AE Order Number Banner

Report Description

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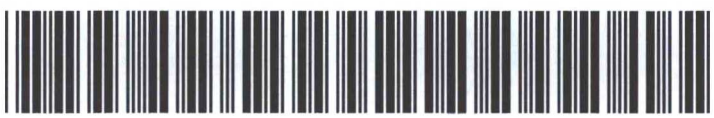

App Number: pCTP0810533836

3RP - 1001

ENTERPRISE FIELD SERVICES, LLC

12/19/2017

SOIL VAPOR EXTRACTION AND AIR SPARGING WORK PLAN
(Revised October 23, 2017)

Property:

Largo Compressor Station
NE ¼ and SE ¼, S15 T26N R7W
Rio Arriba County, New Mexico

OCD RP: 3R-1001
GROUNDWATER DISCHARGE PLAN GW-211

Revised October 23, 2017
Apex Project No. 725040112154

Prepared for:

Enterprise Field Services, LLC
P.O. Box 4324
Houston, Texas 77210-4324
Attn: Mr. Gregory E. Miller, P.G.

Prepared by:

W. Catt Wilson, P.E.
Principal Engineer

Apex Companies, LLC
606 S Rio Grande, Unit A, Aztec, NM 87410 T 505.334.5200 F 505.334.5204 www.apexcos.com

Enterprise Products

ENTERPRISE PRODUCTS PARTNERS L.P.
ENTERPRISE PRODUCTS HOLDINGS LLC
(General Partner)

ENTERPRISE PRODUCTS OPERATING LLC

November 7, 2017

ACCEPTED FOR RECORD

7016 3010 0000 0901 3238
Return Receipt Requested

Ms. Vanessa Fields
New Mexico Energy, Minerals & Natural Resources
Department – Oil Conservation Division District 3
1000 Rio Brazos Road
Aztec, New Mexico 87410

RE: ***Soil Vapor Extraction and Air Sparging Work Plan (Revised October 23, 2017)***
Enterprise Field Services, LLC – **Largo Compressor Station**
County Road (CR) 379, Rio Arriba Co., New Mexico
Groundwater Discharge Plan GW-211
OCD RP: 3R-1001

OIL CONS. DIV DIST. 3
NOV 16 2017

Dear Ms. Fields:

Please find attached, the *Soil Vapor Extraction and Air Sparging Work Plan* (the "Work Plan") prepared by Apex TITAN, Inc. (Apex, Revised October 23, 2017). The Work Plan is associated with a condensate storage tank release (January 2008), as well as historical hydrocarbon impacts discovered in other areas of the Enterprise Field Services, LLC (Enterprise) Largo Compressor Station (the Site).

The attached Work Plan identifies revised details associated with the design, installation and implementation of an air-sparge and soil vapor extraction (AS/SVE) system based on recent discussions with the New Mexico Oil Conservation Division (NMOCD) District 3 Office in Aztec, NM. Previously proposed designs were included in the *Soil Remediation Plan* (Apex, May 11, 2017) and the original *Soil Vapor Extraction and Air Sparging Work Plan (Apex, September 15, 2017)*.

The proposed installation of an AS/SVE system, as detailed in the attached Work Plan, is to remediate any soil that is left in place following the excavation activities where hydrocarbon concentrations exceed the NMOCD Remediation Action Levels (RALs). The system is also designed to remediate groundwater beneath the soil impacts where dissolved-phase hydrocarbon concentrations exceed the RALs. Because the exact (final) limits of the excavation in Area 3 cannot be known at this time, the Work Plan assumes the final limits. As such, the actual number and location of well points of the AS/SVE system in Area 3 may be adjusted to avoid potential "short-circuiting" of the applied vacuum through (and around the edges of) the previously-excavated areas. Although AS/SVE is intended as the chosen option for soil remediation in Area 1, this Work Plan assumes that SVE may be utilized for soil remediation in Area 3. Upon completion of Phase 1 and Phase 2 excavation activities (and receipt and review of confirmation soil sample analytical data), Enterprise may choose to continue excavation of soils that contain petroleum hydrocarbon concentrations in exceedance of the RALs.

Enterprise has completed Phase 1 excavation activities in Area 3 and is currently performing Phase 2 excavation (of the most heavily-impacted soils in the central plume area). Enterprise anticipates that Phase 2 excavation activities will be followed by continued excavation, or the installation of the proposed AS/SVE system (as outlined in the Work Plan). As such, Enterprise requests that the OCD review and approve the attached Work Plan.

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Enterprise appreciates the OCD's continued assistance and guidance with this project. Should you have any questions, comments or concerns, or require additional information, please feel free to contact me any time at 713-381-8780, or at gemiller@eprod.com.

Sincerely,

Gregory E. Miller, P.G.
Supervisor, Environmental

Rodney M. Sartor, REM
Director, Environmental

/bjm
Attachment
cc: Mr. Brandon Powell – NMOCD, Aztec, NM
Mr. Randy Bayliss – NMOCD, Santa Fe, NM
ec: Mr. Marc E. Gentry – Apex, Houston, TX
Mr. Tom Long - Enterprise, Farmington, NM
Mr. John Berry – Landowner

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APPENDICES

APEX

SOIL VAPOR EXTRACTION AND AIR SPARGING WORK PLAN

GROUNDWATER DISCHARGE PLAN GW-211
OCD RP: 3R-1001

LARGO COMPRESSOR STATION
NE ¼ AND SE ¼, S15 T26N R7W
Rio Arriba County, New Mexico

Apex Project No. 725040112154

The original version of the *Soil Vapor Extraction and Air Sparging Work Plan* was dated September 15, 2017. This document was revised to reflect the outcome of recent negotiations with the New Mexico Energy, Minerals, and Natural Resources Department (EMNRD), Oil Conservation Division (OCD), Apex Companies, LLC (Apex), has prepared a soil vapor extraction (SVE) and air sparging work plan to conduct remediation of soil and groundwater impacted by petroleum hydrocarbon releases at the Enterprise Field Services, LLC (Enterprise), Largo Compressor Station. This work plan includes: (1) an introduction describing the facility and release areas; (2) a summary of the plan for corrective action; (3) details of the SVE and air sparge component of the corrective action plan, and; (4) a summary of Apex's standard of care, limitations, and reliance.

1.0 INTRODUCTION

The Enterprise Largo Compressor Station is located off of County Road (CR) 379 in Section 15, Township 26 North, Range 7 West, in Rio Arriba County, New Mexico (36.4855N, 107.5578W), referred to hereinafter as the "Site". The Site is a natural gas compressor station designed to dehydrate and compress natural gas gathered from production wells in the area for transportation via pipeline. The Site was constructed in the mid-1960s and currently includes two (2) compressor engines, a dehydration unit and related treater, one (1) bullet storage tank, a new condensate storage tank battery containing seven (7) tanks, inlet scrubbers, a control room, a stormwater retention pond, and an office/shop building.

The Site is subject to regulatory oversight by the New Mexico EMNRD OCD. To address activities related to crude oil/condensate related releases, the New Mexico EMNRD OCD utilizes the *Guidelines for Remediation of Leaks, Spills and Releases* as guidance, in addition to the New Mexico EMNRD OCD rules, specifically New Mexico Administrative Code (NMAC) 19.15.29 *Release Notification*. These guidance documents establish investigation and abatement action requirements for sites subject to reporting and/or corrective action.

The areas of known or potential impact at the Site have been previously designated as Areas 1 through 4 in prior New Mexico EMNRD OCD correspondence. Petroleum hydrocarbon soil impact is present in Area 1 and Area 3 as indicated on Figure 1 of Appendices A and B, respectively. This work plan identifies the design specifications of the SVE/air sparge system for Area 1 and Area 3 at the Site.

The remediation systems have been designed to operate full time, with cycling between individual wells (Area 1) or groups of wells (Area 3) to optimize mixing and prevent inefficient channeling of subsurface flows. Operational volumetric flow rates of the combined SVE and air sparge system in Area 1 are anticipated to be between 60 and 140 standard cubic feet per minute (scfm). Operational volumetric flow rates of the combined SVE and air sparge system in Area 3 are

anticipated to be between 270 and 400 standard cubic feet per minute (scfm). Implementation of the designs presented in the appendices are intended to allow for remediation of the full volume of impacted soil and groundwater remaining after Phase 1 and Phase 2 soil excavation.

2.0 OVERVIEW OF CORRECTIVE ACTION

Per New Mexico EMNRD OCD's conditional approval of the *Enterprise Products Soil Remediation Plan* and *Enterprise Products Soil Remediation Plan Amendment*, Apex has prepared a detailed SVE and air sparging plan for Area 1, and the portions of Area 3 not directly remediated via the ongoing soil excavation activities. The overall remedial approach utilizes a combined strategy of soil excavation in areas of high residual hydrocarbon saturation (greater than 10,000 milligrams per kilogram [mg/kg]) and SVE with air sparging over the rest of the distributed soil and groundwater impacts. Air sparging may also be implemented in portions of Area 3, if excavation activities are not able to remove all impacted soil within the saturated zone.

Phase 1 and Phase 2 Soil Excavation

Phase 1 of the soil remediation is currently being implemented in Area 3 of the Largo Compressor Station. This phase involves removing an estimated 10,000 cubic yards of impacted soils in the vicinities of the active pipelines and transporting that material to the Envirotech, Inc. landfarm near Hilltop, New Mexico for disposal/treatment. Unaffected overburden soils, if encountered, will be utilized as berm material or segregated to the extent practical and stockpiled on the site pending reuse. Excavation adjacent to the pipelines will include the removal of soils to the full depth of observed impact, as practicable.

Following the conclusion and evaluation of the pipeline excavation (Phase 1), Phase 2 of the soil remediation is anticipated to include the removal of the most heavily impacted soils remaining in Area 3, based on existing laboratory data and future confirmation sampling of the excavated area.

Previous excavations and soil borings in Area 3 have encountered groundwater between 10 and 20 feet bgs. Saturated soils may necessitate the need to place some soils in lined containment to allow drainage prior to transporting offsite. Drained liquids will be properly disposed.

Enterprise will attempt to remove non-aqueous phase liquids (NAPL), if present, from the excavation(s) daily. Hydrocarbon affected water will be properly disposed of at an NMOCD-approved facility. If practicable, Enterprise would leave the excavation open as long as recoverable NAPL is present.

SVE and Air Sparge Implementation

The results of the SVE pilot test, presented in the *Enterprise Products Soil Remediation Plan Amendment,* dated August 14, 2017, demonstrated that soils in the vadose zone, soils in the smear zone, and condensate can be viably remediated using SVE at the Site. To achieve full remediation of saturated zone soils and groundwater, a full-scale SVE remediation system will be coupled with air sparging to depths of known saturated zone soil impacts in Area 1, and in Area 3 outside the boundary of the final excavation footprint.

