOR
P-601	AIR STRIPPER TRANSFER PUMP	1.5 HP MODEL: 1ST1F5D4	GOULDS
T-611, T-612	GRANULAR ACTIVATED CARBON	250 LB-EACH, AQUEOUS PHASE GRANULAR ACTIVATED CARBON, MODEL: 2162	ENPRESS
AW-201	AIR/WATER SEPARATOR	120 GALLON MOISTURE SEPARATOR TANK, RATED FOR 29 INHG	ESD
P-201	AIR/WATER SEPARATOR TRANSFER PUMP	1.5 HP, PROGRESSIVE CAVITY PUMP, MODEL: 5VD28	MOYNO/EMERSON
B-201	VAPOR EXTRACTION BLOWER	20 HP, SUTORBILT ROTARY POSITIVE DISPLACEMENT LOBE BLOWER, MODEL: 5LP-DSL BLOWER MODEL: 5LP-DSL, MOTOR MODEL: BJ09	GARDNER DENVER/ TECO WESTINGHOUSE
T-201, T-202	GRANULAR ACTIVATED CARBON	1,000 LB-EACH, VAPOR PHASE GRANULAR ACTIVATED CARBON UNITS	ESD
ES-201	EXHAUST SILENCER	MODEL: RD-8	UNIVERSAL SILENCER
AC-101	AIR COMPRESSOR	7.5 HP, BLOWER MODEL: 2475N7.5, MOTOR MODEL: ELT7E1D	INGERSOLL-RAND/EMERSON
AD-101	REFRIGERATED AIR DRYER	24.7 CFM, MODEL: D42IN	INGERSOLL-RAND

(A): ABBREVIATIONS: HP = HORSEPOWER; GPM = GALLONS PER MINUTE; PSI = POUNDS PER SQUARE INCH
W.C. = INCHES OF WATER COLUMN; LB = POUND; HG = INCHES OF MERCURY; CFM = CUBIC FEET PER MINUTE

ALARMS:

1) EQUALIZATION TANK T–211, HIGH–HIGH ALARM
2) EQUALIZATION TANK T–211, LOW–LOW ALARM
3) AIR STRIPPER AS–601, LOW SUMP PRESSURE
4) AIR STRIPPER AS–601, HIGH–HIGH ALARM IN THE SUMP
5) AIR STRIPPER AS–601, LOW–LOW ALARM IN THE SUMP
6) LIQUID PHASE CARBON INLET T–611, HIGH PRESSURE ALARM
7) AIR/WATER SEPARATOR AW–201, HIGH–HIGH ALARM
8) AIR/WATER SEPARATOR AW–201, LOW–LOW ALARM
9) VAPOR EXTRACTION SYSTEM B–201, HIGH VACUUM ALARM
10) AIR COMPRESSOR AC–101, HIGH OR LOW PRESSURE ALARM
11) TREATMENT BUILDING FLOOR SUMP, LSHH 701, HIGH–HIGH ALARM
12) CONTROL PANEL, EMERGENCY STOP ALARM

NOTES:

1. PIPING MATERIAL AND SIZES WERE INSTALLED AS INDICATED ON THIS DRAWING.
2. ALL PIPING AND FITTINGS WERE PRESSURE–TESTED TO MANUFACTURER SPECIFICATIONS BEFORE FULL SCALE OPERATION.
3. ALL PIPING AND FITTINGS WERE LABELED TO CORRESPOND WITH THE DRAWING. FLOW ARROWS WERE INSTALLED ON ALL PIPING TO SIGNIFY FLOW DIRECTION BEFORE AND AFTER EACH INLET/DISCHARGE CONNECTION.
4. FLOW METERS WERE INSTALLED WITH MANUFACTURER SPECIFIED STRAIGHT PIPE LENGTHS ON THE INLET AND OUTLET.
5. ALL ELECTRICAL WIRING WAS INSTALLED INTRINSICALLY SAFE.

REVISIONS
REV | DESCRIPTION

SEAL

DRAWN BY RA 05/12/2020
CHECKED DCC 07/07/2022
APPROVED

PROCESS AND INSTRUMENTATION FLOW DIAGRAM

RECORD DRAWING – OU–1 DPE SYSTEM
FORMER EMERSON POWER TRANSMISSION
ITHACA, NEW YORK

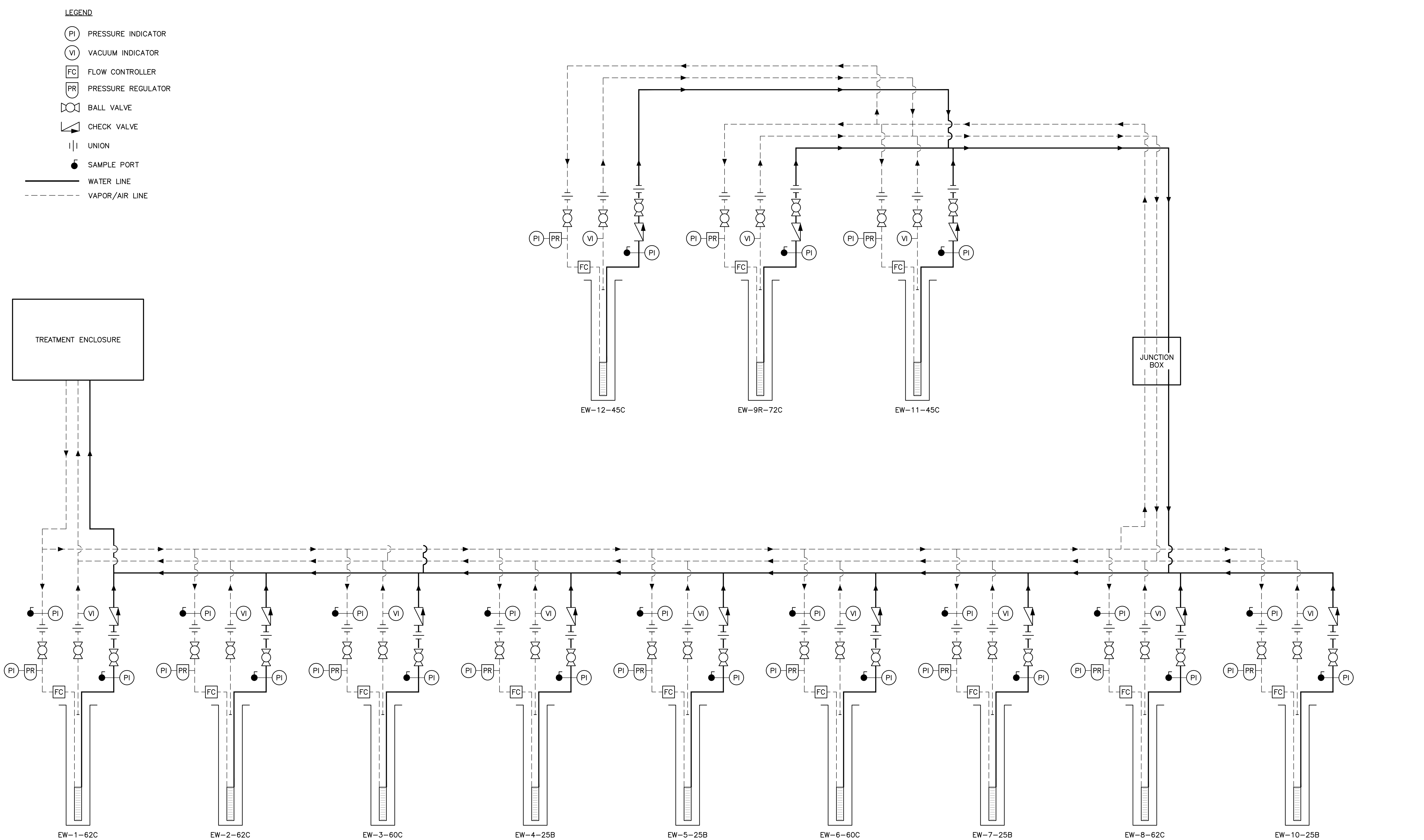
PREPARED FOR
EMERSON – ST. LOUIS, MISSOURI

WSP USA Inc.
11 STANWIX STREET, SUITE 950
PITTSBURGH, PA 15222
TEL: +1 412.604.1040

SHEET 5A

Drawing Number
314P1545.001–D165

D



REVISIONS

REV	DESCRIPTION

SEAL

DATE

DRAWN BY RA 07072020
CHECKED DCC 07072022
APPROVED

PROPERTY OF WSP USA INC.

IMPORTANT: THIS DRAWING PRINT IS LOANED FOR MUTUAL ASSISTANCE AND AS SUCH IS SUBJECT TO RECALL AT ANY TIME. INFORMATION CONTAINED HEREON IS NOT TO BE DISCLOSED OR REPRODUCED IN ANY FORM FOR THE BENEFIT OF PARTIES OTHER THAN NECESSARY SUBCONTRACTORS AND SUPPLIERS WITHOUT THE WRITTEN CONSENT OF WSP USA INC.

NOTICE: THIS DRAWING HAS BEEN PREPARED UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, IT IS A VIOLATION OF STATE LAW FOR ANY PERSONS, UNLESS ACTING UNDER THE DIRECTION OF A LICENSED PROFESSIONAL ENGINEER, TO ALTER THIS DOCUMENT IN ANY WAY.

PROCESS AND INSTRUMENTATION FLOW DIAGRAM

RECORD DRAWING – OU-1 DPE SYSTEM
FORMER EMERSON POWER TRANSMISSION
ITHACA, NEW YORK

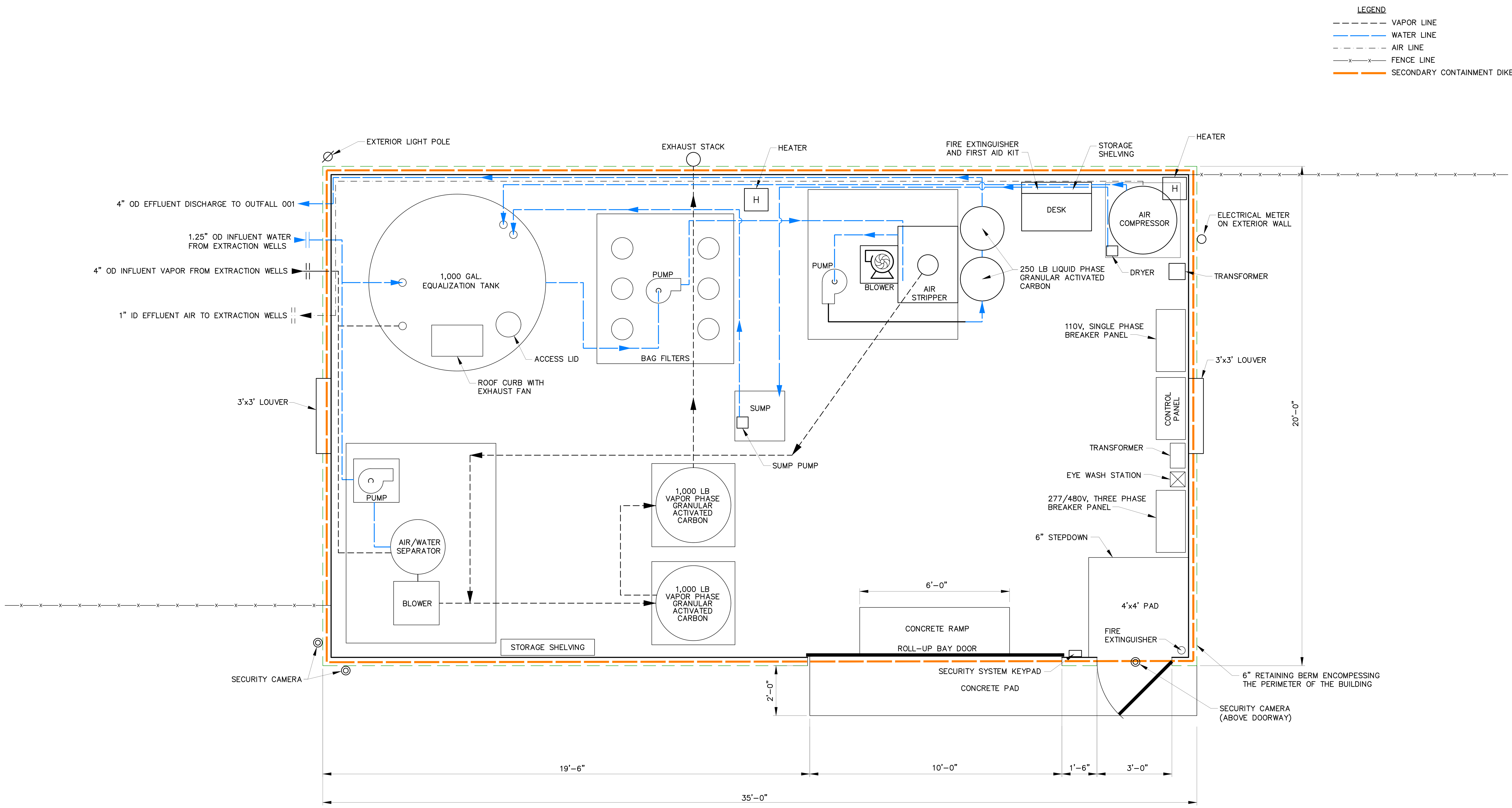
PREPARED FOR
EMERSON – ST. LOUIS, MISSOURI

WSP USA Inc.
11 STANWIX STREET, SUITE 950
PITTSBURGH, PA 15222
TEL: +1 412.604.1040

SHEET 5B

Drawing Number
314P1545.001–D165

D



LEGEND
VAPOR LINE
WATER LINE
AIR LINE
FENCE LINE
SECONDARY CONTAINMENT DIKE
EXTERIOR LIGHT POLE
EXHAUST STACK
HEATER
FIRE EXTINGUISHER AND FIRST AID KIT
STORAGE SHELVING
HEATER
4" OD EFFLUENT DISCHARGE TO OUTFALL 001
1.25" OD INFLUENT WATER FROM EXTRACTION WELLS
4" OD INFLUENT VAPOR FROM EXTRACTION WELLS
1" ID EFFLUENT AIR TO EXTRACTION WELLS
1,000 GAL. EQUALIZATION TANK
PUMP
BAG FILTERS
ACCESS LID
ROOF CURB WITH EXHAUST FAN
DESK
AIR COMPRESSOR
ELECTRICAL METER ON EXTERIOR WALL
PUMP
BLOWER
AIR STRIPPER
250 LB LIQUID PHASE GRANULAR ACTIVATED CARBON
DRYER
TRANSFORMER
110V, SINGLE PHASE BREAKER PANEL
3'x3' LOUVER
3'x3' LOUVER
CONTROL PANEL
SUMP
SUMP PUMP
TRANSFORMER
EYE WASH STATION
277/480V, THREE PHASE BREAKER PANEL
6" STEPDOWN
PUMP
AIR/WATER SEPARATOR
BLOWER
1,000 LB VAPOR PHASE GRANULAR ACTIVATED CARBON
1,000 LB VAPOR PHASE GRANULAR ACTIVATED CARBON
STORAGE SHELVING
6'–0"
CONCRETE RAMP
ROLL-UP BAY DOOR
4'x4' PAD
FIRE EXTINGUISHER
20'–0"
SECURITY CAMERA
SECURITY SYSTEM KEYPAD
CONCRETE PAD
6" RETAINING BERM ENCOMPESSING THE PERIMETER OF THE BUILDING
SECURITY CAMERA (ABOVE DOORWAY)
2'–0"
19'–6"
10'–0"
1'–6"
3'–0"
35'–0"

BUILDING EQUIPMENT LAYOUT

0 2 4
SCALE IN FEET

NOTE:
EQUIPMENT LOCATIONS ARE APPROXIMATE.

REVISIONS
REV | DESCRIPTION

DRAWN BY
CHECKED
APPROVED

BUILDING EQUIPMENT LAYOUT

RECORD DRAWING – OU-1 DPE SYSTEM
FORMER EMERSON POWER TRANSMISSION
ITHACA, NEW YORK

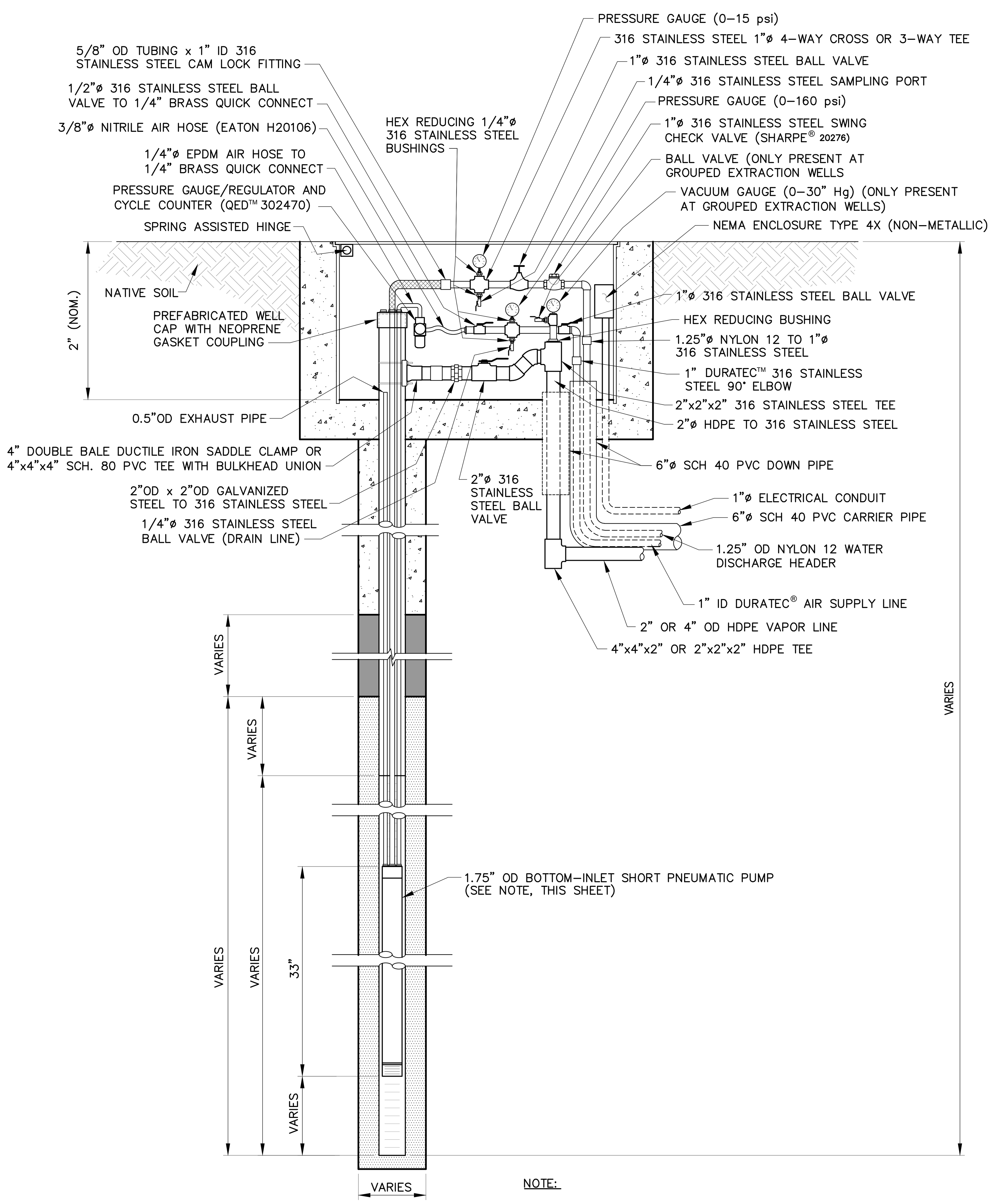
PREPARED FOR
EMERSON – ST. LOUIS, MISSOURI

WSP USA Inc.
11 STANWIX STREET, SUITE 950
PITTSBURGH, PA 15222
TEL: +1 412.604.1040

SHEET 6

Drawing Number
314P1545.001–D166

D



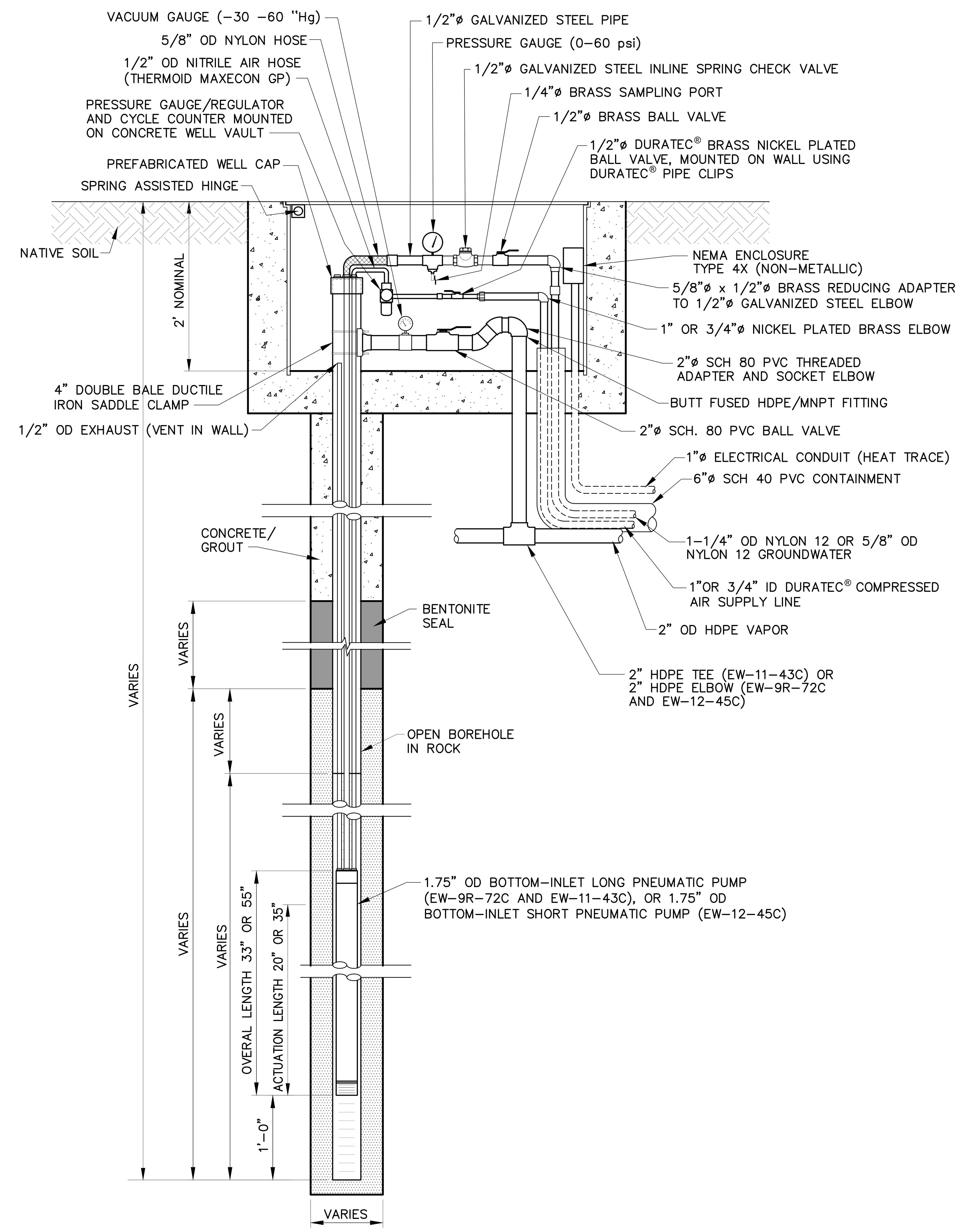
NOTE:

EW–1–62C, EW–2–62C, EW–6–60C, AND EW–8–62C ARE OPEN BOREHOLES. SEE TABLE ON SHEET 4 FOR WELL COMPLETION DETAILS FOR COMPLETED WELLS EW–3–60C, EW–4–25B, EW–5–25B, EW–7–25B, AND EW–10–25B.

SECTION

WELL VAULT COMPLETION AND WELL PUMP INSTALLATION DETIAL
FOR EW-1-62C THROUGH EW-8-62C AND EW-10-25B (TYPICAL)

0 6" 1 2
SCALE, FEET



SECTION

WELL VAULT COMPLETION AND WELL PUMP INSTALLATION DETAIL
FOR EW-9R-72C, EW-11-43C, AND EW-12-45C (TYPICAL)

0 6" 1 2
SCALE, FEET

TRENCHING:

1. ALL TRENCHING FOR UNDERGROUND PIPING INSTALLATION WAS EXCAVATED TO THE DEPTHS INDICATED. EXCAVATED NATIVE SOIL AND DEBRIS NOT USED FOR BACKFILL WERE DISPOSED OF OFFSITE PER APPLICABLE STATE REGULATIONS.

2. CONVEYANCE PIPING WAS INSTALLED WITHIN TRENCHES EXCAVATED TO A MINIMUM OF 3 FEET BELOW GROUND SURFACE. THE PIPE WAS BACKFILLED WITH A MINIMUM OF 2 INCHES OF PIPE BEDDING MATERIAL BELOW AND ABOVE THE CONVEYANCE PIPING. THE REMAINDER OF THE TRENCH WAS BACKFILLED WITH NATIVE SOIL. BACKFILL WAS COMPACTED USING A VIBRATORY PLATE WITH MAXIMUM 6" LIFTS. CONTRACTOR WAS UNABLE TO COMPACT THE SOIL BETWEEN EW–8–62C AND JUNCTION BOX DUE TO THE GRADIENT OF THE HILL. BACKFILLED NATIVE SOIL WAS PLACED AND GRADED FLUSH WITH THE SURFACE ELEVATION OF THE EXISTING NATIVE SOIL SURROUNDING THE TRENCH.

3. ALL REMOVED SECTIONS OF THE ASPHALT PAVED WALKING PATH WERE REPLACED WITH SCREENING MATERIAL AND GRAVEL. REMOVED PARKING LOT SECTIONS WERE REPLACED WITH CONCRETE OR ASPHALT. REPLACED PAVEMENT WAS OF A THICKNESS MATCHING EXISTING MATERIAL SURROUNDING THE CUT. THE SURFACE OF THE REPLACEMENT PAVEMENT WAS FINISHED FLUSH WITH THE SURFACE GRADE OF THE SURROUNDING PAVEMENT.

PIPE INSTALLATION:

1. WATER CONVEYANCE PIPING WAS INSTALLED AS 1.25–INCH NYLON 12 TUBING. THE COMPRESSED AIR SUPPLY PIPING WAS COMPLETED AS 1–INCH INNER DIAMETER (ID) DURATEC ALUMINUM COMPOSITE WITH MANUFACTURER'S RECOMMENDED FITTINGS. UNDERGROUND VACUUM CONVEYANCE PIPING WAS INSTALLED AS 2–INCH OUTER DIAMETER (OD) HIGH–DENSITY POLYETHYLENE (HDPE) PIPING FROM EW–5–25B/EW–6–60C TO EW–12–45C, AND 4–INCH OD HDPE FROM EW–5–25B/EW–6–60C TO THE TREATMENT BUILDING. ALL HDPE JOINTS AND CONNECTIONS WERE BUTT FUSED.

2. WATER CONVEYANCE PIPING AND AIR SUPPLY CONVEYANCE PIPING ARE CONTAINED WITHIN A 6–INCH SCH 40 PVC CARRIER PIPE. THE CARRIER PIPING HAS A MINIMUM PRESSURE RATING OF 160 PSI. VAPOR CONVEYANCE PIPING WAS BURIED ALONG SIDE THE CARRIER PIPE TO THE DEPTHS SHOWN.

4. PIPING ROUTES WERE COMPLETED AS SHOWN ON SHEET 2 OF THE DRAWINGS.

5. WATER AND COMPRESSED AIR PIPING ENTERED AND EXITED THE WELL VAULTS THROUGH 6–INCH SCH 40 PVC CARRIER PIPES. PIPING RUNS WERE COMPLETED FROM VAULT TO VAULT AS SHOWN ON SHEET 3. THE HDPE WAS INSTALLED VIA A HEADER AND LATERAL AS SHOWN ON SHEET 8.

PUMP AND PUMP EQUIPMENT INSTALLATION:

1. EXTRACTION WELL PUMPS, ARE 1.75–INCH OUTER DIAMETER (OD) CONTROLLERLESS BOTTOM–INLET SHORT AND LONG PNEUMATIC AUTO PUMPS (AP2B) MANUFACTURED BY QED ENVIRONMENTAL SYSTEMS. PUMPS WERE INSTALLED IN ACCORDANCE WITH THE DETAIL ON THIS SHEET AND THE MANUFACTURER'S SPECIFICATIONS.

2. CONNECTION TUBING WAS INSTALLED AND FITTED IN ACCORDANCE WITH THE DETAIL ON THIS SHEET AND THE MANUFACTURER'S INSTRUCTIONS. CONNECTION TUBING FROM THE PUMP HEAD TO THE PREFABRICATED VACUUM WELL CAP IS NYLON 12 TUBING MANUFACTURED BY QED ENVIRONMENTAL SYSTEMS. TUBING CONSISTS OF 0.625–INCH OUTSIDE DIAMETER (OD) WATER DISCHARGE LINE, 0.375–INCH OD AIR SUPPLY, AND 0.50–INCH OD EXHAUST PIPE. THE TUBING TRANSITIONS TO STEEL WITHIN THE WELL VAULT.

3. WELL CAPS FOR THE VACUUM EXTRACTION WELLS ARE PREFABRICATED 4–INCH DIAMETER VACUUM CAPS MANUFACTURED BY QED ENVIRONMENTAL SYSTEMS. WELL CAPS WERE INSTALLED AND FITTED BY CONTRACTOR IN ACCORDANCE WITH THE DETAIL ON THIS SHEET AND THE MANUFACTURER'S INSTRUCTIONS.

4. WELL HEAD PIPING AND VALVES WERE INSTALLED IN ACCORDANCE WITH THE DETAIL ON THIS SHEET. THE AIR SUPPLY LINE IS EQUIPPED WITH A PRESSURE REGULATOR/INDICATOR AND CYCLE FLOW COUNTER MANUFACTURED BY QED ENVIRONMENTAL SYSTEMS. THE VAPOR EXTRACTION LINE IS EQUIPPED WITH A VACUUM GAUGE, TEMPERATURE GAUGE (EW–9R–72C, EW–11–43C, AND EW–12–45C), AND VACUUM RELIEF VALVE. THE WATER DISCHARGE LINE IS EQUIPPED WITH A PRESSURE GAUGE (EW–3–60C/EW–4–25B, EW–5–25B/EW–6–60C, EW–9R–72C, EW–11–43C, AND EW–12–45C).

5. UPON INSTALLATION, ALL PUMPS AND PUMP EQUIPMENT WERE PERFORMANCE TESTED IN ACCORDANCE WITH THE MANUFACTURER'S INSTRUCTIONS. WELL HEAD PIPING AND FITTINGS WERE TESTED FOR LEAKS UNDER ANTICIPATED OPERATING PRESSURES. ALL PERFORMANCE TESTING AND LEAK TESTING WAS PERFORMED UNDER THE DIRECT SUPERVISION OF THE ENGINEER.

WELL HEAD PIPING:

1. IN–VAULT WATER DISCHARGE PIPING TRANSITIONS FROM NYLON 12 TO 316 STAINLESS STE. CONTRACTOR INSTALLED BRONZE OR 316 STAINLESS STEEL BALL VALVES RATED FOR W.O.G. SERVICE AT A MINIMUM PRESSURE OF 150 PSI IN ALL EXTRACTION WELL VAULTS. CONTRACTOR INSTALLED A SAMPLING SPIGOT AT EACH EXTRACTION WELL BETWEEN THE PUMP AND THE BALL VALVE. CONTRACTOR INSTALLED A QUICK CONNECT FITTING ON THE WATER DISCHARGE PIPING WHERE APPROPRIATE TO ALLOW FOR EASY DISCONNECTION FROM THE WELL CAP.

2. IN–VAULT AIR SUPPLY TUBING IS 0.375–INCH OD TUBING AND TRANSITIONS TO 1–INCH DURATEC, OR 1–INCH 316 STAINLESS STEEL. ALL AIR SUPPLY CONTROL VALVES AND DRIP LINE VALVES ARE BRASS. CONTRACTOR INSTALLED QUICK CONNECT FITTINGS ON THE AIR SUPPLY PIPING WHERE APPROPRIATE TO ALLOW FOR EASY DISCONNECTION FROM THE WELL CAP AND PRESSURE REGULATOR/INDICATOR/CYCLE COUNTER ASSEMBLY.

WELL HEAD AND VAULT COMPLETION:

1. THE VAULTS ARE CONSTRUCTED OF STEEL AND COATED FOR CORROSION PROTECTION. THE EW–1–62C, EW–9R–72C, EW–11–43C, AND EW–12–45C ARE VAULTS RATED TO SUPPORT SURFACE LOADINGS FROM VEHICULAR TRAFFIC. ALL VAULT COVERS ARE GASKETED FOR WATER TIGHTNESS.

2. ALL PENETRATIONS THROUGH THE WELL VAULT WERE SEALED FOR WATER–TIGHTNESS USING A WATERPROOF, NON–SHRINKING SEALANT SUITABLE FOR UNDERGROUND USE.