Implementation of the air sparge system will include the installation of air sparge wells throughout the area of saturated soil impacts, screened at depths of up to 25 feet below ground surface, and with well spacings of 20 feet (alternating air sparge and SVE wells), per New Mexico EMNRD OCD's mandate, included in their email correspondence dated August 22, 2017. Remediation

system design packages for Area 1 and Area 3 are presented in Appendix A and Appendix B, respectively. Given Apex's experience implementing the air sparge and SVE technology in similar lithology, air sparge and SVE activities would likely result in remediation of the adsorbed hydrocarbons in the vadose and submerged soil, as well as the dissolved phase hydrocarbon plume, within a period of 18-24 months of system operation. The elimination of hydrocarbon mass would be achieved in several ways:

- Direct removal of volatilized hydrocarbons in vapor extracted by the SVE system.
- Volatilization of dissolved hydrocarbons in air injected by the air sparge system that rises through the water column to be captured by the SVE system.
- Accelerated aerobic biodegradation and natural source zone depletion within the vadose zone and smear zone as a result of aeration and accelerated partitioning of hydrocarbon vapors with increased pore volume exchange.
- Accelerated aerobic biodegradation within the saturated zone via greatly increased dissolved oxygen concentrations for biological metabolism and the flushing of growth-limiting byproducts such as carbon dioxide and methane.
- Accelerated desorption of hydrocarbons in saturated soil as a result of agitation. Once desorbed into solution, the hydrocarbons are more readily available as a food source for biodegradation.

Additional considerations should be acknowledged, that may ultimately extend the operational time of the SVE and air sparging system:

- The relatively short vadose zone soil column may encourage "short circuiting" of the SVE process to the ground surface over time, due to the necessary shallow screen placement. If this occurs, installation of a surface cap may be necessary.
- Clay/silt rich soils in some of the vadose zone stratum may not remediate as quickly, due to significantly lower air permeability than the surrounding sands.

3.0 SVE AND AIR SPARGING OPERATIONAL DETAILS

The detailed design specifications presented in Appendix A and Appendix B for Areas 1 and 3, respectively, reflect operational performance goals integral to the design and construction of the system. Key operational goals and design specifications are as follows:

- SVE wells will be constructed to include screens extending from the shallowest contact with impacted soil (determined by the oversight geologist during borehole drilling) to a depth of 2 to 3 feet into the saturated zone (to ensure contact with smear zone impacts). Each SVE well will be completed based on borehole-specific observations. Example well completion details are included in Appendices A and B.
- Air sparge wells will be constructed to include 2-foot-long screens extending to a depth of 2 to 3 feet below the deepest interval of saturated zone soil impacts. Each air sparge well will be completed based on borehole-specific observations. Example well completion details are included in Appendices A and B.

- Separate remediation system equipment will be installed at Areas 1 and 3. Each remediation system will be enclosed within a pre-engineered, turn-key, insulated, Class 1, Division 2 shed with its own power supply.

- The remediation system for Area 1 will not include treatment of SVE exhaust vapor.

- The remediation system for Area 3 will include treatment of SVE exhaust vapor, likely via an electrical catalytic oxidizer.

- Each SVE well is designed to operate at average flow rates of 3 to 10 scfm, at applied wellhead vacuums of 20 to 40 inches of water column. Individual well performance will vary, depending on soil characteristics in contact with the screen and reasonable operating parameters to improve overall run time and avoid stress to remediation equipment.

- Each air sparge well is designed to operate at average flow rates of 2 to 5 scfm, at applied wellhead pressures of 5 to 25 pounds per square inch (psi). Individual well performance will vary, depending on soil characteristics in contact with the screen and reasonable operating parameters to improve overall run time and avoid stress to remediation equipment.

- Total SVE system flow rates (cycling between groups of wells) are anticipated to be in the range of 40 to 100 scfm in Area 1, and 200 to 300 scfm in Area 3.

- Total air sparge system flow rates (cycling between groups of wells) are anticipated to be in the range of 20 to 40 scfm in Area 1, and 70 to 100 scfm in Area 3.

- The systems have been designed to remediate, to applicable New Mexico standards, the full volume of known petroleum hydrocarbon soil and groundwater impact that remains at the Site after the Phase 1 and Phase 2 soil removal activities are complete.

- The remediation systems have been designed to operate full time, with cycling between individual wells (Area 1) or groups of wells (Area 3) to optimize mixing and prevent inefficient channeling of subsurface flows.

- Apex personnel will continually optimize remediation system performance through monitoring of remote telemetry communication from the systems' programmable logic controllers (PLCs), operation and maintenance (O&M) at a minimum of twice per month, SVE effluent sampling, soil gas sampling, and monitoring by the Project Engineer.

- Apex will provide remediation system operational data within each Site monitoring report (quarterly, during the first year of operation), and will include a detailed evaluation of system efficacy and progress toward remedial endpoints in each annual report.

Modifications to the remediation system layout in Area 3 are likely, given the ongoing excavation activities and upcoming soil boring investigation around the perimeter of known soil impacts. Modifications will be negotiated with the New Mexico EMNRD OCD, and the final Area 3 remediation system design will be documented in a future amendment to this report. Possible modifications to the Area 3 design cannot be finalized until Phase 1 and Phase 2 soil excavation activities are complete, and may include the following:

- The final extent and depths of the Phase 1 and Phase 2 excavation activities, and the results of the upcoming perimeter soil boring investigation will change the area of planned air sparge and SVE system well coverage.

- The number and distribution of air sparge wells within areas of the Phase I and Phase 2 excavation will depend on the extent to which changing groundwater levels affect the feasibility of removing impacted soil within the upper 4 to 6 feet of the saturated zone, and observations made by field personnel.

- As excavation progresses, and additional soil borings are conducted, observations of the extent of relatively impermeable clay soil within the areas of planned air sparge and SVE remediation may lead to a conclusion of technical infeasibility.

4.0 REMEDIAL ENDPOINT AND CONFIRMATION SAMPLING

As noted above, Apex will perform continuous optimization of the remediation systems during operation and maintenance (O&M) events, conducted at least twice per month. Apex will provide remediation system operational data within each Site monitoring report (quarterly, during the first year of operation), and will include a detailed evaluation of system efficacy and progress toward remedial endpoints in each annual report. A determination that the remedy has reached a point of limited efficacy (potentially due to asymptotic mass removal rates or persistent contaminant distribution observed in sampling results) will be cause for modifications to the remedial approach. The remedy will be considered complete, and the remediation system shut down (either in whole, or in part for areas that have reached completion) when:

1) Achievement of groundwater cleanup goals in samples from groundwater monitoring wells will indicate that the groundwater remedy has reached a satisfactory endpoint, and that the remedy for saturated zone soil has reached a satisfactory endpoint.

2) Apex will collect at least one confirmation soil sample at each location outside the boundary of the Phase 1 and Phase 2 excavations where unsaturated zone soil was previously identified as impacted in excess of the New Mexico EMNRD OCD Remediation Action Level (RAL). Laboratory analytical results showing contaminant concentrations below the RAL will indicate that the remedy for unsaturated zone soil has reached a satisfactory endpoint.

5.0 STANDARD OF CARE, LIMITATIONS, AND RELIANCE

Apex's services were performed in accordance with standards customarily provided by a firm rendering the same or similar services in the area during the same time period. Apex makes no warranties, expressed or implied, as to the services performed or described herein. Additionally, Apex does not warrant the work of third parties supplying information used in the report (e.g. laboratories, regulatory agencies, or other third parties). This scope of services was performed in accordance with the scope of work agreed with the client.

Findings, conclusions, or recommendations resulting from these services are based upon information derived from the on-Site activities and other services performed under this scope of work and it should be noted that this information is subject to change over time. Certain indicators of the presence of hazardous substances, petroleum products, or other constituents may have been latent, inaccessible, unobservable, or not present during these services, and Apex cannot represent that the Site contains no hazardous substances, toxic materials, petroleum products, or

other latent conditions beyond those identified during this scope of services. Environmental conditions at other areas or portions of the Site may vary from those encountered at actual sample locations. Apex's findings and recommendations are based solely upon data available to Apex at the time of these services.

This report has been prepared for the exclusive use of Enterprise, and any authorization for use or reliance by any other party (except a governmental entity having jurisdiction over the Site) is prohibited without the expressed written authorization of Enterprise and Apex. Any unauthorized distribution or reuse is at the client's sole risk. Notwithstanding the foregoing, reliance by authorized parties will be subject to the terms, conditions and limitations stated in the proposal, the report, and Apex's Agreement. The limitation of liability defined in the agreement is the aggregate limit of Apex's liability to the client.

APPENDIX A

Area 1 Design Specifications

Area 1 Remediation System Design Specifications
Mandated 20-foot Well Spacings

Largo Compressor Station
NE ¼ AND SE ¼, S15 T26N R7W
Rio Arriba County, New Mexico

Apex Project No. 725040112154

Below are preliminary specifications of an Air Sparge (AS) and Soil Vapor Extraction (SVE) remediation system at the Largo Compressor Station. System design is based on SVE pilot testing performed July 25 and 26, 2017, New Mexico Oil Conservation Division (NMOCD) mandated well placing, and remediation system designs at similar sites.

System Specifications

The remediation system will be enclosed within a pre-engineered 12 foot by 6 foot shed (or similar) insulated with R13 insulation or better. The system will include one (1) exhaust fan and one (1) intake vent. A UL 508A/698A listed control panel will be mounted on the exterior of the building. All electrical wiring within the enclosure will be completed by a licensed electrician in accordance with Class 1, Division 2 requirements, prior to delivery to the site. Electrical power will be supplied by Enterprise from the compressor station electrical panel and is believed to be 480 volts, 3-phase. Power will be delivered to the system through an underground conduit or utilizing an overhead connection. A transformer will be installed adjacent to the 100 amp main disconnect to convert the 480 volt, 3-phase supply to 240 volt, 3-phase power. The control system and general system components will consist of:

- One (1) National Electrical Manufacturers Association (NEMA) 3R or higher control panel enclosure.
- Hand-Off-Auto switches for the SVE blower, Air Sparge blower, heat exchanger, exhaust fan, and Air Sparge solenoid valves.
- Two (2) Emergency Stop buttons, located near the door inside the shed and near the SVE blower, respectively.
- One (1) Reset push-button for resetting system alarms.
- One (1) Control Power On/Off switch, and one (1) Building Light switch.
- One (1) Power monitor/motor saver, to protect the blower motors from undervoltage, phase loss, or phase reversal conditions.
- One (1) lightning surge arrester to protect the control panel components from voltage spikes.
- One (1) programmable logic controller (PLC) with power filter to provide system control.
- One (1) Touch screen operator interface to provide a user-friendly way to view system parameters, including runtime and alarm data.