3. ALL PIPES ENTERING THE VAULT THROUGH THE PVC DOWNPIPES WERE HEAT TRACED.

REVISIONS

REV	DESCRIPTION

SEAL

DRAWN BY
CHECKED
APPROVED

DATE

EXTRACTION WELL DETAILS

RECORD DRAWING – OU-1 DPE SYSTEM
FORMER EMERSON POWER TRANSMISSION
ITHACA, NEW YORK

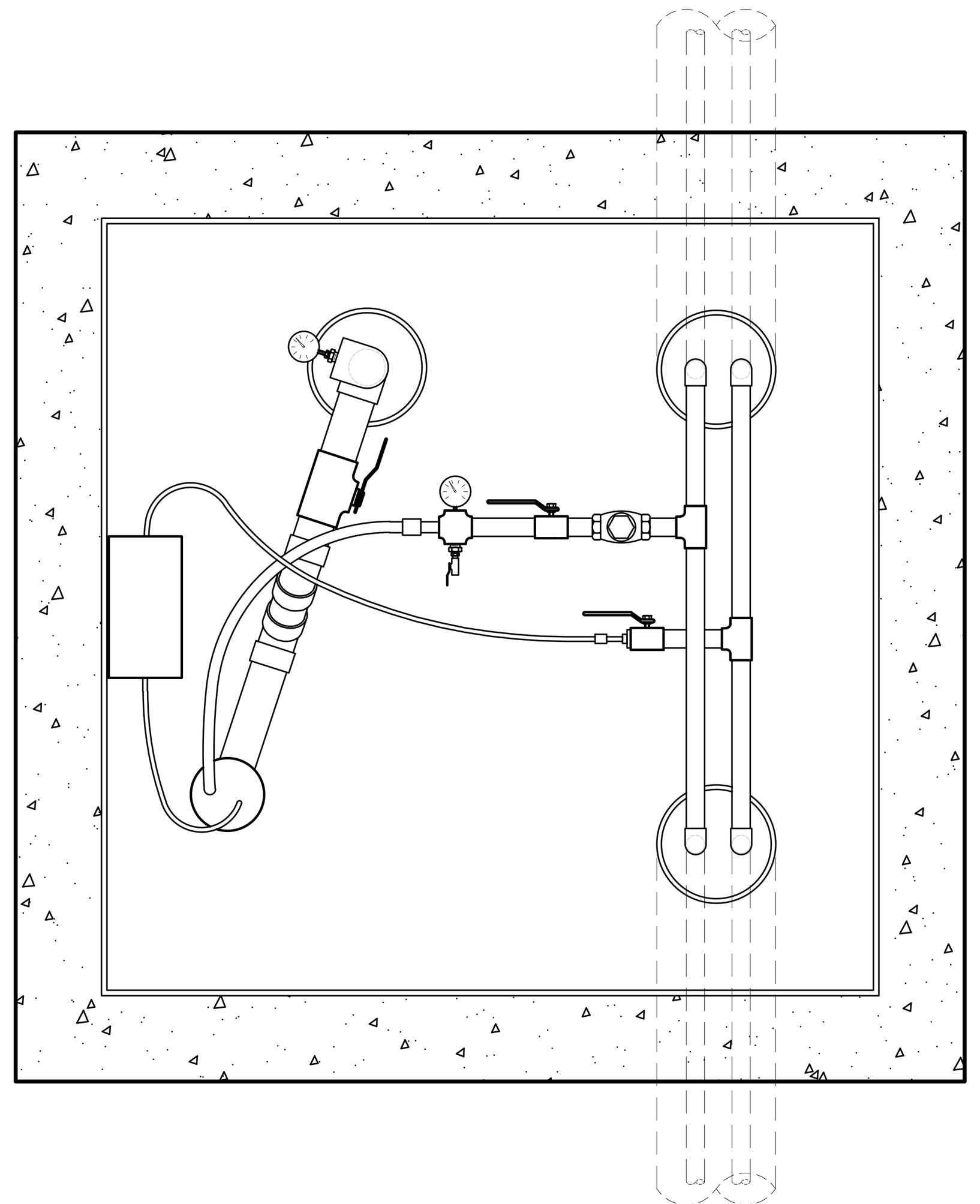
PREPARED FOR
EMERSON – ST. LOUIS, MISSOURI

WSP USA Inc.
11 STANWIX STREET, SUITE 950
PITTSBURGH, PA 15222
TEL: +1 412.604.1040

SHEET 7

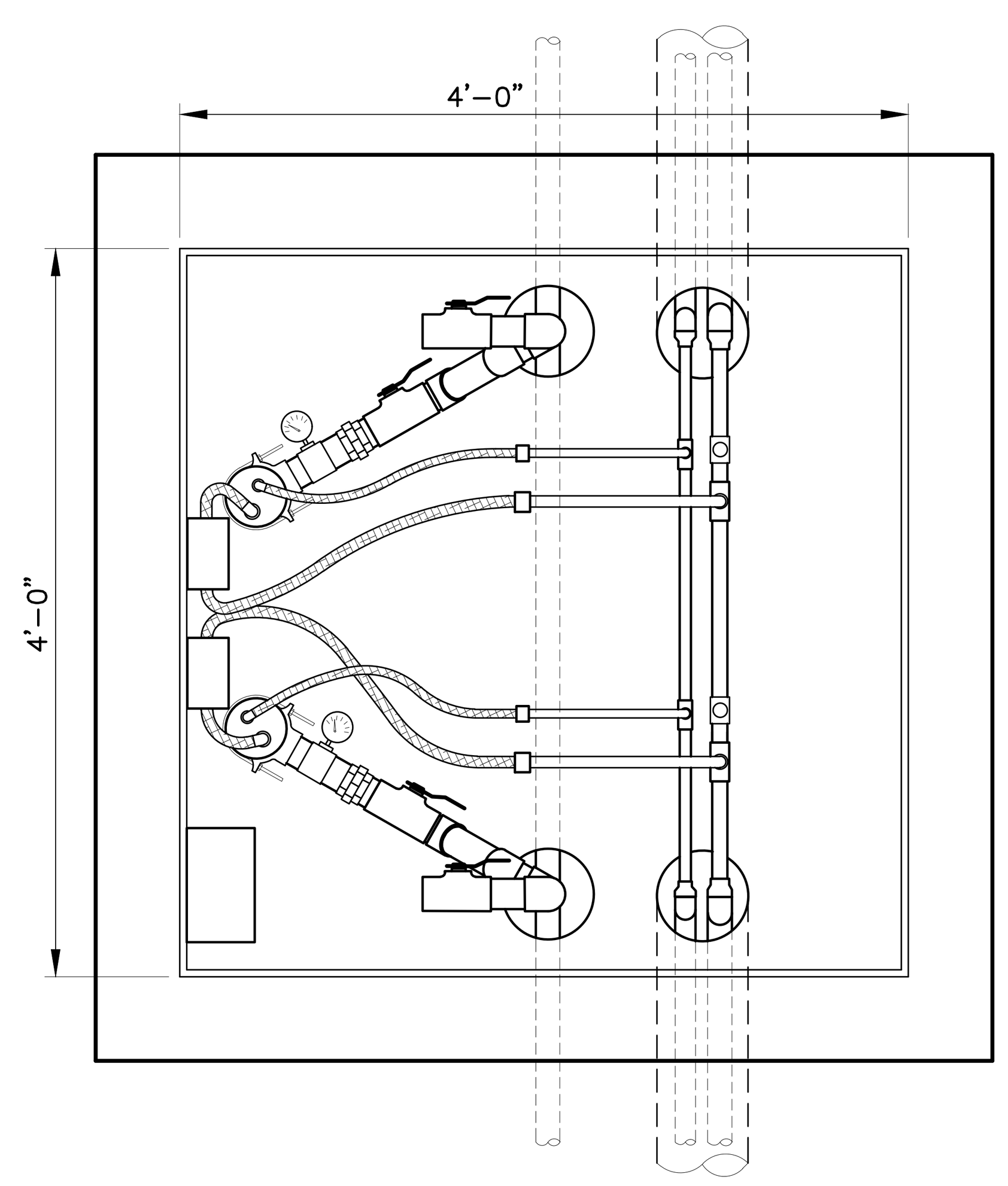
Drawing Number
314P1545.001–D167

D



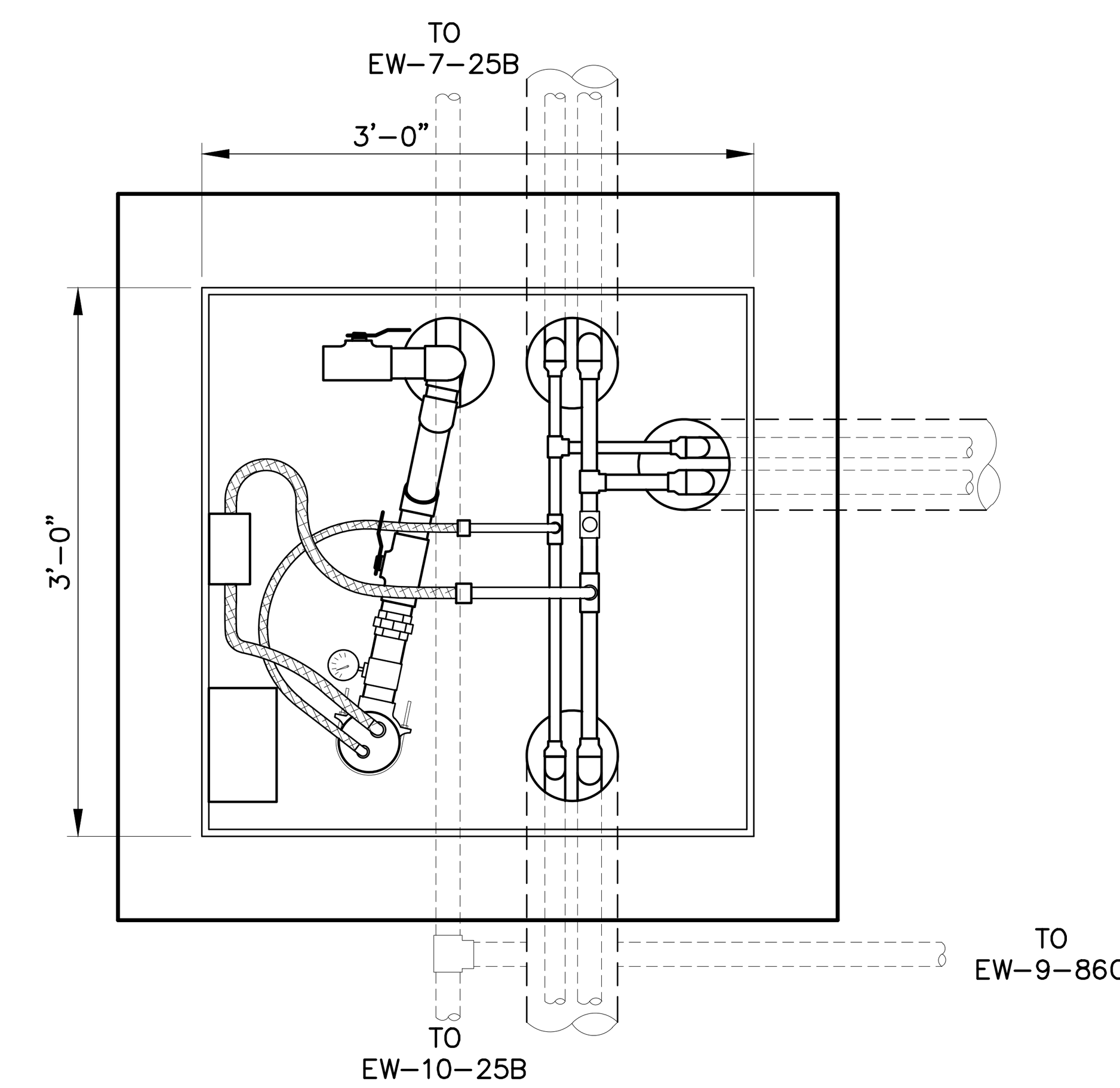
EXTRACTION WELL VAULT COMPLETION EW-1-62B, EW-2-62C, AND EW-7-25B

NOT TO SCALE



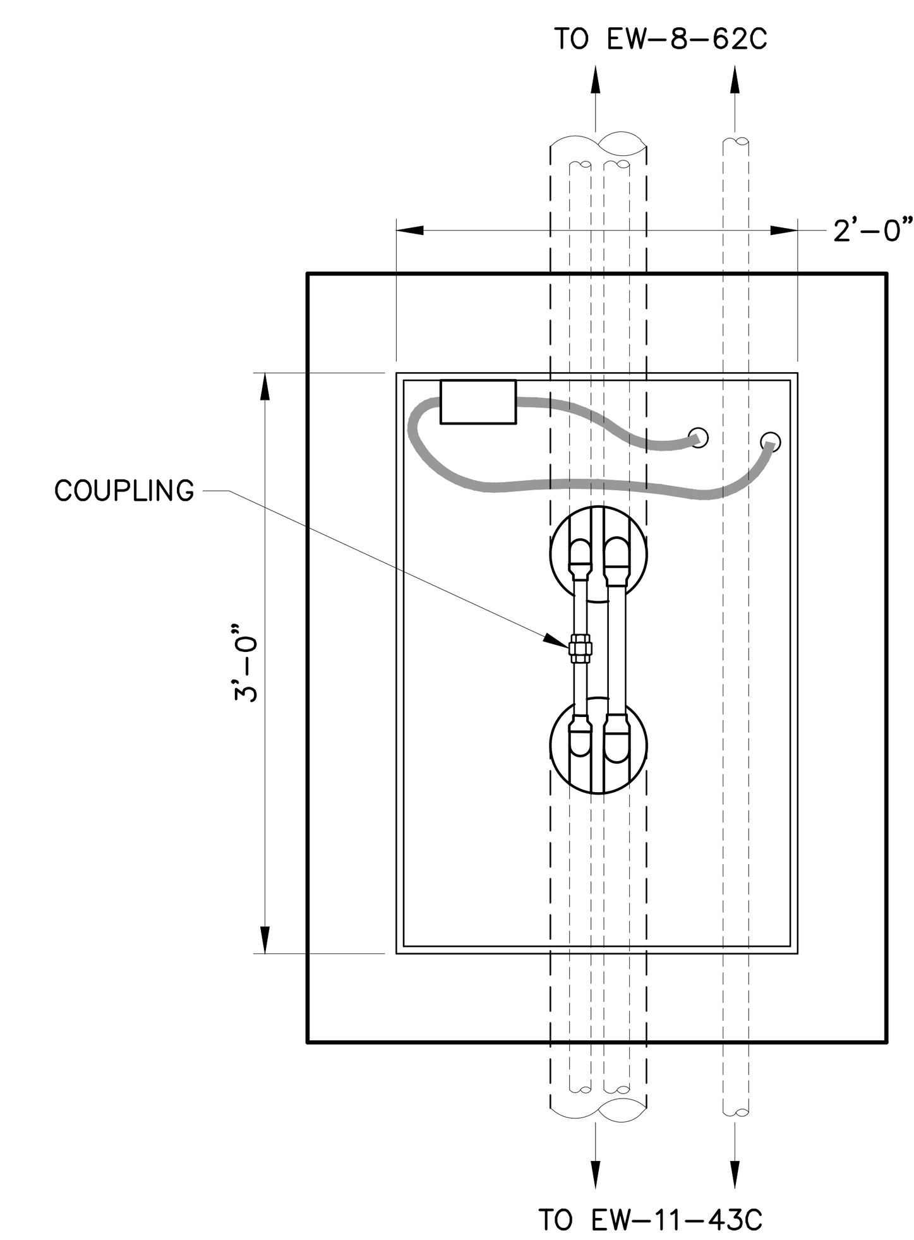
EXTRACTION WELL FAULT COMPLETION FOR EW-3-60C, EW-4-25B, EW-5-25B, AND EW-6-60C

NOT TO SCALE



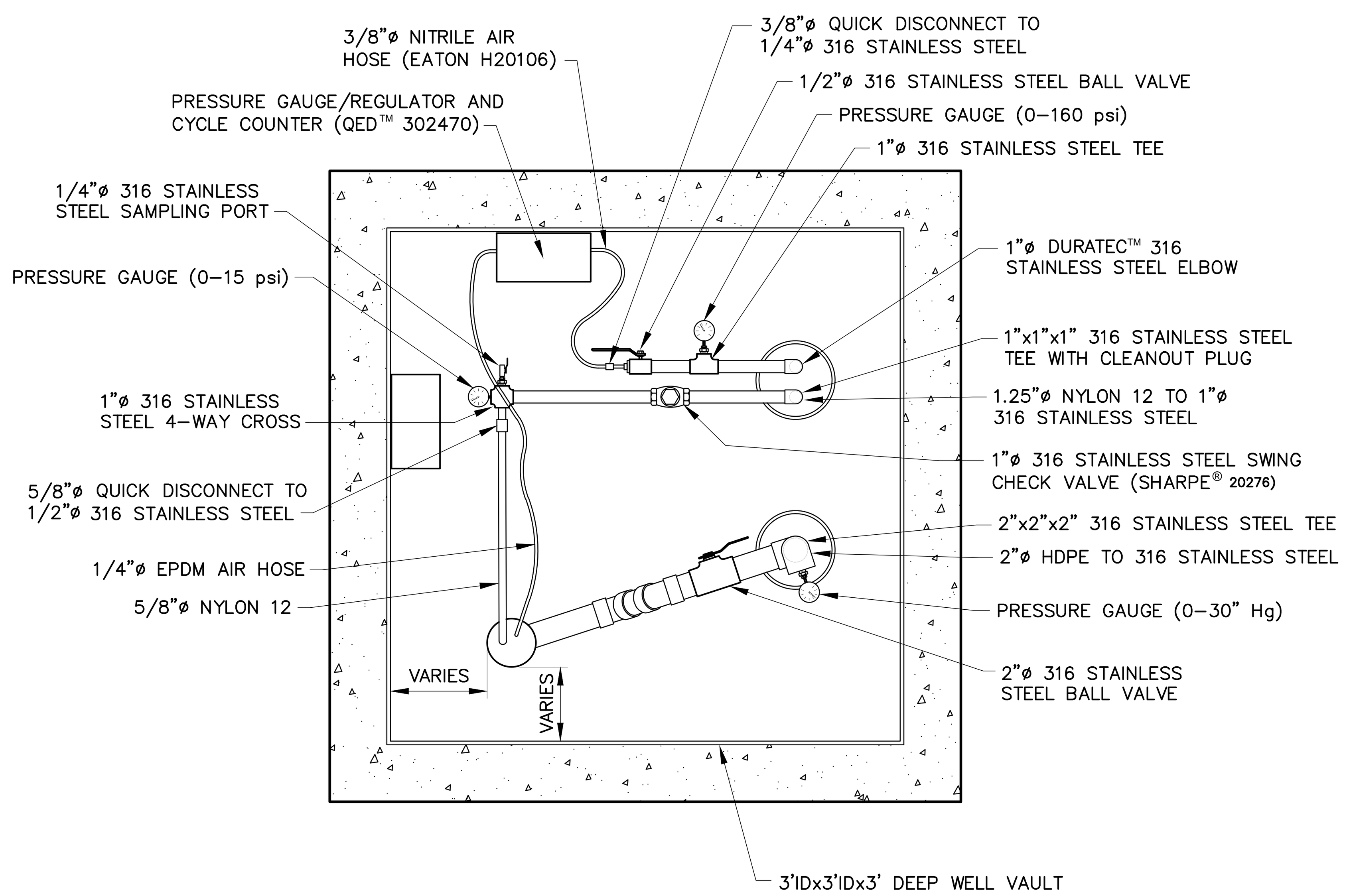
EXTRACTION WELL VAULT COMPLETION FOR EW-8-62C

NOT TO SCALE



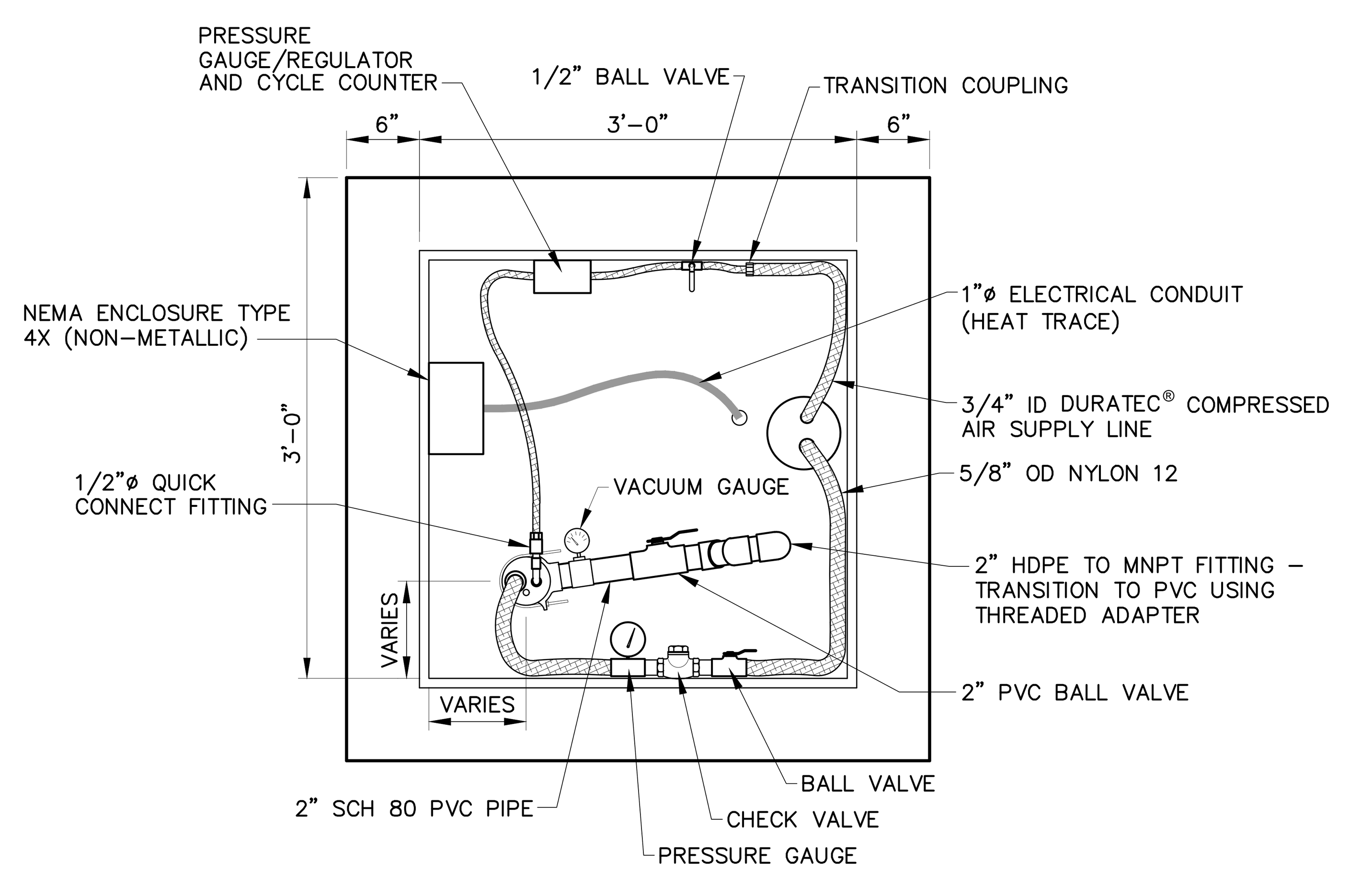
JUNCTION BOX VAULT COMPLETION

NOT TO SCALE



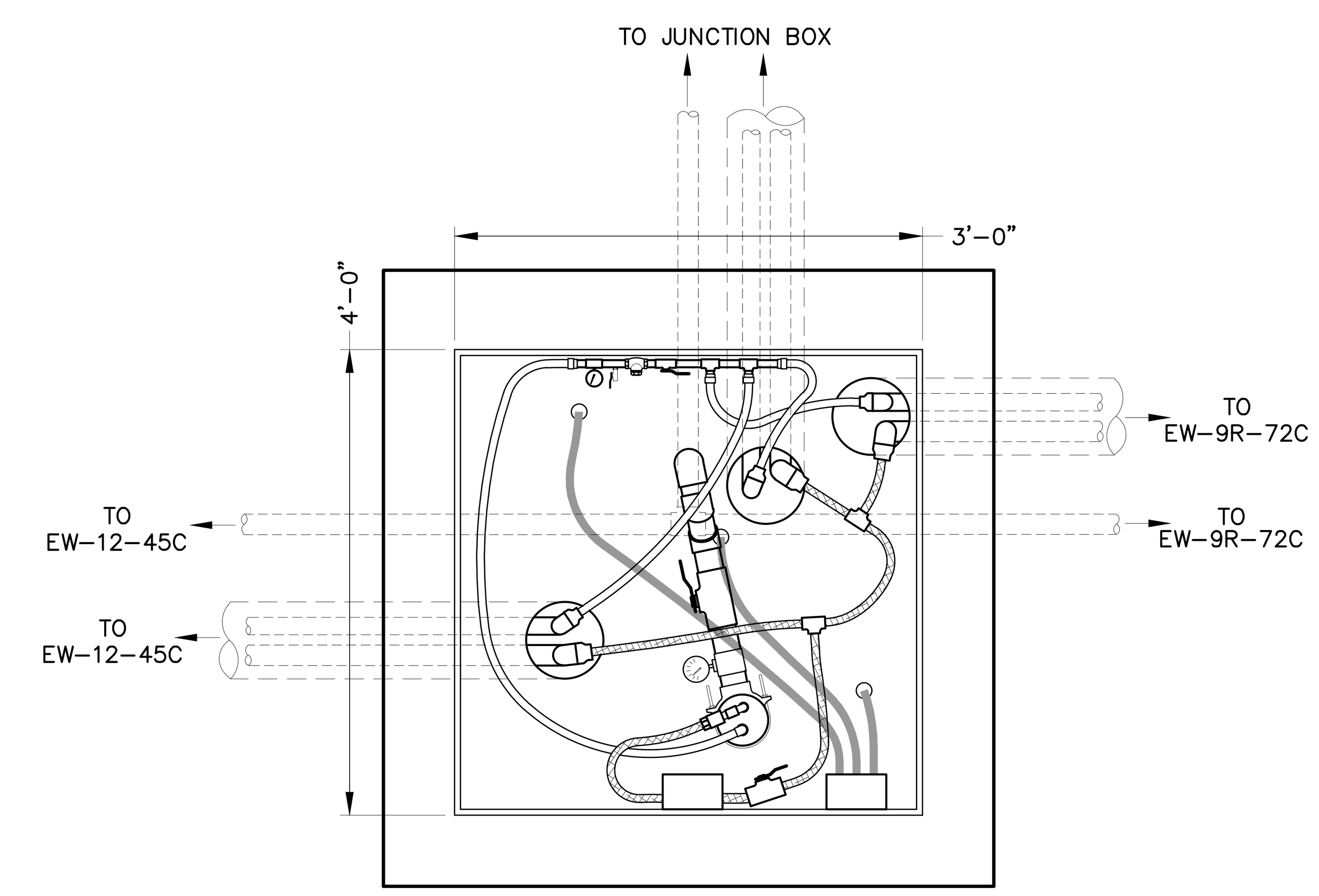
EXTRACTION WELL VAULT COMPLETION FOR EW-10-25B

NOT TO SCALE



EXTRACTION WELL VAULT COMPLETION (EW-9R-72C AND EW-12-45C)

NOT TO SCALE



EXTRACTION WELL VAULT COMPLETION (EW-11-43C)

NOT TO SCALE

NOTE:

SEE EXTRACTION WELL VAULT COMPLETION (EW-9R-72C AND EW-12-45C) ABOVE FOR SIMILAR VAULT BOX COMPONENTS.

THE ORIGINAL VERSION OF THIS DRAWING IS IN COLOR. BLACK & WHITE REPRODUCTION MAY NOT ACCURATELY DEPICT CERTAIN INFORMATION.

D

REVISIONS

REV	DESCRIPTION

DRAWN BY

CHECKED

APPROVED

SEAL

DATE

EXTRACTION WELL DETAILS

RECORD DRAWING – OU-1 DPE SYSTEM
FORMER EMERSON POWER TRANSMISSION
ITHACA, NEW YORK

PREPARED FOR

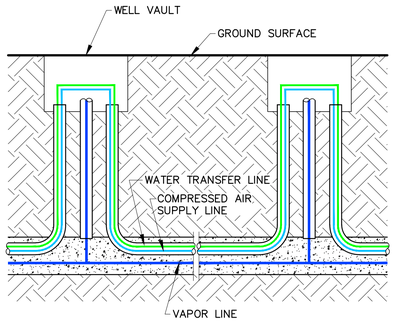
EMERSON – ST. LOUIS, MISSOURI

WSP USA Inc.
11 STANWIX STREET, SUITE 950
PITTSBURGH, PA 15222
TEL: +1 412.604.1040

SHEET 8

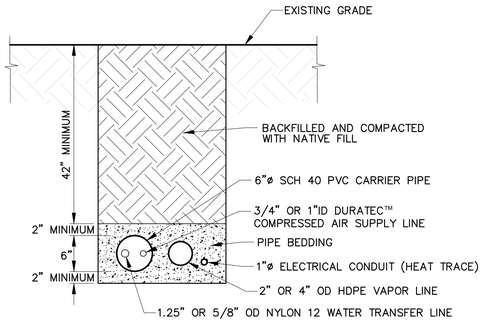
Drawing Number

314P1545.001-D168



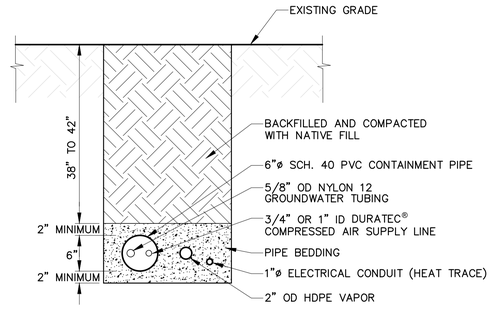
TYPICAL TRENCH CROSS SECTION DETAIL

NOT TO SCALE



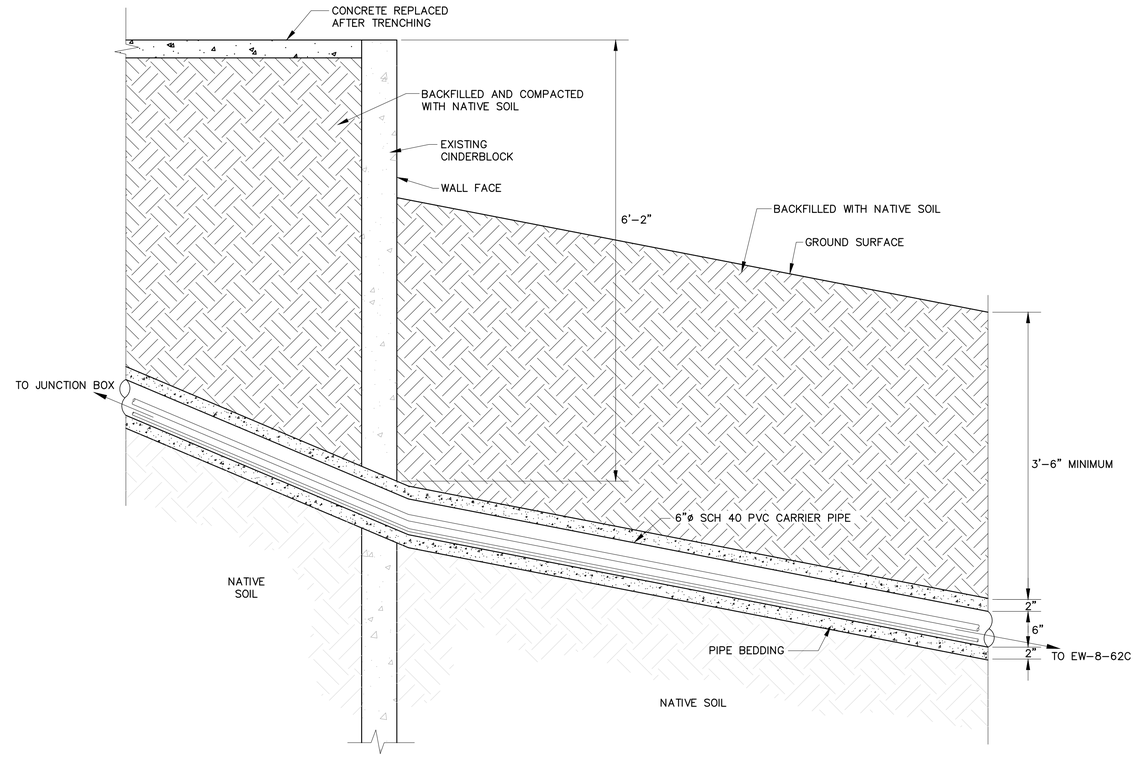
9/A TYPICAL GROUNDWATER, COMPRESSED AIR, AND VAPOR EXTRACTION PIPE TRENCH DETAIL

NOT TO SCALE



9/C GROUNDWATER, COMPRESSED AIR, AND VAPOR EXTRACTION PIPE TRENCH DETAIL (AT GAS LINE CROSSING)

NOT TO SCALE



9/B RETAINING WALL FACE INSTALLATION CROSS SECTION

NOT TO SCALE

THE ORIGINAL VERSION OF THIS DRAWING IS IN COLOR. BLACK & WHITE REPRODUCTION MAY NOT ACCURATELY DEPICT CERTAIN INFORMATION.

D

R:\Shared_GSECAD\Shared\CADAssets_CLIENTS\EMERSON\NY-ithaca\CAD\314P1545.001-D169.dwg 7/7/2022 12:31 PM USR02011165

REVISIONS

REV	DESCRIPTION		
1	Revised:	Chkd:	Appr.:
2	Revised:	Chkd:	Appr.:
3	Revised:	Chkd:	Appr.:

SEAL

DATE

DRAWN BY

CHECKED

APPROVED

TRENCHING AND RETAINING WALL FACE INSTALLATION CROSS SECTION

RECORD DRAWING – OU-1 DPE SYSTEM
FORMER EMERSON POWER TRANSMISSION
ITHACA, NEW YORK

PREPARED FOR
EMERSON – ST. LOUIS, MISSOURI

WSP USA Inc.
11 STANWIX STREET, SUITE 950
PITTSBURGH, PA 15222
TEL: +1 412.604.1040

SHEET 9

Drawing Number
314P1545.001–D169

APPENDIX

A SPDES PERMIT EQUIVALENT

NEW YORK STATE DEPARTMENT OF ENVIRONMENTAL CONSERVATION
Division of Water, Bureau of Water Permits
625 Broadway, Albany, New York 12233
www.dec.ny.gov

Emerson Electric Co.

Project Site Remediation
Wastewater Discharge SPDES Permit Equivalent

DRAINAGE BASIN: **07 / 05**

DER Site No: 7-55-010
Effective Date: **August 1, 2022**
Expiration Date: **July 31, 2027**

Discharger Name and Address:

Emerson Electric Co.
ATTN: Steve Clarke
8000 W. Florissant Ave, Station 1963
(314) 553 1953
Contact Email Address: steve.clarke@emerson.com

is authorized to discharge from the facility described below:

Emerson Electric Co.
620 South Aurora St.
Ithaca, NY 14850

From the following outfall(s):

Outfall No.	Outfall Description	Location	Receiving Water	WIN *	Class
01A	Treated Remediation Wastewater	42°25'57.18"N 76°29'53.95"W	Tributary of Cayuga Lake	0-66-12-P296-75-6	C
001	Stormwater, Ground water seepage and treated remedial wastewater	42°25'56.03"N 76°29'54.85"W	Tributary of Cayuga Lake	0-66-12-P296-75-6	C
009	Stormwater and Groundwater Seepage	42°25'51.67"N 76°29'59.86"W	Tributary of Cayuga Lake	0-66-12-P296-75-6	C
011	Groundwater seepage	42°25'56.46"N 76°29'55.25"W	Tributary of Cayuga Lake	0-66-12-P296-75-6	C

* Water Index Number

The discharges from the treatment facility shall be limited and monitored by the operator as specified below:

Outfall No. and Parameter	CAS No.	Discharge Limitations		Units	Minimum Monitoring Requirements		FN
		Monthly Avg.	Daily Max		Measurement Frequency	Sample Type	
Outfall 01A - Treated Remediation Discharge							
Flow		Monitor	Monitor	GPD	Monthly	Totalizer	
pH (range)	NA	6.5 – 8.5		SU	Monthly	Grab	
Temperature	NA		Monitor	°F	Monthly	Grab	
Tetrachloroethylene	00127-18-4		0.001	mg/l	Monthly	Grab	
Trichloroethylene	-		0.01	mg/l	Monthly	Grab	
Sum of Dichlorobenzenes	-		0.01	mg/l	Monthly	Grab	
Bromoform	00075-25-2		0.01	mg/l	Monthly	Grab	
Chlorobenzene	00108-90-7		0.005	mg/l	Monthly	Grab	
Chlorodibromomethane	00124-48-1		0.01	mg/l	Monthly	Grab	
Chloroform	00067-66-3		0.01	mg/l	Monthly	Grab	
Cyanide, Free	-	5.2	22	ug/l	Monthly	Grab	1
Dichlorobromomethane	00075-27-4		0.01	mg/l	Monthly	Grab	

1,1 Dichloroethane	00075-34-3		0.01	mg/l	Monthly	Grab	
1,1 – Dichloroethylene	00075-35-4		0.01	mg/l	Monthly	Grab	
Methylene Chloride	00065-09-2		0.01	mg/l	Monthly	Grab	
1,1,2,2- Tetrachloroethane	00079-34-5		0.01	mg/l	Monthly	Grab	
Toluene	00108-88-3		0.05	mg/l	Monthly	Grab	
1,2-(trans)-Dichloroethylene	00156-60-5		0.01	mg/l	Monthly	Grab	
1.2-(cis)-Dichloroethylene	00156-59-2		0.01	mg/l	Monthly	Grab	
1,1,1-Trichloroethane	00071-55-6		0.01	mg/l	Monthly	Grab	
Xylenes, Total	00095-47-6 00108-38-3 00106-42-3		0.01	mg/l	Monthly	Grab	
Vinyl Chloride	00075-01-4		0.01	mg/l	Monthly	Grab	
Benzene	00071-43-2		0.001	mg/l	Monthly	Grab	

Outfall No. and Parameter	CAS No.	Discharge Limitations		Units	Minimum Monitoring Requirements		FN
		Monthly Avg.	Daily Max		Measurement Frequency	Sample Type	
Outfall 001 - Stormwater, Groundwater Seepage and Treated Groundwater							
Flow	NA		Monitor	GPD	Monthly	Estimate	
pH (range)	NA	6.5 – 8.5		SU	Monthly	Grab	
Total Barium	07440-39-3		Monitor	mg/l	Quarterly	Grab	
Total Lead	07439-92-1		7.4	ug/l	Monthly	Grab	
Mercury	07439-97-6		Monitor	ng/l	Quarterly	Grab	2
Tetrachloroethylene	00127-18-4		0.001	mg/l	Monthly	Grab	
Trichloroethylene	-		0.01	mg/l	Monthly	Grab	
Cyanide, Free		5.2	22	ug/l	Quarterly	Grab	1

Outfall No. and Parameter	CAS No.	Discharge Limitations		Units	Minimum Monitoring Requirements		FN
		Monthly Avg.	Daily Max		Measurement Frequency	Sample Type	
Outfall 009 – Stormwater and Groundwater Seepage							
Cyanide, Free	-	5.2	22	ug/l	Quarterly	Grab	1

Footnotes: (see on the next page)

1: Free Cyanide is the sum of HCN and CN, expressed as CN. The WQBEL of 5.2 ug/l Monthly Average and 22 ug/l Daily Max for Cyanide will become effective on August 1, 2025. An interim limit of Monitor Only shall apply from August 1, 2022, until July 31, 2025.

2. Mercury shall be analyzed using USEPA Method 1631

Schedule of Compliance for Cyanide: The permittee shall comply with the following schedule:

Outfall No.	Parameters	Compliance Action	Due Date
009	Cyanide	The permittee shall monitor for Free Cyanide at the frequency specified in the effluent limit tables. Following 2 years of monitoring, permittee shall submit a report summarizing free Cyanide trends and if the final effluent limits are exceeded, measures to be taken to meet final limits and a schedule to be made enforceable under this permit equivalent. The schedule to address free cyanide exceedances shall not exceed 18 months. The facility shall meet effluent discharge limitations for Cyanide.	August 1, 2022 September 30, 2024 November 1, 2025
011	Cyanide	The discharge from Outfall 011 shall be sampled for Free Cyanide. A sample shall be collected during the first discharge of each month from Outfall 011 until three (3) samples have been collected. Sampling results shall be submitted to the DER project engineer.	March 1, 2023

Additional Conditions:

1. Discharge is not authorized until such time as an engineering submission showing the method

of treatment is approved by the Department. The discharge rate may not exceed the effective or design treatment system capacity. A summary of the monthly monitoring data shall be submitted to the Department twenty-eight (28) days following the end of each monthly monitoring period. All monitoring data, engineering submissions and modification requests must be submitted to:

Karen A Cahill
Division of Environmental Remediation
NYSDEC R7
615 Erie Blvd West
Syracuse, NY 13204-2400
Tel: 315-426-7432
Email: karen.cahill@dec.ny.gov

2. Samples and measurements, to comply with the monitoring requirements specified above, must be taken from the effluent side of the final treatment unit prior to discharge to the receiving water body unless otherwise noted above.

3. Monitoring and analysis shall be conducted using sufficiently sensitive test procedures approved under 40 CFR Part 136 unless other test procedures have been specified in this permit equivalent.

4. Only site generated wastewater is authorized for treatment and discharge.

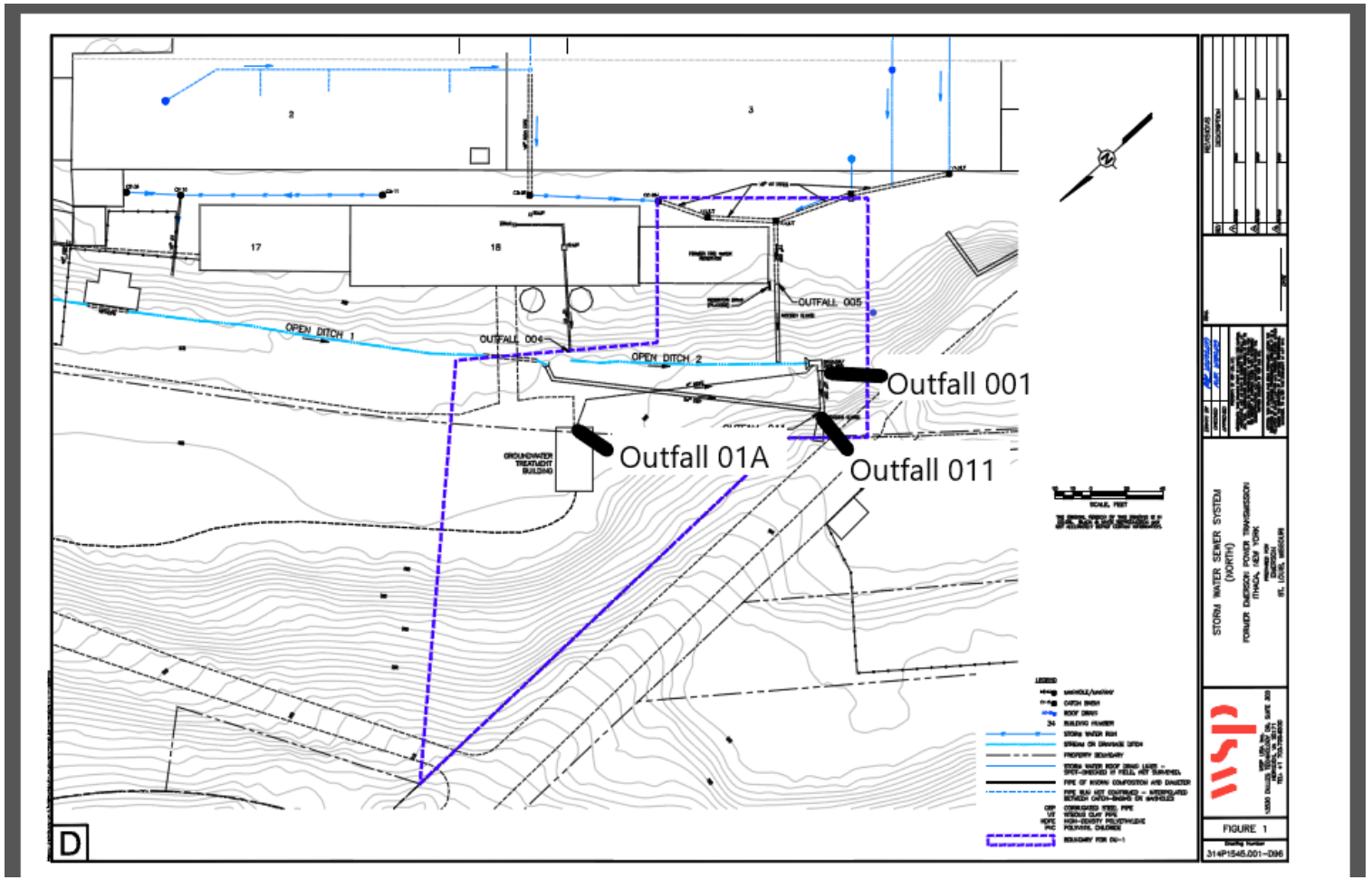
5. Authorization to discharge is valid only for the period noted above but may be renewed if appropriate. A request for renewal must be received 6 months prior to the expiration date to allow for a review of monitoring data and reassessment of monitoring requirements.

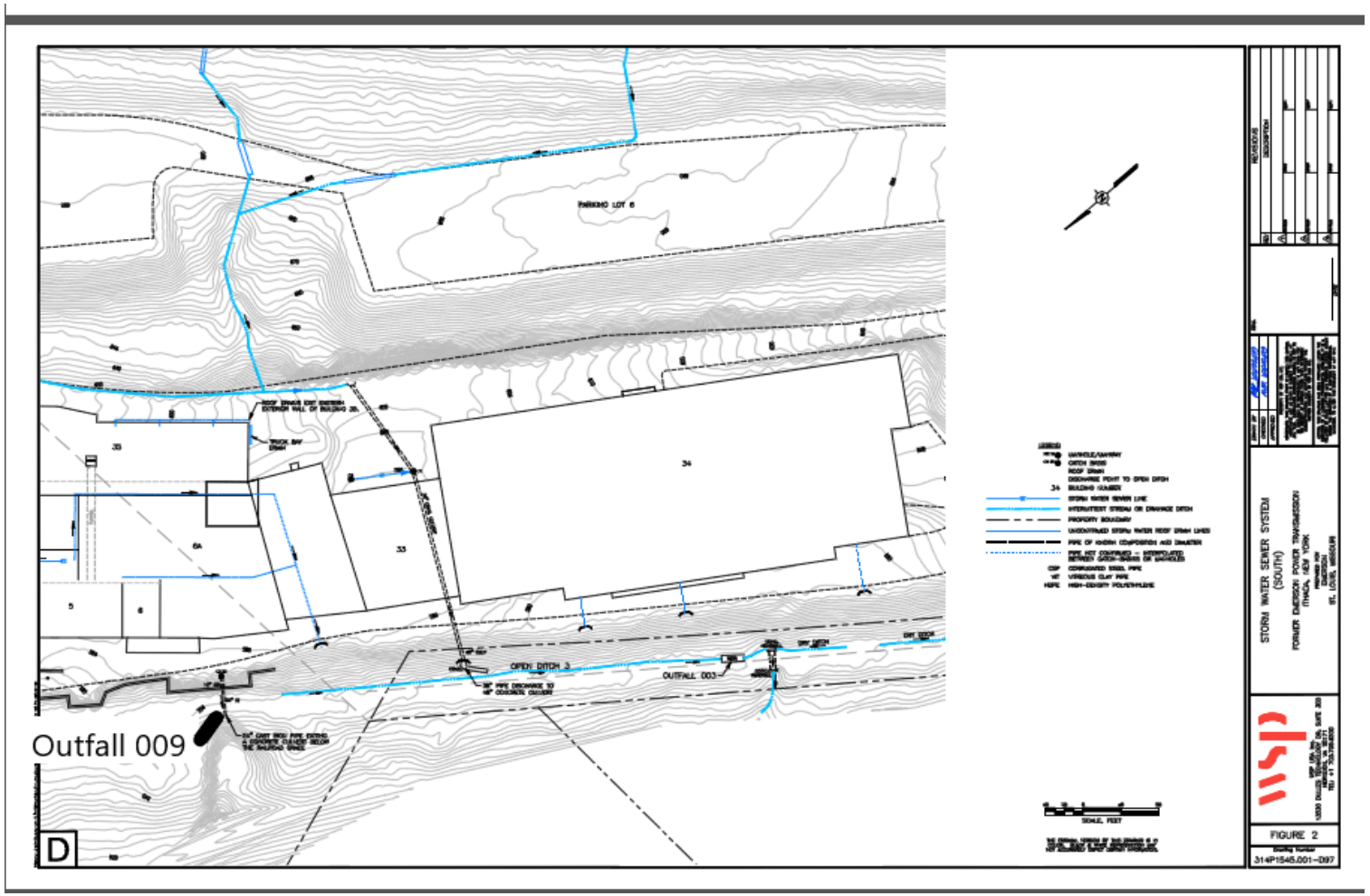
6. Any use of corrosion/scale inhibitors, biocidal-type compounds, or other water treatment chemicals used in the treatment process must be approved by the department prior to use.

7. This discharge and administration of this discharge must comply with the substantive requirements of 6NYCRR Part 750.

MONITORING LOCATIONS:

Outfall 001 and 01A




Outfall 009
PARKING LOT 6
OPEN DITCH 3
OUTFALL 003
STORM WATER SEWER SYSTEM (SOUTH)
FORMER EMERSON POWER TRANSMISSION
ITHACA, NEW YORK
FIGURE 2
314P1545.001-D97
D

APPENDIX

B ELECTRICAL CERTIFICATION

CITY OF ITHACA
108 East Green Street Ithaca, New York 14850-5690

BUILDING DEPARTMENT
Telephone: 607/274-6508 Fax: 607/274-6521

May 14, 2009

Matco Electric
615 Five Mile Drive
Ithaca, NY 14850

RE: Electrical Work Permits

Dear Sir:

On April 24, 2009, Matco Electric applied for electrical work permits for the following properties:

620 South Aurora Street — Emerson Building Inspection
501 South Cayuga Street
111 South Titus Street
210 West Spencer Street

receipt number 38873. This letter certifies that such work has been finished and has passed the final electrical inspection.

If you have questions, please call me at 274-6508.

Thank you for your cooperation.

Sincerely,

David B. Wilbur

David Wilbur
Electrical Inspector

DW:mh
Enclosures

APPENDIX

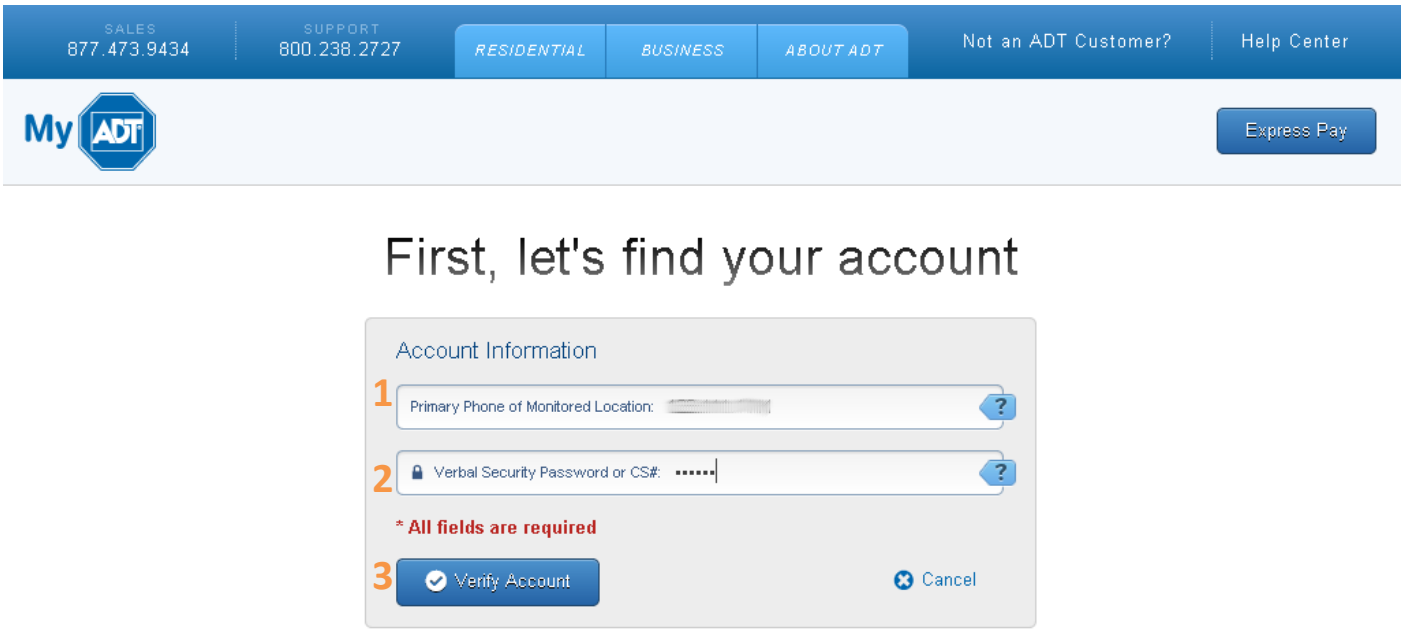
C ADT SECURITY SYSTEM

MyADT.com Quick Sheet

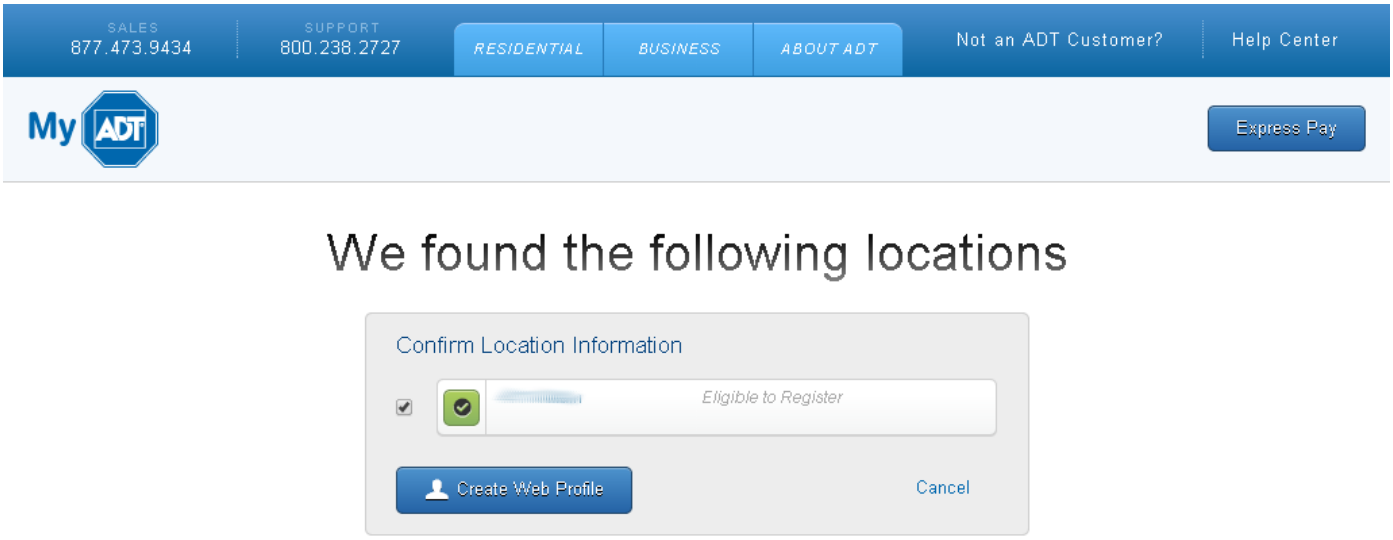
Registering for MyADT.com

1) Go to www.MyADT.com and click the blue **Sign Up on Less Than 60 Seconds** button.

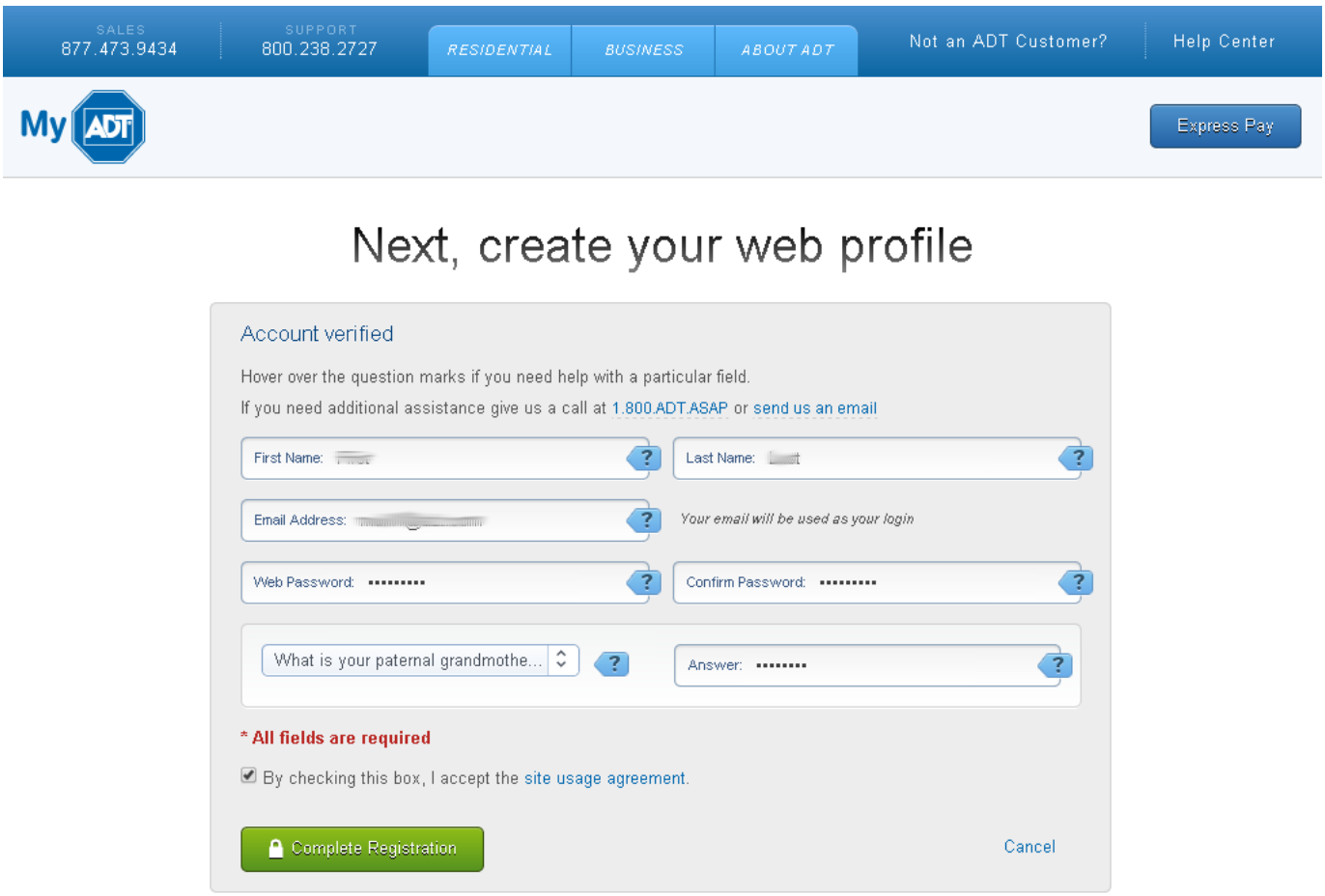
2) Enter the Primary Phone Number associated with the monitored location and either the Verbal Security Password (PIC) or CS#. Click **Verify Account**.



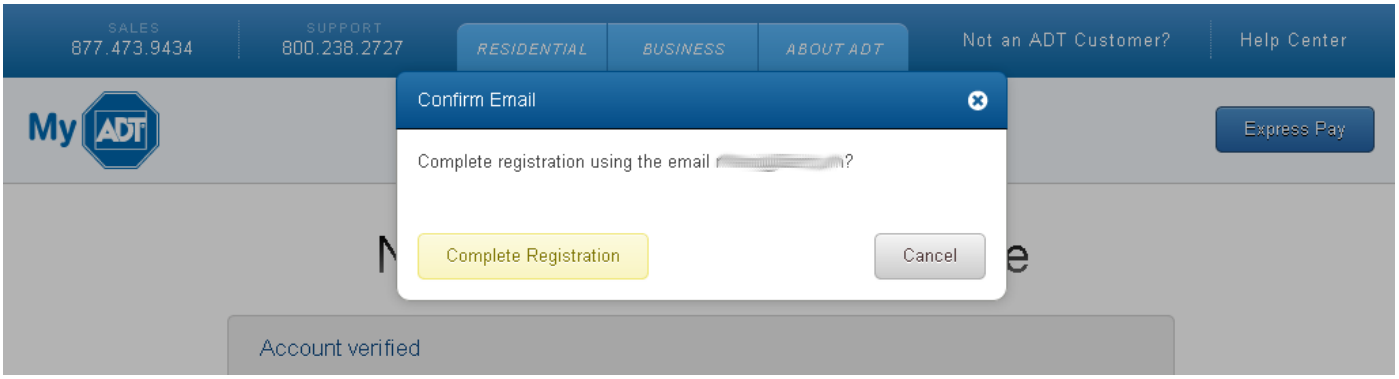
3) Select the location to register, verify the street address is correct and click **Create Web Profile**.



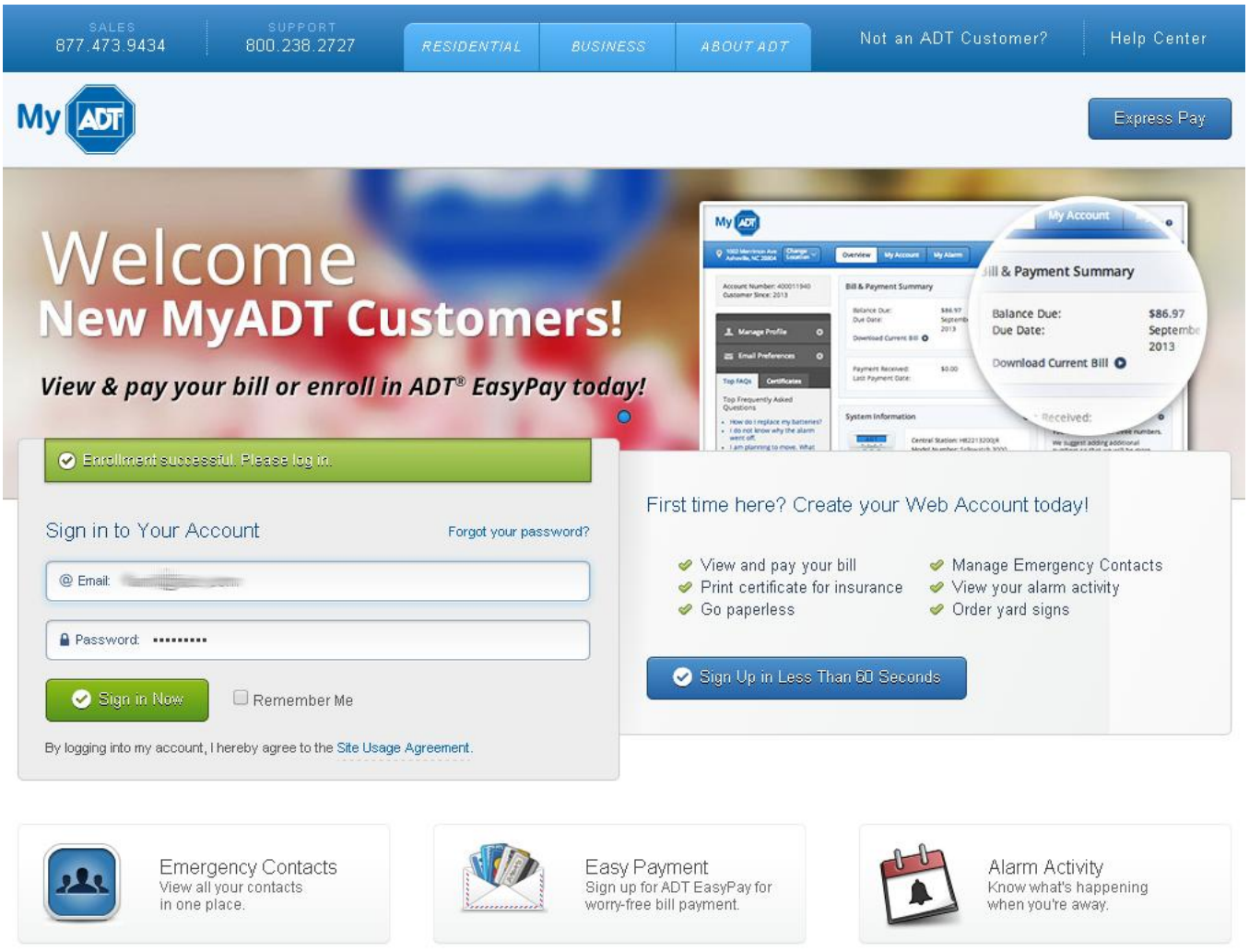
4) Fill out the information in the Web Profile form and check the box to agree to the site usage agreement. Click **Complete Registration** when done.



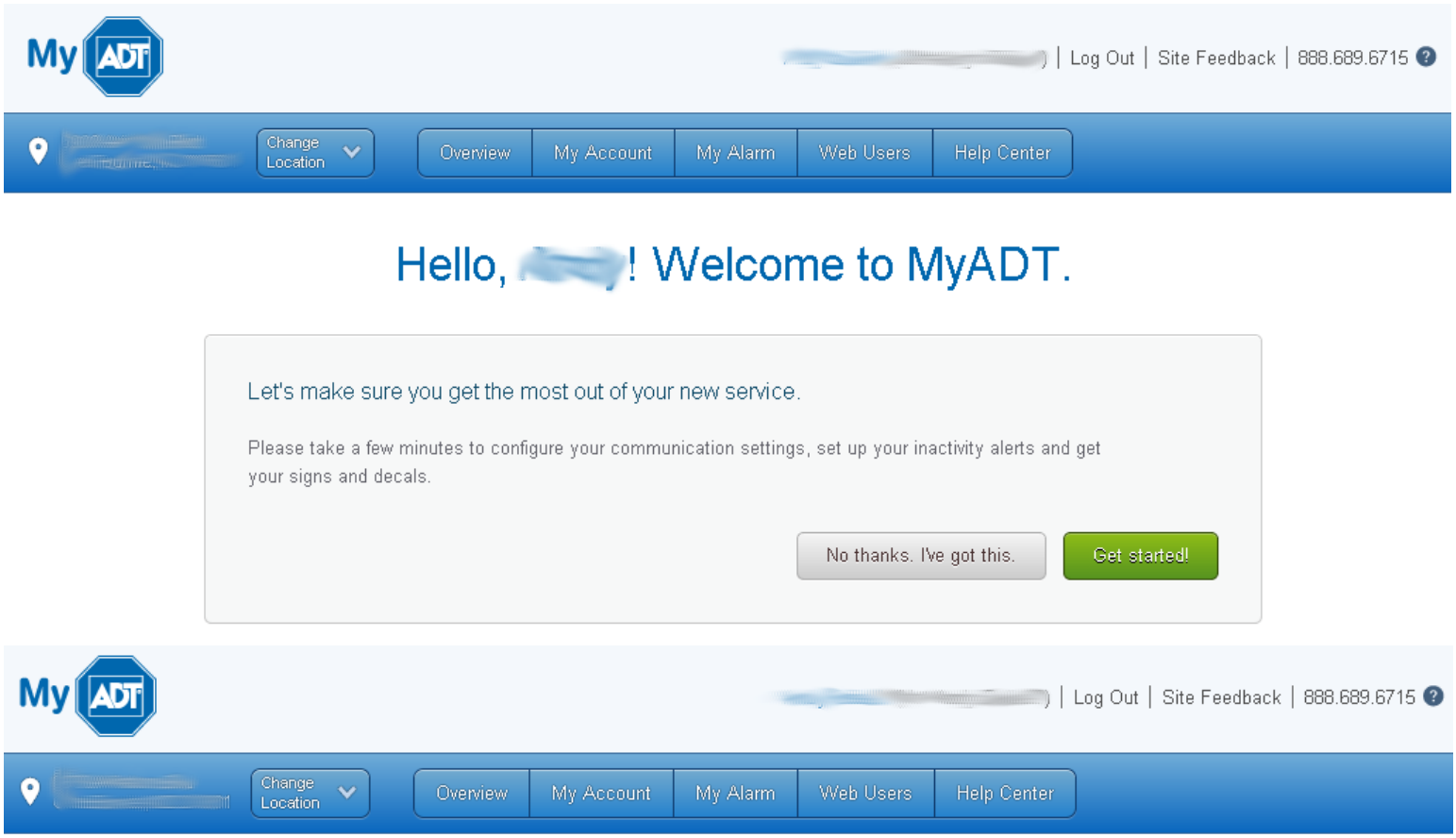
5) Confirm that the email address entered is the one that should be used to login to the account and click **Complete Registration**.

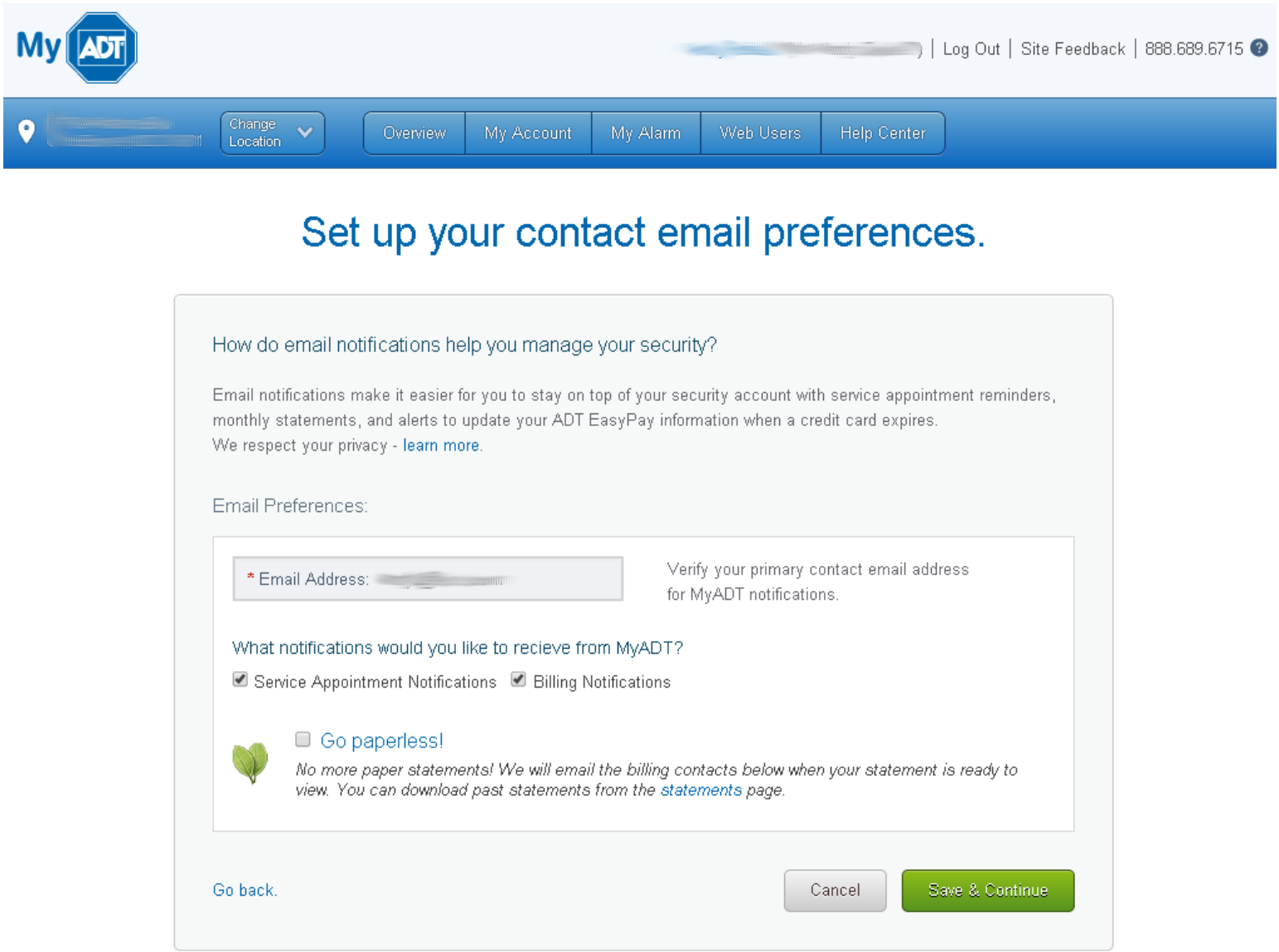


6) When the account has been successfully created, the user will be redirected to the login page where they can sign in to their new account with their login email and web password.



7) After logging in for the first time, the customer will be presented with the Welcome Experience (four screenshots below) in which they can set up their email preferences, Inactivity Alerts, generate a Certificate of Installation, and Order Yard Signs:





Sign up for system inactivity alerts.

Why do I need inactivity alerts?

Alarm events, such as false alarms and system tests, appear in your alarm history as "alarm activity." If you do not see any activity in your alarm history, this is an indication that your system is not communicating properly with ADT. Usually this is caused by changes to phone, cable, satellite, or internet service. Inactivity alerts will check that your system is communicating properly with ADT and notify you of any problems so that they may be resolved quickly.

Every 2 Months

*Notification Email: [redacted]

Go back.

Cancel | Save & Continue

My ADT

[redacted] | Log Out | Site Feedback | 888.689.6715

[redacted] Change Location | Overview | My Account | My Alarm | Web Users | Help Center

You're all set. Don't forget the essentials!

Order your ADT Security yard signs and decals.

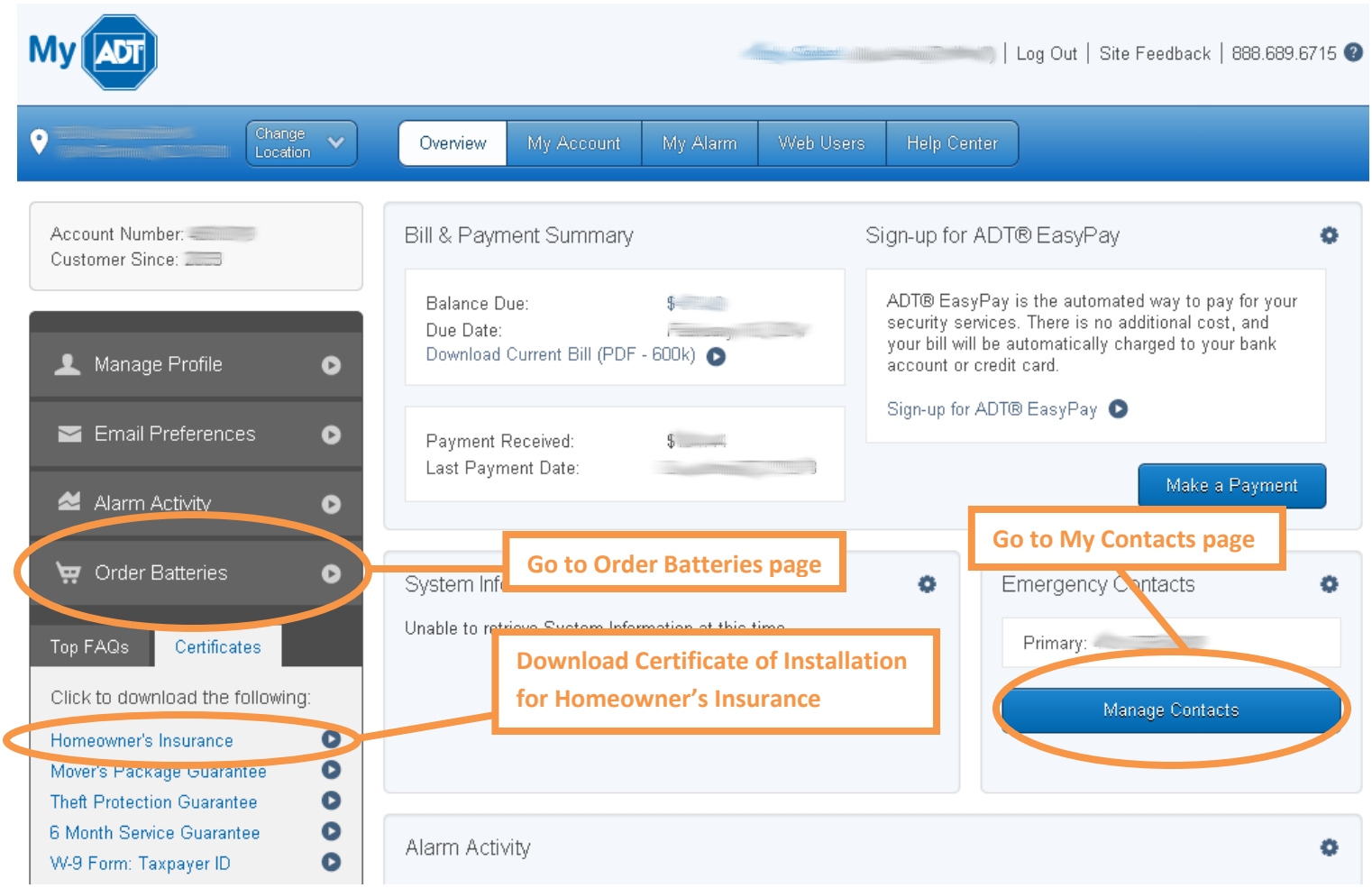
Thank you for taking the time to set up your account. Now, take a moment to order your ADT security yard signs and decals, or start managing your security account with MyADT.

Get your insurance savings! Download your Certifcate of Installation.
You could qualify for savings on your homeowners insurance up to 20%.

Go back.