- One (1) 24 volt, direct current (VDC) power supply for PLC and touchscreen power supply, if needed.
- One (1) fused power disconnect (located on building exterior) to remove system power.
- Four (4) Type E motor controllers to control the SVE blower, Air Sparge blower, heat exchanger, and exhaust fan.
- Three (3) 24-hr. timers to control SVE blower and sparge solenoid on/off times.
- The shed shall drain into a sump with a liquid sensor that will shut off SVE and AS operation in the event of a liquid release.
- One (1) hydrogen sulfide (H_2S) and volatile organic compound sensor to detect ambient vapors in the enclosure. High conditions of either sensor will shut down SVE and AS operation and turn on the exhaust fan.
- One (1) explosion-proof heater, in-shed temperature sensor, and temperature setting in control panel.
- Intrinsically safe barrier relays to interface with process switches inside the building.
- Modem and antenna to provide the operator with the ability to remotely view and operate the touch-panel controller, receive daily status reports, to receive alarm notifications, and to remotely reset most system alarms.
- Various control relays and terminal blocks.

SVE System Specifications

The SVE system design is based on pilot testing performed onsite, by Apex, on July 25 and 26, 2017. See the SVE System Piping and Instrumentation Diagram (P&ID, Figure 2) for more information regarding process flow. The proposed SVE system will consist of the following equipment:

- One (1) vacuum blower, powered by a three-phase, totally-enclosed, fan-cooled (TEFC) motor. Blower will be belt-driven or directly coupled. The SVE blower should have a variable frequency drive to allow adjustment of blower speed.
- One (1) moisture knockout (KO) tank with at least 30 gallon capacity at the high level switch, with internal demister inside tank, a site tube, and a drain valve.
- One (1) inline filter between the manifold and blower, to protect the blower from moisture and particulates that come through the manifold lines.
- One (1) bleed air inlet filter and valve, located on blower inlet piping.
- One (1) discharge silencer on blower outlet piping to reduce outside noise to less than 80 dB at 5 feet from the remediation enclosure.
- One (1) emission stack with rain cap.
- Two (2) 3/8" sample ports, located on the KO tank inlet piping, and adjacent to the total flow meter.
- Two (2) vacuum gauges (0-100" water column (w.c.) range), one connected to the

KO tank inlet piping, and one connected to the blower inlet piping.

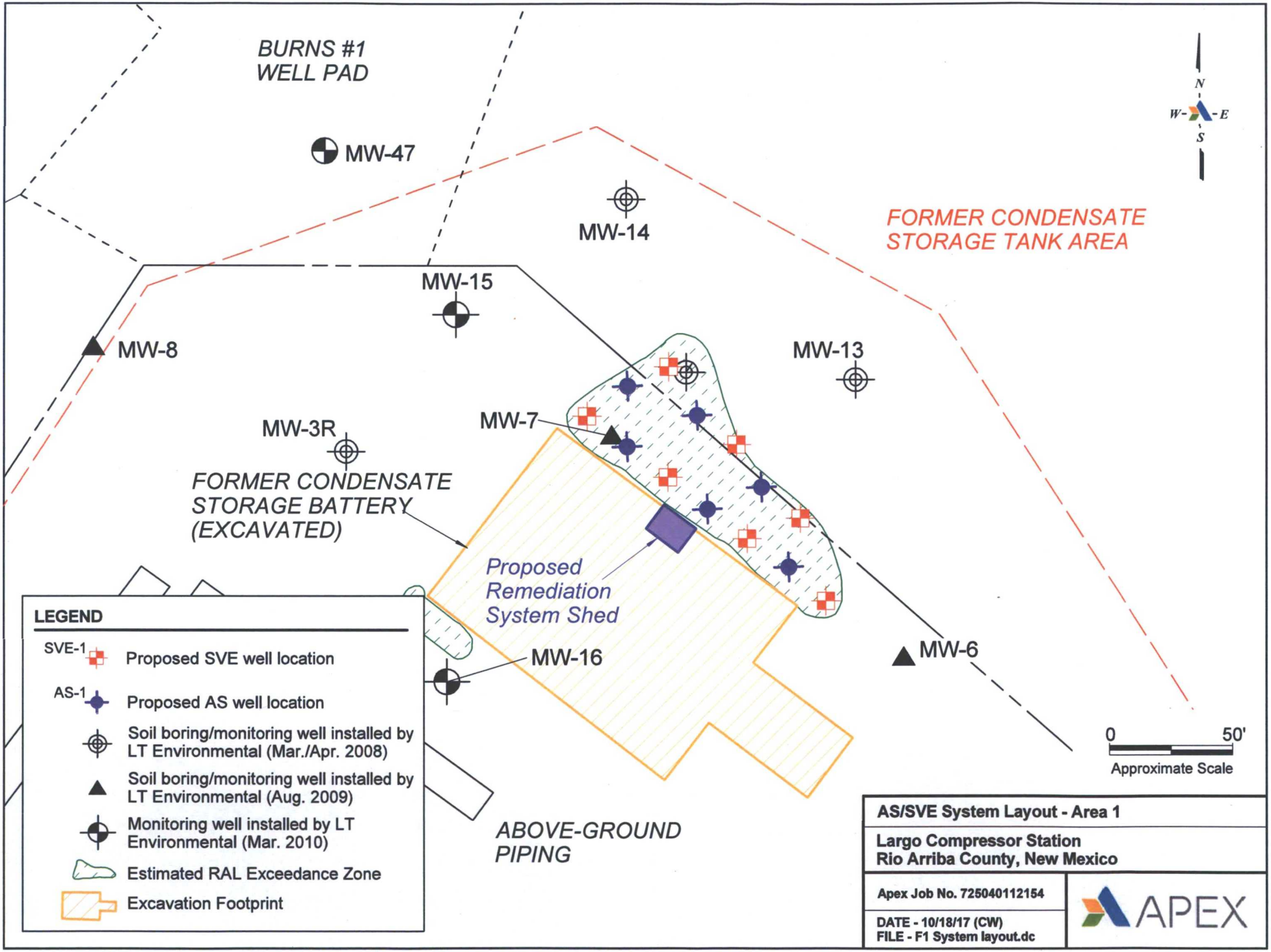
- One (1) slide gate valve, located on the KO tank inlet piping, used to isolate the SVE manifold piping during the SVE blowback procedure.
- One (1) vacuum relief valve, initially set at least 5" w.c. below the maximum vacuum achievable by the vacuum blower.
- One (1) low vacuum switch, initially set at 10" w.c., connected to the KO tank inlet piping.
- One (1) temperature switch (32-250 F° range, adjustable setting), connected to the SVE discharge piping.
- One (1) venturi total flow sensor and magnehelic differential pressure gauge, 0-200 standard cubic feet per minute (SCFM) range, connected to blower inlet piping.
- One (1) temperature gauge (-20/120 F° range), located on blower inlet piping after venturi.
- One (1) polyvinyl chloride (PVC) extraction manifold with twelve (12) SVE extraction manifold lines, each line consisting of the following components:
    - One (1) venturi flow sensor and gauge (0-25 SCFM range);
    - One (1) 1 ½-inch flow control gate valve;
    - One (1) inlet vacuum gauge (0-60" w.c. range);
    - One (1) 3/8-inch sample port with ¼-inch Tygon tubing connection.
    - 2-inch flex hose, to connect to 2-inch PVC subsurface pipe stub ups.
- Piping to be leak tested at 10 pounds per square inch, gauge, (psig) positive pressure for 30 minutes.

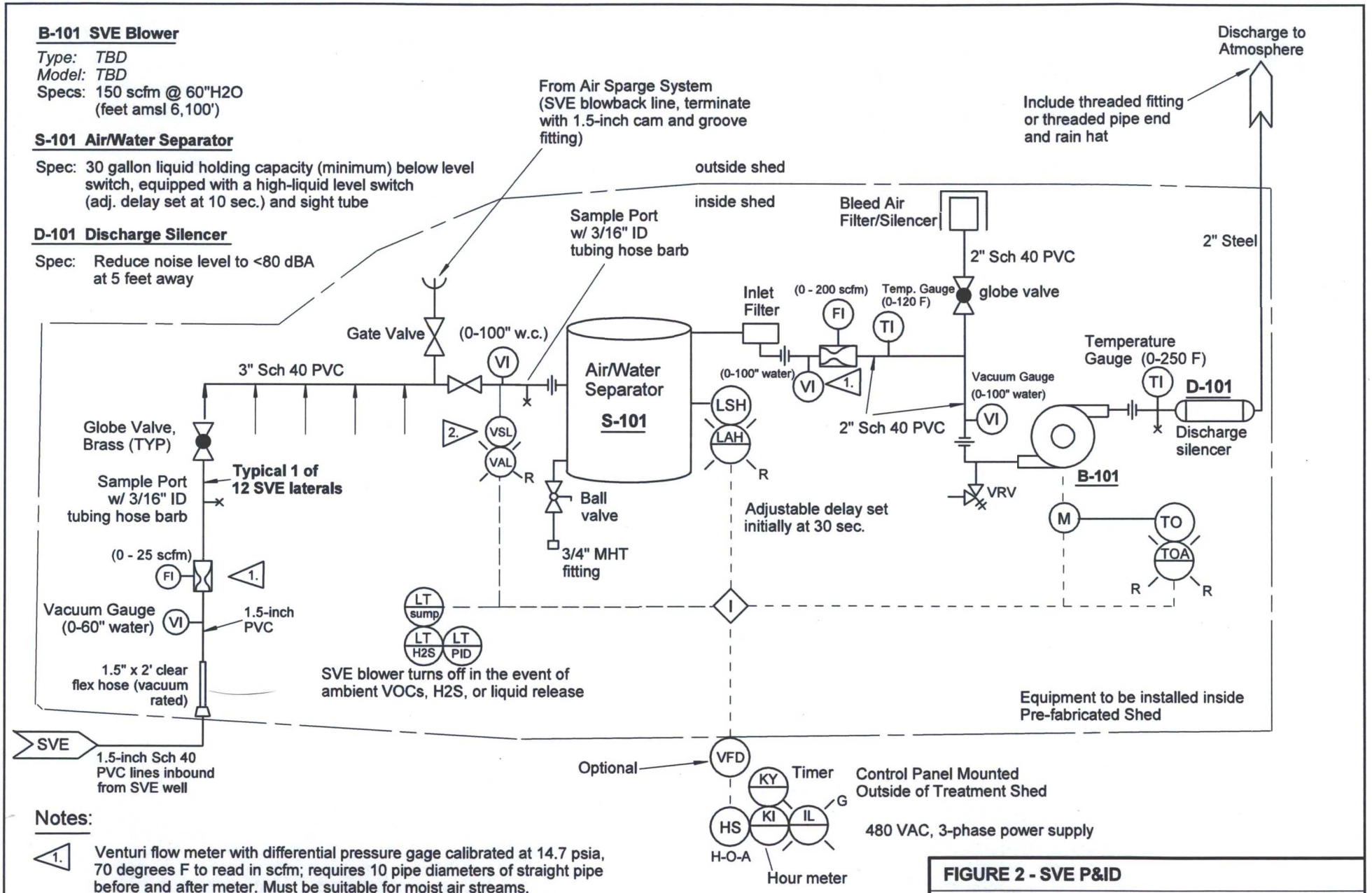
AS System Specifications

The AS component of the remediation system was designed based on operation at similar sites, and is sized to be coupled with the SVE performance, which is based on site-specific pilot testing. See the AS System P&ID (Figure 3) for more information regarding process flow. Specific information regarding components is presented below:

- One (1) compressor, powered by a three-phase, TEFC motor.
- One (1) inline filter on the blower inlet to protect the blower from particulates and dust.
- One (1) explosion-proof, fan-cooled heat exchanger, powered by a close- coupled three-phase, TEFC motor, to decrease the process air temperature.
- One (1) blower discharge high pressure switch, initially set at 30 psig, connected to the blower outlet piping before the heat exchanger.
- One (1) discharge temperature gauge (100-300 F° range), located on the blower outlet piping before the heat exchanger.
- One (1) heat exchanger discharge high temperature switch gage (32-300 F° range), initially set at 140 F°, connected to the heat exchanger outlet piping.
- One (1) flow control gate valve, located on the heat exchanger outlet piping.