Start using MyADT | Order Yard Signs & Decals

Where to Find Other Frequently Used Features



MEMO

TO: WSP Employees using the Treatment Building

FROM: Jeffrey Baker

SUBJECT: ADT Security System, Ithaca Treatment Building, Ithaca NY

DATE: July 7, 2022

READ THIS DOCUMENT IN ITS ENTIRETY BEFORE ATTEMPTING TO OPERATE THE SYSTEM

KEY FACTS

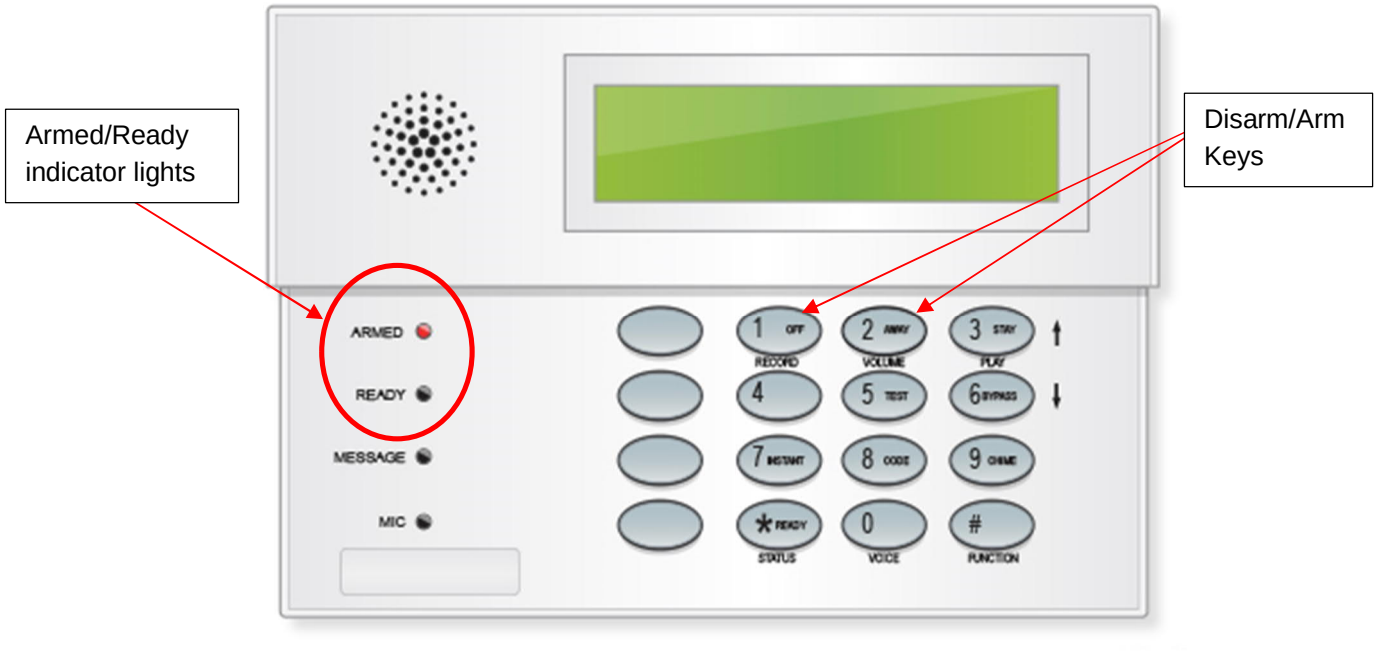
- ADT Helpline: (800) 515-2216
- The system is a Safewatch Pro 3000 with three (3) closed circuit television cameras.
- Location:

  Treatment System Building

  620 S Aurora St

  Ithaca NY, 14850
- The system is wired to contact Jeff Baker or Nate Winston and then the Ithaca Police Department if the door is opened and it is not disarmed within 30 seconds.
- Prior to entering the system or onsite work, you must contact Jeff Baker (Jeffrey.Baker@wsp.com) or Nate Winston (Nathaniel.Winston@wsp.com) to request a designated PIN
- WSP may provide contractors with **pages 1 through 3** of this document. All other pages are for internal use only.
- The system should be left **ARMED** at the end of the day. Team members must communicate when working in/out of the building to avoid setting off the alarm.

ARMING/DISARMING THE SYSTEM



DISARMING

1. If you do not have the ADT Pulse App on your phone, proceed to Step 2. If you are a WSP user and you have the ADT Pulse App on your phone:
    a. Use the ADT Pulse app on your phone (WSP user) to disarm the system.
    b. Proceed to Steps 2 and Step 3 only.
    c. You do not need to disarm the system from the keypad if you have successfully disarmed it through your phone app.
2. Use lock box on back North exterior wall to get key to unlock man-door.
    a. Lockbox code is **XXXX**
3. Unlock the man-door.
4. The keypad is located inside of the man-door on the left hand side, above the light switch.
5. Open the man-door.
6. Upon opening the door, the touchpad will beep as it counts the “entry delay”.
7. Within 30 seconds of opening the man-door:
    a. Enter your PIN (provided by Jeff Baker or Nate Winston)
    b. Press the [1 - OFF] Key.
    c. The countdown should stop.
    d. The GREEN Ready indicator light should be glowing green.

NOTE: sequential key depressions must be made within 10 seconds of each other. If 10 seconds elapse without a key depression, the entry is automatically aborted and the user must start over from the beginning

If you make a *mistake* while entering the code, press the **[*]** and then start over.

ARMING

1. If you do not have the ADT Pulse app on your phone, proceed to Step 2. If you are a WSP user and you have the ADT Pulse App on your phone:
    a. Use the Pulse App to arm the System.
    b. Proceed to Step 5.
2. To arm the system using the key pad:
3. Enter your PIN on the keypad.
4. Press the [2 - AWAY] key.
5. You have 30 seconds to exit the building.
6. Lock the man-door.
7. Return the key to the lockbox.

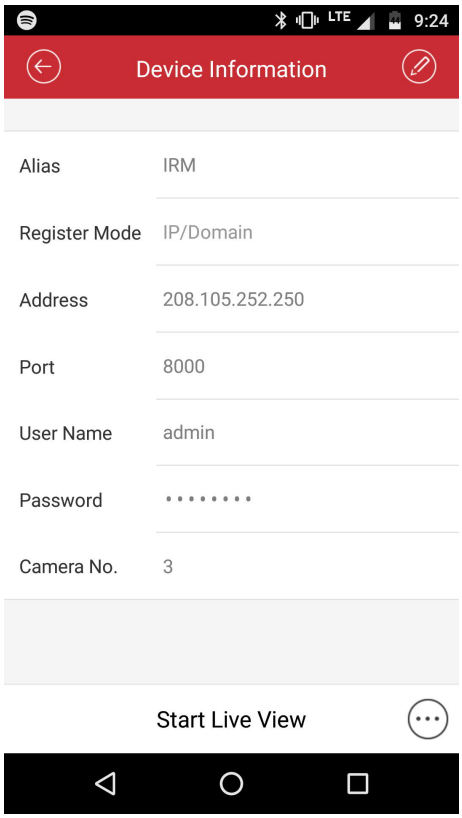
1. ACCOUNT INFORMATION

Account Number	
Customer since	July 2018
Phone on Record	Jeff Baker Cell (Primary) – (724) 882 – 9723 Nate Winston (Secondary) – (315) 420 - 9973
Verbal Security Password	XXXX
Location	620 S Aurora St, Ithaca NY, 14850
My ADT Website - See Bill & Payment Summary - See System Activity - E-mail Preferences - Alarm Activity - Emergency Contacts/Preferences	www.myadt.com
ADT Pulse Website/app - See history of site access - Alarm activity - Arm/Disarm the system - Assign user access codes	https://portal.adtpulse.com/myhome/10.0.0-60/access/signin.jsp

2. REMOTELY VIEWING CAMERAS

For smartphone application:

1. Install the iVMS4500 app on smartphone
2. In the app, go to Devices > (+) > Manual Adding
3. Input the information below:



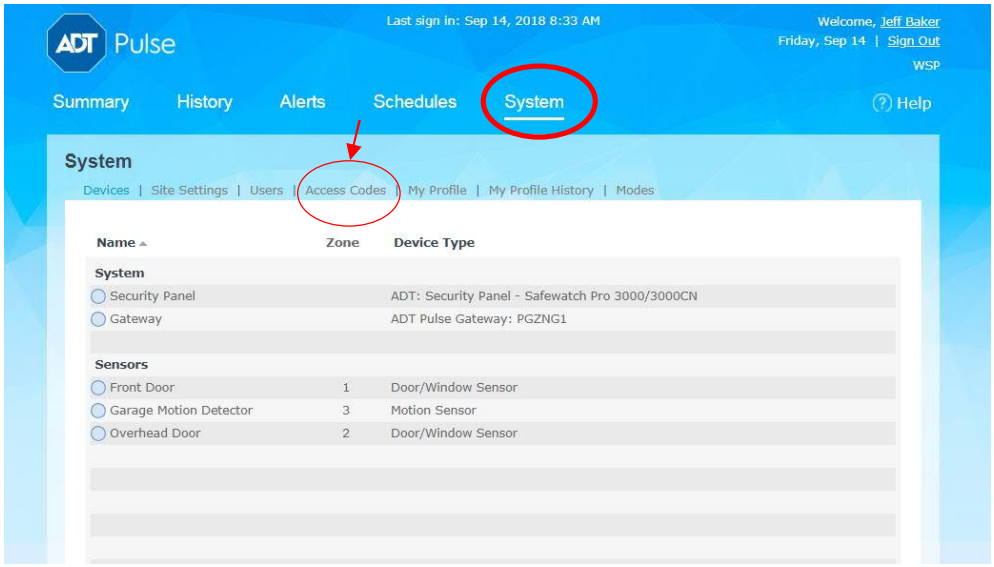
For desktop application:

1. Download the iVMS-4200 from Hikvision
2. Input the IP address, username and password as above

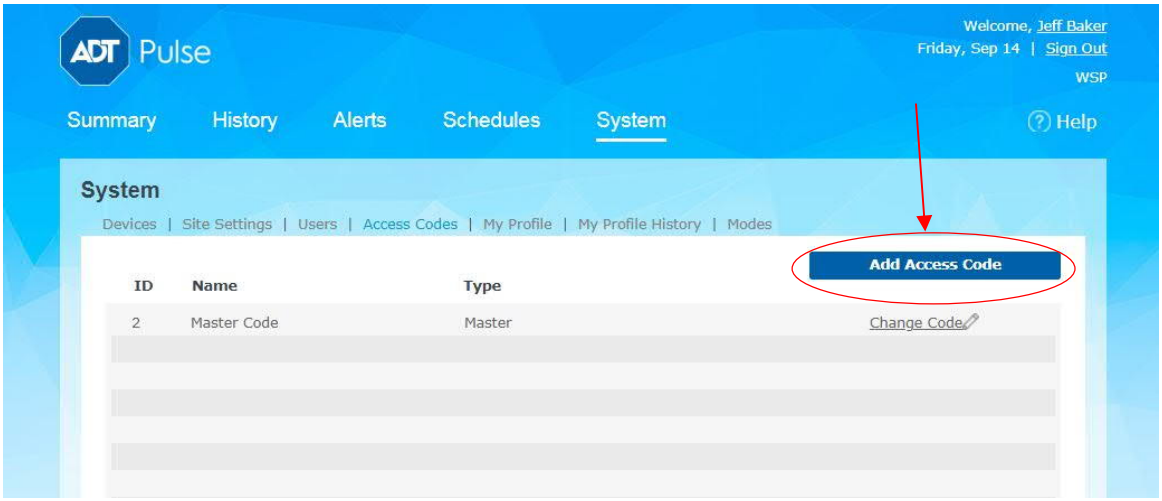
3. ADT PULSE AND ASSIGNING USER CODES

A specific PIN must be generated for each user prior to a user entering the building. The user will input the PIN to disarm the system. Complete the following steps to generate a PIN for an individual.

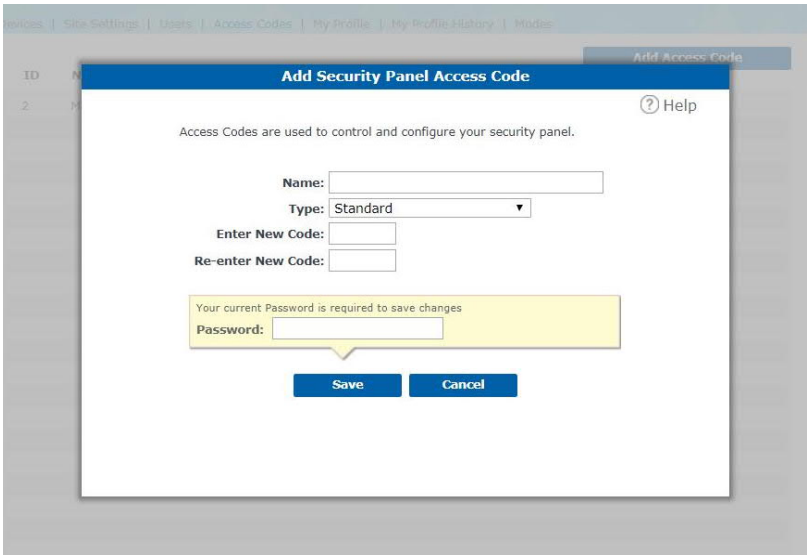
1. Log into the ADT Pulse portal: https://portal.adtpulse.com/myhome/10.0.0-60/access/signin.jsp
2. Disarm the system
3. Click on the System tab



4. Click on Access Codes, wait for information to load
5. Click on “Add Access Code” in the right hand corner



6. Complete the fields shown on the pop up screen



a. In the **Name** field, enter a name for the access code

b. From the **Type** drop-down menu, select the type of access code

c. In the **Enter New Code** field, enter the desired access code. An access code is typically 4 digits but can be up to 6 digits

d. In the **Re-enter New Code** field, confirm the access code by entering it again.

e. In the **Password** field, enter your password

f. Click **Save**

7. When an access code is used to arm or disarm the system (from the security system keypad) the history of that event indicates which access code was used. The assigned names to the access codes will be displayed on the system history.

8. NOTE: There is no way to have a code “expire” after a given amount of time. WSP must go in and delete the access code from the system.

APPENDIX

D EQUIPMENT MANUALS

APPENDIX

E TREATMENT BUILDING DRAWINGS

CONTRACT DOCUMENTS
FOR
EMERSON POWER TRANSMISSION
ITHACA, NEW YORK

SITEWORK
1. ALL EXTERIOR BOTTOM OF FOOTINGS SHALL NOT BE LESS THAN FOUR FEET BELOW FINISHED EXTERIOR GRADE.
2. ALL FOOTINGS SHALL BEAR ON 95% COMPACTED STRUCTURAL FILL PLACED OVER SUITABLE INDIGENOUS SOILS HAVING A MINIMUM NET ALLOWABLE BEARING CAPACITY OF 1000 PSF.
3. NO FOOTINGS OR SLABS SHALL BE PLACED IN WATER OR ON FROZEN GROUND.
4. COMPACT FOOTING SUB-GRADES TO A MINIMUM OF 95% MODIFIED PROCTOR DENSITY AT OPTIMUM MOISTURE CONTENT.
5. ALL FINISHED EXCAVATIONS AND BEARING GRADES SHALL BE INSPECTED AND APPROVED BY THE ENGINEER.
   TESTING AGENCY BEFORE ANY CONCRETE IS PLACED.
6. ALL STRUCTURAL FILL UNDER ANY PORTION OF THE BUILDING SHALL BE COMPACTED IN 8-INCH LIFTS.
7. LOCATE ALL EXISTING BELOW GRADE UTILITIES AND PROTECT FROM DAMAGE.

CONCRETE WORK
1. A QUALITY CONTROL PROGRAM OF FIELD TESTING AND INSPECTION SHALL BE PERFORMED ON ALL STRUCTURAL CONCRETE WORK.
2. CONCRETE SHALL HAVE THE FOLLOWING MINIMUM COMPRESSIVE STRENGTH AT 28 DAYS.
   (a) FOUNDATION WALLS, PIERS AND FOOTINGS: 3000 PSI (MINIMUM)
   (b) SLABS ON GRADE: 4000 PSI (MINIMUM)
3. AIR ENTRAINMENT ALLOWED ONLY @ EXTERIOR CONCRETE.
4. CONCRETE SLABS SHALL BE CAST SO THAT THE SLAB THICKNESS IS AT NO POINT LESS THAN THAT INDICATED ON THE DRAWINGS.
5. CONCRETE MIX DESIGN FOR EACH STRENGTH OF CONCRETE SPECIFIED SHALL BE SUBMITTED FOR ENGINEER'S REVIEW.
6. REFER TO ACI 305 FOR HOT WEATHER CONCRETE REQUIREMENTS AND ACI 306 FOR COLD WEATHER CONCRETE REQUIREMENTS.

RE-STEEL
1. ALL REINFORCEMENT SHALL BE GRADE 60 AND CONFORM TO ASTM 615.
2. WELDED WIRE FABRIC REINFORCEMENT SHALL CONFORM TO ASTM 185.
3. CLEARANCE OF MAIN REINFORCEMENT FROM ADJACENT SURFACES SHALL CONFORM TO THE FOLLOWING (UNLESS OTHERWISE SHOWN IN DETAIL):
   (a) UNFORMED STRUCTURES IN CONTACT WITH GROUND (FOOTING OR WALL BOTTOM: 3 INCHES
   (b) SLABS ON GRADE: 2 1/2 INCHES
   (c) FORMED SURFACES IN CONTACT WITH GROUND OR EXPOSED TO WEATHER: 2 INCHES
   (d) IN ALL CASES, CLEARANCE NOT LESS THAN DIAMETER OF BARS.
4. ALL WORKMANSHIP AND MATERIAL SHALL CONFORM TO THE "MANUAL OF STANDARD PRACTICE FOR DETAILING REINFORCED
   CONCRETE STRUCTURES" (ACI-315), AND BUILDING CODE REQUIREMENTS FOR REINFORCED CONCRETE (ACI-318).
5. ALL REINFORCING SHALL BE INSPECTED AND APPROVED BY THE ENGINEER OR OWNERS TESTING AGENCY BEFORE CONCRETE IS PLACED.
6. WELDED WIRE FABRIC SHALL BE LAPPED ONE FULL MESH PANEL OR 6" MINIMUM.
7. ALL REINFORCING SPLICES SHALL CONFORM TO THE TABLE(S) PROVIDED IN THE GENERAL NOTES FOR EACH STRENGTH OF CONCRETE
   BUT IN NO CASE LESS THAN THE REQUIREMENTS OF THE LATEST EDITION OF ACI-319.
8. BAR SUPPORTS SHALL BE GALVANIZED.

PRE-ENGINEERED METAL BUILDINGS
1. BUILDING TO BE DESIGNED AND FABRICATED BY KIRBY BUILDING SYSTEMS TO MEET SPECIFIED DESIGN LOADS.
   KIRBY BUILDING SPECIFICATIONS ARE ATTACHED. KIRBY BUILDING SYSTEMS TO PROVIDE BUILDING DRAWINGS
   STAMPED BY A NEW YORK STATE LICENSED PROFESSIONAL ENGINEER.
2. WALL PANELS TO BE 26 GAUGE KIRBY RIB EXPOSED FASTENER PAINTED PANELS (35 YEAR PAINT WARRANTY): TAUPE SAND
3. ROOF PANELS TO BE 26 GAUGE KIRBY RIB GALVALUME EXPOSED FASTENER PANELS (20 YEAR NO PERFORATION
   WARRANTY).
4. ALL TRIM AND GUTTERS TO BE 26 GAUGE PAINTED TO MATCH WALL PANELS (35 YEAR PAINT WARRANTY).
5. LOUVERS AND MAN DOOR TO BE WHITE.
6. METAL BUILDING INSULATION TO BE 6" THICK (R-19) WITH REINFORCED WHITE VINYL FACING MEETING FLAME SPREAD < 25 AND SMOKED DEVELOPED < 50 AND ASTM E84 FOR SURFACE BURNING.

DESIGN LOADS

MECHANICAL ITEMS SUSPENDED FROM STRUCTURAL FRAMING = 5 PSF (COLLATERAL LOAD)

ROOF SNOW LOAD	
GROUND SNOW LOAD, Pg (Elevation<1,000 FT)	40 PSF
SNOW EXPOSURE FACTOR, Ce	1.0
SNOW LOAD IMPORTANCE FACTOR	1.0
THERMAL FACTOR, Ct =	1.0
WIND LOAD	
BASIC WIND SPEED	90 MPH
WIND IMPORTANCE FACTOR	1.0
BUILDING CATEGORY	I
WIND EXPOSURE	B
APPLICABLE INTERNAL PRESSURE COEFFICIENT	± .18
SEISMIC LOAD	
SEISMIC USE GROUP	I
SEISMIC DESIGN CATEGORY	C
SPECTRAL RESPONSE COEFFICIENTS	S_{DS} = .297
	S_{D1} = .161
SITE CLASS =	E

LIST OF DRAWINGS

BUILDING CODE OF NEW YORK STATE CODE ANAYLSIS:
1. CHAPTER 3 - USE GROUP
   UTILITY AND MISC. GROUP U

2. CHAPTER 5 - BUILDING HEIGHTS AND AREAS
   NEW BUILDING IS TYPE 2 B CONSTRUCTION
   TABLE 503 ALLOWABLE HEIGHTS AND BUILDING AREA
   U ALLOWABLE 2 STORY, 8,500 SF > NEW 1 STORY, 700 SF

3. CHAPTER 6 - TYPE OF CONSTRUCTION
   TYPE 2B NON-COMBUSTIBLE
   TABLE 602 FIRE-RESISTANCE REQUIREMENTS FOR EXTERIOR WALLS
   FIRE SEPARATION DISTANCE (FT) > 10 < 30 GROUP A, B, E, F-2, I, R, S-2,
   U TYPE 2B 0 HOURS

4. CHAPTER 7 - FIRE RESISTANCE RATED CONSTRUCTION
   704.2.1 EXTERIOR WALLS ARE CONSTRUCTED WITH NON-COMBUSTIBLE MATERIALS

5. CHAPTER 9 - FIRE PROTECTION SYSTEMS
   SECTION 903.2.10 - SPRINKLER SYSTEM NOT REQUIRED
   SECTION 906 PORTABLE FIRE EXTINGUISHER - TO BE PROVIDED
   SECTION 907 FIRE ALARM AND DETECTION SYSTEMS - NOT REQUIRED

6. CHAPTER 10 - MEANS OF EGRESS
   TABLE 1004.1.2 MAXIMUM FLOOR AREA ALLOWANCES PER OCCUPANTS
   FLOOR AREA SF = PERSONS
   SF PER OCCUPANT 300
   = 700 SF / 300 = 3 OCCUPANTS

   1003.3 MEANS OF EGRESS COMPONENTS MINIMUM DOOR WIDTH
   32"<36" PROVIDED

   1013 EXITS - MINIMUM NUMBER OF EXITS PROVIDED (1) REFERENCE TABLE
   1014.1 OCCUPANT LOAD IS 3<50

   300 GROSS FLOOR AREA SF PER OCCUPANT
   COMMON PATH OF TRAVEL - 100 FT
   EXIT TRAVEL DISTANCE - 300 FT (W/ OUT SPRINKLER). MAXIMUM DISTANCE IS 35 FT.
   ILLUMINATED EXITS NOT REQUIRED - SECTION 1011

7. CHAPTER 11 - ACCESSIBILITY
   NOT APPLICABLE

8. CHAPTER 29 - PLUMBING SYSTEMS
   NOT APPLICABLE

9. ELECTRIC WORK TO BE INSPECTED AND PROVIDE FINAL INSPECTION CERTIFICATE CERTIFYING ALL WORK MEETS NEW YORK STATE CODE.

EMERSON POWER TRANSMISSION:
620 S. AURORA ST.
ITHACA, NY 14850

KV ENGINEERING, P.L.L.C.
COMMERCIAL & RESIDENTIAL DESIGN
23 PINE RIDGE DRIVE
HORSEHEADS, N.Y. 14845
PH: 607.739.8600
FX: 607.796.0374

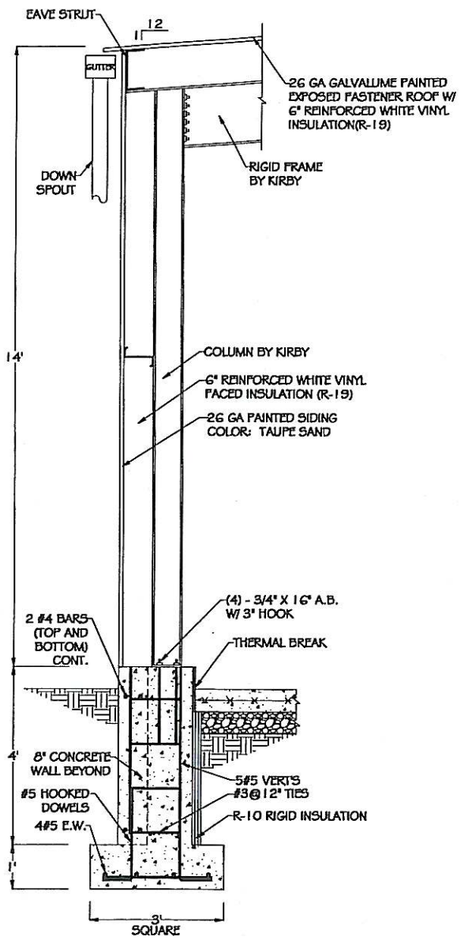
STRUCTURAL ENGINEERING & DESIGN

DATE:	9/10/08
DRAWN BY:	JPV
CHECKED BY:	KMV
SCALE:	AS NOTED
PROJECT #	00175

COVER PAGE

SEAL:

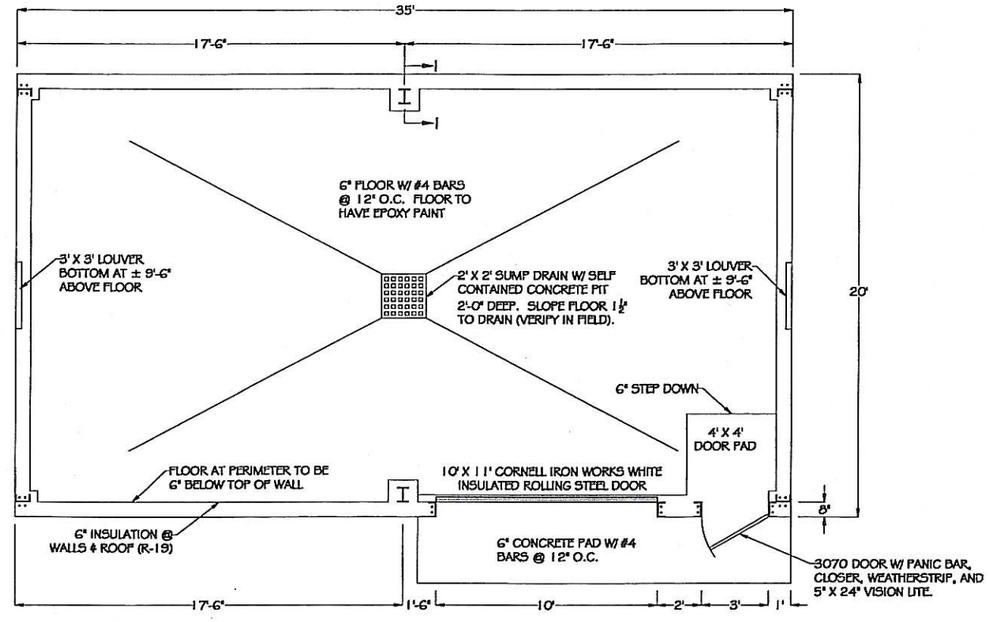
SHEET:
C



TYPICAL WALL SECTION

SCALE 1/2"=1'-0"

I-1 / A-1



FLOOR PLAN

SCALE: 1/4" = 1'-0"

NOTE:
LOCATION OF 2' X 2' ROOF CURB AND EXHAUST FAN TO BE FIELD VERIFIED.

EMERSON POWER TRANSMISSION:

620 S. AURORA ST.
ITHACA, NY 14850

KV ENGINEERING, P.L.L.C.
COMMERCIAL & RESIDENTIAL DESIGN
23 PINE RIDGE DRIVE
HORSEHEADS, N.Y. 14845
PH: 607.739.8800
FX: 607.796.0374

STRUCTURAL ENGINEERING & DESIGN

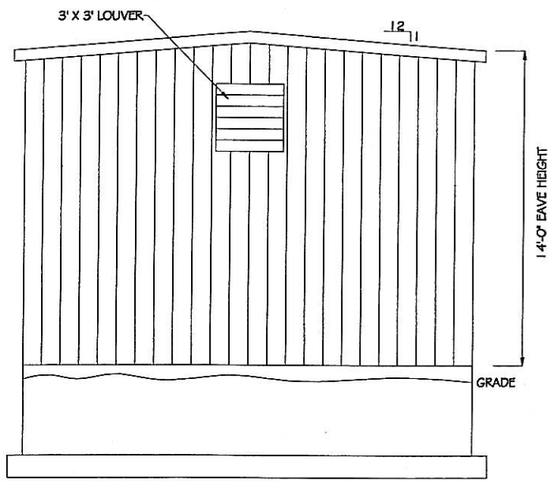
DATE:	9/10/08
DRAWN BY:	JPV
CHECKED BY:	KMV
SCALE:	AS NOTED
PROJECT #	00175

FLOOR PLAN

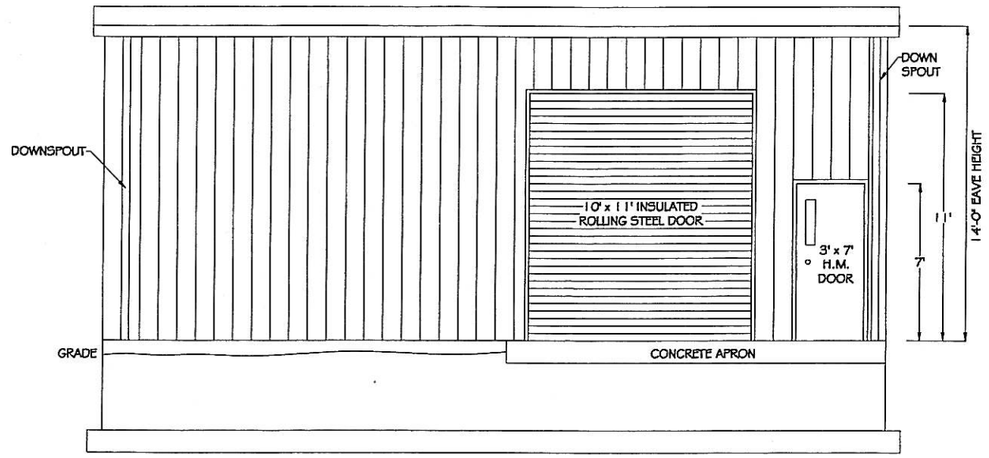
SEAL:

SHEET:

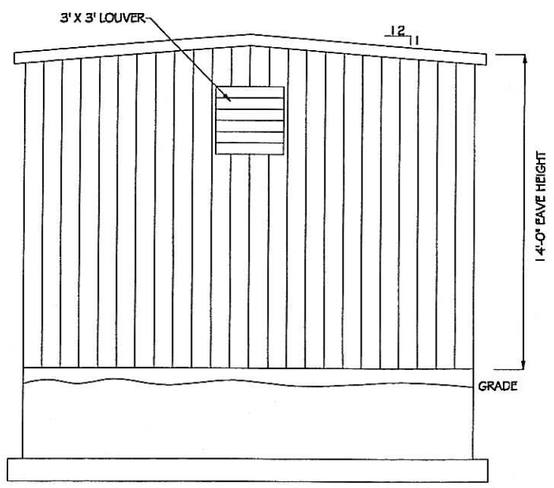
A-1



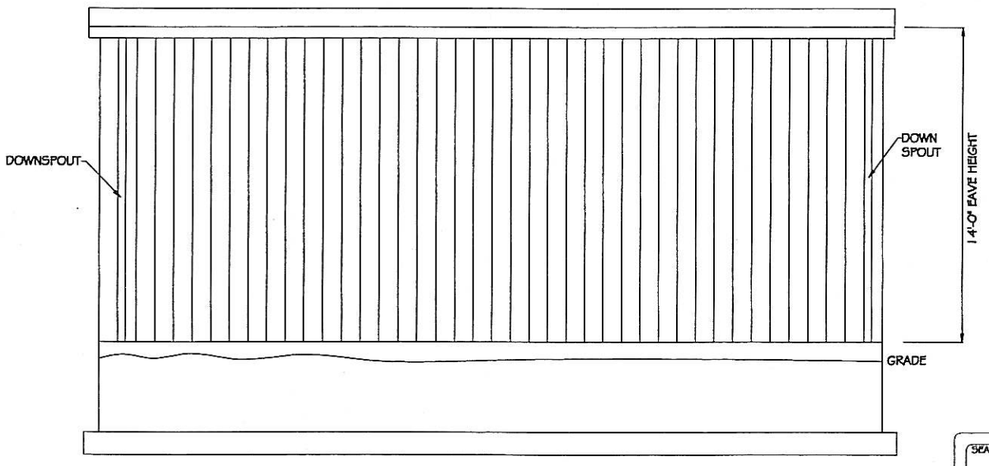
WEST ELEVATION



FRONT ELEVATION



EAST ELEVATION



REAR ELEVATION

EMERSON POWER TRANSMISSION:

620 S. AURORA ST.
ITHACA, NY 14850

KV ENGINEERING, P.L.L.C.
COMMERCIAL & RESIDENTIAL DESIGN
23 PINE RIDGE DRIVE
HORSEHEADS, N.Y. 14845
PH: 607.739.8800
FX: 607.796.0374

STRUCTURAL ENGINEERING & DESIGN

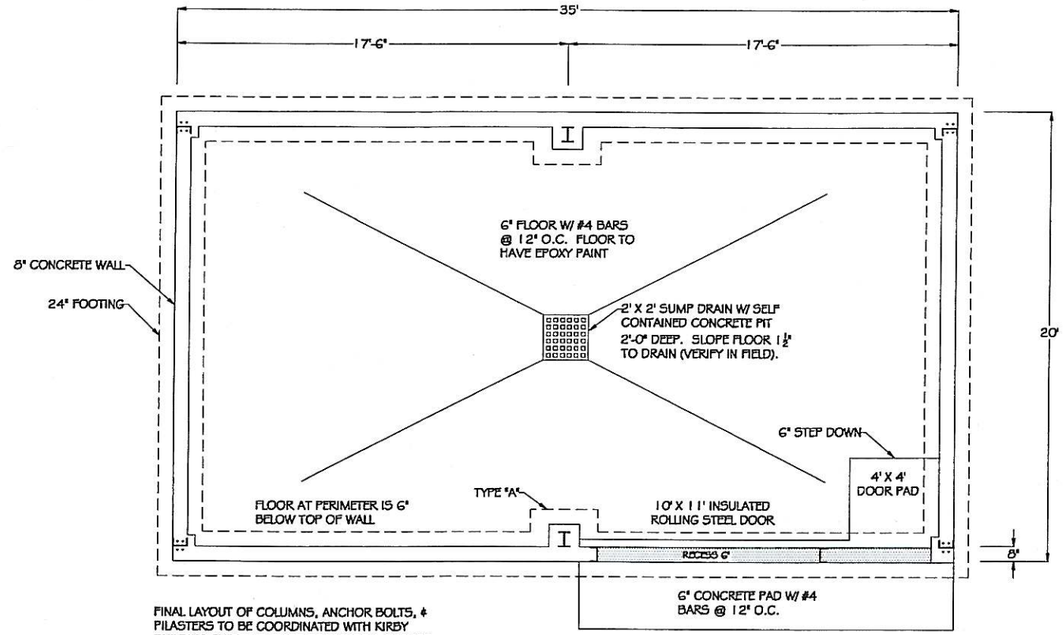
DATE:	9/10/08
DRAWN BY:	JPV
CHECKED BY:	KMV
SCALE:	1/4"=1'-0"
PROJECT #	00175

ELEVATIONS

SEAL:

SHEET:

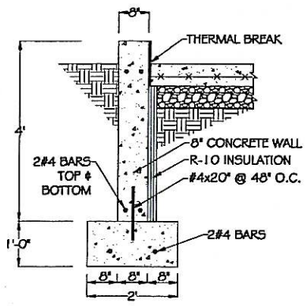
A-2



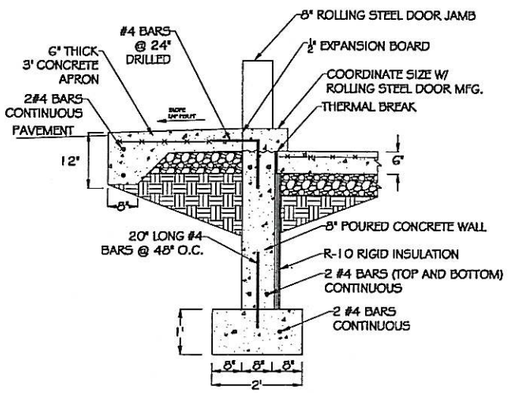
FINAL LAYOUT OF COLUMNS, ANCHOR BOLTS, & PILASTERS TO BE COORDINATED WITH KIRBY BUILDING SYSTEMS SHOP DRAWINGS & ANCHOR BOLT PLANS.

PATCH ASPHALT PAVEMENT WHERE DISTURBED.