- One (1) venturi flow sensor and total flow gauge (0-50 SCFM range), located on the heat exchanger outlet piping.
- One (1) pressure gauge (0-40 psig range) located on the blower outlet piping before the heat exchanger.
- One (1) blowback line connecting Sparge piping to SVE piping, with 2" gate valve, 2" pressure relief valve (initially set at 8 pounds per square inch [psi]), and pressure gauge (0-15 psi range).
- Two (2) welded 2-inch steel sparge distribution manifolds with twelve (12) sparge injection manifold lines total, divided into two (2) zones isolated by normally closed solenoid valves, with a bleed air valve on each zone header. Each sparge injection line consists of the following components:
    - One (1) venturi flow sensor and gauge (0-10 SCFM range);
    - One (1) 1-inch flow control gate valve;
    - One (1) outlet pressure gauge (0-30 psig range);
    - One (1) 1-inch check valve.
    - 1-inch flex hose, to connect to 1-inch PVC subsurface stub up piping (subsurface piping is 2-inch PVC, with a reducing coupling to 1-inch for connection to manifold)
- All piping is to be leak tested at 30 psig for 30 minutes prior to delivery to the site.


BURNS #1
WELL PAD
MW-47
MW-14
FORMER CONDENSATE
STORAGE TANK AREA
MW-15
MW-8
MW-13
MW-7
MW-3R
FORMER CONDENSATE
STORAGE BATTERY
(EXCAVATED)
Proposed
Remediation
System Shed
MW-16
MW-6
ABOVE-GROUND
PIPING
N
W
E
S
0
50'
Approximate Scale
LEGEND
SVE-1
Proposed SVE well location
AS-1
Proposed AS well location
Soil boring/monitoring well installed by LT Environmental (Mar./Apr. 2008)
Soil boring/monitoring well installed by LT Environmental (Aug. 2009)
Monitoring well installed by LT Environmental (Mar. 2010)
Estimated RAL Exceedance Zone
Excavation Footprint
AS/SVE System Layout - Area 1
Largo Compressor Station
Rio Arriba County, New Mexico
Apex Job No. 725040112154
DATE - 10/18/17 (CW)
FILE - F1 System layout.dc
APEX



Notes:

1. Venturi flow meter with differential pressure gage calibrated at 14.7 psia, 70 degrees F to read in scfm; requires 10 pipe diameters of straight pipe before and after meter. Must be suitable for moist air streams.

2. Low vacuum switch, adjustable, initially set at 10" water; 15 second delay; shuts down sparge system.

3. All electrical components inside the shed to be rated for Class I Division 2 environment.

4. Remediation system to be configured for remote operation of the touchpanel.

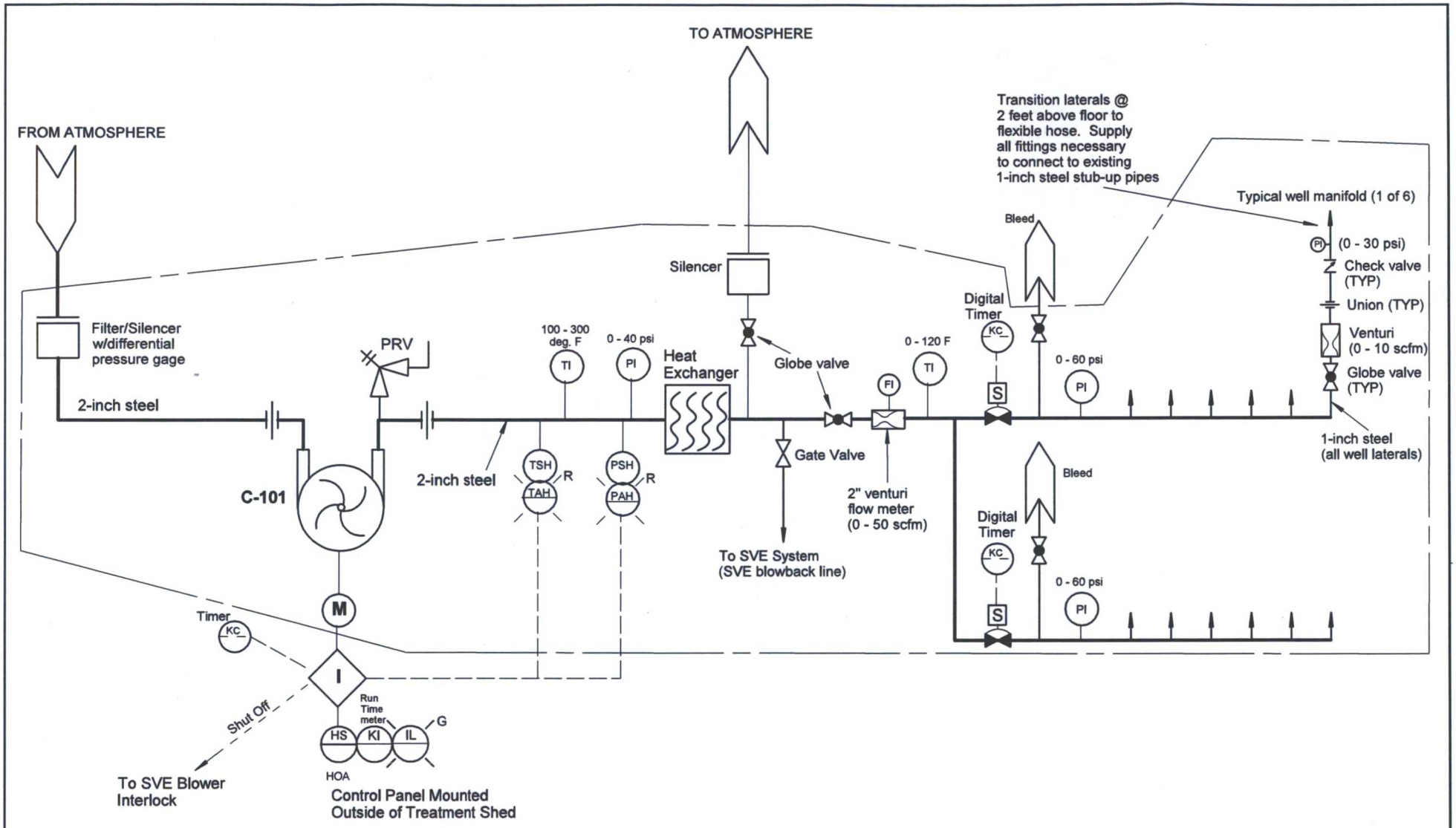
FIGURE 2 - SVE P&ID

Largo Compressor Station
Rio Arriba County, New Mexico

Apex Job No. 725040112154

DATE - 8/31/17 (EW)
FILE - F2 P&ID.dc

APEX



C-101 Sparge Compressor

Type: TBD
Model: TBD
Spec: 40 scfm @ 25 psig at 6,100 feet above mean sea level, ambient temp = -20 F to 115 deg F

Notes:

1. Compressor selection shall be confirmed as adequate.
2. Other system components shall be selected to reduce maintenance.
3. Ensure that venturi meter position allows minimum before and after pipe runs per vendor recommendations.
4. Ensure that selected compressor specifications allow for flows in scfm that can be achieved at an elevation of 6,100 feet AMSL.
5. All equipment to be installed inside a heated and ventilated shed suitable for maintaining optimum temps for equipment and O&M personnel.

FIGURE 3 - AS P&ID

Largo Compressor Station
Rio Arriba County, New Mexico

Apex Job No. 725040112154

DATE - 8/31/17 (EW)
FILE - F3 P&ID.dc

APEX

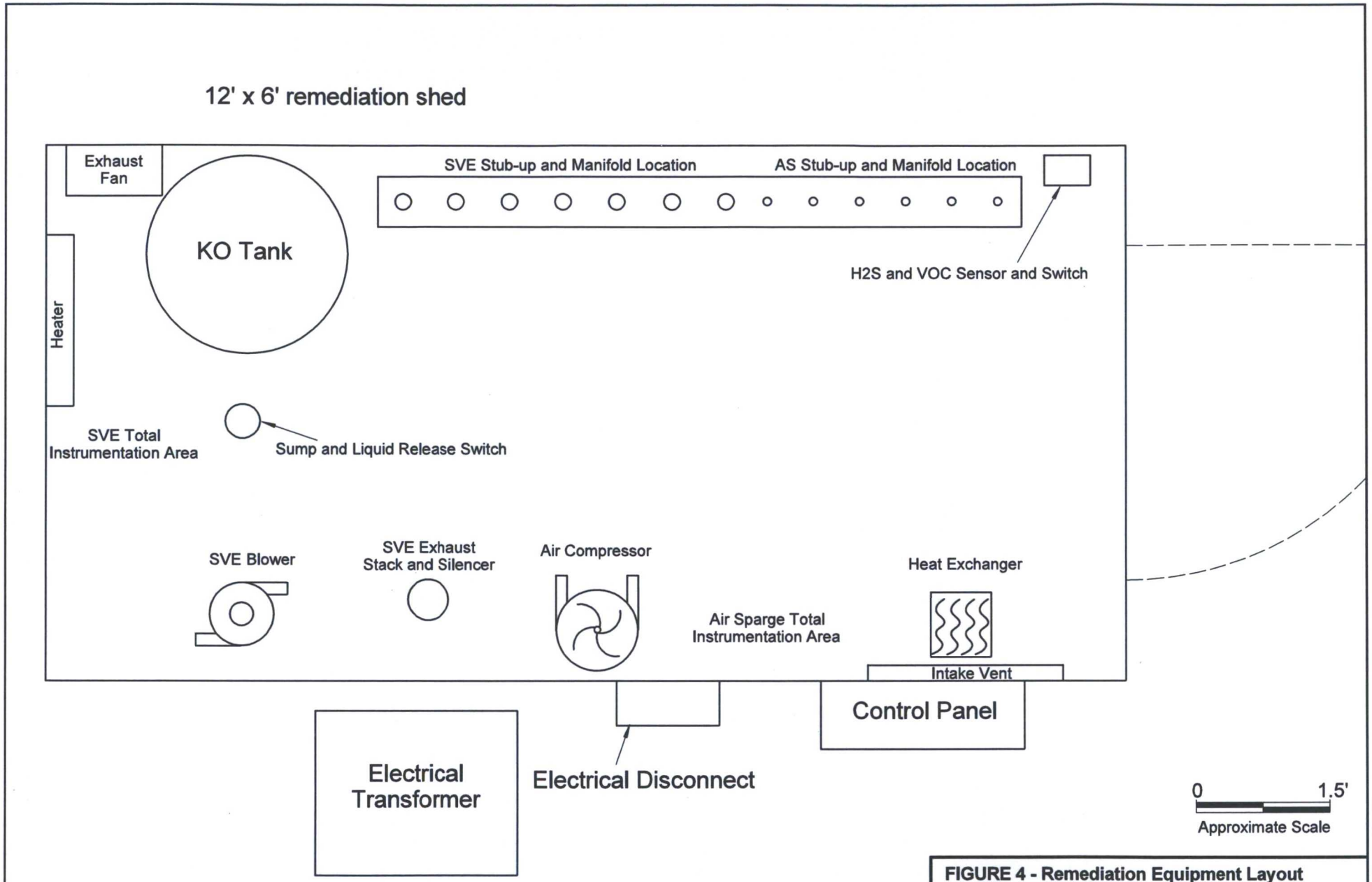


FIGURE 4 - Remediation Equipment Layout

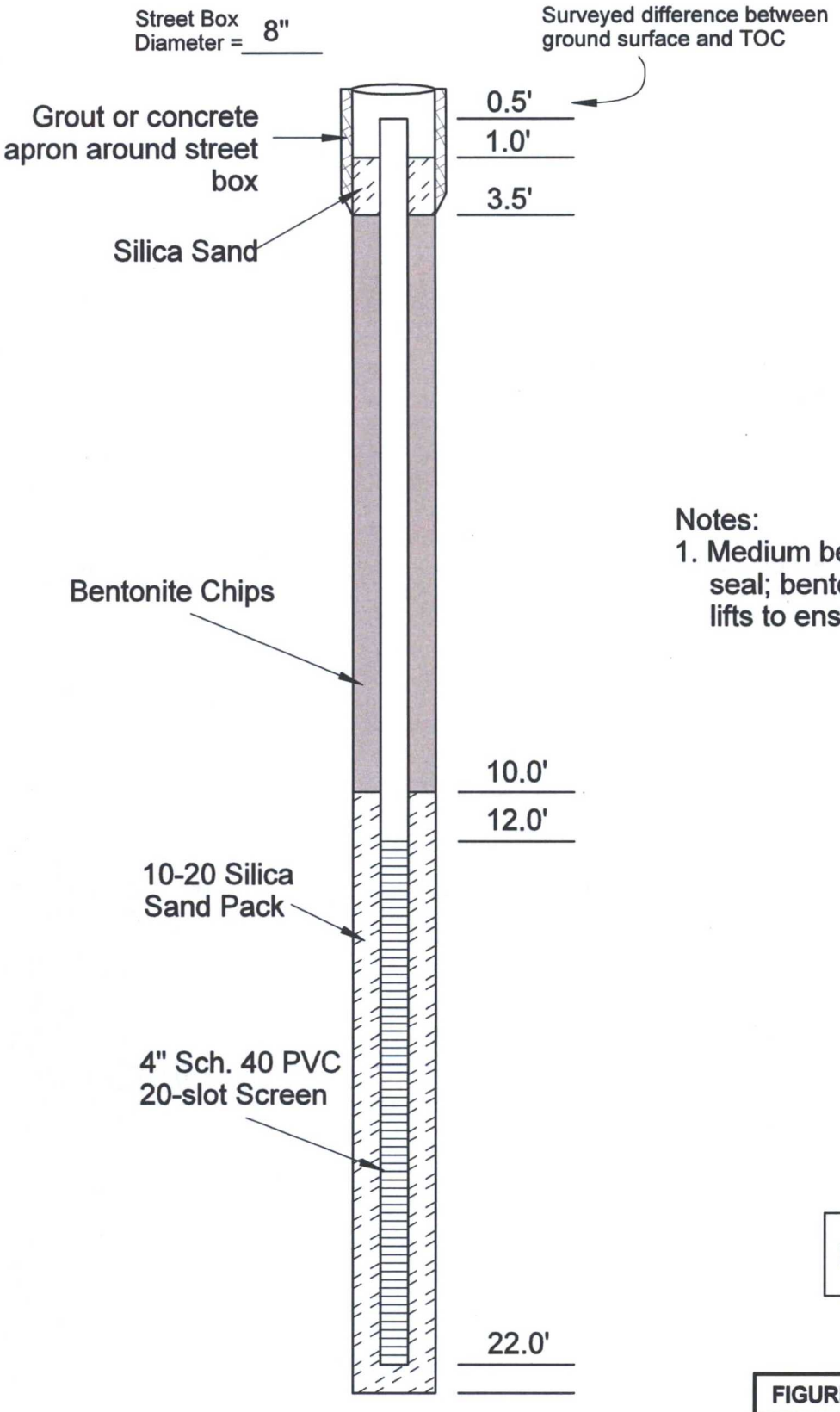
Largo Compressor Station
Rio Arriba County, New Mexico

Apex Job No. 725040112154

DATE - 10/22/17 (CW)
FILE - F4 Equipment layout.dc

APEX

Well Completion Detail



Notes:

1. Medium bentonite chips to be used for well seal; bentonite should be well hydrated in lifts to ensure adequate seal.

FIGURE NOT TO SCALE

* Measuring Point is Below Ground Surface (bgs)

FIGURE 5 - SVE Well Completion Detail

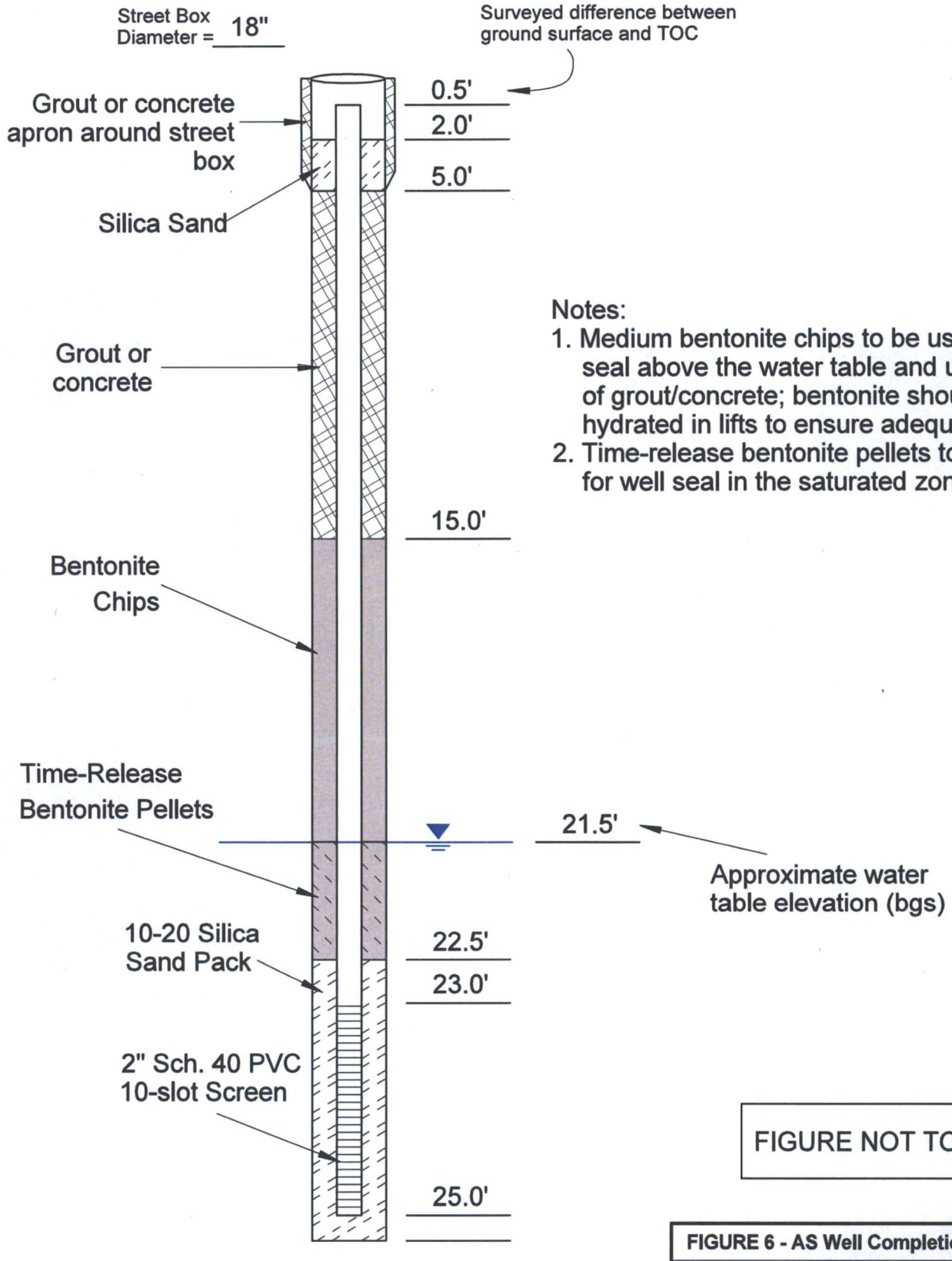
Largo Compressor Station
Rio Arriba County, New Mexico

Apex Job No. 725040112154

DATE - 8/30/17 (DC)
FILE - F5 SVE Well Detail.dc

APEX

Well Completion Detail



Notes:

1. Medium bentonite chips to be used for well seal above the water table and up to the start of grout/concrete; bentonite should be well hydrated in lifts to ensure adequate seal.
2. Time-release bentonite pellets to be used for well seal in the saturated zone.

FIGURE NOT TO SCALE

* Measuring Point is Below Ground Surface (bgs)

FIGURE 6 - AS Well Completion Detail

Largo Compressor Station
Rio Arriba County, New Mexico

Apex Job No. 725040112154

DATE - 8/30/17 (DC)
FILE - F6 AS Well Detail.dc

APEX

APPENDIX B

Area 3 Design Specifications

Area 3 Remediation System Design Specifications
Mandated 20-foot Well Spacings

Largo Compressor Station
NE ¼ AND SE ¼, S15 T26N R7W
Rio Arriba County, New Mexico

Apex Project No. 725040112154

Below are preliminary specifications of an Air Sparge (AS) and Soil Vapor Extraction (SVE) remediation system at the Area 3 section of the Largo Compressor Station. System design is based on SVE pilot testing performed July 25 and 26, 2017, and remediation system designs at similar sites.