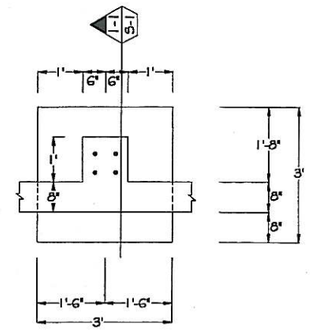
FOUNDATION PLAN
SCALE: 1/4" = 1'-0"



WALL SECTION
SCALE 1/2"=1'-0"

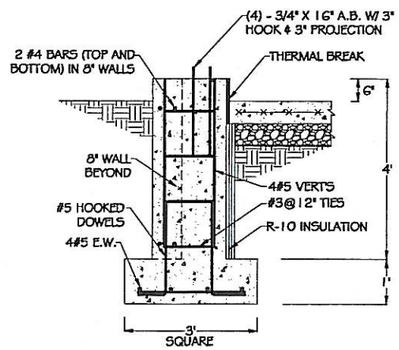


OVERHEAD DOOR SECTION
SCALE: ½"=1'-0"



TYPE "A" FOOTING
SCALE 1/2"=1'-0"

VERIFY SIZE OF PILASTER WITH KIRBY ANCHOR BOLT PLANS



SECTION 1-1 / S-1
SCALE 1/2"=1'-0"

EMERSON POWER TRANSMISSION:
620 S. AURORA ST.
ITHACA, NY 14850

KV ENGINEERING, P.L.L.C.
COMMERCIAL & RESIDENTIAL DESIGN
23 PINE RIDGE DRIVE
HORSEHEADS, N.Y. 14845
PH: 607.739.8800
FX: 607.796.0374

STRUCTURAL ENGINEERING & DESIGN

DATE:	9/10/08
DRAWN BY:	JPV
CHECKED BY:	KMV
SCALE:	AS NOTED
PROJECT #	00175

FOUNDATION PLAN

SEAL:

SHEET:

S-1

APPENDIX

F SAMPLING SOPS

FIELD STANDARD OPERATING PROCEDURE #1

NOTE TAKING AND FIELD BOOK ENTRIES PROCEDURE

The field book is a record of the day's activities that serves as a reference for future reporting and analyses. The field book is also a legal record for projects that may be used during legal proceedings. It is of the utmost importance that all notes are complete and comprehensive. The user is advised to read the entire standard operating procedure (SOP) and review the project site health and safety plan (HASP) and/or project safety plan (PSP) before beginning any onsite activities.

1.1 ACRONYMS AND ABBREVIATIONS

HASP	Health and safety plan
IDW	Investigation-derived waste
PSP	Project safety plan
SOP	Standard operating procedure

1.2 MATERIALS

- Permanently-bound waterproof field book (e.g., Rite-in-the-Rain® #550, or equivalent)
- Black or blue ballpoint pen (waterproof ink recommended; do not use felt-tip pens)

1.3 PRECONDITIONS AND BACKGROUND

This SOP has been prepared as part of the company's Environmental Quality Management Plan and is designed to provide detailed procedures for common field practices. Compliance with the methods presented in this document is mandatory for all field personnel and will ensure that the tasks are performed in a safe and consistent manner, are in accordance with federal and state guidance, and are technically defensible.

This SOP is written for the sole use of company employees and will be revised periodically to reflect updates to company policies, work practices, and the applicable state and/or federal guidance. Employees must verify that this document is the most recent version of the company's SOPs. Employees are also strongly advised to review relevant state and/or federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

WSP requires that all personnel performing specific project assignments be appropriately qualified, including having required certifications or licenses, and properly trained in accordance with the requirements of their assignment, the Environmental Service Line's field standard operating procedures, and the Quality Management System.

The purpose of the field book is to provide a written log of all of field events and conditions. The notes must include sufficient detail (i.e., who, what, when, where, why, and how) to enable others to reconstruct the day's activities for analysis, reporting, or litigation. It is important to be objective, factual, and thorough. Language must be free of personal comments or terminology that might prove inappropriate. Additional data logs or worksheets, such as low flow groundwater sampling sheets, may be used as a supplement; however, under no circumstances should the data sheets be used as a substitute for the daily record of events to be recorded in the field book.

The field book forms the foundation upon which most of the project work (reports, subsequent work plans, etc.) is based. It is critical that the field book's chain of custody be maintained at all times.

1.4 SET-UP PROCEDURES

The first step in setting up a new field book is to add the information necessary for you to identify the field book in the future and for others to return the book to the company, should it be lost. On the first page of the field book (or, for some field books, the inside cover), place a "Return for Reward" notice. Include the following information:

- An "If Found – Return for Reward" notice in bold letters
- Our company name
- Our company address (usually the office where the project is being managed)
- Our company phone number

Reserve the second page of the field book for project-specific information, such as:

- The project name and number
- The project manager's name
- The site telephone number, address, and onsite contact (if appropriate)
- The names and telephone numbers for all key (onsite) personnel
- The emergency telephone numbers including the police, fire, and ambulance (found in the HASP)

Business cards from individuals who visit the site, (including the person in charge of the field book) can be affixed to the inside back cover.

1.5 FIELD BOOK ENTRIES

Start each day on a new page. Include the following information in the header of the first page (and all subsequent pages):

- The date
- The project name
- The page number (if not pre-printed in the field book)

Precede field book entries by the time entered along the left margin of the page using a 24-hour or military clock (e.g., 1330 for 1:30 PM). The first entry of the day must include your and your subcontractor's arrival time at the site, a description of the planned activities, key onsite personnel (including subcontractors), and the weather forecast. The first entry must also detail the tailgate review of the site-specific HASP or PSP with the onsite personnel. Be sure that field book entries are LEGIBLE and contain factual, accurate, and inclusive documentation of project field activities. Blank lines between field book entries should not be included unless necessary to accommodate a large entry (e.g., table or sketch); if blank lines are necessary, draw a line diagonally through any blank lines and initial at the end of the diagonal line. If a mistake is made in an entry, cross out the mistake with a single line and place your initials at the end of the line. Any acronyms written in the field book (including your initials) must be spelled out prior to the first use.

Subsequent log entries must document the day's activities in sequence and must be completed throughout the day as events occur (i.e., do not wait until the end of the work day to complete the notes); should notes need to be entered out of sequence, please identify the non-sequential entries using a footnote or by clearly indicating "Late Entry." Notes must be descriptive and provide location information or diagrams (if appropriate) of the work area or sample locations. Note any changes in the weather and document all deviations from the work plan. Arrival and departure times of all personnel, operational periods of standby, decontamination, and specific activities must be recorded.

Include the following information in entries describing field activities:

- The equipment, materials and methods used by subcontractors, if appropriate (e.g., drill rig type, boring diameters, well casing materials, etc.)
- The equipment, materials and methods used to obtain samples (e.g., split-spoon sampler, polyethylene bailer, pump types, geochemical, water or air monitoring equipment, low-flow purging procedures, etc.)
- The sample identification, which should include the location and depth, as appropriate
- The sample location, including a description of the approximate location as measured from a known point (e.g., 50 feet north of the building entrance; for points not yet surveyed)

- Any air or water monitoring equipment used, associated calibration activities, and measurements
- The sample collection time
- The sample identification of associated quality assurance/quality control samples (e.g., blind duplicate)
- The sample media and analyses to be performed; sizes, numbers, and types of containers; preservation (if any), and any resulting reactions (e.g., effervescence)
- If supplemental data recording logs (digital or hard copy) are used, such as groundwater sampling logs, chains-of-custody, and shipping records, the above information must be entered in the field book and the supplemental records cross-referenced
- The decontamination and disposal procedures for all equipment, samples, and personal protective equipment
- An inventory of the investigation-derived waste (IDW) materials generated during the site activities
- A description of the IDW labeling procedures and the onsite staging information; other sampling-specific information to be included in the IDW log is provided in SOP 5

Maintain a sequential log if the sample locations and areas of interest are photographed (strongly recommended). The photographic log must include:

- The date and time of the photograph
- The sequential number of the photograph (e.g., photograph-1, photograph-2, etc.)
- The general direction faced when the photograph was made
- A description of the subject in the image

1.6 CLOSING NOTES

The last entry of the day must include a brief wrap up of the work accomplished, a description of how the site is being secured, and a description of any near hits, accidents, and incidents that occurred during the day's work. Draw a line through the remainder of the page from the row of text diagonally through any blank lines and initial at the end of the diagonal line.

FIELD STANDARD OPERATING PROCEDURE #3

SAMPLE PACKAGING AND SHIPMENT PROCEDURE

Shipping samples is a basic but important component of field work. The majority of field activities include the collection of environmental samples. Proper packing and preservation of those samples is critical to ensuring the integrity of our work product. The user is advised to read the entire standard operating procedure (SOP) and review the site health and safety plan (HASP) and/or project safety plan (PSP) before beginning any onsite activities. In accordance with the HASP or PSP, proper personal protective equipment (PPE) must be selected and used appropriately.

3.1 ACRONYMS AND ABBREVIATIONS

CFR	Code of Federal Regulations
DOT	U.S. Department of Transportation
IATA	International Air Transport Association
HASP	Health and safety plan
PPE	Personal protective equipment
PSP	Project safety plan
SOP	Standard operating procedure

3.2 MATERIALS

- Suitable shipping container (e.g., plastic cooler)
- Chain-of-custody forms
- Custody seals
- Sample container custody seals (as necessary)
- Mailing address labels (as necessary)
- Shipping form (with account number, as necessary)
- Tape (e.g., strapping, clear packing)
- Permanent marker
- PPE
- Bubble wrap or other packing material

Temperature-preserved samples:

- Large plastic garbage bag
- Wet ice
- Heavy-duty zipper-style plastic bags
- Universal sorbent materials

Note: Some materials will be supplied by the laboratory, while others are must be supplied by the sampler. Confirm supplier of materials prior to mobilizing to the field.

3.3 PRECONDITIONS AND BACKGROUND

This SOP has been prepared as part of the company's Environmental Quality Management Plan and is designed to provide detailed procedures for common field practices. Compliance with the methods presented in this document is mandatory for all field personnel

and will ensure that the tasks are performed in a safe and consistent manner, are in accordance with federal and state guidance, and are technically defensible.

This SOP is written for the sole use of company employees and will be revised periodically to reflect updates to company policies, work practices, and the applicable state and/or federal guidance. Employees must verify that this document is the most recent version of the company SOPs. Employees are also strongly advised to review relevant state and/or federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

WSP requires that all personnel performing specific project assignments be appropriately qualified, including having required certifications or licenses, and properly trained in accordance with the requirements of their assignment, the Environmental Service Line's field standard operating procedures, and the Quality Management System.

This SOP is designed to provide the user with a general outline for shipping samples and assumes the user is familiar with basic field procedures, such as recording field notes (SOP 1), sample collection and quality assurance procedures (SOP 4), and investigation derived waste management procedures (SOP 5).

Most environmental samples are classified non-hazardous materials due to unknown characteristics and hazardous classes, however environmental samples can meet the definition of U.S. Department of Transportation (DOT) hazardous materials when shipped by air, ground, or rail from a project site to the laboratory (e.g., free product, samples preserved with a hazardous material [TerraCore® samplers]). As such, field staff must work with their assigned company compliance professional to determine whether the sample shipment is subject to any specific requirements (e.g., packaging, marking, labeling, and documentation) under the DOT hazardous materials regulations.

3.4 SAMPLE SHIPMENT PROCEDURES

The two major concerns in shipping samples are incidental breakage during shipment and complying with applicable DOT and courier requirements for hazardous materials shipments.

> **NOTE: Many couriers, including Federal Express and United Parcel Service, have requirements that the company register with them before shipping hazard materials. In most cases, it is the sampling location, not the company office address, which needs to be registered. Therefore, each project will likely have unique requirements. Please contact your company compliance professional to determine whether or not you will be required to register for your shipment.**

Protecting the samples from incidental breakage can be achieved using "common sense." Pack all samples in a manner that will prevent them from moving freely about in the cooler or shipping container. Do not allow glass surfaces to contact each other. When possible, repack the sample containers in the same materials that they were originally received in from the laboratory. Cushion each sample container with plastic bubble wrap, styrofoam, or other nonreactive cushioning material. A more detailed procedure for packing environmental samples is presented below.

3.4.1 NON-HAZARDOUS MATERIAL ENVIRONMENTAL SAMPLES

The first step in preparing your samples for shipment is securing an appropriate shipping container. In most cases, the analytical laboratory will supply the appropriate container for bottle shipment, which can be used to return samples once they have been collected. Be sure that the container is large enough to contain the samples plus a sufficient amount of packing materials, and if applicable, enough wet ice to maintain the samples at the preservation temperature (usually 4 degrees Celsius). Use additional shipping containers as needed so that sample containers are protected from breakage due to overcrowding. Do not use lunch-box sized coolers or soft sided coolers, which do not offer sufficient insulation or protection from damage.

3.4.1.1 TEMPERATURE-PRESERVED SAMPLE CONTAINER PREPARATION

Temperature-preserved samples should be shipped to the laboratory in an insulated container (e.g., cooler). If using a plastic cooler with a drain, securely tape the inside of the drain plug with duct tape or other material to ensure that no water leaks from the cooler during shipment. Place universal sorbent materials (e.g., sorbent pads) in the bottom of the insulated container. The amount of sorbent material must be sufficient to absorb any condensation from the wet ice and a reasonable volume of water from melted wet ice (if a bag were to rupture) or a damaged (aqueous) sample container.

The next step is to line the insulated container with a large, heavy-duty plastic garbage bag. If shipping breakable sample containers (e.g., glass), place bubble wrap or other packing materials on the bottom of the container. Place the samples, including a temperature blank, on the packing materials with sufficient space to allow for the addition of more bubble wrap or other packing material between the sample containers. Place large or heavy sample containers on the bottom of the cooler with lighter samples placed on top to minimize the potential for breakage. Place all sample containers in the shipping container right-side up. Do not overfill the cooler with samples; room must be left for a sufficient volume of wet ice. Wet ice must be double-bagged in heavy-duty zipper-style plastic bags (1 gallon-sized, or less); properly seal both bags before placing in the insulated container. Place the bags of ice on top of or between the samples. Place as much ice as possible into the cooler to ensure the samples arrive at the lab at the required preservation temperature, even if the shipment is delayed. Fill any remaining space in the container with bubble wrap or other packing material to limit the airspace and minimize the shifting of the sample containers and in-transit melting of ice. Securely close the top of the heavy-duty plastic bag and knot or seal with tape.

3.4.1.2 NON-TEMPERATURE-PRESERVED SAMPLE CONTAINER PREPARATION

Non-temperature-preserved samples should be shipped to the laboratory in a durable package (e.g., hard plastic container or cardboard box). If shipping breakable sample containers (e.g., glass), place bubble wrap or other packing materials on the bottom of the container. Place the samples on the packing materials with sufficient space to allow for the addition of more bubble wrap or other packing material between and on top of the sample containers. Place large or heavy sample containers on the bottom of the container with lighter samples placed on top to minimize the potential for breakage. Place all sample containers within the shipping container right-side up. Fill any remaining space in the container with bubble wrap or other packing material to limit the airspace and minimize the shifting of the sample containers and in-transit melting of ice.

3.4.1.3 CONTAINER SHIPMENT

Samples in the container should be cross-checked against the chain-of-custory before signing off on the form and sealing the cooler. Place the original chain-of-custody form (i.e., laboratory copy) into a heavy-duty zipper-style plastic bag, affix/tape the bag to the shipping container's inside lid, and then close the shipping container; as required, include return shipping labels for the laboratory to return company-owned coolers. Only one chain-of-custody form is required to accompany one of the shipping containers per sample shipment; the other coolers in the shipment do not need to include chain-of-custody forms, unless required by the project. At this point, sample shipment preparations are complete if using a laboratory courier.

Once the shipping container is sealed, shake test the shipping container to make sure that there are no loose sample containers. If loose sample containers are detected, open the shipping container, repack the contents, and reseal the shipping container. If sending the sample shipment through a commercial shipping vendor, place two signed and dated chain-of-custody seals on alternate sides of the shipping container lid so that it cannot be opened without breaking the seals. Securely fasten the top of the shipping container shut with clear packing tape; carefully tape over the custody seals to prevent damage during shipping.

Affix a mailing label with the ship to and return to addresses to the top of the shipping container using clear shipping tape. Use the pre-printed return mailing label from the laboratory, if provided, or complete a new mailing label from the shipping carrier. Ship environmental samples to the contracted analytical laboratory using an appropriate delivery schedule. **Note: Samples can be shipped for Saturday delivery once the lab has been verified to be open and receiving samples on the weekend.**

Verify whether the shipment cost should be billed to the sender or recipient, and ensure the internal billing reference section on the mailing label includes either the laboratory's billing reference number, if the shipment is billed to the laboratory, or the project billable number, if the shipment is billed to WSP.

Declare the value of samples on the shipping form for insurance purposes, if applicable. When shipping samples to a lab, identify a declared value equal to the carrier's default value ($100); additional fees will be charged based on a higher value declared. Our preferred carrier, Federal Express, will only reimburse for the actual value of the cooler and its contents if a sample shipment is lost; they will not reimburse for the cost of having to re-collect the samples. [Please note: if you are shipping something other than samples, such as field equipment, declare the replacement value of the contents.]

Record the tracking numbers from the shipping company forms (i.e., the airbill number) in the field book and retain a copy of the shipping airbill. On the expected delivery date, confirm sample receipt by contacting the laboratory or tracking the package using the tracking number; provide this confirmation information to the project manager.

> **NOTE: Most shipping carriers adhere to transit schedules with final pickup times each day; these schedules are subject to change and vary by service location. If shipping containers are dropped off at a service location after the final pickup time, transit to the laboratory will not be initiated until the following day, and samples may not be properly preserved. Therefore, confirm transit schedules in advance of each sampling event, and ensure samples are delivered to the carrier before the final pickup time of the day.**

3.4.2 HAZARDOUS MATERIALS SAMPLES

Employees rarely ship hazardous materials due to DOT shipping requirements. If you find that your samples could be considered a DOT hazardous material, first coordinate with the assigned company compliance professional and project manager to make a hazardous material classification and, if necessary, establish the necessary protocols and to receive the appropriate training/certification.

> **NOTE: Employees shipping samples regulated as hazardous materials or exempt hazardous materials by air must have International Air Transport Association (IATA) training. IATA training is a separate training required in addition to DOT hazardous materials training for such shipments. Most of our employees do not have IATA training and therefore, anyone who needs to ship by air MUST consult with a company IATA-trained compliance professional.**

FIELD STANDARD OPERATING PROCEDURE #4

SAMPLE COLLECTION AND QUALITY ASSURANCE PROCEDURE

The purpose of this procedure is to assure that sample volumes and preservatives are sufficient for analytical services required under U.S. Environmental Protection Agency (EPA) or other agency approved protocols. This operating procedure describes sample identification procedures, sampling order for select analytes, quality control and quality assurance (QA/QC) sampling procedures, and custody documentation. The user is advised to read the entire standard operating procedure (SOP) and review the site health and safety plan (HASP) and/or project safety plan (PSP) before beginning any onsite activities. In accordance with the HASP, proper personal protective equipment (PPE) must be selected and used appropriately.

4.1 ACRONYMS AND ABBREVIATIONS

ºC	degrees Celsius
COC	chain-of–custody [form]
DI	laboratory-grade, analyte-free deionized water
DOT	US Department of Transportation
EDD	electronic data deliverable
EPA	US Environmental Protection Agency
HASP	health and safety plan
ID	identification [number]
MS/MSD	matrix spike and matrix spike duplicate
MSA	master services agreement
PPE	personal protective equipment
PSP	project safety plan
QA	quality assurance
QA/QC	quality assurance/quality control
QAPP	quality assurance project plan
SOP	standard operating procedure
VOCs	volatile organic compounds

4.2 MATERIALS

- Field book
- Indelible (waterproof) markers or pens
- PPE
- Sampling containers and labeling/shipping supplies

- Deionized (DI) water
- Cleaned or dedicated sampling equipment

4.3 PRECONDITIONS AND BACKGROUND

This SOP has been prepared as part of the company's Environmental Quality Management Plan and is designed to provide detailed procedures for common field practices. Compliance with the methods presented in this document is mandatory for all field personnel and will ensure that the tasks are performed in a safe and consistent manner, are in accordance with federal and state guidance, and are technically defensible.

This SOP is written for the sole use of employees and will be revised periodically to reflect updates to company policies, work practices, and the applicable state and/or federal guidance. Employees must verify that this document is the most recent version of the company's SOPs. Employees are also strongly advised to review relevant state and federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

WSP requires that all personnel performing specific project assignments be appropriately qualified, including having required certifications or licenses, and properly trained in accordance with the requirements of their assignment, the Environmental Service Line's field SOPs, and the Quality Management System.

This SOP is designed to provide the user with a general outline for collecting environmental and quality assurance samples and assumes the user is familiar with basic field procedures, such as recording field notes (SOP 1), sample shipment procedures (SOP 3), investigation derived waste management procedures (SOP 5), and equipment decontamination (SOP 6). This SOP does not cover investigation planning, nor does it cover the analysis of the analytical results. These topics are more appropriately addressed in a site-specific work plan or a dedicated quality assurance project plan (QAPP). This SOP does not include an special handling requirements for specific parameters such as low-level mercury or per- and polyfluoroalkyl substances. These requirements should be included in the QAPP.

4.4 SAMPLE IDENTIFICATION PROCEDURES

All sample containers (e.g., glass bottles, plastic jars, foil bags, plungers, etc.) should be identified by an affixed sample label. Unless otherwise approved by your project manager or specified in your site-specific work plan/QAPP, information on the sample container labels must include the site/project name, project/task number, unique alpha-numeric sample identification (ID) number, sample collection date, time of collection using the military or 24-hour clock system (i.e., 0000 to 2400 hours), analytical parameters, preservative, and the initials of the sampling personnel. Employees are advised to use pre-printed waterproof mailing labels (e.g., Avery® 5xxx-series Waterproof Address Labels) for all sample identification. Electronic label templates are available.

The sample identification (ID) number must, unless otherwise approved by your project manager or specified in your site-specific work plan/QAPP, follow the company's naming protocol. This protocol was developed to aid in determining the type of sample collected (e.g., soil, groundwater, vapor, etc.), the sample location, and, where appropriate, the sample depth. This protocol was also designed to ensure consistency across the company.

Construct sample IDs in the following format:

SB-10A (4-6)

Where, in this example:

- SB = the first two or three characters will define the sample type (see list of approved prefixes below); in this case, a soil boring
- 10A = the next two or three alpha-numeric digits (separated by a dash from the sample type identifier) indicate the location of the boring on the site; in this case, boring number 10A
- (4-6) = the depth the sample was collected, with the first number (including decimals, if necessary) indicating the top of the sample interval (in feet) and the second number indicating the bottom of the sample interval (in feet); not all sample types will include depth information.

Additional label information may be added after the last character of the sample ID number (e.g., sample date, underground storage tank number, area of concern number, "Area" number, client identifier, etc.). Separate any additional information from the required portion of the sample name by dash(es).

Sample Prefix	Permitted Use
AA	Ambient outdoor air sample
CC	Concrete core/chip sample
CS	Confirmation/verification soil sample collected from an excavation
HA	Soil sample collected with a hand auger
IAB	Indoor air sample – basement
IAC	Indoor air sample – crawl space
IAF	Indoor air sample – first floor
MW	Soil sample collected from a monitoring well borehole or a groundwater sample collected from a monitoring well
PZ	Groundwater sample collected from a piezometer
SB	Soil sample collected from boreholes that will not be converted to monitoring wells
SED	Sediment sample
SG	Soil gas sample other than a sub-slab sample (e.g., sample collected from a temporary or permanent polyvinyl chloride sample point or stainless steel screen implant)
SL	Sludge sample
SS	Surface soil sample collected using hand tools (e.g., trowel, spoon, etc.) and typically at depths less than 2 feet below ground surface
SSV	Sub-slab vapor sample
SW	Surface water sample
TC	Tree core sample
TP	Soil sample collected from a test pit
WC	Waste characterization sample
WP	Wipe sample
WW	Wastewater

4.5 SAMPLE CONTAINERS, PRESERVATIVES, AND HOLDING TIMES

The first step in sample collection is to verify that the correct number and type of sample containers were provided, and that each contains the appropriate preservatives for the proposed project (i.e., check against the sampling plan requirements outlined in the site-specific QAPP or, for those projects without a site-specific QAPP, the laboratory Task Order). Inspect all containers and lids for flaws (cracks, chips, etc.) before use. Do not use any container with visible defects or discoloration. Report non-receipt and any discrepancies of specific types of sample containers to the team leader or project manager immediately. Make arrangements to have missing or additional sampling containers provided on an expedited basis.

Precautions must be taken to prevent cross-contamination and contamination of the environment when collecting samples. Wear a clean pair of new, disposable gloves each time a different sample is collected and don the gloves immediately prior to collection. This limits the possibility of cross-contamination from accidental contact with gloves soiled during collection of the previous sample. The gloves must not contact the medium being sampled and must be changed any time during sample collection when their cleanliness is compromised. ***In no case should gloved hands be used as a sampling device: always use the appropriate sampler to move the sample from the sampling device to the laboratory-supplied containers.***

Sample collection must follow all appropriate SOPs, state and federal regulations, or guidance, for the collection of environmental samples; the recommended order of sample collection is:

- Geochemical measurements (e.g., temperature, pH, specific conductance)
- Volatile organic compounds (VOCs)
- Extractable organics, petroleum hydrocarbons, aggregate organics, and oil and grease
- Per- and Polyfluoroalkyl substances
- Total metals
- Dissolved metals
- Inorganic non-metallic and physical and aggregate properties
- Microbiological samples
- Radionuclides

Fill the sample bottles to the appropriate level for the parameter analyzed including eliminating head space, as appropriate. Collected samples that require thermal preservation must be immediately (within 15 minutes) placed in a cooler with wet ice and maintained at a preservation temperature of 4° Celsius (ºC).

4.6 FIELD QUALITY ASSURANCE/QUALITY CONTROL SAMPLES

Field quality assurance/quality control (QA/QC) samples may include equipment blanks, trip blanks, temperature blanks, duplicates, matrix spike and matrix spike duplicate samples, field blanks, and split samples. The project manager or QAPP must specify the type and frequency of QA/QC sample collection. The QA/QC sample identification number must, unless otherwise approved by your project manager or specified in your site-specific work plan, follow the company's naming protocol as discussed in the sections below. QA/QC samples must be clearly identified on our copy of the chain-of-custody (COC) form (described below) and in the field book. Failure to properly collect and submit required QA/QC samples can result in invalidation of an entire sampling event.

Several blanks, discussed below, require laboratory-grade analyte-free, deionized water (DI) be used. Only if all options to obtain laboratory-grade DI have been exhausted should store-grade distilled water be used to prepare blanks. If store-grade distilled water is used, be sure to record the source and lot number in the field book.

Collect, preserve, transport and document split samples using the same protocols as the related samples.

4.6.1 EQUIPMENT BLANKS

Equipment blanks, or rinsate blanks, are used to document contamination attributable to using non-dedicated equipment (i.e., equipment that must be decontaminated after each use). Collect equipment blanks in the field at a rate of one per type of sampling equipment per day, unless otherwise specified. If the site-specific work plan or QAPP indicates that an equipment blank is to be collected from dedicated sampling equipment, collect the equipment blank in the field before sampling begins. If field decontamination of sampling equipment is required, prepare the equipment blanks after the equipment has been used and field-decontaminated at least once.

Prepare equipment blanks by filling or rinsing the pre-cleaned equipment with DI and collecting the rinsate in the appropriate sample containers. Record the type of sampling equipment used to prepare the blank and how the equipment blank was generated in the field book. Decontamination of the equipment following equipment blank procurement is not required.

The samples must be labeled, preserved, and filtered (if required) in the same manner as the environmental samples. Have the equipment blanks analyzed for all the analytes for which the environmental samples are being analyzed, unless otherwise specified. Designate equipment blanks using "EB", followed by the date, and in the order of equipment blanks collected that day. For example, the first equipment blank collected on July 4, 2015, would be designated EB070415-1.

4.6.2 TRIP BLANKS

Trip blanks are used to document VOC contamination attributable to shipping and field handling procedures. Trip blanks are only required when analyzing samples for VOCs. The blanks are prepared by the analytical laboratory and shipped along with the empty sample containers. These pre-filled blanks should accompany the environmental sample containers wherever they are stored onsite (i.e., keep the trip blank sample bottles in the same shipping container used to ship and store VOC sample bottles during the sampling event). Never open the laboratory-supplied trip blank sample bottles. Only as a last resort, store-grade distilled water, can be poured into empty VOC sample bottles to generate event-specific trip blanks (or augment the laboratory-supplied ones, if they are provided in insufficient numbers).

The trip blanks, even those provided by the analytical laboratory, should be labeled in the field like other environmental samples collected during the investigation activities. Identify trip blanks using the prefix "TB", followed by the date. For example, the trip blank shipped with a cooler of samples on July 4, 2019, would be designated TB070419-1. If a second trip blank is needed on that same day, the designation would be TB070419-2. A minimum of one trip blank should accompany each shipping container of VOC samples, unless more stringent project requirements are in place. The number of trip blanks needed per shipment can be minimized by shipping all the VOC samples in the same shipping container (if possible).

4.6.3 FIELD BLANKS

The field blank is analogous to the trip blank in that it is designed to assess and document any contamination to the environmental samples that can be attributable to the (ambient) field conditions. Not all projects require the use of field blanks. Their use, if required, and the frequency of collection (often 1 blank per 10 or 20 environmental samples collected) is detailed in the QAPP and the site-specific work plan. The sample is collected by pouring DI water into empty glassware at the site during the sampling event. The intent is to expose the field blank to the same conditions in the atmosphere as those present when the environmental samples were collected.

Identify field blanks using the prefix "FB", followed by the date. For example, the field blank shipped collected on August 22, 2019, would be designated FB082219. If a second field blank is needed on that same day, the designation would be FB082219-2. At least one field blank should be collected for each analytical parameter identified in the sampling event.

4.6.4 TEMPERATURE BLANKS

Temperature blanks are used to determine if the samples are at the appropriate temperature for preservation at the time the sample container (cooler) is received by the analytical laboratory. The temperature is determined by measuring the temperature blank, which provides a proxy for the temperature of the sample container upon arrival at the laboratory. These temperature blanks are typically provided by the laboratory and should be included in each sample cooler used to ship and store the sample bottles during the sampling event. If laboratory-provided temperature blanks are not available, fill a clean, unpreserved sample bottle with potable, DI, or store-grade distilled water and identify the bottle as a temperature blank.

4.6.5 DUPLICATES

Duplicate samples, which are used for measuring the variability and documenting the precision of the sampling process, should be collected at a rate of at least 1 duplicate per 20 environmental samples collected, unless specific project requirements (as detailed in a QAPP) are in place. Be sure that the location selected for duplication has sufficient sample volume and is within the area of contamination, if known. Under no circumstances can equipment or trip blanks be used as duplicates.

Collect each duplicate sample at the same time, from the same sample aliquot, and in the same sampling order (i.e., volatile organic compounds, then semivolatile organic compounds, then inorganics, etc.) as the corresponding environmental sample. Sample bottle aqueous duplicate samples, for example, should be alternately filled with the environmental sample bottles (i.e., the actual sample bottle and the bottle to be used for the duplicate) from the same sampling device. If the sampling device does not hold enough volume to fill the sample containers, fill the first container with equal portions of the sample, and pour the remaining sample into the next

sample containers. Obtain additional sample volume and pour the first portion into the last sample container, and pour the remaining portions into the first containers. Continue with these steps until all containers have been filled.

Duplicate samples will be assigned arbitrary sample ID and a false collection time so that they are not identified as duplicates by the laboratory (i.e., submit the duplicates samples as *blind* to the lab). The blind duplicate sample "location designation" will be left up to the project manager; however, in no case will "Dup" be allowed to appear in the sample name. The duplicate samples should be analyzed for the same analytes as the original environmental sample. Be sure to record the sampling method, duplicate sample ID, the false time, and the actual time of collection in the field notebook. The duplicate should also be indicated in separate documentation, such as on our carbon copy of the chain-of-custody (i.e., the yellow copy), and not on the original chain-of-custody that accompanies the samples to the laboratory.

4.6.5 MATRIX SPIKE AND MATRIX SPIKE DUPLICATES

Matrix spike and matrix spike duplicate samples (i.e., MS/MSD samples) are used to determine the bias (accuracy) and precision of an analytical method for a specific sample matrix. Many of the company's projects require the collection of MS/MSD samples; however, laboratory generated MS/MSD samples are sufficient for some projects (as detailed in the QAPP or site-specific work plan). Collect MS/MSD samples at a rate of 1 MS and 1 MSD (i.e., 2 samples) for every 20 environmental samples, unless more stringent project requirements (as detailed in a QAPP) are in place. Clearly convey the MS/MSD identity to the laboratory by adding "MS" or "MSD" after the sample name (e.g., MW-01MS) and/or in the comments section of the chain-of-custody on the same line as the parent sample. Under no circumstances can equipment or trip blanks be used as MS/MSD samples.

4.6.6 SPLIT SAMPLES

Split samples may be collected as a means of determining compliance or as an added measure of quality control. Split samples measure the variability between laboratories and not the variability of sample collection and laboratory procedures (i.e., they are not equivalent to duplicate samples). The split samples must be subsamples of the same parent material used for the environmental sample: soil should be collected from the same in-place material (for VOCs) or, for non-discrete samples, the same mixing vessel after homogenization. Collect aqueous split samples using the same alternating bottle approach detailed in the duplicate sample description above. These procedures will ensure that the split samples are valid and are representative of the environmental sample collected as part of the investigation.

Collecting split samples of soil, sediment, waste, and sludge is not recommended because the homogenization necessary for a true split sample in these matrices is not possible and the resulting laboratory results would not be comparable.

Spilt samples should have the same sample location designation (e.g., MW-01, SB-03 (4-6), but are differentiated from each other by inserting the laboratory analyzing or the agency/consultant collecting the sample after the sample location (e.g., MW-01-WSP and MW-01-EPA).

4.7 CUSTODY DOCUMENTATION

Sample custody protocols are used to demonstrate that the samples and sample containers were handled and transferred in such a manner as to prevent tampering. Legal COC begins when the pre-cleaned sample containers are dispatched to the field from the laboratory and continues through sample analysis and eventual disposal of the sample and sample containers. Maintaining custody requires that samples must be in the actual possession or view of a person who is authorized to handle the samples (e.g., sample collector, laboratory technician, etc.), secured by the same person to prevent tampering, or stored in a designated secure area.

It is a good idea to limit, to the extent possible, the number of individuals who physically handle the samples. Samples must be placed in locked storage (e.g., locked vehicle, locked storeroom, etc.) when not in the possession or view of authorized personnel. Do not leave samples in unoccupied motel or hotel rooms or other areas where access cannot be controlled by the person(s) responsible for custody without first securing samples and shipping or storage containers with tamper indications in place (i.e., custody seals).

The COC form is used to trace sample possession from the time of collection to receipt at the analytical laboratory. It is recommended that the company's COC be used rather than the laboratory-supplied COC form to ensure that all necessary data are recorded. Submit one COC form per sample shipment, unless more stringent project requirements are in place (as detailed in the QAPP or site-specific work plan). The COC needs to have a unique COC number (pre-printed on the form), accompany all the samples, and include all appropriate project-specific information, such as:

- Project number, name, and location
- Sampler's printed name(s) and signature(s)
- Sample identification number
- Date and time (using the 24-hour clock) of collection
- Sample matrix (e.g., soil, aqueous, solid, etc.)
- Total number of containers per sample
- Parameters requested for analysis including number of containers per analyte.
- Remarks (e.g., irreducible headspace, field filtered sample, expected concentration range, specific turn-around time requested, etc.)
- Signatures of all persons involved in the chain of possession in chronological order
- Requested turn-around-time
- Name and location of analytical laboratory
- Custody seal numbers
- Shipping courier name and tracking information
- Internal temperature of shipping container upon shipment to laboratory, as needed
- Internal temperature of shipping container upon delivery to laboratory
- Employee contact information

Affix custody seals to all storage and shipping container closures when transferring or shipping sample container kits or samples to an off-property party. Place the seal so that the closure cannot be opened without breaking the seal. In the field book, record the time, date and signatures of responsible personnel affixing and breaking all seals for each sample container and shipping container. Affix new custody seals every time a seal is broken until continuation of evidentiary custody is no longer required.

FIELD STANDARD OPERATING PROCEDURE #5

INVESTIGATION DERIVED WASTE MANAGEMENT PROCEDURE

The purpose of this standard operating procedure (SOP) is to provide instructions for handling, storing, and managing investigation derived waste (IDW) pending disposal. All IDW, which includes (but is not limited to) soil cuttings, development water, purge water, drilling fluids, decontamination fluids, personal protective equipment (PPE), and sampling equipment, must be managed in compliance with applicable or relevant and appropriate requirements. The user is advised to read the entire SOP and review the site health and safety plan (HASP) and/or project safety plan (PSP) before beginning any onsite activities. In accordance with the HASP or PSP, proper PPE must be selected and used appropriately.

5.1 ACRONYMS AND ABBREVIATIONS

DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
HASP	health and safety plan
IDW	investigation derived waste
PCB	polychlorinated biphenyl
PPE	personal protective equipment
PSP	project safety plan
RCRA	Resource Conservation and Recovery Act
SOP	standard operating procedure
TSCA	Toxic Substances Control Act

5.2 MATERIALS

- Pre-printed weatherproof waste labels (e.g., non-hazardous waste, hazardous waste, polychlorinated biphenyls [PCBs], etc.)
- IDW log (Figure 1)
- Permanent ink marking pen, paint, stick/pen
- Sampling equipment (refer to sampling SOPs)
- Impermeable covers (tarps), as needed
- Duct tape, rope, or other material to secure tarp
- Copy of the waste manifest or bill of lading

5.3 PRECONDITIONS AND BACKGROUND

This SOP has been prepared as part of the company's Environmental Quality Management Plan and is designed to provide detailed procedures for common field practices. Compliance with the methods presented in this document is mandatory for all field personnel and will ensure that the tasks are performed in a safe and consistent manner, are in accordance with federal and state guidance, and are technically defensible.

This SOP is written for the sole use of company employees and will be revised periodically to reflect updates to company policies, work practices, and the applicable state and/or federal guidance. Employees must verify that this document is the most recent version

of the company SOPs. Employees are also strongly advised to review relevant state and/or federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

WSP requires that all personnel performing specific project assignments be appropriately qualified, including having required certifications or licenses, and properly trained in accordance with the requirements of their assignment, the Environmental Service Line's field standard operating procedures, and the Quality Management System.

This SOP is designed to provide the user with a general outline for handling, storing, and managing IDW pending disposal and assumes the user has received current U.S. Department of Transportation (DOT) training, Hazardous Waste Operations and Emergency Response training, and Resource Conservation and Recovery Act (RCRA) training (if required) and is familiar with basic field procedures, such as recording field notes (SOP 1), sample shipment procedures (SOP 3), sample collection and quality assurance procedures (SOP 4), and equipment decontamination (SOP 6). The SOP does not cover investigation planning; DOT, RCRA, and Toxic Substances Control Act (TSCA) regulations; nor does it cover the evaluation of the analytical results. **Consult and involve the company's compliance professionals during all phases of IDW management and disposal.**

It is important to note that information contained in this SOP is based on federal regulations and interpretive guidance provided by the U.S. Environmental Protection Agency (EPA) and other federal regulatory sources; therefore, information provided in this SOP may be superseded by state or local-specific statutes or regulations. Field personnel must plan for and discuss the handling procedures with the project manager and assigned company compliance professional before mobilizing to the field.

5.4 IDW GENERAL PROCEDURES

Nearly all intrusive field activities will generate solid or liquid wastes. Examples include:

Solid Waste

- Soil cuttings
- Drilling mud
- Plastic sheeting
- Spent carbon or filters
- PPE (e.g., Tyvek coveralls, gloves, respirator cartridges)
- Disposable or dedicated sampling equipment (e.g., bailers, hoses, clamps, buckets, cartridge filters)
- Field analytical waste (e.g., HACH kits, Chlor-n-Soil kits, Gastech tubes)
- Compressed gas cylinders (e.g., isopropylene, helium)
-
- Disposable cleaning materials (e.g., wipes or rags)

Liquid Waste

- Decontamination water
- Development water
- Drilling fluids
- Purge water
- Soap or wash solutions
- Reagents (e.g., hexane, nitric acid, methanol)

The specific procedures for dealing with these materials after the field activities have been completed will vary depending on whether the materials are considered to be non-hazardous, RCRA hazardous (characteristic or listed wastes), TSCA-regulated PCB waste, and/or DOT hazardous materials. The characterization of the wastes to be generated should be determined in conjunction with a company compliance professional before the field event occurs, based on previously generated data; however, in some cases, particularly for new sites, the status of the wastes may not be known. In these cases, handle IDW as hazardous waste until the status can be verified. Field personnel must consult their assigned company compliance professionals for assistance in proper waste characterization and to determine waste management requirements applicable to the site.

5.4.1 WASTE MINIMIZATION

As possible, select investigation methods and techniques that will minimize the amount of wastes generated during field activities, particularly if the IDW is hazardous. Examples include using direct-push methods instead of hollow stem augers (to minimize soil cuttings) during a soil investigation, if appropriate, eliminating the use of solvents or solvent-based cleaners for decontamination, if

possible, and limiting contact with the materials to reduce the amount of PPE required. Minimizing the amount of waste generated will reduce handling requirements and overall project costs, and is consistent with the company's corporate goals for sustainability.

5.5 ONSITE IDW MANAGEMENT PROCEDURES

Onsite handling procedures typically involve containerization of the IDW for offsite disposal at a regulated facility or, in the case of certain non-hazardous wastes, onsite disposal. Should more than one waste stream be present onsite, segregate the IDW containers by waste stream to facilitate the future waste disposal. The procedures for each type of waste are presented below.

5.5.1 NON-HAZARDOUS WASTE MANAGEMENT

If the IDW is classified as non-hazardous waste, the following procedures must be implemented only if approved by the applicable regulatory agency and after being discussed and approved by the project manager, project compliance professional, client, and facility personnel:

- Soil can be either:
  - spread around the borehole or other onsite location
  - placed back in the boring or excavated test pit
  - containerized and disposed of offsite
- Groundwater and decontamination fluids can be either:
  - poured onto the ground next to the well to allow infiltration
  - discharged to either the publically-owned treatment works or storm sewer
  - discharged to the onsite wastewater treatment plant
  - containerized and disposed of offsite
- After rendering the IDW unusable (e.g., cutting or tearing material), PPE, plastic sheeting, disposable cleaning materials, and spent bag filters can be double bagged and disposed of as general trash or containerized and disposed of offsite.
- Compressed gas cylinders should be depressurized and disposed of as general trash, recycled as scrap metal, or containerized and disposed of offsite.
- Field analytical waste (e.g., HACH® kits, Chlor-n-Soil® kits) can be disposed of in accordance with the manufacturer's instructions provided the disposal method is approved by the company's project manager and compliance professional.
- Minimize the volume of reagents as much as possible. Consult a company compliance professional to determine the proper disposal of any quantity of unused reagents. Empty reagent containers may be disposed of as general trash after removing all chemical name and warning labels, or may be containerized and disposed of offsite.
- Spent water treatment media (e.g., carbon, resin) should be containerized and disposed of offsite.
- Exploration and production exempt waste derived from material that was downhole at an oil and gas production site.

If the IDW is containerized and is classified as non-hazardous, the following procedures will apply:

- Place the non-hazardous IDW in DOT-compliant containers (e.g., 55-gallon drum, roll-off container, or temporary storage tank). Before placing IDW in the containers, ensure that the containers are in good condition and will not leak.
- Drums used as containers must remain closed except when adding, sampling, or inspecting the waste. The drums cannot be used as a work surface once waste is put in the container.
- Mark the container with the appropriate waterproof, self-adhesive non-hazardous waste label. The label must include a description of the contents of the container (e.g., soil cuttings, purge water) and the generator name (the client or the facility, never the company). **Field personnel must consult the project compliance professional for help in properly completing the labels.**
- Complete the IDW Log (Figure 1) before leaving the site. Present one copy of the log to the site contact and the original to the project manager.
- The IDW containers must be properly closed, wiped clean, and stored in a secure onsite location.

5.5.2 HAZARDOUS WASTE MANAGEMENT

If site data or generator knowledge indicates that the IDW is RCRA hazardous, the following procedures will apply:

- Place IDW in DOT-compliant containers (e.g., 55-gallon drum, roll-off container, or temporary storage tank). Before placing IDW in the containers, ensure that the containers are appropriate for the type of IDW generated (e.g., solid in containers authorized for transport of solids), in good condition and will not leak.

- Containers must remain closed except when adding, sampling, or inspecting the material. The containers cannot be used as a work surface once waste is put in the container.
- Mark the container with an appropriate waterproof, self-adhesive hazardous or radiological waste label. The label must include the accumulation start date, a description of the contents of the container (e.g., soil cuttings, purge water), the EPA identification number, the generator name (the client or the facility, never the company), and the hazardous waste codes, if known. **Field personnel must consult the project compliance professional for help in properly completing the labels.**
- The IDW containers must be properly closed, wiped clean, and stored in a secure onsite location (i.e., a designated facility hazardous waste storage area) to limit access. At a minimum, place the drums on an impermeable surface (if available) in an area of limited access. If stored outside, cover the containers with a secured tarp at the end of each field day until the containers are picked up for disposal.
- Complete the IDW Log (Figure 1) before leaving the site. Present one copy of the log to the site contact and the original to the project manager.
- If applicable, ensure that weekly inspections are conducted, and the proper inspection forms for documentation are completed during the entire time the waste is stored onsite. **Field personnel must consult the project compliance professional for help to determine if weekly inspections are required.**

If the IDW is presumed to be hazardous and sampling is required to confirm its classification, it must be labeled "Hazardous Waste-Pending Analysis" and sampled for the parameters specified by the project compliance professional or project manager before leaving the site. Any waste confirmation samples must be collected in accordance with the company's SOPs. Treatment, storage, and disposal facilities will usually specify the required analysis for waste profiles.

5.5.3 PCB WASTE MANAGEMENT

If information exists to classify PCB-containing IDW as TSCA-regulated IDW (i.e., PCBs greater than 50 milligrams per kilogram), the following procedures must be implemented:

- Place the PCB-containing IDW in DOT-compliant containers (e.g., 55-gallon drum, roll-off container, or temporary storage tank). Before placing IDW in the containers, ensure that the containers are in good condition and will not leak.
- Containers must remain closed except when adding, sampling, or inspecting the material. The containers cannot be used as a work surface once waste is put in the container.
- Mark the container with an appropriate waterproof, self-adhesive yellow label with the words "Caution Contains PCBs", the "removed from service" date (the accumulation start date), and a description of the contents of the container (e.g., soil cuttings). Complete the label with the name and phone number of the company personnel to contact in the event of an accident or spill. **Field personnel must consult the project compliance professional for help in properly completing the labels.**
- The IDW containers must be properly closed, wiped clean, and stored in a secure PCB storage area onsite. If a PCB storage area is not available, construct a temporary PCB storage area. Cover the containers with a secured tarp at the end of each field day until the drums are picked up for disposal. Place one yellow 6" x 6" "Caution Contains PCBs" label on the outside of the tarp, and note the "Removed from service date" on the label.
- Complete the IDW Log (Figure 1) before leaving the site. Present one copy of the log to the site contact and the original to the project manager.
- If applicable, inspect the area and the containers for leaks once every 30 days in accordance with TSCA requirements during the entire period the waste is stored onsite. **Field personnel must consult the project compliance professional for help to determine if weekly inspections are also required.**

5.6 POST-FIELD IDW MANAGEMENT ACTIVITIES

Field personnel must follow up on the management of the IDW after returning from the field. RCRA hazardous and TSCA-regulated PCB-containing wastes have storage time limits and periodic inspection requirements to remain in compliance with federal, state, or local regulations. Arrangements for proper disposal of wastes must be made within the required time limits and must be consistent with all applicable regulatory requirements, as well as the company's contracting procedures and policies for waste disposal. Copies of waste disposal documentation (e.g., bill of lading, waste manifest, land disposal restriction form, etc.) should be provided to the project manager and saved with the project files.

INVESTIGATION DERIVED WASTE LOG

Date/Time:_____

Site Information:
Site Name: _____ Site EPA ID #: _____
Site Contact: _____ Site Address: _____
Site Contact Telephone No: _____

Origin of Material: _____
Type of Waste Generated:
- ☐ Soil Cuttings ☐ PPE ☐ Decontamination Water
- ☐ Groundwater ☐ Storm Water ☐ Drilling Fluids
- ☐ Other (Describe): _____

Field Activities that Generated the Waste:
- ☐ Soil Borings ☐ Well Sampling ☐ Well Installation
- ☐ Decontamination ☐ Excavation ☐ Pumping Tests
- ☐ Other (Describe): _____

Generation Date: _____ ***90/180/270-Day Deadline(for hazardous waste)***: _____
Quantity of Waste Generated and Container Type: _____
_____
Storage Location: _____
Waste Identification:
- ☐ Non-hazardous Waste (pending analysis)
- ☐ Non-hazardous Waste (based on site information or generator knowledge)
- ☐ Hazardous Waste (pending analysis)
- ☐ Hazardous Waste (based on site information or generator knowledge)
- ☐ PCB-containing Waste
- ☐ Radiological Waste

If generator knowledge or site information was used for identification, explain: _____
_____
_____
Type of Label Applied to Container: ☐ Non-hazardous ☐ Hazardous ☐ PCB ☐ Radiological
WSP Information (Note: One copy to site contact - the original copy to project manager)
Personnel/Contact: _____ Project No.:_____
Telephone: _____

Date Removed: _____ Signature: _____

FIELD STANDARD OPERATING PROCEDURE #6

DECONTAMINATION PROCEDURE

The decontamination procedures outlined in this standard operating procedure (SOP) are designed to ensure that all sampling equipment is free from the analytes that could potentially interfere with sample results. The user is advised to read the entire SOP and review the site health and safety plan (HASP) and/or project safety plan (PSP) before beginning any onsite activities. In accordance with the HASP or PSP, proper personal protective equipment (PPE) must be selected and used appropriately.

6.1 ACRONYMS AND ABBREVIATIONS

DI	deionized water
DOT	U.S. Department of Transportation
EPA	U.S. Environmental Protection Agency
HASP	health and safety plan
PPE	personal protective equipment
PSP	project safety plan
QAPP	quality assurance project plan
SOP	standard operating procedure

6.2 MATERIALS

- Field book
- PPE
- Polyethylene sheeting and/or garbage bags
- Laboratory-grade non-phosphate detergent[1] (e.g., Luminox® or Liquinox®)
- Cleaning reagents, as needed (e.g., isopropyl alcohol, methanol, hexane, nitric acid)
- Potable water
- Deionized (DI) water
- Containers (e.g., plastic buckets)
- Bristle brushes
- Aluminum foil
- Spray bottles
- Paper towels
- Pressurized steam cleaner (e.g., steam jenny), as needed
- Waste collection containers (e.g., drums), as needed
- Decontamination pad, as needed

6.3 PRECONDITIONS AND BACKGROUND

This SOP has been prepared as part of the company's Environmental Quality Management Plan and is designed to provide detailed procedures for common field practices. Compliance with the methods presented in this document is mandatory for all field personnel

[1] Not all laboratory-grade detergents are phosphate free. Be sure to verify the detergent's phosphate content before use.

and will ensure that the tasks are performed in a safe and consistent manner, are in accordance with federal and state guidance, and are technically defensible.

This SOP is written for the sole use of company employees and will be revised periodically to reflect updates to company policies, work practices, and the applicable state and/or federal guidance. Employees must verify that this document is the most recent version of the company's SOPs. Employees are also strongly advised to review relevant state and/or federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

WSP requires that all personnel performing specific project assignments be appropriately qualified, including having required certifications or licenses, and properly trained in accordance with the requirements of their assignment, the Environmental Service Line's field SOPs, and the Quality Management System.

This SOP is designed to provide the user with a general outline for decontamination and assumes the user is familiar with basic field procedures, such as recording field notes (SOP 1), sample shipment procedures (SOP 3), sample collection and quality assurance procedures (SOP 4), and investigation-derived waste management procedures (SOP 5). All decontamination references must be available for consultation in the field, including:

- Company's SOPs
- Applicable state and federal guidelines or procedures
- Manufacturer's manuals
- Project-specific work plan, PSP and/or HASP, and QAPP

6.4 GENERAL PROCEDURES

The cleaning and decontamination procedures described below are designed to ensure that the equipment used for sample collection is free of analytes that could potentially alter the analytical results. These procedures are primarily targeted at preventing the incidence of cross-contamination (i.e., compounds of interest being transferred on the sampling equipment from one sample to another) in order to produce high quality, representative sample results. As with all analytical sampling, the effectiveness of the cleaning procedures must be demonstrated with the collection of equipment blanks; equipment blank sample collection procedures and frequency are discussed in SOP 4.

6.4.1 EQUIPMENT AND REAGENT SELECTION

It is important for employees to evaluate the expected types of contamination before mobilization to a site. State programs (or the U.S. Environmental Protection Agency [EPA], depending on the site) may require more stringent decontamination procedures than those listed in this SOP, specify the types and grades of various cleaning detergents and reagents (e.g., acids and solvents), or allow the use of phosphate-containing detergents, such as Liquinox® liquid detergent (preferred[2]) or the powdered Alconox®. Decontamination equipment (e.g., spray bottles, brushes, etc.) should be constructed of non-reactive, non-leachable materials (e.g., metal, glass, Teflon®-coated, polyethylene, etc.) which are compatible with the reagents and solvents being used for decontamination.

Many of the cleaning reagents (e.g., nitric acid, hexane, methanol) are U.S. Department of Transportation (DOT) hazardous materials and must be shipped using a ground delivery service. The Safety Data Sheets (SDSs) for any hazardous cleaning reagents to be used onsite must be reviewed before the commencement of work, and the potential hazards and protective measures to be employed must be addressed in the HASP. Do not use decontamination liquids that have been improperly stored (e.g., unsealed containers).

In specific cases, it may be necessary to steam clean the field equipment before proceeding with the decontamination steps presented in Section 6.5 (e.g., hollow stem augers). Generally, the company's subcontractors are responsible for bringing or building a decontamination pad, if necessary, to contain the spray from a steam jenny. As possible, decontamination pads should be constructed on a level, paved surface in an area known or believed to be free of surface contamination, and should be of sufficient size to contain the decontamination water. Equipment that is steam cleaned should be placed on racks or saw horses and not on the floor of the

[2] Liquinox® liquid detergent, manufactured by Alconox, Inc., is phosphate-free and does not contribute to nutrient loading or algae blooms in the environment.

decontamination pad. Decontamination water should be removed from the decontamination pad frequently to minimize the potential for leaks or overflow.

Consult and involve the company's compliance professionals for storage procedures and disposal requirements of cleaning reagents, detergents, wastes, and other decontamination-related materials.

6.4.2 OTHER CONSIDERATIONS

In preparing for decontamination, you should perform the following activities (with all observations and measurements noted in the field book):

- Perform a quick reconnaissance of the site to identify a decontamination (pad) area and evaluate the accessibility to and safety of the location.
- If working in a hazardous waste exclusion area, the decontamination area should be located in the contaminant reduction zone.
- Record a description of the decontamination (pad) area.

Survey the breathing zone around the decontamination area with the appropriate air quality meter(s), as necessary (see HASP), to ensure that the level of PPE is appropriate. When decontaminating equipment, it is important to find a suitable location away from any sources of cross-contamination that could compromise the integrity of the decontamination. As possible, position the decontamination area away from fuel-powered equipment, such as drill rigs or excavators, and upwind of other site activities (e.g., purging, sampling).

6.5 DECONTAMINATION PROCEDURES

The decontamination procedures described below are a four- to nine-step process, depending on the the applicable federal or state guidelines, the project-specific work plan, or the QAPP. Sampling activities must be initiated with clean, decontaminated equipment. Decontaminate all non-dedicated equipment that contacts the sample directly (e.g., spoons, trowels, pumps), before and between each sample location and sampling interval. record decontamination procedures in the field book. Disposable, single use items, such as bailers or tubing, do not require decontamination.

The decontamination process includes the following four basic steps:

1. Physical removal of soil or debris
2. Wash with non-phosphate detergent, such as Liquinox®, and nylon brush
3. Potable water rinse
4. Laboratory-supplied deionized (DI), analyte-free water rinse (distilled water can be used as a substitute, if necessary)

The first step is to remove as much soil or other debris from the sampling device as possible near the sampling area to limit the spread of potentially-contaminated materials into clean areas of the site. Containerize all soil or debris in DOT-compliant containers in accordance with SOP 5 or the project-specific work plan. Dispose of all wastes in conformance with the project-specific work plan and applicable regulations.

Cleaning and decontamination should occur at a designated area(s) (i.e., decontamination pad) on the site. If gross contamination or an oily film or residue is observed on the equipment, use a steam jenny or wash by hand, using a brush, to remove the particulate matter or surface film. Heavy oils or grease may be initially removed with paper towels soaked with isopropyl alcohol.

The physical removal of debris process is followed by soaking (a simple dunk of the equipment is insufficient) and hand scrubbing the equipment with a solution of potable water and non-phosphate detergent (mixed to the manufacturer's instructions) followed by a potable water rinse. If not using a decontamination pad, the most common set-up uses multiple 5-gallon plastic buckets (or equivalent) for washing and rinsing. The decontamination containers should be labeled as to their contents and pertinent information from original source, such as the date opened or transferred, and the expiration date (as well as any applicable hazardous labels), placed on polyethylene sheeting (to contain drips of decontamination fluids during the decontamination process), and sealed when not in use to prevent accidental release of the fluids. If decontaminating sealed submersible pumps, pump both the non-phosphate detergent wash

fluid and the potable water rinse through the pump body itself (usually done in separate buckets) to ensure that the internal components are thoroughly cleaned. Replace the detergent solution and rinse water at least daily or when it becomes oily or silty.

Next, place the DI water for the rinse in a small spray bottle or pour over the equipment after the potable water rinse.

Typically, this level of decontamination (i.e., steps 1 through 4) is sufficient.

Following Steps 1 through 4, additional decontamination (steps 5 through 9) may be required by the applicable federal or state guidelines, the project-specific work plan, or the QAPP. Typically, these decontamination steps are performed when sampling for inorganics or oil-related substances using non-motorized equipment. These steps include:

5 10% nitric acid rinse (if metals are part of the analyses)
6 Laboratory-supplied DI water rinse
7 Pesticide-grade solvent rinse (e.g., acetone [preferred], hexane, or isopropyl alcohol)
8 Air dry (solvent must evaporate)
9 Laboratory-supplied DI water rinse

Isopropyl alcohol is the recommended solvent for organic contaminants because it is readily available and is not a DOT hazardous material; where possible, lab-grade isopropyl alcohol should be used . However, other solvents (e.g., hexane and methanol) may be more effective in removing certain contaminants, such as oils or polychlorinated biphenyls, but any waste generated using these solvents must be managed accordingly. Solvents are never used for decontamination if sampling for volatiles organic compounds.

Handle the solvents and acid with care and store unused chemicals in their original, labeled, protective containers when not in use. It is a good idea to transfer small quantities of each solution into labeled, laboratory-grade spray bottles, which offer a convenient and controllable way to rinse the equipment. The equipment can then be rinsed over a 5-gallon plastic bucket or other suitable container placed on plastic sheeting as with the first part of the cleaning process. Nitric acid rinses must be used only on non-carbon steel sampling devices. Do not spray acid or solvent into pumps.

Decontamination steps used at sites where radioactive materials are contaminants of concern are similar with a few special considerations. Radiation contamination monitoring is used to help locate contamination and guide the success of the decontamination process. The liberal use of water and fluids as a decontamination agents are minimized, where practicable, because of the expense that can be incurred with disposing of radioactively contaminated decontamination water. Containerized decontamination wastes must be evaluated for radioactive content and disposed of appropriately depending on their content.

6.6 HANDLING DECONTAMINATED EQUIPMENT

Handle any decontaminated equipment using clean gloves to prevent re-contamination. Place the equipment away (preferably upwind) from the decontamination area once the process has been completed on clean plastic sheeting to allow it to air-dry. Once the equipment is dry, protect it from re-contamination by securely wrapping and sealing with aluminum foil (shiny side out) or clean, disposable plastic bags (inorganics only). Plastic bags may be wrapped directly around wet or dry equipment except when the expected contaminants include volatile and extractable organics; under those circumstances, allow the equipment to completely dry or wrap it in aluminum foil.

All sampling equipment must be decontaminated at the end of the investigation (i.e., prior to departure from the site). Label each piece of equipment with the date of decontamination, the initials of personnel performing the decontamination, and the type of decontamination solution(s) used. Containerize all decontamination fluids, and other disposable decontamination materials in DOT-compliant containers in accordance with SOP 5 or the project-specific work plan. Dispose of all wastes, including open and unused solvents or acids, in conformance with the project-specific work plan and applicable regulations.

FIELD STANDARD OPERATING PROCEDURE #7

WATER QUALITY MONITORING EQUIPMENT PROCEDURE

The procedures outlined in this Standard Operating Procedure (SOP) are designed to ensure that water quality monitoring equipment is calibrated and used properly. Specifically, this SOP addresses the short-term or discrete-measurement use of portable water quality monitoring equipment for the collection of physical, chemical, or biological field measurements. Common field parameters include temperature, pH, specific conductance (SC), turbidity, oxidation-reduction potential (ORP), and dissolved oxygen (DO). The user is advised to read the entire SOP and review the site health and safety plan (HASP) and/or project safety plan (PSP) before beginning any onsite activities. In accordance with the HASP or PSP, proper personal protective equipment (PPE) must be selected and used appropriately.

7.1 ACRONYMS AND ABBREVIATIONS

DI	deionized water
DO	dissolved oxygen
°F	degrees Fahrenheit
HASP	health and safety plan
IDW	investigation derived waste
mg/l	milligrams per liter
mV	millivolts
NTU	nephelometric turbidity units
ORP	oxidation-reduction potential
PPE	personal protective equipment
PSP	project safety plan
QAPP	quality assurance project plan
SC	specific conductance
SDS	safety data sheets
SOP	standard operating procedure
SU	standard units
µS/cm	microsiemens per centimeter
(mS/cm)	millisiemens per centimeter

7.2 MATERIALS

- Field book
- PPE
- Water quality meter
- Flow-through cell, as appropriate
- Display/logger
- Communication cables
- Calibration cup or beaker

- Calibration reagents and standard solutions, as appropriate
- Deionized water (DI) or distilled water
- Decontamination supplies

7.3 PRECONDITIONS AND BACKGROUND

This SOP has been prepared as part of the company's Environmental Quality Management Plan and is designed to provide detailed procedures for common field practices. Compliance with the methods presented in this document is mandatory for all field personnel and will ensure that the tasks are performed in a safe and consistent manner, are in accordance with federal and state guidance, and are technically defensible.

This SOP is written for the sole use of company employees and will be revised periodically to reflect updates to company policies, work practices, and the applicable state and/or federal guidance. Employees must verify that this document is the most recent version of the company SOPs. Employees are also strongly advised to review relevant state and/or federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

WSP requires that all personnel performing specific project assignments be appropriately qualified, including having required certifications or licenses, and properly trained in accordance with the requirements of their assignment, the Environmental Service Line's field SOPs, and the Quality Management System.

This SOP is designed to provide the user with a general outline for preparing water quality monitoring equipment for use and assumes the user is familiar with basic field procedures, such as recording field notes (SOP 1), investigation derived waste (IDW) management procedures (SOP 5), and equipment decontamination (SOP 6). This SOP does not cover the selection of water quality monitoring equipment, nor does it cover water quality monitoring equipment-specific instructions. These topics require a significant amount of planning and are more appropriately addressed in a project-specific work plan. Be sure to review the project-specific work plan or Quality Assurance Project Plan (QAPP) and any applicable state and federal guidelines or calibration procedures. The sampler should be familiar with the use and calibration of all sampling and monitoring equipment. All sampling references must be available for consultation in the field, including:

- Company's SOPs
- Applicable state and federal guidelines or sampling procedures
- Manufacturer's manuals
- Project-specific work plan, PSP and/or HASP, and QAPP

7.4 GENERAL EQUIPMENT HANDLING AND MANAGEMENT PROCEDURES

Multi-parameter water quality meters are typically bundled in a single housing unit known as a sonde. These types of units offer a single, convenient device that is capable of measuring most or all of the parameters monitored during a typical sampling event. Individual parameter water quality meters are available and, in some cases, offer a higher degree of accuracy, although the difficulty in deploying multiple meters for most tasks relegates them to specialty use.

Field personnel must consult their assigned company compliance professionals for assistance in proper use, storage, and disposal of all calibration standard solutions.

The manufacturer's recommendations and instructions vary from one instrument to the next; however, all types of water quality monitoring equipment share common handling and management procedures designed to ensure the integrity of the measurements collected. Based on these procedures, the user should:

- Follow the manufacturer's instructions for transportation, assembly, operation, calibration, and maintenance specific to your equipment. The manufacturer's instructions should be followed explicitly in order to obtain accurate results.
- Keep either the sensor guard or transportation/calibration cup installed when not in use to avoid damaging the sensors. Some sensors require a small amount of water in the transportation/calibration cup; follow the manufacturer's recommendations.
- Inspect the sensors to be sure that they are clean, installed properly and are not damaged.

- Ensure that all equipment is in proper working condition, and that batteries are properly charged before using the equipment for field testing measurements.
- Protect instruments that are sensitive to static electricity.
- Record manufacturer name and model number for each instrument used in the field book.
- Calibrate the instrument, as close to the time of use as possible, and repeat at the frequency suggested by the project-specific work plan, QAPP, or manufacturer. All calibration records must be maintained in the project files.
- Protect the instrument from direct sunlight, precipitation, and extremely hot or cold temperatures.
- Store cables only after they are clean, dry, and neatly coiled – do not bend or crimp cables, and attach any provided storage caps.
- Protect cables from abrasion or unnecessary tension when in use.
- Unless otherwise instructed by the manufacturer, decontaminate water quality monitoring equipment using a non-phosphate detergent solution with a small, nonabrasive brush, cotton swab or cloth, followed by a thorough DI water rinse.

7.5 CALIBRATION PROCEDURES

Water quality monitoring equipment must be inspected and the sensors calibrated before use. Calibration frequency is dependent upon project specifications, instrument performance, and manufacturer's recommendations; repeat the calibration procedures as directed in the project-specific work plan, QAPP, or manufacturer's guidance. Consult the manufacturer's guidelines before beginning the calibration process and contact the manufacturer's technical support if problems or questions arise. Maintain all calibration records in the project files.

Conduct the following procedures to ensure proper calibration and record observations in the field book:

- Complete field calibration in an area sheltered from wind, dust, and temperature/sunlight fluctuations such as inside a room or vehicle in which the ambient temperature of the standards is maintained at a temperature greater than 40 degrees Fahrenheit (°F) and less than 100°F, unless otherwise specified by the manufacturer.
- Use standard calibration solutions in accordance with the project-specific work plan, QAPP, or manufacturer's guidance. Allow water quality monitoring equipment to equilibrate to the air temperature for at least 15 minutes after being powered on, or for the specified time period recommended by the manufacturer.
- Record the brand, concentration, lot numbers and expiration dates of standard solutions in the field book.
- Handle standard solutions in a manner that prevents their dilution or contamination. Do not use expired standard solutions. Do not reuse standard solutions or pour solutions back into the bottle; ensure that proper chain-of-custody has been followed for standard solutions stored at a site.
- Ensure that the water quality monitoring equipment has been set to display or record the appropriate measurement units, as available – be sure to record the units of measure in the field book or field form.
- Unless otherwise instructed by the manufacturer, use the calibration cup that comes with the instrument for calibration.
- Use the recommended volume of standard solution when filling the calibration cup (e.g., the standard solution must cover the temperature sensor, as most sensors require temperature compensation).
- Be careful not to over tighten the calibration cup; many calibration cups have vents that allow their equilibration with ambient pressure.
- Rinse sensors thoroughly with DI water after use of each standard solution, followed by a rinse with the next standard solution to be used.
- Wait for readings to stabilize (approximately 30 seconds under normal conditions) before adjusting and saving the calibration point.
- If calibration fails to meet criteria, follow the manufacturer's instructions for corrective action to adjust instrument performance and note any indication of a substandard calibration.
- If the instrument does not start up, meet the requirements above, or calibrate properly, the instrument should not be used.
- Document the time, date, serial number (or other identifier) and calibration status for each instrument.

7.5.1 SPECIFIC CONDUCTANCE

Specific conductance, or, more commonly conductivity, measures the ability of water to conduct an electric current. It is generally reported in either microsiemens per centimeter (μ S/cm) or millisiemens per centimeter (mS/cm); be sure to note the units used in the field book. Natural waters, including groundwater, commonly exhibit SC below 1 μ S/cm. Elevated SC measurements (i.e., greater

than 500 μ S/cm) are a proxy for the amount of dissolved solids, which may be indicative of inadequate well development, grout contamination (or an inadequate grout seal), or contamination.

When calibrating water quality monitoring equipment for SC:

- If not specified in the project-specific work plan, choose a SC standard solution recommended by the instrument manufacturer; otherwise, select a standard that is similar to the anticipated conductivity of the water being sampled.
- The presence of air bubbles in conductivity electrodes will cause erroneous readings and incorrect calibration. Transmission lines, alternating-current electrical outlets and radio-frequency noise sources may cause interference; check with the instrument manufacturer's specifications for troubleshooting procedures.

7.5.2 DISSOLVED OXYGEN

Dissolved oxygen measurements are used to assess the water quality with respect to certain metals (the amount of oxygen can control the valence state of metals) and, more typically, biological activity. Concentrations of DO in groundwater under ambient conditions generally range from 1 to 4 milligrams per liter (mg/l). Erratic or elevated (greater than 4 mg/l) DO readings may indicate equipment maintenance issues, such as a fouled sonde, torn membrane, a sensor out of calibration range; or inappropriate monitoring procedures that are causing excessive agitation and aeration of the water column. The meters are sensitive to atmospheric interference: *ex situ* measurements (i.e., those measured outside of the well itself) should only be collected using a flow-through cell.

Dissolved oxygen meters vary widely in their sensitivity. Select the type of DO sensor (i.e., the polarographic [or Clark cell] sensor or the luminescent [optical] sensor) that is most appropriate for the scope of work detailed in the project-specific work plan. The guidance below is for the more common polarographic sensor; consult the manufacturer's guidance for maintenance and calibration procedures specific to optical DO meters.

- Check the DO membrane for bubbles, wrinkles or tears. If necessary, install a new membrane and replace worn or stretched O-rings. Manufacturer guidance generally specifies membrane replacement should be completed at least 3 to 4 hours before use.
- Most manufacturers recommend that the sensor be allowed to equilibrate to the temperature of the water-vapor-saturated air before calibration, as specified in the manufacturer's instructions.
- Fill the calibration cup with less than 1/8 inch of water, or as recommended by the manufacturer.
- Remove any water droplets from the sensor without wiping the membrane. Water droplets on the sensor can cause a temperature compensation error in the DO calibration.
- Do not submerge or wet the sensor when loosely attaching the calibration cup.
- Enter the barometric pressure and wait for readings to stabilize before adjusting and saving the calibration point.

7.5.3 PH

The effective concentration (or activity) of hydrogen ions on a numerical scale known as pH, which is expressed as the negative base-10 logarithm of the hydrogen-ion activity in moles per liter. Natural (uncontaminated) waters typically exhibit a pH ranging from 5 to 9 Standard Units (SU). Deviation of pH from background may indicate the presence of groundwater contamination or well construction problems.

Typically, a two-point calibration is used for pH (i.e., a zero-point and span calibration[s]):

- If not specified in the project-specific work plan, select a 7 SU buffer (zero-point) plus a second pH buffer (4 SU or 10 SU) that brackets the range of expected pH.
- If applicable, calibrate the conductivity and DO sensors before calibrating the pH sensor. This helps prevent cross-contamination of the conductivity sensor from pH buffer solutions (pH buffers have much higher conductivities than most environmental waters).
- Allow time for the pH and temperature sensors to equilibrate to the temperature of the buffer and stabilize before adjusting and saving the calibration point. Record the temperature reading and use the chart provided by the buffer manufacturer to determine the true pH of the buffer at that temperature and adjust the calibration reading to that value.
- Repeat the calibration process with the second buffer.

7.5.4 OXIDATION-REDUCTION POTENTIAL

Oxidation-reduction potential is a numerical index of the intensity of the oxidizing or reducing conditions within an aqueous solution. Oxidizing conditions are indicated by positive potentials and reducing conditions are indicated by negative potentials. These values are frequently used when evaluating the biodegradation capacity of a system. The ORP of natural (uncontaminated) waters typically ranges from +500 to -100 millivolts (mV). The meters for ORP, like those for DO, are sensitive to atmospheric interference and must be measured using a flow-through cell. Avoid touching the sensors during calibration and measurement as calibration can be affected by static electricity.

A one-point calibration, at a known temperature, is used to calibrate the ORP sensor:

- Fill the calibration cup with enough standard solution (i.e., ZoBell's solution) to completely cover the temperature and ORP sensors.
- Allow time for the ORP and temperature sensors to equilibrate to the temperature of the buffer and stabilize before adjusting and saving the calibration point. Record the temperature reading and use the chart provided by the manufacturer to determine the true ORP of the solution at that temperature and adjust the calibration reading to that value.

7.5.5 TURBIDITY

Turbidity is the presence of suspended mineral and organic particles in a water sample. Turbid water may indicate inadequate well construction, development or improper sampling procedures, such as purging at an excessive rate that exceeds the well yield. Purging and sampling in a manner that minimizes turbidity is particularly important when analyzing for total metals and other hydrophobic compounds, such as polychlorinated biphenyls, which may exhibit artificially elevated concentrations in high-turbidity samples due to their adsorption to colloidal material. Generally, the turbidity of *in situ* groundwater is very low (at or below 10 nephelometric turbidity units, NTUs); however, some groundwater zones may have natural turbidity higher than 10 NTUs.

Standard turbidity solutions are not necessarily interchangeable. Serious calibration errors can result from using inappropriate standards. Use only those standard turbidity solutions that are prescribed for the sensor by the instrument manufacturer.

Turbidity consists of a zero-point calibration and a span calibration(s):

- Fill the calibration cup to the reference line with DI or a zero-point standard.
- Allow time for the turbidity sensors to stabilize before adjusting and saving the calibration point.
- Record the temperature and use the chart provided by the manufacturer to determine the true turbidity of the standard and adjust the calibration reading to that value.
- Repeat the calibration process with the standard span calibration standard(s).