System Specifications

The remediation system will be enclosed within a 40 foot by 8 foot shipping container (or similar) insulated with R13 insulation or better. The system will include one (1) exhaust fan and one (1) intake vent. A UL 508A/698A listed control panel will be mounted on the exterior of the building. All electrical wiring within the enclosure will be completed prior to delivery to the site by a licensed electrician in accordance with Class 1, Division 2 requirements. Electrical power will be supplied by Enterprise from the onsite electrical panel and is believed to be 480 volts, 3-phase. Power will be delivered to the system through an underground conduit or utilizing an overhead connection. A transformer will be installed adjacent to the 200 amp main disconnect to convert the 480 volt, 3-phase supply to 240 volt, 3-phase power, if needed, based on compressor and vacuum blower specifications. The control system and general system components will consist of:

- One (1) NEMA 3R or higher control panel enclosure.
- Hand-Off-Auto switches for the SVE blower, Air Sparge blower, heat exchanger, exhaust fan, SVE solenoid valves, and Air Sparge solenoid valves.
- Two (2) Emergency Stop buttons, located near the door inside the shed and near the SVE blower, respectively.
- One (1) Reset push-button for resetting system alarms.
- One (1) Control Power On/Off switch, and one (1) Building Light switch.
- One (1) Power monitor/motor saver, to protect the blower motors from undervoltage, phase loss, or phase reversal conditions.
- One (1) lightning surge arrester to protect the control panel components from voltage spikes.
- One (1) PLC with power filter to provide system control.
- One (1) Touch screen operator interface to provide a user-friendly way to view system parameters, including runtime and alarm data.
- One (1) 24 VDC power supply for PLC and touchscreen power supply, if needed.

- One (1) fused power disconnect (located on building exterior) to remove system power.
- Four (4) Type E motor controllers to control the SVE blower, Air Sparge blower, heat exchanger, and exhaust fan.
- Fourteen (14) 24-hr. timers to control SVE group solenoids and sparge group solenoids on/off times.
- The shed shall drain into a sump with a liquid sensor that will shut off SVE and AS operation in the event of a liquid release.
- One (1) hydrogen sulfide (H2S) and volatile organic compound sensor to detect ambient vapors in the enclosure. High conditions of either sensor will shut down SVE and AS operation and turn on the exhaust fan.
- One (1) explosion-proof heater, in-shed temperature sensor, and temperature setting in control panel.
- Intrinsically safe barrier relays to interface with process switches inside the building.
- Modem and antenna to provide the operator with the ability to remotely view and operate the touchpanel, receive daily status reports, to receive alarm notifications, and to remotely reset most system alarms.
- Various control relays and terminal blocks.

SVE System Specifications

The SVE system design is based on pilot testing performed onsite, by Apex, on July 25 and 26, 2017. See the SVE System Piping and Instrumentation Diagram (P&ID, Figure 2) for more information regarding process flow. The proposed SVE system will consist of the following equipment:

- One (1) vacuum blower, powered by a three-phase, TEFC motor. Blower will be belt-driven or directly coupled. The SVE blower should have a variable frequency drive to allow adjustment of blower speed.
- One (1) Falco 600 (or similar) electric catalytic oxidizer for emissions treatment.
- One (1) emission stack with rain cap.
- One (1) moisture knockout tank with at least 100 gallon capacity at the high level switch, with internal demister inside tank, a site tube, and a drain valve.
- One (1) inline filter between the manifold and blower, to protect the blower from moisture and particulates that come up through the manifold lines.
- One (1) bleed air inlet filter and valve, located on blower inlet piping.
- One (1) discharge silencer on blower outlet piping to reduce outside noise to less than 80 dB at 5 feet from the remediation enclosure.
- Two (2) 3/8" sample ports, located on the KO tank inlet piping, and adjacent to the total flow meter.
- One (1) vacuum gauge (0-100" w.c. range) connected to the KO tank inlet piping.

- One (1) vacuum gauge (0-200"w.c. range) connected to the blower inlet piping.
- One (1) slide gate valve, located on the KO tank inlet piping, used to isolate the SVE manifold piping during the SVE blowback procedure.
- One (1) vacuum relief valve, initially set at least 5" w.c. below the maximum vacuum achievable by the vacuum blower.
- One (1) low vacuum switch, initially set at 10" w.c., connected to the KO tank inlet piping.
- One (1) temperature switch (32-250 Deg. F range, adjustable setting), connected to the SVE discharge piping.
- One (1) venturi total flow sensor and magnehelic differential pressure gauge (0-600 SCFM range), connected to blower inlet piping.
- One (1) temperature gauge (-20/120 Deg. F range), located on blower inlet piping after venturi.
- Four (4) PVC extraction manifolds controlled by solenoid valves (or similar) with twenty-five (25) SVE extraction manifold lines in each group, each line consisting of the following components:
    - One (1) venturi flow sensor and gauge (0-25 SCFM range);
    - One (1) 1 ½-inch flow control gate valve;
    - One (1) inlet vacuum gauge (0-60" w.c. range);
    - One (1) 3/8-inch sample port with ¼-inch Tygon tubing connection.
    - 2-inch flex hose, to connect to 2-inch PVC subsurface pipe stub ups.
- Piping to be leak tested at 10 psig (positive pressure) for 30 minutes.

AS System Specifications

The AS component of the remediation system was designed based on operation at similar sites, and is sized to be coupled with the SVE performance, which is based on site-specific pilot testing. See the AS System Piping and Instrumentation Diagram (P&ID, Figure 3) for more information regarding process flow. Specific information regarding components is presented below:

- One (1) compressor, powered by a three-phase, TEFC motor.
- One (1) inline filter on the blower inlet to protect the blower from particulates and dust.
- One (1) explosion-proof, fan-cooled heat exchanger, powered by a close-coupled three-phase, TEFC motor, to decrease the process air temperature.
- One (1) blower discharge high pressure switch, initially set at 30 psig, connected to the blower outlet piping before the heat exchanger.
- One (1) discharge temperature gauge (100-300 deg. F range), located on the blower outlet piping before the heat exchanger.
- One (1) heat exchanger discharge high temperature switch gage (32-300 deg. F range), initially set at 140 deg. F, connected to the heat exchanger outlet piping.
- One (1) flow control gate valve, located on the heat exchanger outlet piping.

- One (1) venturi flow sensor and total flow gauge (0-150 SCFM range), located on the heat exchanger outlet piping.
- One (1) pressure gauge (0-40 psig range) located on the blower outlet piping before the heat exchanger.
- One (1) blowback line connecting Sparge piping to SVE piping, with 4" gate valve, 4" pressure relief valve (initially set at 8 psi), and pressure gauge (0-15 psi range).
- Ten (10) welded 2-inch steel sparge distribution manifolds with ten (10) sparge injection manifold lines at four (4) of the manifold groups and eleven (11) sparge injection manifold lines at six (6) of the manifold groups. Manifold groups are to be isolated by normally closed solenoid valves, with a bleed air valve on each zone header. Each sparge injection line consists of the following components:
    - One (1) venturi flow sensor and gauge (0-10 SCFM range);
    - One (1) 1-inch flow control gate valve;
    - One (1) outlet pressure gauge (0-30 psig range);
    - One (1) 1-inch check valve.
    - 1-inch flex hose, to connect to 1-inch PVC subsurface stub up piping (subsurface piping is 2-inch PVC, with a reducing coupling to 1-inch for connection to manifold)
- All piping is to be leak tested at 30 psig for 30 minutes prior to delivery to the site.