7.6 EQUIPMENT USE PROCEDURES

The monitoring equipment is ready to use once the calibration has been completed. The specific use of the device will be dictated by the project-specific work plan or QAPP; however, all projects should follow these general procedures during use:

- Charge instrument batteries per the manufacturer's instructions, as necessary.
- Ensure that instrument is warmed up and the measured value(s) on the water quality monitoring equipment are equilibrated (i.e., readings are representative of the solution, not ambient air) before recording in the field book.
- Biological growth or debris in the water can foul sensors; as possible, avoid inserting the sonde in areas that will result in having to stop and clean algae, sediment, or debris from the sensors (e.g., do not place on bottom of a well or streambed).
- If continuous monitoring is required, follow the manufacturer's instructions for performing continuous data logging events.

For flow through cells:

- Inspect the integrity of the flow-through cell and O-rings.
- Connect the discharge tubing to the bottom of the flow-through cell using properly-sized tubing and fittings. Connect the effluent tubing to the top of the flow-through cell and secure the end of the tubing into the designated groundwater purge container.
- Shield the flow-through cell from direct sunlight to minimize changes in the temperature.

- Do not record any measurements until all the air from the flow-through cell and the effluent tubing has been displaced and the sensors have equilibrated. The presence of air bubbles in the flow-through cell will result in highly biased readings.
- Do not collect samples for laboratory analysis from the groundwater in the flow-through cell.

7.7 CLOSING NOTES

Once field activities are complete, secure the site in accordance with the project-specific work plan. Decontaminate all equipment prior to departure and properly manage all PPE and IDW in conformance with SOP 6, the project-specific work plan, and applicable regulations.

FIELD STANDARD OPERATING PROCEDURE #11

GROUNDWATER SAMPLING PROCEDURE

Groundwater sampling procedures outlined in this Standard Operating Procedure (SOP) are designed to ensure that collected samples are representative of current site conditions. These procedures can be applied to permanently or temporarily installed monitoring wells, direct-push sample points, water supply wells with installed plumbing, extraction wells for remedial groundwater treatment systems, and excavations where groundwater is present. The user is advised to read the entire SOP and review the site health and safety plan (HASP) and/or project safety plan (PSP) before beginning any onsite activities. In accordance with the HASP, proper personal protective equipment (PPE) must be selected and used appropriately.

11.1 ACRONYMS AND ABBREVIATIONS

ID	inside diameter
DI	deionized
DNAPL	dense non-aqueous phase liquid
DO	dissolved oxygen
DTW	depth-to-water
HASP	health and safety plan
IDW	investigation-derived waste
l/min	liters per minute
LNAPL	light non-aqueous phase liquid
mg/l	milligrams per liter
mV	millivolts
NAPL	non-aqueous phase liquid
NTU	nephelometric turbidity unit
ORP	oxygen reduction potential
PID	photoionization detector
PPE	personal protective equipment
PSP	project safety plan
QAPP	quality assurance project plan
SOP	standard operating procedure
SU	standard units
TD	total depth
TOC	top-of-casing
VOCs	volatile organic compounds

11.2 MATERIALS

- Field book
- PPE
- Air quality monitoring equipment (e.g., photoionization detector [PID]) with calibration reagents and standards, as needed
- Electronic water level indicator or interface probe
- Water quality meter(s) with a flow-through cell, and calibration reagents and standards, as needed
- Field test kits, as needed
- Adjustable wrench or manhole wrench, as needed
- Well key(s), as needed
- Power supply, as needed
- Sampling containers and labeling/shipping supplies
- Deionized (DI) water
- Container(s) for water storage (e.g., bucket, drum)
- Pump or bailers, tubing, and associated lanyard materials
- Filters, as needed
- Decontamination supplies

11.3 PRECONDITIONS AND BACKGROUND

This SOP has been prepared as part of the company's Environmental Quality Management Plan and is designed to provide detailed procedures for common field practices. Compliance with the methods presented in this document is mandatory for all field personnel and will ensure that the tasks are performed in a safe, consistent manner; are in accordance with federal and state guidance; and are technically defensible.

This SOP is written for the sole use of company employees and will be revised periodically to reflect updates to company policies, work practices, and the applicable state and/or federal guidance. Employees must verify that this document is the most recent version of the company SOPs. Employees are also strongly advised to review relevant state and/or federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

WSP requires that all personnel performing specific project assignments be appropriately qualified, including having required certifications or licenses, and properly trained in accordance with the requirements of their assignment, the Environmental Service Line's field SOPs, and the Quality Management System.

This SOP is designed to provide the user with a general outline for conducting groundwater sampling and assumes the user is familiar with basic field procedures, such as recording field notes (SOP 1), utility location (SOP 2), sample shipment procedures (SOP 3), sample collection and quality assurance procedures (SOP 4), investigation derived waste (IDW) management procedures (SOP 5), equipment decontamination (SOP 6), and use and calibration of all sampling and monitoring equipment (SOPs 7 and 8). This SOP does not cover investigation planning, nor does it cover the analysis of the analytical results. These topics are more appropriately addressed in a project-specific work plan. Before groundwater sampling, be sure to review the project-specific work plan or quality assurance project plan (QAPP) and any applicable state and federal guidelines or sampling procedures. All sampling and monitoring references must be available for consultation in the field, including:

- Company SOPs
- Applicable state and federal guidelines or sampling procedures
- Manufacturer's manuals
- Project-specific work plan, PSP and/or HASP, and QAPP

11.4 GENERAL PROCEDURES

Although the techniques used to sample groundwater are varied, most sampling events can be broken down into a three-step sequence:

1. Gauging: The measurement of the water column height (i.e., total well depth less depth-to-water) within the well.

2 Purging: The removal of stagnant water from the well bore to ensure that samples collected are representative of groundwater conditions in the water-bearing zone surrounding the well.
3 Sample Collection: After purging, the collection of aliquots of groundwater in method-specific, preserved (as needed) containers.

The procedures and equipment that are used to accomplish these steps are project-specific and should be discussed by the project team before arriving onsite. All types of groundwater sampling, however, regardless of the equipment used, share common handling and management procedures that are designed to ensure the integrity of the samples collected. These procedures include:

- The use of new, disposable, decontaminated, or dedicated sampling equipment
- The use and rotation of the appropriate PPE
- Selection of a suitable sampling location and staging area

Wear a clean pair of new, disposable gloves each time a different sample is collected and don the gloves immediately prior to collection. This limits the possibility of cross-contamination from accidental contact with gloves soiled during collection of the previous sample. The gloves must not contact the medium being sampled and must be changed any time during sample collection when their cleanliness is compromised. ***Gloved hands should not be used as a sampling device; always use the appropriate equipment to move the sample from the sampling device to the laboratory-supplied containers.***

11.5 EQUIPMENT SELECTION

Collect all samples using either new, disposable equipment or properly decontaminated sampling equipment. Groundwater purging and sampling equipment should be selected based on the analytical requirements of the project and the project-specific conditions (e.g., well diameter, depth to water, dissolved constituents, etc.) likely to be encountered. The equipment should be constructed of non-reactive, non-leachable materials (e.g., stainless steel, Teflon®, Teflon®-coated steel, polyethylene, polypropylene, etc.) that are compatible with the chemical constituents at the site. Note that project or regulatory guidance may limit the type of equipment for groundwater sampling.

Consider the following when choosing groundwater purging and sampling equipment:

- the diameter and depth of the well
- the depth to groundwater
- the volume of water to be withdrawn
- the sampling and purging technique
- the volume of sample required
- the analytes of interest

Select the decontamination procedures based on the types of sampling to be performed and media encountered; decontamination may require multiple steps or differing cleaning methods (see SOP 6 for decontamination procedures). In no case, should disposable, single-use materials be used to collect more than one sample.

11.6 PRE-SAMPLING CONSIDERATIONS

You should perform the following activities in preparing for sampling with all observations and measurements noted in the field book and on the project-specific groundwater monitoring log, if appropriate:

- Perform a quick reconnaissance of the site to identify sampling locations and evaluate the accessibility to the sampling location.
- Record the approximate ambient air temperature, precipitation, wind (direction and speed), tide, and other field conditions. In addition, any site-specific conditions or situations that could potentially affect the samples at the sample locations should be recorded.
- Record temporary sampling locations with respect to approximate distance to and direction from at least one permanent feature.
- Survey the breathing zone around the sampling location with the appropriate air quality meter(s), as necessary (see HASP), to ensure that the level of PPE is appropriate.
- Install the pump, tubing, passive sampler or other appropriate sampling equipment to the depth prescribed in the project-specific work plan or QAPP.

- Containerize and manage purge water in accordance with the project-specific work plan.

It is important to minimize any sources of cross-contamination that could compromise the integrity of the groundwater samples. Consider the following:

- Position fuel-powered equipment away from the sample collection area, such as drill rigs or excavators, and upwind of other site activities (e.g., purging, sampling, decontamination) that could influence the sample. This is particularly important when screening samples in the field for volatile organic compounds with a PID but should not be limited to the active sample collection.
- Establish a secure sample staging area in an uncontaminated area of the site.

11.7 GAUGING PROCEDURES

All wells should be opened to the atmosphere in advance of sampling to allow any pressure differentials, which could artificially raise or depress the water column in the well, to dissipate. The wells should be inspected to ensure that the protective casing is intact and has not been damaged. Remove the well covers and all standing water around the top of the well casing (for flush mounted-protective covers), as necessary, before opening the inner well cap or plug. Unlock and carefully remove well cap and allow the well to stand undisturbed for a minimum of 15 minutes, or as required by the project-specific work plan, before conducting any down-hole testing or measurements. If required by the HASP, survey the open well casing and the breathing zone around the wellhead with a PID to ensure that the level of PPE is appropriate.

11.7.1 GROUNDWATER LEVEL AND TOTAL DEPTH MEASUREMENT PROCEDURES

Depth to water (DTW) and total depth (TD) measurements are collected prior to sampling and are used to determine the volume water to be purged from the well (if using techniques other than no-purge or low flow sampling). The DTW measurements are also used after the field event to establish the groundwater elevation, flow direction, and gradient. Unless otherwise directed, do not place any objects inside the casing of private water wells; accordingly, DTW and TD measurements should not be collected at private water wells. Measurements of TD are not required for low flow and no-purge sampling applications and should not be measured before sampling the well.

Water level measurements must be collected within the shortest interval possible from all the wells to be gauged during the event before beginning any purge and sampling procedures at the site. This will ensure a nearly instantaneous snapshot of the water levels before the formations are disturbed by pumping or acted upon by other outside influences, such as tides, precipitation, barometric pressure, river stage, or intermittent pumping of production, irrigation, or supply wells.

Record the following observations and measurements (and the time when they were collected) in the field book:

- Measure the casing inside diameter (ID) and record in inches
- Measure the DTW with an electronic water level indicator (or an interface meter, if non-aqueous phase liquid [NAPL] is potentially present – see procedures below) from the top-of-casing (TOC) at the surveyor's mark, if present, and record the depth (to the nearest 0.01 foot) in feet below TOC
- If no mark is present, measure from the north side of the casing and mark the measuring point with a knife, metal file (if the inner casing is metal) or indelible marker for future reference
- Measure the TD from TOC at the surveyor's mark or north side of the casing, as appropriate.

Measuring the depth of deep wells with long water columns can be problematic due to tape buoyancy and weight effects or sediment in the bottom of the well casing. Care must be taken, and proper equipment selection must be used in these situations to ensure accurate measurements. Multiple TD measurements in silt-laden wells can provide a more precise assessment of the bottom depth.

11.7.2 GAUGING WELLS WITH NON-AQUEOUS PHASE LIQUID

If NAPL is potentially present at the site, the DTW and NAPL thickness measurements are collected using an interface meter capable of distinguishing between the NAPL and the groundwater, or a weighted tape coated with the appropriate reactive indicator paste for the suspected NAPL. Measuring NAPL thicknesses must be done with care to avoid agitating the liquids and generating an emulsion. This is particularly the case for light NAPL (LNAPL; those having a density less than water), which are typically viscous oils that

cling to the probe. Oil coating the probe can result in thickness measurements that are biased high (i.e., overestimate the thickness of the NAPL).

Conduct the following procedures to ensure an accurate measurement of the NAPL thickness:

- For LNAPL, slowly lower the electronic interface probe in the well casing until the electronic tone indicates the probe is at the top of the LNAPL layer; measure the depth below the TOC to the nearest 0.01 foot.
- To gauge the NAPL thickness, advance the probe slowly through the layer until the electronic tone indicates top of the water column and then slowly bring the probe back up to the bottom of the LNAPL. Repeat this process several times to ensure an accurate measurement of the bottom of the LNAPL layer (which can include bubbles and an emulsion layer).
- For dense NAPL (DNAPL), advance the probe through the water column until the tone indicates the top of the DNAPL layer; record the depth below TOC.
- To gauge the DNAPL thickness, advance the probe through the layer to the bottom of the well.

11.8 GROUNDWATER PURGING PROCEDURES

Purging is a process whereby potentially stagnant water is removed allowing the collection of samples that are representative of groundwater conditions in the water-bearing zone. The water in a well bore that has not been purged may be different than the surrounding formation due to exposure to ambient air. There are several purging (and no-purge) methods that may be used, depending on specific conditions encountered (e.g., DTW, hydraulic conductivity of the formation, etc.) and the sampling requirements. The purge/no purge options are described below.

- *Multiple Volume Purge:* Traditional well purging technique that relies on the withdrawal of the volume of the well bore and the surrounding filter pack (if present); three to five well volumes are typically removed using pumps or bailers. This methodology relies on equipment that is easy to obtain and use and is generally accepted in most states as an appropriate purging method.
- *Temporary Well Purge:* A variation of the multiple volume purge technique that often uses inertia lift pumps, peristaltic pumps, or bailers to remove water from a temporary well or discrete groundwater sampler (e.g., a groundwater profiler or direct-push screen point sampler). This is a less stringent technique that is typically done to minimize the turbidity of the samples, which can be high due to the lack of a well filter pack.
- *Private Water Well or In-Place Plumbing Purge:* A variation on the multiple volume purge technique whereby a tap or faucet is opened on a fixed water supply pipe and is allowed to remain open until the potentially stagnant water within the well casing and other components of the system (e.g., fixed piping, pressure tanks, etc.) has been removed and groundwater representative of the water-bearing zone is discharged at the tap.
- *Low Flow (Minimal Drawdown/Low Stress) Purge (and Sampling):* A modified purging technique that establishes an isolated, discrete, horizontal flow zone directly adjacent to the pump intake; this method requires the pump to be placed within a screened-interval or open borehole. Pumping rates are typically 0.1 to 0.5 liters per minute (l/min) or less to minimize the stress on the surrounding formation and reduce the geochemical alteration of the groundwater caused by pumping.
- *No-Purge/Passive Sampling Techniques:* These techniques use specialized equipment, such as trap-style samplers or permeable diffusion bags, to sample the undisturbed water column within a screened interval or open borehole. This methodology assumes that the water in the well is representative of the surrounding formation. This approach is well suited for some volatile organic compounds (VOCs), metals, and hydrophobic compounds, depending on the sampling device used.

11.8.1 CALCULATING ONE PURGE VOLUME

Multiple volume purging techniques require that a ***minimum*** of three well volumes of water must be removed before sample collection. The actual amount of water removed may be greater than the three volumes, depending on geochemical parameter stabilization (the field measurement of these parameters is discussed below).

Calculate the volume of water in a well or boring using the following equation:

$$\textbf{Volume (gallons)} = (\textbf{TD} - \textbf{DTW}) \times \textbf{ID}^2 \times \textbf{0.041}$$

where:

TD = total depth (feet)

DTW = depth to water (feet)

ID = inner diameter (inches)

Alternately, the volume of water in a well or boring may also be calculated by multiplying the water column height by the gallons per foot of water for the appropriate well or boring diameter:

ID	Gallons per foot of water	Gallons per three water columns
1-inch	0.04	0.12
2-inch	0.16	0.48
3-inch	0.37	1.11
4-inch	0.65	1.98

Calculate the total volume of the pump, associated tubing and container for in situ measurements (flow-through cell), using the following equation:

Volume (in gallons) = P + ((0.0041)*D2*L) + fc

where:

P = volume of pump (gallons)
D = tubing diameter (inches)
L = length of tubing (feet)
fc = volume of flow-through cell (gallons)

11.8.2 MULTIPLE VOLUME PURGE PROCEDURES

Begin purging at a rate that will not cause excessive turbulence and drawdown in the well; commonly less than 1 gallon per minute for a typical 2-inch diameter monitoring well. You may need to observe the water elevation after the pump is started and adjust the flow rate to minimize the amount of drawdown in the well casing. The objective is to remove the stagnant water in the casing and surrounding filter pack or open borehole allowing water from the surrounding water-bearing zone to enter the well for sampling with as little disturbance as possible. Excessive pump rates or well dewatering can result in higher turbidity, potential volatilization, and geochemical alteration of dissolved parameters.

Typically collect geochemical parameters (i.e., pH, specific conductance, dissolved oxygen [DO], oxygen-reduction potential [ORP], and temperature) at a minimum frequency of once for every well volume of water removed during the purge process. Record the measurements in the field book along with any other pertinent details, such as the visual quality of the water (e.g., color, odor, and presence of suspended particulates) and the approximate withdrawal rate (this can be estimated using a calibrated container and stopwatch). Review the geochemical measurements to ensure that readings have stabilized (after the minimum purge volume has been achieved). This is a proxy for determining that you are purging formation water rather than potentially stagnant water in the casing. Stabilization occurs when at least three consecutive measurements are within the following tolerances:

Multiple Volume Purge Stabilization Parameters	
pH	± 0.1 standard units (SU)
Specific Conductance	± 3%
Temperature	± 3%
Dissolved Oxygen (DO)	± 0.2 milligrams per liter (mg/l) or 10% (flow-through cell only)
Turbidity	± 10% for values greater than 10 nephelometric turbidity units (NTU)
Oxygen Reduction Potential (ORP)	± 10 millivolts (mV; flow-through cell only)

Parameter stabilization that does not occur within five well volumes may require you consult your project manager to decide whether to collect a sample or to continue purging. Wells with extremely slow recharge may also be problematic. Purging these wells, in some cases, may result in dewatering the well before the minimum purge can be completed. Allow wells or borings purged dry to recharge to a level of approximately 90% of the static (pre-purge) water elevation and proceed immediately to sample collection. If recovery exceeds 2 hours, sample as soon as sufficient sample volume is available, in accordance with applicable regulations.

11.8.3 LOW FLOW PURGE PROCEDURES

Low flow purging and sampling is used to obtain representative groundwater samples without removing all the water within the well. The protocol uses relatively low pumping rates (i.e., less than 0.5 l/min) to establish an isolated zone around the inlet of the pump where flow is horizontal (i.e., from the water bearing zone) rather than from the stagnant water in the well casing above and below the pump. Selection of an appropriate pump is critical to establishing the flow zone: it must be well suited for both low pumping rates and the analytes being sampled. Bailers are not appropriate for low flow sampling.

The set-up for low flow sampling includes positioning the pump at the appropriate depth within the casing such that the pump inlet is within the screened section of the well. Slowly lower the pump, where appropriate, and tubing into the water column to avoid agitating the water column; use of a lanyard is recommended (i.e., do not use the extraction tubing to lift or lower the pump). Secure the pump and/or tubing at the wellhead once the specified sampling depth has been achieved and record the depth in the field book. Avoid contacting the bottom of the well by using pre-cut tubing at the appropriate length or by lowering the pump/tubing simultaneously with an electronic water level indicator. Once the pump/tubing has been inserted and secured, allow the water levels to return to static conditions before initiating the purge.

The discharge tubing must be connected to an in-line flow-through cell equipped with a multi-parameter real-time water quality meter. The flow-through cell minimizes the exposure of the groundwater to ambient air, which can influence DO and ORP measurements.

Start the pump and maintain a steady flow rate that results in a stabilized water level (less than 0.3 feet of drawdown or as specified in the project-specific work plan). The pumping rate may need to be adjusted depending on the response of the water levels in the well. Record each adjustment made to the pumping rate and the water level measured immediately after each adjustment. Purging should not exceed 0.5 l/min.

During purging, monitor and record the flow rate and geochemical parameters at 30 seconds to 5-minute intervals (depending on the hydraulic conductivity of the aquifer, diameter of the well, and pumping rate). Stabilization occurs once the following criteria have been met over three successive measurements made at least three minutes apart:

Low Flow Purge Stabilization Parameters	
Water Level Drawdown	<0.3 feet
pH	± 0.1 SU
Specific Conductance	± 3%
Temperature	± 3%
DO	± 0.2 mg/l or 10% (flow-through cell only)
Turbidity	± 10% for values greater than 10 NTU
ORP	± 10 mV (flow-through cell only)

Record any other notable observations in the field book (e.g., groundwater color).

11.8.4 NO-PURGE SAMPLING TECHNIQUES

Several alternate sampling devices are available, such as equilibrated grab samplers, passive diffusion samplers, and other in situ sampling devices, that will allow sample collection without purging the well. These devices may be particularly useful for sampling low permeability geologic materials, assuming the device is made of materials compatible with the analytical parameters, meets data quality objectives, and has been properly evaluated.

No-purge grab or trap samplers are placed in the well before sampling and typically remain closed (i.e., no water is allowed into the sampler during insertion) until the sampler is activated. This allows the sampler device to equilibrate with the surrounding groundwater (to prevent adsorption to the sampler materials) and for the groundwater to recover and re-establish the natural flow after the disturbance caused by the sampler insertion into the well. Typical equilibration times depend on the well recovery rates and the type of sampler used. Samples recovered using the no-purge devices are either transferred to containers at the well head or the sampler itself is shipped to the laboratory for analysis. Examples of equilibrated grab samplers include HydraSleeve™, Snap Sampler™, and Kemmerer samplers.

Equilibration time for diffusion samplers are generally dictated by the diffusion rate through the permeable membrane and, thus, are less sensitive to changes induced within the well during deployment. Most diffusion bag samplers have a minimum equilibration time of 14 days prior to sample collection. The samplers may be deployed for an extended period (e.g., three months or longer), although the continuous exchange between the sampler and the well water means that the sampler will likely reflect only the conditions in the few days preceding the sample collection.

11.8.5 TEMPORARY WELL PURGE PROCEDURES

Procedures used to purge temporary groundwater monitoring wells differ from permanent wells because temporary wells are installed for immediate sample acquisition. Wells of this type may include open bedrock boreholes, standard polyvinyl chloride well screen and riser placed in open boreholes, or drilling rod-based sampling devices (e.g., Wellpoint®, Geoprobe® screen point or Hydropunch® samplers). Purging temporary wells of this type may not be necessary because stagnant water is typically not present. However, if water is used in the drilling process, purging would be necessary. Purging can minimize the turbidity in the sample, which can be significant due to the disturbance caused by the sampler installation and to rinse the sampling system with groundwater. The exception is for groundwater profiling applications (e.g., using a Waterloo Profiler®) where a more rigorous purge is used (using the multiple volume purge techniques described above) to limit the potential for cross-contamination between sample intervals.

11.8.6 PRIVATE WATER WELL OR IN-PLACE PLUMBING PURGE PROCEDURES

The configuration and construction of private water wells varies widely and access points for obtaining groundwater samples may be limited. WSP personnel should coordinate with the property owner or site representative to access functioning ports and valves to avoid causing any inadvertent damage.

Collect the groundwater sample as close to the well as possible (e.g., from a sample port at the well head) to ensure the sample is representative. Ideally, the sample should be collected upstream of the piping and treatment equipment (e.g., particulate filter, water softener, carbon filters, ultra-violet lights), heating unit, or storage tanks. The following potential sampling locations are presented in order of preference:

- Sampling port or spigot near the well head or piping system prior to entry into the storage tank
- Sampling port or spigot at storage tank
- Sampling port or spigot downstream of the pressure tank or holding tank but upstream of any water treatment equipment
- Tap or faucet

If purging from a tap or faucet, try to remove any aerators, filters, or other devices from the tap before purging and work with the property owner or site representative to bypass any water treatment systems. Document where the sample was collected and any steps that were taken to minimize the potential alteration of the water sample in the field book.

Purge the system by opening the tap or spigot and allowing the water to run for several minutes. Observe and record the purge rate for the system. The minimum purge volume must be more than the combined volume of the pump, tanks, piping, etc. Review the geochemical measurements (after the minimum purge volume has been removed) to ensure that readings have stabilized using the same procedures as those used for the multiple volume purge detailed above. Purge the system for a minimum of 15 minutes if the minimum volume is unknown. Sample only after the geochemistry parameters have stabilized and no there are no suspended particles (e.g., iron or rust) visible. Record the final purge volume in the field book and any water quality observations.

11.9 GROUNDWATER SAMPLE COLLECTION PROCEDURES

Collect groundwater samples as soon as possible after the geochemical parameters indicate representative groundwater is present. As practically possible, reduce the pump flow rate, but maintain a flow rate high enough to deliver a smooth stream of water without splashing or undue agitation. Collect samples directly from the tubing as it exits the well bore; do not sample on the downstream side of flow-through cells or any other instrumentation. If using a bailer for sample collection, lower and raise the bailer slowly and smoothly to minimize the disturbance to the water within the well.

Collect groundwater samples in order of volatilization sensitivity with organic compounds sampled first followed by inorganic compounds:

- VOCs
- Extractable organics, petroleum hydrocarbons, aggregate organics, and oil and grease
- Per- and Polyfluoroalkyl substances
- Total metals
- Dissolved metals (see filtering procedures below)
- Inorganic non-metallic and physical and aggregate properties
- Microbiological samples
- Radionuclides

Collect quality assurance/quality control samples in accordance with SOP 4 and the project-specific work plan or QAPP.

As necessary, conduct field tests or screening in accordance with the project-specific work plan and manufacturer's specifications for field testing equipment. Field samples must be directly transferred from the sampling equipment to the container that has been specifically prepared for that given parameter; intermediate containers should be avoided. If field chemical preservation is required, check the pH preservation by pouring a small portion of sample onto a pH test strip Adjust pH with additional preservative, if necessary.

Record the sample depth interval, if applicable, in the field book. Note the volume, phases, odor, and color of the groundwater.

11.9.1 GROUNDWATER FILTRATION PROCEDURES

Filtered groundwater samples are sometimes used for field kit analyses and should only be collected for laboratory analysis after approval from the appropriate regulatory agency or project manager. The filtered samples can be collected by attaching the in-line filter directly to the outlet tubing for a pressurized bailer, a submersible pump or a peristaltic pump. Intermediate containers can be used with a peristaltic pump if the well is too deep to use the pump to recover the sample directly. The intermediate container should be unpreserved laboratory-supplied glassware to avoid any cross-contamination during the filtering process.

Filtered samples using pumps should use the following procedures:

- Use a variable speed peristaltic pump with the in-line filter fitted on the outlet end of the tubing and the pump inlet tubing into the intermediate container holding the unpreserved groundwater sample; or,
- If a submersible pump is used to collect the groundwater sample, attached the in-line filter to the outlet end of the tubing (do not allow the groundwater to pass through flow-through cells or any other instrumentation while sampling)

Once the filter is connected:

- Turn on the pump and maintain a flow rate high enough to deliver a smooth stream of water without splashing or undue agitation. Hold the filter upright with the inlet and outlet in the vertical position and pump groundwater through the filter until all atmospheric oxygen has been removed and the minimum volume of water has been flushed through the filter, in accordance with the manufacturer's specifications
- Collect the filtered samples by placing the filtered output directly into the sample container
- If sediment is visible in the sample container after filtration, filter break-through has occurred and the sampling and filtering process should be repeated
- Discard the tubing and filter appropriately

Record sample filtration in the field book.

11.9.2 NON-AQUEOUS PHASE LIQUID SAMPLING PROCEDURES

Non-aqueous phase liquid is typically sampled to identify the compound, usually through an analytical "fingerprint" analysis. If samples are to be collected, the sampling options and techniques should be discussed with the assigned WSP compliance professional and project manager to ensure that the NAPL is either not considered to be a hazardous material for shipping to the laboratory or is properly shipped by qualified personnel using appropriate shipping containers (SOP 3). Samples of NAPL should be collected using the same procedures as above and placed in the appropriate laboratory-supplied containers, packed on ice, and shipped to the analytical laboratory using procedures outlined in SOP 3.

11.9.3 SAMPLE LABELING AND PREPARATION FOR SHIPMENT

Groundwater samples for offsite laboratory analysis should be prepared as follows:

1. Clean the outside of the sample container, if necessary
2. Affix a sample tag or label to each sample container and complete all required information (sample number, date, time, sampler's initials, analysis, preservatives, place of collection)
3. Place clear tape over the tag or label (if non-waterproof labels are used), as needed
4. If needed, preserve samples immediately after collection by placing them into an insulated cooler filled with bagged wet ice to maintain a temperature of approximately 4°Celcius
5. Record the sample designation, date, time, and the sampler's initials in the field book and on a sample tracking form, if appropriate
6. Complete the chain-of-custody forms with appropriate sampling information, including:
   - location
   - sample name
   - sample collection date and time
   - number of sample containers

- analytical method
- field filtration status

7 Secure the sample packing and shipping in accordance with proper procedures

Do not ship hazardous waste samples without first consulting a WSP compliance professional.

11.10 CLOSING NOTES

Secure and restore the site once sampling is completed. This may include locking permanent monitoring wells, staging the IDW, and disposing of (in conformance with applicable regulations) sampling expendables, such as plastic sheeting, tubing, and PPE. All locations where temporary wells or other sampling devices (e.g., profilers or direct-push equipment) should be marked with spray paint, stakes, or other appropriate method for future reference or survey, including collecting Global Positioning System coordinates and photographs, in accordance with the project-specific work plan. Decontaminate all equipment prior to departure and properly manage all PPE and investigation-derived wastes in conformance with SOP 6, the project-specific work plan, and applicable regulations.

FIELD STANDARD OPERATING PROCEDURE #17

WASTE SAMPLING PROCEDURES FOR SOLID MATERIAL

Solid waste sampling procedures outlined in this standard operating procedure (SOP) are designed to ensure that samples are representative of the waste. Solid or semi-solid waste materials are commonly stored or staged in open (e.g., waste piles, outfalls, surface impoundments) or closed units (e.g., drums, tanks and associated ancillary equipment, containers, sumps). Solid waste samples can be collected for onsite screening or for laboratory analysis. The user is advised to read the entire SOP and review the site health and safety plan (HASP) and/or project safety plan (PSP) before beginning any onsite activities. In accordance with the HASP or PSP, proper personal protective equipment (PPE) must be selected and used appropriately.

17.1 ACRONYMS AND ABBREVIATIONS

ºF	degrees Fahrenheit
HASP	health and safety plan
IDW	investigation-derived waste
NAPL	non-aqueous phase liquid
PID	photoionization detector
PPE	personal protective equipment
PSP	project safety plan
QAPP	quality assurance project plan
QA/QC	quality assurance/quality control
SOP	standard operating procedure
VOC	volatile organic compounds

17.2 MATERIALS

- Field book
- PPE
- Air quality monitoring equipment (e.g., photoionization detector [PID]), as needed
- Field test kits, as needed
- Sample bottles, labels, indelible markers, and clear tape
- Expanding ruler or tape measure
- Solid waste sampler (e.g., trowels, shovels, spoons, bucket auger, sludge judge, dredge)
- Mixing tray or bowl, as needed
- Decontamination supplies

17.3 PRECONDITIONS AND BACKGROUND

This SOP has been prepared as part of the company's Environmental Quality Management Plan and is designed to provide detailed procedures for common field practices. Compliance with the methods presented in this document is mandatory for all field personnel and will ensure that the tasks are performed in a safe and consistent manner, are in accordance with federal and state guidance, and are technically defensible.

This SOP is written for the sole use of company employees and will be revised periodically to reflect updates to company policies, work practices, and the applicable state and/or federal guidance. Employees must verify that this document is the most recent version of the company SOPs. Employees are also strongly advised to review relevant state and/or federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

WSP requires that all personnel performing specific project assignments be appropriately qualified, including having required certifications or licenses, and properly trained in accordance with the requirements of their assignment, the Environmental Service Line's field SOPs, and the Quality Management System.

This SOP is designed to provide the user with a general outline for conducting waste material sampling and assumes the user is familiar with basic field procedures, such as recording field notes (SOP 1), utility location (SOP 2), sample shipment procedures (SOP 3), sample collection and quality assurance procedures (SOP 4), investigation-derived waste (IDW) management procedures (SOP 5), equipment decontamination (SOP 6), use and calibration of all sampling and monitoring equipment (SOPs 7 and 8), and waste water sampling (SOP 18). This SOP does not cover waste storage, waste characterization, or waste profiling, nor does it cover the evaluation of the analytical results. These topics are more appropriately addressed in a project-specific work plan. Before sampling, be sure to review the project-specific work plan or quality assurance project plan (QAPP) and any applicable state and federal guidelines or sampling procedures.

Consult and involve the company's compliance professionals during all phases of waste sampling. Do not ship samples which could be classified as hazardous waste without first consulting a company compliance professional.

All sampling and monitoring references must be available for consultation in the field, including:

- Company SOPs
- Applicable state and federal guidelines or sampling procedures
- Manufacturer's manuals
- Project-specific work plan, PSP and/or HASP and QAPP

17.4 GENERAL PROCEDURES

Solid waste sampling presents a number of unique challenges for safe collection due to the potentially hazardous environment(s) where waste materials are located. Sampling of closed waste containers (e.g., drums, tanks) is considered a higher hazard risk because of the potential of exposure to toxic gases, internal pressure, or flammable/explosive atmospheres. Due to these potential hazards, proper safety precautions (e.g., monitoring, venting, and grounding) must be employed during opening and sampling of waste containers. Follow the appropriate safety requirements stipulated in the HASP. Do not bodily enter tanks, sumps, or pipes, such as storm sewers or other drainage conveyances, during sample collection.

Employees are not authorized to open closed units that are unlabeled or contain unknown contents.

Each sampling situation will have unique set of equipment requirements and techniques. The selected equipment and procedures are project-specific and should be discussed by the praoject team, including the assigned compliance professional, before arriving onsite. All types of solid waste sampling, however, regardless of the equipment used, share common handling and management procedures that are designed to ensure the integrity of the samples collected. These procedures include:

- The use of new, disposable or decontaminated sampling equipment
- The use and rotation of the appropriate PPE
- Selection of a suitable sampling location and staging area

Wear a clean pair of new, disposable gloves each time a different sample is collected and don the gloves immediately prior to collection. This limits the possibility of cross-contamination from accidental contact with gloves soiled during collection of the previous sample. The gloves must not come in contact with the medium being sampled and must be changed any time during sample collection when their cleanliness is compromised. ***Gloved hands should not be used as a sampling device; always use the appropriate equipment to move the sample from the sampling device to the laboratory-supplied containers.***

17.4.1 EQUIPMENT SELECTION

Collect all samples using either new, disposable equipment, or properly decontaminated sampling equipment. Common waste sampling equipment includes trowels, shovels, spoons and bucket augers. Follow the manufacturer's operation manual for proper sampling procedures. Solid waste sampling equipment should be selected based on the analytical requirements of the project and the project-specific conditions likely to be encountered. The equipment should be constructed of non-reactive, non-leachable materials (e.g., stainless steel, Teflon®, Teflon®-coated steel, polyethylene, polypropylene) which are compatible with the chemical constituents at the site. Extension rods or other appropriate devices can be used, as necessary, to allow the sample to be collected at a distance (or through deeper water) to minimize the risk to the sampler. When choosing sampling equipment, give consideration to:

- the type and location of the waste unit
- the required depth of the sample
- the volume of sample required
- the analytes of interest

Select the decontamination procedures based on the types of sampling to be performed and media encountered; decontamination may require multiple steps or differing cleaning methods, depending on the sampling objectives and media encountered (see SOP 6 for decontamination procedures). In no case should disposable, single use materials be used to collect more than one sample.

17.4.2 SAMPLING CONSIDERATIONS

In preparing for sampling, you should perform the following activities (with all observations and measurements noted in the field book):

- Perform a quick reconnaissance of the site to identify sampling locations and evaluate the accessibility to the waste unit, including ladders or stairs, and ensure that proper grounding is present, if needed.
- Record the approximate ambient air temperature, precipitation, wind (direction and speed), tide, and other field conditions in the field book. In addition, any site-specific conditions or situations that could potentially affect the samples at the sample locations should be recorded.
- Record sample locations with respect to approximate distance to and direction from at least one permanent feature and/or description of the waste unit (e.g., type, capacity, markings, condition, and contents).
- Survey the breathing zone around the sampling location with the appropriate air quality meter(s), as necessary (see HASP), to ensure that the level of PPE is appropriate.

When sampling, it is important to find a suitable sampling location away from any sources of cross-contamination that could compromise the integrity of the samples. Consider the following:

- Position the sample collection area away from fuel-powered equipment, such as drill rigs or excavators, and upwind of other site activities (e.g., purging, sampling, decontamination) that could influence the sample. This is particularly important when screening samples in the field for volatile organic compounds (VOCs) with a PID, but should not be limited to the active sample collection.
- If wastewater samples are being collected from the same location or vessel, collect the wastewater samples first to avoid disturbing the bottom and suspending solid waste in the water column (see SOP 18 for waste water sampling procedures).
- Store samples already collected from the field for laboratory analysis in clean containers and securely stage, if possible, in an uncontaminated area of the site.