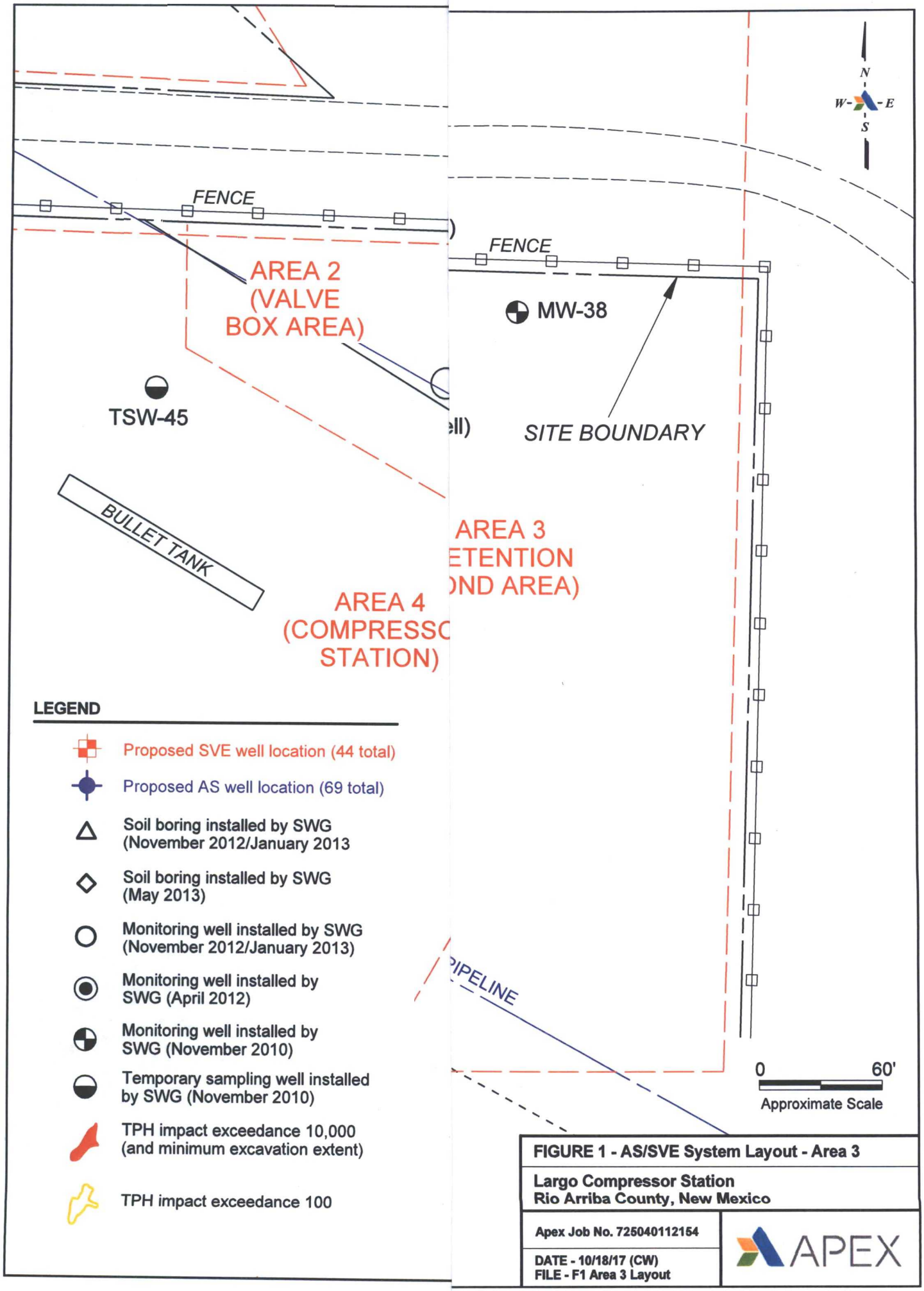


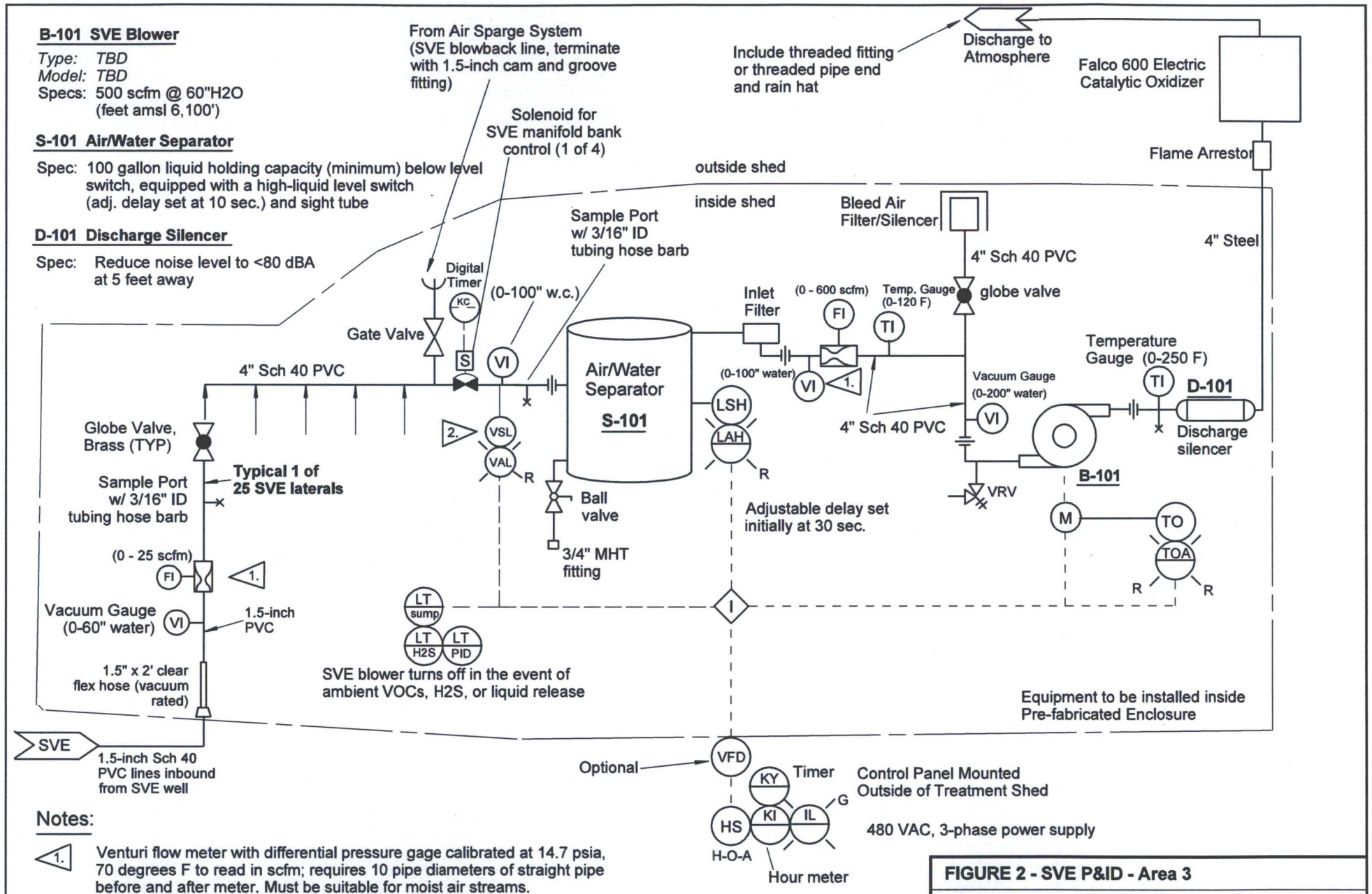
FIGURE 1 - AS/SVE System Layout - Area 3

Largo Compressor Station
Rio Arriba County, New Mexico

Apex Job No. 725040112154

DATE - 10/18/17 (CW)
FILE - F1 Area 3 Layout

APEX



Notes:

1. Venturi flow meter with differential pressure gage calibrated at 14.7 psia, 70 degrees F to read in scfm; requires 10 pipe diameters of straight pipe before and after meter. Must be suitable for moist air streams.
2. Low vacuum switch, adjustable, initially set at 10" water; 15 second delay; shuts down sparge system.
3. All electrical components inside the shed to be rated for Class I Division 2 environment.
4. Remediation system to be configured for remote operation of the touchpanel.

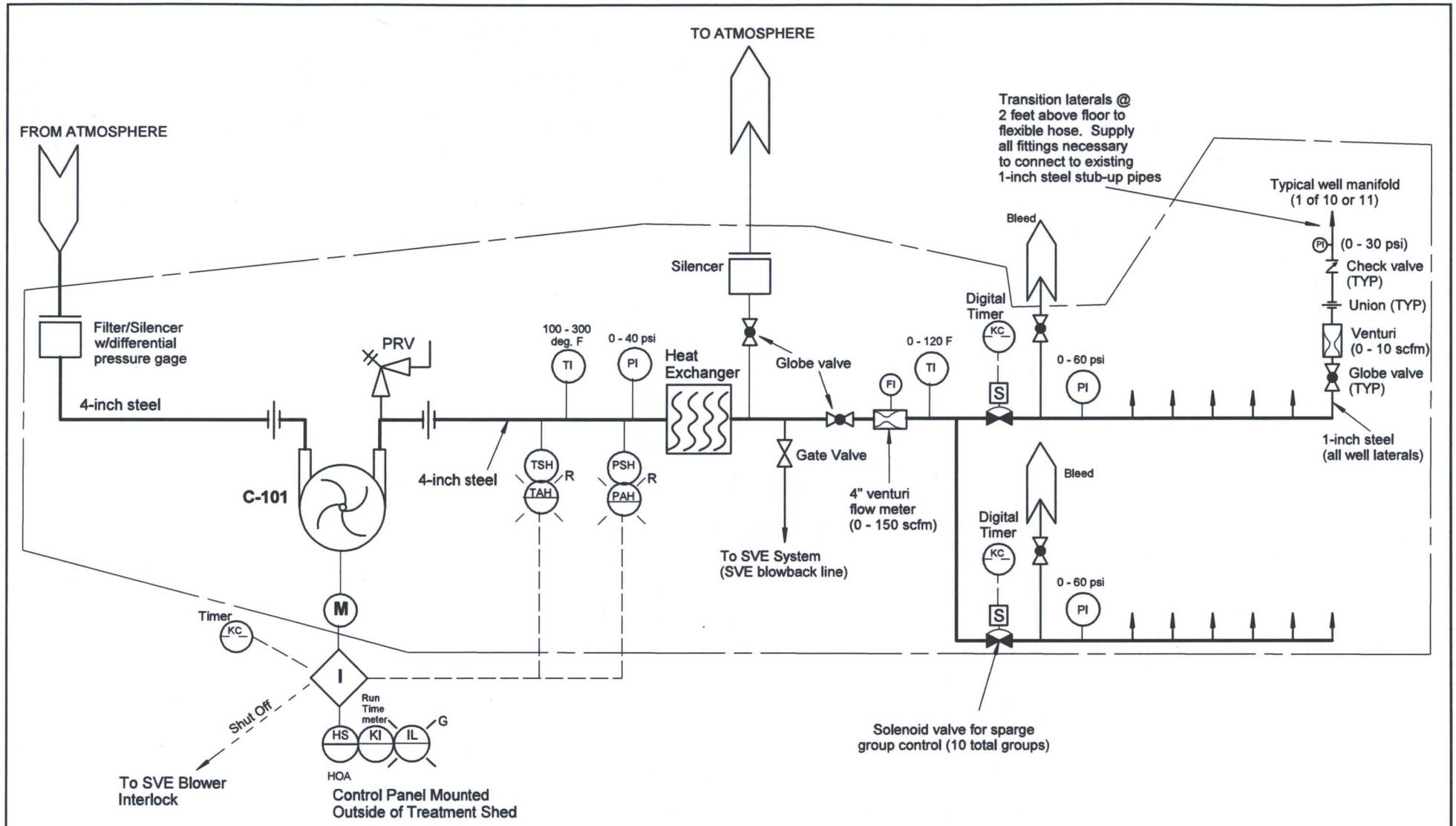
FIGURE 2 - SVE P&ID - Area 3

Largo Compressor Station
Rio Arriba County, New Mexico

Apex Job No. 725040112154

DATE - 9/13/17 (EW)
FILE - F2 P&ID.dc

APEX



C-101 Sparge Compressor

Type: TBD
Model: TBD
Spec: 120 scfm @ 25 psig at 6,100 feet above mean sea level, ambient temp = -20 F to 115 deg F

Notes:

1. Compressor selection shall be confirmed as adequate.
2. Other system components shall be selected to reduce maintenance.
3. Ensure that venturi meter position allows minimum before and after pipe runs per vendor recommendations.
4. Ensure that selected compressor specifications allow for flows in scfm that can be achieved at an elevation of 6,100 feet AMSL.
5. All equipment to be installed inside a heated and ventilated shed suitable for maintaining optimum temps for equipment and O&M personnel.