17.4.3 SAFETY CONSIDERATIONS

Solid waste sampling may present a number of unique challenges for safe collection. Solid waste materials are frequently heterogeneous due to the physical characteristics of the matrix (e.g., particle size, viscosity), the distribution of hazardous constituents within the matrix, or the manner in which the material was managed or disposed. Because waste often stratifies over time due to different densities of phases, settling of solids, or varying wastes generated at different times, both solid and liquid waste samples may need to be collected (see SOP 18 for waste water sampling procedures).

Before opening, visually inspect all waste units for the following:

- pressurization (bulging/dimples)
- crystals formed around the drum opening
- leaks, holes, stains
- labels, markings, hazardous warnings, potential shock sensitivity (as indicated by contents listed on waste label)
- composition and type (steel/polyethylene/polypropylene and open/bung)
- dead vegetation around drum
- condition, age, rust
- sampling accessibility (including a determination if it qualifies as a confined space)

Caution should be exercised when :

- Opening closed waste containers, such as sealed drums, because of the potential pressurization and presence of explosive/flammable gases and/or toxic vapors.
- Sampling in situ wastes (e.g., landfills) because of the potential presence of explosive/flammable gases or toxic vapors.
- Sampling stockpiled waste or the surface of a waste disposal unit may not be stable and could present an engulfment hazard.

Waste containers showing evidence of pressurization and/or crystals must be furthered assessed to determine if remote opening is needed.

If containers cannot be accessed for sampling, heavy equipment may be necessary to stage the containers before sampling. Adequate time should be allowed for the contents to stabilize after a container is handled.

A grounding strap must be used when sampling metal waste containers, such as 55-gallon steel drums, due to the potential presence of explosive/flammable gases. First attach a grounding strap, then touch the waste container opening with a gloved hand and allow an electrically conductive path to form, as appropriate. Using spark-resistant tools, slowly open the waste container (e.g., vents, pressure release valves, bung or drum ring and/or lid) to allow the unit to vent to the atmosphere. Do not attempt to use a manual bung wrench or de-header on drums that potentially contain shock-sensitive, reactive, explosive or flammable materials. Once sampling is complete, (re)seal the waste container in accordance with the manufacturer's instructions.

Do not bodily enter containers, such as roll off boxes, or pipes, such as storm sewers or other drainage conduits, during sample collection as these may be considered confined spaces.

Heavy equipment may also be necessary to collect samples from inaccessible locations (e.g., excavator bucket used to collect sample from an excavation pit).

Employees are not authorized to sample surface impoundments used to manage wastes from a boat; all sampling should be conducted from the banks or piers of surface impoundments.

Employees are not authorized to open closed units that are unlabeled or contain unknown contents.

17.5 SOLID WASTE SAMPLE COLLECTION PROCEDURES

There are two primary types of solid waste samples: grab samples and composite (a sample composited from several locations collected concurrently) samples. Refer to the project-specific work plan for prescribed sampling methods.

Push or drive the method-specific decontaminated or disposable sampling equipment (e.g., trowel, spoon) into the solid waste materials to the desired sampling depth. Slowly retrieve the sample, and transfer to the sample containers. Samples collected from an excavator bucket should be taken from the center of the material to ensure material is representative of the desired sampling interval. Occasionally solid waste materials lack cohesiveness and are subject to falling out of the sampler. The use of core catchers on the leading end of the sampler may help retain the sample until it is retrieved to the surface; core catchers must be evaluated for compatibility with the proposed analytical program before use.

For investigation-releated sampling activities, dedicated samplers, if used, or the waste materials themselves, should be placed on plastic sheeting (for logging) in a consistent manner such that the orientation of the sample (i.e., which end is "up") and the depth

interval is readily apparent to the sampling personnel. Measure the length of the material recovered relative to the interval the sampler was advanced in percent notation (e.g., 75%) or as a fraction of the total length of the sample interval (e.g., [3/4] indicating 3 out of 4 feet) and record this information in the field book. Record the depth interval through which the sampler was advanced in the field book. Note the state, quantity, phases, and color of the solid waste in the field book. If field screening for organic vapors is required, break or cut the waste every 3 to 4 inches and quickly scan the breaks in the core material with the appropriate air quality monitoring equipment (e.g., PID) and record the readings and approximate depth in the field book. These measurements can be used to select appropriate waste samples for VOC or headspace analysis, if required (see procedures below). Should any sample location require a vertical or horizontal offset from the proposed location, indicate the reason and record the actual sample location in the field book.

If a liquid sample is not required, decant liquid into a separate container or back into the vessel being sampled. If a liquid sample is required, decant any liquid directly into sample containers (see SOP 18). If necessary, collect additional waste material to provide sufficient sample volume.

17.5.1 UNDISTURBED SAMPLE COLLECTION

Undisturbed waste material samples collected for geotechnical parameters (e.g., porosity, permeability) generally require the use of specialized undisturbed sampling equipment (e.g., Shelby tube or sealed Geoprobe® liner) and collection procedures. The sampling device, once retrieved, is typically capped or sealed (to maintain the sample in its relatively undisturbed state), labeled with the sample name, orientation of the sample (i.e., top and bottom), depth interval, and shipped to the appropriate geotechnical laboratory. Follow sample labeling, preparation, and shipping procedures in SOPs 3 and 4.

17.5.2 VOLATILE ORGANIC COMPOUND SAMPLING

Analytical samples for VOC analysis should be collected **immediately** after screening with the PID to avoid volatilization of constituents to the atmosphere. Transfer the waste material from the center portion of the sample interval directly into the sample containers; **do not homogenize waste materials for VOC analysis**. Collect the sample such that no headspace is present above the waste material when the cover is placed on the container. If sampling by US Environmental Protection Agency Method 5035 is required, follow manufacturer's specifications to use a closed-system sampler (e.g., Encore® samplers). Collect quality assurance/quality control (QA/QC) samples, if appropriate, in accordance with SOP 4, the project-specific work plan, and the QAPP.

17.5.3 HEADSPACE ANALYSIS

Collect samples for field-based headspace analysis, if required by the project-specific work plan, **after collecting the VOC samples**. First, examine the contents of the sample and remove coarse gravel, organic material (e.g., roots, grass, and woody material) and any other debris. Collect the sample using decontaminated spoons or trowels and seal it in a heavy-duty zipper-style plastic bag. Label the sample indicating the sampling location, depth, and date. Shake the sample vigorously for approximately 15 seconds to disaggregate the sample and expose as much surface area of the material as possible (to release the VOCs to the atmosphere within the bag). If necessary, warm the sample to room temperature (70º Fahrenheit, ºF) by placing the bag in a heated room or vehicle. This step is very important when the ambient temperature is below 32 ºF.

VOCs, if present, will volatilize into the sealed bag. Allow the bag to stand (to achieve equilibrium) for approximately 15 minutes. Carefully open the bag slightly and place the tip of the PID into the opening. Do not insert the tip of the probe into the waste material and avoid the uptake of water droplets. Record the highest meter response. Erratic PID response may result from high organic vapor concentrations or elevated headspace moisture. If these conditions exist, qualify the headspace data in the field book. It is also important to record the ambient temperature, humidity, and whether moisture was present in the plastic bag. Duplicate 10% of the headspace samples by collecting two samples from the same location. Generally, duplicate sample values should be consistent to ±20%. Samples collected for headspace screening cannot be retained for laboratory analysis.

17.5.4 SEMI- AND NON-VOLATILE ANALYTICAL SAMPLE COLLECTION

Collect remaining organic samples then inorganic samples in the following order of volatilization sensitivity:

- Extractable organics, petroleum hydrocarbons, aggregate organics, and oil and grease
- Metals
- Inorganic non-metallic and physical and aggregate properties
- Microbiological samples
- Radionuclides

If homogenization is required in order to produce a sample representative of the waste material, mix the soils (using stainless steel bowls and spoons, or other appropriate equipment) to a homogeneous particle size and texture. Transfer the soils from the sampler or mixing bowl to the sample container using a decontaminated or dedicated stainless steel spoon or spatula. Collect QA/QC samples in accordance with SOP 4, the project-specific work plan, and the QAPP. If approved by the appropriate regulatory agency and specified in the project-specific work plan, composite samples can be collected to minimize the total number of analytical samples. Composite samples consist of equal aliquots (same sample size) of waste material from each location being sampled (e.g., from multiple areas of a soil pile), by mixing the waste to a homogeneous particle size and texture using new or decontaminated stainless steel bowls and a stainless steel spoon or trowel. Transfer the contents to the appropriate laboratory-supplied sample container using a stainless steel spoon. Collect QA/QC samples, if appropriate, in accordance with SOP 4, the project-specific work plan, and the QAPP.

Interstitial water, or pore water, is the water occupying the space between solid particles. It can be isolated to provide either a matrix for toxicity testing or an indication of the concentration and partitioning of contaminants with a solid matrix. Pore water samples may be collected in the field using any available technology that will preserve the integrity of the analytes of interest during collection (e.g., lysimeter) or extracted in the laboratory from field-collected waste. The substrate type will dictate the volume of sample needed. In all cases, consult the laboratory conducting the analyses to provide estimates of the amount of sample necessary to obtain the desired quantity of pore water.

If necessary, conduct field tests or screening of waste materials in accordance with the project-specific work plan and manufacturer's specifications for field testing equipment.

17.5.5 NON-AQUEOUS PHASE LIQUID SAMPLING PROCEDURES

Non-aqueous phase liquids (NAPL) may be encountered in solid waste units. If NAPL samples are required, the sampling options and techniques should be discussed with the assigned compliance professional and project manager to ensure that the NAPL is not considered to be a hazardous material for the purpose of shipping to the laboratory (SOP 3). Samples of NAPL should be collected using the same procedures as above and placed in the appropriate laboratory-supplied containers, packed on ice, and shipped to the analytical laboratory using procedures outlined in SOP 3.

17.5.6 SAMPLE LABELING AND PREPARATION FOR SHIPMENT

Once collected, prepare the waste samples for offsite laboratory analysis:

1. Clean the outside of the sample container with paper towels or appropriate materials, if necessary
2. Affix a sample tag or label to each sample container and complete all required information (sample number, date, time, depth interval, sampler's initials, analysis, preservatives, place of collection)
3. Place clear tape over the tag or label (if non-waterproof labels are used)
4. Preserve samples immediately after collection by placing them into an insulated cooler filled with bagged wet ice to maintain a temperature of approximately 4°Celcius
5. Record the sample designation, date, time, depth interval, and the sampler's initials in the field book and on a sample tracking form, if appropriate
6. Complete the chain-of-custody forms with appropriate sampling information, including:
   - Location

- Sample name
- Sample collection date and time
- Number of sample containers
- Analytical method

7 Complete sample packing and ship in accordance with proper procedures

Do not ship samples which could be classified as hazardous waste without first consulting a compliance professional.

17.6 CLOSING NOTES

Once sampling is completed, secure the waste unit(s) in accordance with the project-specific work plan. If possible, restore and mark all sample locations with spray paint, stakes, or other appropriate marker for future reference or survey, including collecting Global Positioning System coordinates and photographs, in accordance with the project-specific work plan. Decontaminate all equipment prior to departure and properly manage all PPE and IDW in conformance with SOP 6, the project-specific work plan, and applicable regulations.

FIELD STANDARD OPERATING PROCEDURE #18

WASTEWATER SAMPLING PROCEDURES

Wastewater sampling procedures outlined in this standard operating procedure (SOP) are designed to ensure that samples are representative of the wastewater from which they were collected and that they have not been altered or contaminated by the sampling and handling methods. Wastewater samples are generally collected from influent or effluent waste streams at domestic and non-domestic facilities, including water treatment systems and outfalls (e.g., streams, rivers, ponds, lakes, canals, ditches, wetlands, lagoons, and estuaries); wastewater samples are also collected from liquids associated with solid waste materials. Wastewater samples can be collected for onsite screening or for laboratory analysis. The user is advised to read the entire SOP and review the site health and safety plan (HASP) and/or project safety plan (PSP) before beginning any onsite activities. In accordance with the HASP or PSP, proper personal protective equipment (PPE) must be selected and used appropriately.

18.1 ACRONYMS AND ABBREVIATIONS

HASP	Health and safety plan
IDW	Investigation-derived waste
NAPL	Non-aqueous phase liquid
PID	Photoionization detector
PPE	Personal protective equipment
PSP	Project safety plan
QAPP	Quality assurance project plan
QA/QC	Quality assurance/quality control
SOP	Standard operating procedure
VOC	Volatile organic compounds

18.2 MATERIALS

- Field book
- PPE
- Air quality monitoring equipment (e.g. photoionization detector [PID]) with calibration reagents and standards, as needed
- Electronic water level indicator or interface probe
- Water quality meter(s) with calibration reagents and standards
- Field test kits, as needed
- Sample bottles, labels, indelible markers, and clear tape
- Hip-waders or rubber boots, as needed
- Expanding ruler or tape measure
- Wastewater sampler (e.g., dipper, pump, bailer, composite sampler)
- Tubing, as needed
- In-line filter; variable-speed peristaltic pump or a submersible pump, as needed
- Lanyard materials, as needed
- Decontamination supplies

18.3 PRECONDITIONS AND BACKGROUND

This SOP has been prepared as part of the company's Environmental Quality Management Plan and is designed to provide detailed procedures for common field practices. Compliance with the methods presented in this document is mandatory for all field personnel and will ensure that the tasks are performed in a safe and consistent manner, are in accordance with federal and state guidance, and are technically defensible.

This SOP is written for the sole use of company employees and will be revised periodically to reflect updates to company policies, work practices, and the applicable state and/or federal guidance. Employees must verify that this document is the most recent version of the company SOPs. Employees are also strongly advised to review relevant state and/or federal guidance, which may stipulate program-specific procedures, in advance of task implementation.

WSP requires that all personnel performing specific project assignments be appropriately qualified, including having required certifications or licenses, and properly trained in accordance with the requirements of their assignment, the Environmental Service Line's field SOPs, and the Quality Management System.

This SOP is designed to provide the user with a general outline for conducting wastewater sampling and assumes the user is familiar with basic field procedures, such as recording field notes (SOP 1), sample shipment procedures (SOP 3), sample collection and quality assurance procedures (SOP 4), investigation-derived waste (IDW) management procedures (SOP 5), equipment decontamination (SOP 6), use and calibration of all sampling and monitoring equipment (SOPs 7 and 8), and solid waste sampling (SOP 17). This SOP does not cover investigation planning, waste storage, waste characterization, or waste profiling, nor does it cover the evaluation of the analytical results. These topics are more appropriately addressed in a project-specific work plan. Before sampling, be sure to review the project-specific work plan or quality assurance project plan (QAPP) and any applicable state and federal guidelines or sampling procedures.

Consult the company's compliance professionals during all phases of wastewater sampling. Do not ship hazardous waste samples without first consulting a company compliance professional.

All sampling and monitoring references must be available for consultation in the field, including:

- Company SOPs
- Applicable state and federal guidelines or sampling procedures
- Manufacturer's manuals
- Project-specific work plan, project safety plan and/or HASP, and QAPP

18.4 GENERAL PROCEDURES

Wastewater sampling presents a number of unique challenges for safe collection due to the potentially hazardous environment(s) where waste materials are located. Sampling of closed waste containers (e.g., drums, tanks) is considered a higher hazard risk because of the potential of exposure to toxic gases, internal pressure, or flammable/explosive atmospheres. The breathing zone must be monitored with the appropriate equipment when waste containers are opened for sampling to ensure that the safety of the work environment is not compromised. Follow the appropriate safety requirements stipulated in the HASP. Do not bodily enter tanks, sumps, or waste containers, or pipes, such as storm sewers or other drainage conveyances, during sample collection.

Company personnel are not authorized to open closed units that are unlabeled or contain unknown contents.

Each sampling situation will have a unique set of sampling equipment requirements and techniques. The selected equipment and procedures are project-specific and should be discussed by the project team, including the assigned compliance professional, before arriving onsite. All types of wastewater sampling, regardless of the equipment used, share common handling and management procedures that are designed to ensure the integrity of the samples collected. These procedures include:

- The use of new, disposable or decontaminated sampling equipment
- The use and rotation of the appropriate PPE
- Selection of a suitable sampling location and staging area

Wear a clean pair of new, disposable gloves each time a different sample is collected and don the gloves immediately prior to collection. This limits the possibility of cross-contamination from accidental contact with gloves soiled during collection of the previous sample. The gloves must not contact the medium being sampled and must be changed any time during sample collection when their cleanliness is compromised. ***Gloved hands should not be used as a sampling device; always use the appropriate equipment to move the sample from the sampling device to the laboratory-supplied containers.***

18.4.1 EQUIPMENT SELECTION

Collect all samples using either new, disposable equipment, or properly decontaminated sampling equipment. Common wastewater sampling equipment includes handheld tools (e.g., dippers, bailers), pumps, permanently-deployed automatic or manual composite samplers, or sampling ports. Follow the manufacturer's operation manual for proper sampling procedures. When choosing sampling equipment, give consideration to:

- the type and location of the waste unit
- the required depth of the sample
- the volume of sample required
- the analytes of interest

The equipment should be selected based on the analytical and project-specific requirements and should be constructed of non-reactive, non-leachable materials (e.g., stainless steel, Teflon®, Teflon®-coated steel, polyethylene, polypropylene) that are compatible with the chemical constituents at the site. Extension rods can be used, as necessary, to minimize the risk to the sampler by allowing the sample to be collected at a distance or through deeper water.

Select the decontamination procedures based on the types of sampling to be performed and media encountered; decontamination may require multiple steps or differing cleaning methods, depending on the sampling objectives and media encountered (see SOP 6 for decontamination procedures). In no case should disposable, single use materials be used to collect more than one sample.

18.4.2 SAMPLING CONSIDERATIONS

In preparation for sampling, you should perform the following activities (all observations and measurements noted in the field book):

- Perform a quick reconnaissance of the site to identify sampling locations and evaluate the accessibility to the waste unit, including ladders or stairs, and ensure that proper grounding is present, if needed.
- Record the approximate ambient air temperature, precipitation, wind (direction and speed), tide, and other field conditions in the field book. In addition, any site-specific conditions or situations that could potentially affect the samples at the sample locations should be recorded.
- Record sample locations with respect to approximate distance to and direction from at least one permanent feature.
- Describe the sampling location including width of discharge (or diameter of pipe), depth of discharge, water color and clarity (transparency), and approximate surface flow (e.g., slow, fast moving)
- Survey the breathing zone around the sampling location with the appropriate air quality meter(s), as necessary (see HASP), to ensure that the level of PPE is appropriate.

When sampling, it is important to find a suitable sampling location away from any sources of cross-contamination that could compromise the integrity of the samples. Consider the following:

- Position the sample collection area away from fuel-powered equipment, such as engines or generators, and upwind of other site activities (e.g., purging, sampling, decontamination) that could influence the sample. This is particularly important when screening samples in the field for volatile organic compounds (VOCs) with a PID, but should not be limited to the active sample collection.
- Establish a secure sample staging area in an uncontaminated area of the site.
- If solid waste or sediment samples are being collected from the same location or vessel, collect the wastewater samples first to avoid disturbing the bottom and suspending solid wastes or sediment in the water column.
- If collecting several wastewater samples from a linear water body with moving water (e.g., stream, ditch, pipe, or river), start sampling at the downstream location and progressively move upstream.

- Avoid wading into surface discharges, if possible, to avoid sediment suspension and potential cross-contamination; if not possible to avoid wading into the discharge for sample collection, use extreme caution and carefully approach the sample location to minimize disturbance of fine sediments.
- Field personnel should coordinate the sample collection with the property owner/representative for the safety of the field personnel, as well as to minimize potential interference with wastewater operations.
- If using watercraft, collect samples near the bow, away and upwind from any fuel powered equipment; orient the watercraft so that the bow is positioned in the upstream direction. This is particularly important when screening for VOCs with a PID, but should not be limited to the active sample collection.
- Store samples already collected from the field for laboratory analysis in clean containers in an ice-filled cooler (as required) and securely stage, if possible, in an uncontaminated area of the site.

18.4.3 SAFETY CONSIDERATIONS

Wastewater sampling may present a number of unique challenges. All water bodies, particularly those with moving water, are inherently dangerous and must be approached with caution. Steep embankments, loose footing, and the potential presence of subsurface hazards (or dangerous plants or wildlife, for some parts of the country) can lead to serious injury or even death.

Samplers must use appropriate safety equipment (as outlined in the project HASP), such as insulated waders, snake chaps, and flotation devices. If possible, avoid wading into wastewater streams. Be aware of weather conditions, tidal changes, or other events (e.g., a dam release), which may result in unexpectedly higher water, flow conditions, or temperature changes. Do not attempt to sample surface impoundments used to manage potentially hazardous wastes from a boat; all sampling should be conducted from the banks or piers of surface impoundments.

Employees are not authorized to sample surface impoundments used to manage wastes from a boat; all sampling should be conducted from the banks or piers of surface impoundments.

Company personnel are only authorized to open closed units that contain known contents.

Because waste often stratifies over time due to different densities of phases, settling of solids, or varying wastes generated at different times, both solid and liquid waste samples may need to be collected (see SOP 17 for solid and semi-solid waste material sampling procedures).

Before opening, visually inspect all waste units for the following:

- pressurization (bulging/dimples)
- crystals formed around the drum opening
- leaks, holes, stains
- labels, markings, hazardous warnings, potential shock sensitivity (as indicated by contents listed on waste label)
- composition and type (steel/polyethylene/polypropylene and open/bung)
- dead vegetation around drum
- condition, age, rust
- sampling accessibility (including a determination if it qualifies as a confined space)

Caution should be exercised when :

- Opening closed waste containers, such as sealed drums, because of the potential pressurization and presence of explosive/flammable gases and/or toxic vapors.
- Sampling in situ wastes (e.g., landfills) because of the potential presence of explosive/flammable gases or toxic vapors.
- Sampling stockpiled waste or the surface of a waste disposal unit may not be stable and could present an engulfment hazard.

Waste containers showing evidence of pressurization and/or crystals must be furthered assessed to determine if remote opening is needed.

If containers cannot be accessed for sampling, heavy equipment may be necessary to stage the containers before sampling. Adequate time should be allowed for the contents to stabilize after a container is handled.

A grounding strap must be used when sampling metal waste containers, such as 55-gallon steel drums, due to the potential presence of explosive/flammable gases. First attach a grounding strap, then touch the waste container opening with a gloved hand and allow an electrically conductive path to form, as appropriate. Using spark-resistant tools, slowly open the waste container (e.g., vents, pressure release valves, bung or drum ring and/or lid) to allow the unit to vent to the atmosphere. Do not attempt to use a manual bung wrench or de-header on drums that potentially contain shock-sensitive, reactive, explosive or flammable materials. Once sampling is complete, (re)seal the waste container in accordance with the manufacturer's instructions.

Do not bodily enter containers, such as roll off boxes, or pipes, such as storm sewers or other drainage conduits, during sample collection as these may be considered confined spaces.

Heavy equipment may also be necessary to collect samples from inaccessible locations (e.g., excavator bucket used to collect sample from an excavation pit).

18.5 WASTEWATER PURGING PROCEDURES

There are two primary types of wastewater samples: grab samples and composite samples. A grab sample is a single sample collected at one time, while a composite wastewater sample consists multiple temporal or spatially discrete samples combined and treated as a single sample. Refer to the project-specific work plan for prescribed sampling procedures, and refer to the manufacturer's specifications for sample collection equipment used.

Access points for obtaining waste water samples may be limited. Field personnel should coordinate with the property owner/representative to access functioning ports and valves to avoid causing any inadvertent damage.

If purging from a port, tap or faucet, try to remove any aerators, filters, or other devices from the tap before purging. Document where the sample was collected and any steps that were taken to minimize the potential alteration of the sample in the field book. Start to purge the system by opening the tap or spigot. Observe and record the wastewater purge rate, and continue the purge for 1 to 2 minutes to allow the settled solids to flush from the pipe, and then proceed with sample collection. Record in the field book:

- the total purge volume
- sample collection time; for composite samplers, also record the start and stop sample collection date and time for temporal composite samples, or sample locations for spatially discrete composite samples
- any water quality observations

18.6 WASTEWATER SAMPLE COLLECTION PROCEDURES

For locations without permanent samplers or ports, slowly lower the method-specific sampling vessel (e.g., dippers, sampling container) into the wastewater body to the desired sampling depth; Kemmerer, Niskin, Van Dorn, or similar samplers, pumps equipped with tubing, or double check valve bailers can be used to collect samples 12 inches or deeper below the water surface. Allow the wastewater to slowly enter the sampling vessel until the necessary sample volume has been collected. Once filled, slowly retrieve the sampling vessel at a slightly tilted angle in the upstream direction to minimize the disturbance. If necessary, collect additional wastewater to provide sufficient sample volume. Field samples must be directly transferred from the sampling equipment to the container that has been specifically prepared for that given parameter; avoid use of intermediate containers, unless filtration is required (see Section 18.6.1).

For sample collection with permanent samplers or ports, reduce the flow rate to maintain a flow rate high enough to deliver a smooth stream of wastewater without splashing or undue agitation.

Collect wastewater samples in order of volatilization sensitivity with organic compounds sampled first followed by inorganic compounds:

- VOCs (if possible, collect at a flow rate less than 100 milliliters per minute)
- Extractable organics, petroleum hydrocarbons, aggregate organics, and oil and grease
- Per- and Polyfluoroalkyl substances

- Total metals
- Dissolved metals (see filtering procedures below)
- Inorganic non-metallic and physical and aggregate properties
- Microbiological samples
- Radionuclides

Collect quality assurance/quality control samples in accordance with SOP 4 and the project-specific work plan or QAPP.

As necessary, conduct field tests or screening in accordance with the project-specific work plan and manufacturer's specifications for field testing equipment. Field samples must be directly transferred from the sampling equipment to the container that has been specifically prepared for that given parameter; intermediate containers should be avoided.

Record the sample depth interval, if applicable, in the field book. Note the volume, phases, and color of the wastewater in the field book.

18.6.1 WASTEWATER FILTRATION PROCEDURES

Filtered wastewater samples are sometimes used for laboratory or field kit analyses and should only be collected for laboratory analysis after approval from the appropriate regulatory agency and/or project manager. Wastewater filtration is typically done using a variable-speed peristaltic pump or a submersible pump with the in-line filter fitted on the outlet end of the attached tubing. If wastewater sample filtration is necessary, the following procedures should be followed:

1. Insert the pump inlet tubing in the surface water body or, if appropriate, into a laboratory-supplied intermediate container holding the surface water sample to be filtered
2. Turn on the pump; maintain a flow rate high enough to deliver a smooth stream of water but low enough to minimize splashing or undue agitation. Hold the filter upright with the inlet and outlet in the vertical position and pump surface water through the filter until all atmospheric oxygen has been removed and the minimum volume of water has been flushed through the filter, in accordance with the manufacturer's specifications
3. Collect the filtered samples directly into the laboratory-supplied sample container from the pump-filter assembly
4. If sediment is visible in the sample container after filtration, filter break-through has occurred and the sampling and filtering process should be repeated
5. Discard the tubing and filter appropriately

18.6.2 NON-AQUEOUS PHASE LIQUID SAMPLING PROCEDURES

Non-aqueous phase liquids (NAPL) are not typically collected from wastewater units. If NAPL samples are required, the sampling options and techniques should be discussed with the assigned compliance professional and project manager to ensure that the NAPL is not considered to be a hazardous material for the purpose of shipping to the laboratory (SOP 3). Samples of NAPL should be collected using the same procedures as above and placed in the appropriate laboratory-supplied containers, packed on ice, and shipped to the analytical laboratory using procedures outlined in SOP 3.

18.6.3 SAMPLE LABELING AND PREPARATION FOR SHIPMENT

Once collected, prepare the wastewater samples for offsite laboratory analysis:

1. Clean the outside of the sample container, if necessary
2. Affix a sample tag or label to each sample container and complete all required information (sample number, date, time, sampler's initials, analysis, preservatives, place of collection)
3. Place clear tape over the tag or label (if non-waterproof labels are used)
4. If needed, preserve samples immediately after collection by placing them into an insulated cooler filled with bagged wet ice to maintain a temperature of approximately 4°Celcius

5 Record the sample designation, date, time, and the sampler's initials in the field book and on a sample tracking form, if appropriate
6 Complete the chain-of-custody forms with appropriate sampling information, including:
   — location
   — sample name
   — sample collection date and time
   — number of sample containers
   — analytical method
7 Secure the sample packing and shipping in accordance with proper procedures

Do not ship hazardous waste samples without first consulting a WSP compliance professional.

18.7 CLOSING NOTES

Once sampling is completed, secure the wastewater unit(s) in accordance with the project-specific work plan. If possible, restore and mark all sample locations with spray paint, stakes, or other appropriate marker for future reference or survey, including collecting Global Positioning System coordinates and photographs, in accordance with the project-specific work plan. Decontaminate all equipment prior to departure and properly manage all PPE and IDW in conformance with SOP 6, the project-specific work plan, and applicable regulations.

APPENDIX

G LIQUID AND VAPOR GAC SPECIFICATIONS

TIGG 5CC 0408

Virgin Vapor Phase Coconut Based Activated Carbon

www.TIGG.com

DESCRIPTION

TIGG 5CC 0408 is a granular activated carbon made from coconut shell. The combination of high activity level and selective transport and adsorption pores accommodates adsorbates of varied molecular size. This activated carbon also contains the high energy adsorption pores which are vital to attaining ultra high removal of low molecular weight volatile organic compounds.

TYPICAL PROPERTIES	TIGG 5CC 0408
U.S. Sieve, 90 wt% min	4 x 8
CCl_4 Number, min	60
Iodine Number, mg/g, min	1150
Apparent Density, (dense packing)	
g/cc	0.41 – 0.42
lbs/ft^3	26
Moisture - wt% max (as packed)	3
Hardness No. - min	98

TYPICAL APPLICATIONS

This activated carbon can be used to:

- Capture solvents
- Remove VOC's from:
  - Tank vents
  - Air stripper off gas
  - Soil venting
  - Remediation of excavated soil

Standard packaging of the activated carbon is in 55 pound bags or 1100 pound supersacks.

Wet drained activated carbon adsorbs oxygen from the air. Therefore, when workers need to enter a vessel containing wet activated carbon, they should follow confined space/low oxygen level procedures. Activated carbon dust does not present an explosion hazard.

TIGG 5DC 0830 NSF

Virgin Liquid Phase Coconut Based Activated Carbon

Subsidiary of Spencer Turbine

DESCRIPTION

TIGG 5DC 830 is a coconut-based activated carbon specially designed to remove low concentrations of weakly adsorbed organics from water. This activated carbon combines higher than usual microporosity with sufficient transport pores to permit superior loadings of highly soluble organics.

TYPICAL PROPERTIES	TIGG 5DC 830
U.S Sieve, 90 wt% min	8 x 30
Iodine Number, mg/g, min	1100
Apparent Density, (dense packing)	
g/cc	0.42 - 0.47
lbs/ft^3	26 - 29
Abrasion No. - min	85

TYPICAL APPLICATIONS

In TIGG liquid phase potable water treatment equipment, TIGG 5DC 0830 NSF will effectively remove organics as well as chlorine, phenols, pesticides, taste & odor, etc. TIGG 5DC 0830 NSF meets AWWA Standard B-600-74, ANSI/NSF Standard 61 for drinking water applications.

Standard packaging of the activated carbon is in 55 pound bags or 1100 pound supersacks.

Wet drained activated carbon adsorbs oxygen from the air. Therefore, when workers need to enter a vessel containing wet activated carbon, they should follow confined space/low oxygen level procedures. Activated carbon dust does not present an explosion hazard.

APPENDIX

H AIR EMISSIONS COMPLIANCE

MEMO

TO: Guidance for Air Emissions Compliance – Emerson – Ithaca, NY

FROM: Rebecca Frohning and Jeffrey Baker

SUBJECT: Modeling for Air Toxics Compliance

DATE: August 8, 2018

INTRODUCTION

A dual-phase treatment system is in operation at the former Emerson Power Transmission facility located in Ithaca, NY and is currently treating chlorinated VOCs from groundwater. The dual phase system uses a blower and an air stripper to pull soil vapor and treat groundwater. Both vapor streams are combined into one stream that is treated through two carbon vessels operated in series. The task is to determine the allowable discharge in trichloroethene (TCE) out of the second carbon vessel that can be discharged to the atmosphere.

WSP used the EPA AERSCREEN model following NYSDEC guidance. This memo outlines the model inputs and presents the model results for a 1 pound per hour (lb/hr) model run that can be scaled for the pollutants of interest.

MODEL INPUT

AERSCREEN is a screening level air quality model based on EPA's air dispersion model AERMOD. AERSCREEN uses conservative meteorological parameters to predict ambient air concentrations attributed to a single source. AERSCREEN interfaces with MAKEMET, AERMAP, and BPIPPRM preprocessors to perform a screening level analysis. AERSCREEN predicts a 1-hour maximum air concentration and uses multipliers to extrapolate the concentration for other averaging periods.

The information in Table 1 was provided by the project team.

Table 1: AERSCREEN Input Parameters

Input Parameter	Value	Units
Stack Height Above Structure	2	Feet
Stack Height	16	Feet
Inner Diameter	8	Inches
Exit Temperature	120	°F
Exit Velocity	13.13	ft/min
Exit Flow Rate	275	ft^3/min
Shortest Distance from Stack to Property Line	100	Feet

WSP USA
Suite 300
2202 North West Shore Boulevard
Tampa, FL 33607

Tel.: +1 813 520-4444
Fax: +1 813 520-4290
wsp.com

Building Width	20	Feet
Building Length	35	Feet
Direction Building Length is Facing	NE	
Latitude	42.4326	
Longitude	-76.4983	

The terrain option was used to develop an array of receptors from the ambient air boundary at a spacing of 25 meters to a distance of 3000 meters. Source and receptor elevations were determined by using the AERMAP preprocessor with terrain data downloaded from the USGS National Map Viewer (https://viewer.nationalmap.gov/advanced-viewer/).

Meteorological effects were considered assuming minimum and maximum temperatures of 15.2°F and 80.9°F, obtained from historical records from Ithaca Cornell University (https://wrcc.dri.edu/cgi-bin/cliMAIN.pl?ny4174). Default wind speed and anemometer height were used. Meteorology was generated using seasonally varying surface characteristics for generic land use classifications (option 2) using land use 7 (urban), as recommended by the NYSDEC guidance for predominantly industrial areas, regardless of population.

MODEL RESULTS

The maximum modeled impact occurred at a distance of 30.48 meters, coinciding with the ambient air boundary. The results for an emission rate of 1 lb/hr are summarized in Table 2. The maximum concentrations can be multiplied by the emission rate in lb/hr to estimate the concentration for a specific pollutant. AERSCREEN is a screening level model, intended to produce conservative results. A more refined approach may be required for any regulatory purposes.

Table 2: AERSCREEN Results

Averaging Period	Maximum Concentration in µg/m³ per 1 lb/hr
1 hour	932.4
3 hour	932.4
8 hour	839.1
24 hour	559.4
Annual	93.24

MODEL INTERPERATION

The New York annual guideline concentration (AGC) for TCE is 0.2 ug/m3, and the short-term guideline concentration (SGC) is 20 ug/m3. The AGC is an ambient annual-average-based guideline concentrations developed to protect the environment and public health from effects of TCE, which may be associated with long-term exposure to the contaminant. AGCs are based on the most conservative carcinogenic or noncarcinogenic annual exposure limit. SGCs are chosen to protect the general population from adverse acute 1-hour exposures.

In accordance with Mr. Steve DeSantis from the NYSDEC Division of Air Resources - Air Toxics Section, since an air pollution control device is installed (vapor carbon treatment), then it is acceptable for the emission source to have an ambient impact less than one-in-a-hundred-thousand risk level (i.e., 10^{-5}), which equates to a concentration of 10 times the AGC. In our case, we can assume that the ACG for TCE is 2 ug/m3 at the property line. In addition, the AGC is an ambient annual-average-based guideline concentration; therefore, it is acceptable if we exceed the ACG for a short period of time provided that the annual average meets the AGC (x 10). If the emission exceeds 20 ug/m3 TCE the carbon immediately shall be replaced immediately.

Using the information from NYSDEC and the model, the results can be scaled. Based on sample data generated from the vapor extraction (June 2018) and the original air stripper model (February 2009), the before carbon emission rate is 0.0425 lb/hr for TCE. The maximum allowable emission rate without carbon treatment is 0.0021 lb/hr for TCE. The maximum emission rate allowed based on the model, which incorporates the terrain of the area and an air pollution control device is in place is 0.021 lb/hr (slightly lower than a flat terrain of 0.027 lb/hr). The model shows that vapor carbon treatment is necessary to control chlorinated VOC emissions from the treatment system.

CONCLUSIONS AND RECOMMENDATIONS

The concentration of vapor TCE must be equal to or less than 4.4 part per million by volume (ppmv) from the discharge stack of the treatment system (after carbon treatment). WSP recommends monitoring for chlorinated VOC breakthrough between the vapor carbon vessels with the vapor extraction system on and the air stripper actively treating water. Once the between carbon vessel concentration for TCE exceeds 4.4 ppmv, both vapor carbon vessels will be changed out with new virgin granular activated carbon. The carbon shall be immediately changed if the TCE emissions is equal to or greater than 44 ppmv.