FIGURE 3 - AS P&ID - Area 3

Largo Compressor Station
Rio Arriba County, New Mexico

Apex Job No. 725040112154

DATE - 9/13/17 (EW)
FILE - F3 P&ID.dc

APEX

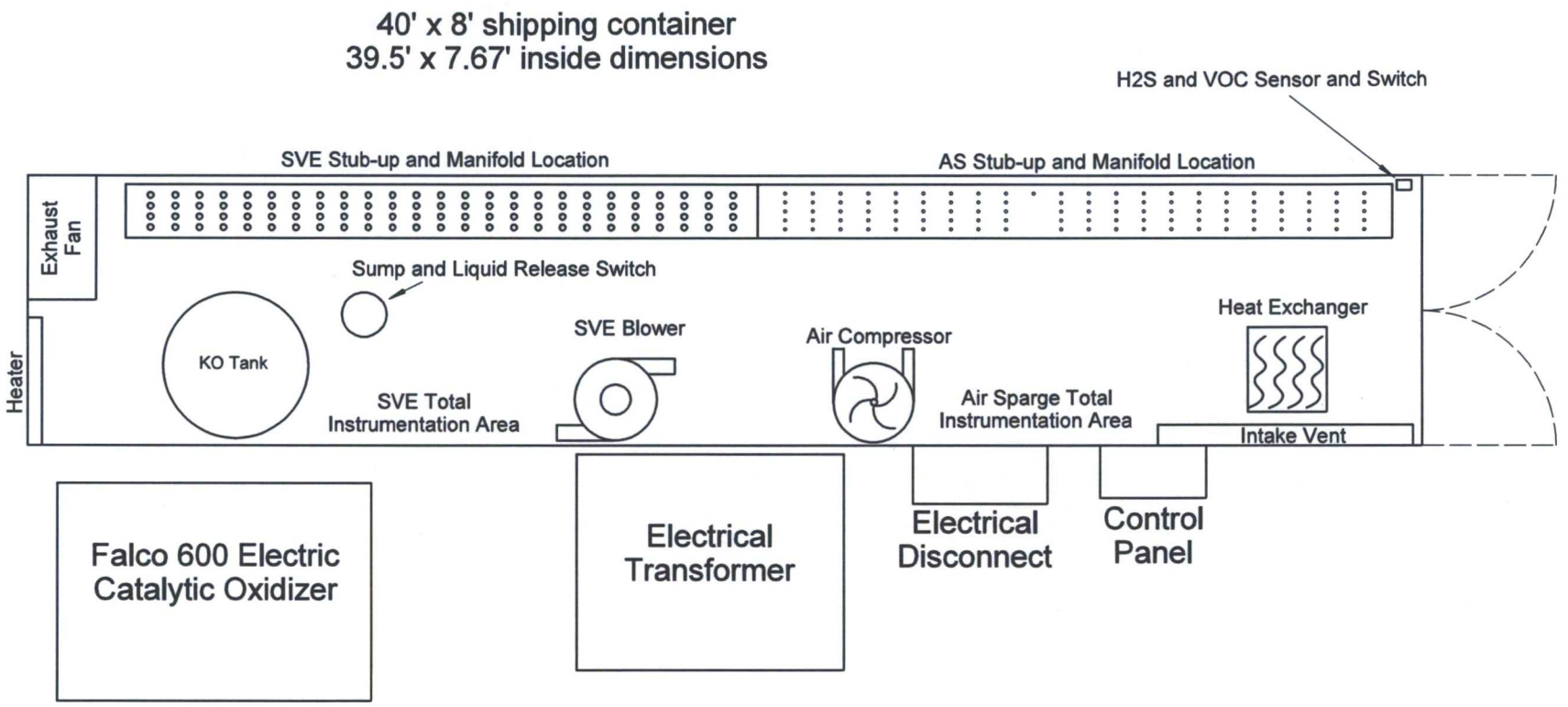


FIGURE 4 - Remediation Equipment Layout - Area 3

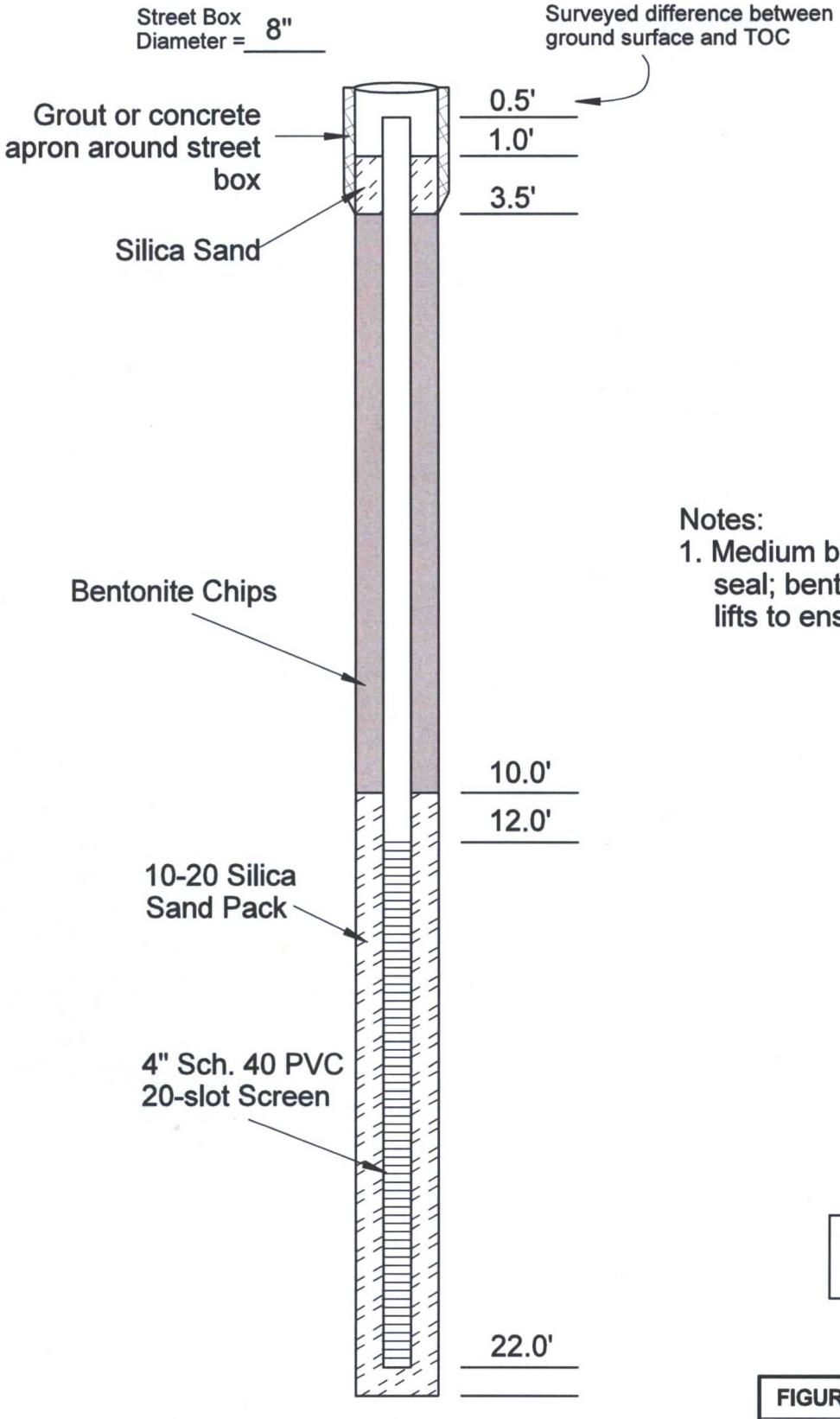
Largo Compressor Station
Rio Arriba County, New Mexico

Apex Job No. 725040112154

DATE - 9/13/17 (EW)
FILE - F4 Equipment layout.dc

APEX

Well Completion Detail



Notes:

1. Medium bentonite chips to be used for well seal; bentonite should be well hydrated in lifts to ensure adequate seal.

FIGURE NOT TO SCALE

* Measuring Point is Below Ground Surface (bgs)

FIGURE 5 - SVE Well Completion Detail

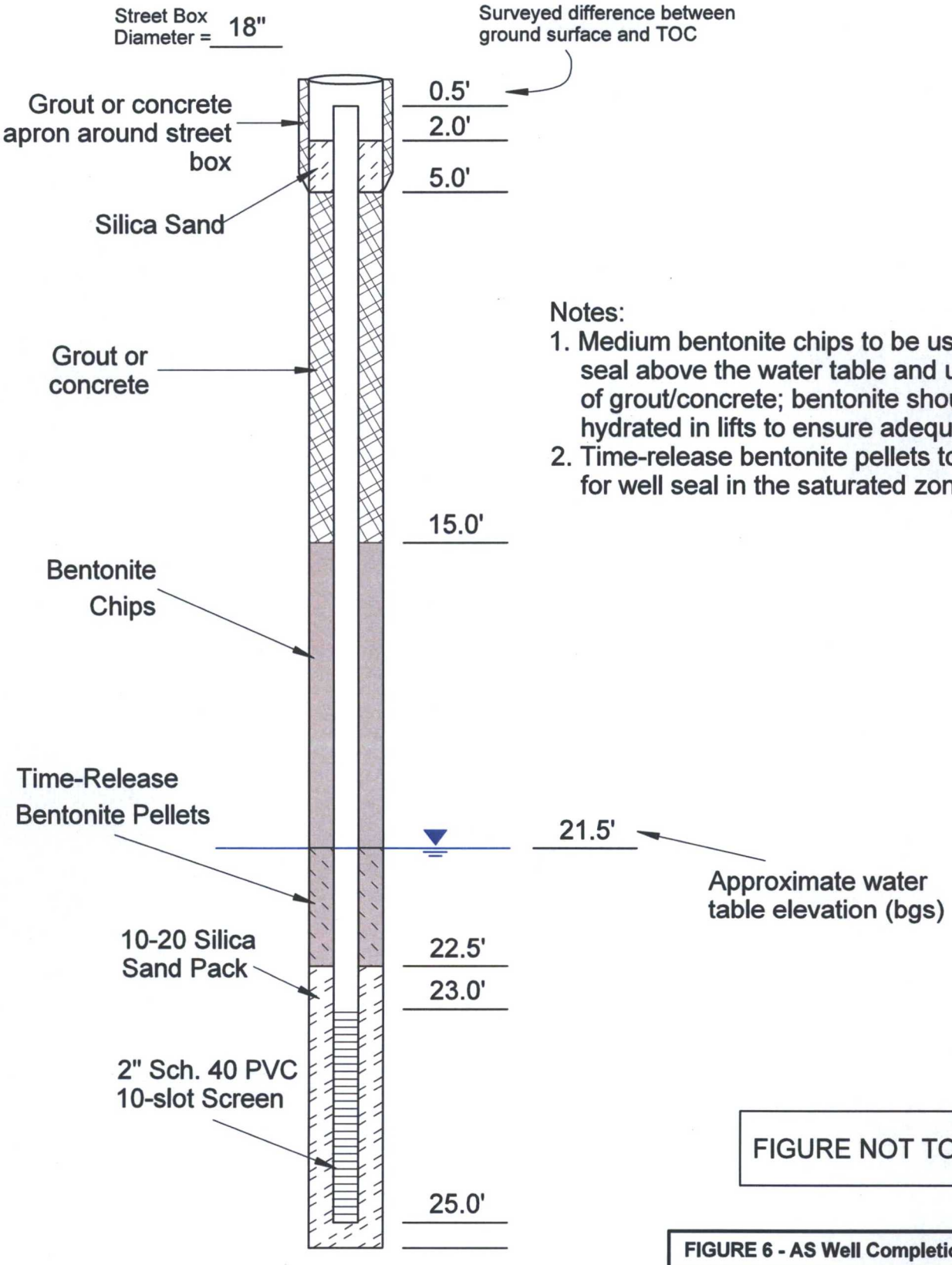
Largo Compressor Station
Rio Arriba County, New Mexico

Apex Job No. 725040112154

DATE - 8/30/17 (DC)
FILE - F5 SVE Well Detail.dc

APEX

Well Completion Detail



Notes:

1. Medium bentonite chips to be used for well seal above the water table and up to the start of grout/concrete; bentonite should be well hydrated in lifts to ensure adequate seal.
2. Time-release bentonite pellets to be used for well seal in the saturated zone.

FIGURE NOT TO SCALE

* Measuring Point is Below Ground Surface (bgs)

FIGURE 6 - AS Well Completion Detail

Largo Compressor Station
Rio Arriba County, New Mexico

Apex Job No. 725040112154

DATE - 8/30/17 (DC)
FILE - F6 AS Well Detail.dc

APEX