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Subject:

Former BP Facility No. WA-11060 (NW2463) - Air Sparge and Soil Vapor Extraction System Installation and Startup Report

ENVIRONMENT

Date:

June 21, 2016

Contact:

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GP09BPNA.WA48

Site Address: 4580 Fauntleroy Way Southwest, Seattle, WA 98126

On behalf of BP West Coast Products, LLC. (BP), Arcadis U.S., Inc. (Arcadis) is pleased to submit this summary of the installation and startup of an air sparge (AS) and soil vapor extraction (SVE) treatment system at the former BP Facility No. 11060 (site) in 2015 and 2016. This report summarizes the construction activities related to the system trenching, construction of the system complex, discharge permitting, and initial system startup. AS and SVE wells were installed at the site prior to system installation activities and reported under separate cover (Arcadis 2015). A site location map is presented on Figure 1.

Air Sparge and Soil Vapor Extraction Installation Activities

In 1996, Alisto Engineering Group (Alisto) installed seven remedial wells, including a single AS well (SP-2) and six combined AS/SVE wells (CW-1 through CW-6), at the site as part of a planned remedial treatment system. Each of these combined AS/SVE remedial wells included a nested one inch AS well and a two inch SVE well installed within the same bore hole. However, the system was never installed and the wells were capped and covered at grade (Alisto 1996).

In 2014, Arcadis installed five SVE wells (VE-1 through VE-5) and six AS wells (AS-1 through AS-6) for the AS/SVE system. The installation of these wells was reported under separate cover, 2014 Annual Site Status Report (Arcadis 2015). In addition to the newly installed AS and SVE wells, three of the previously installed remedial wells (CW-2 through CW-4) were able to be uncapped. These

wells were determined to be usable and were incorporated into the treatment system design.

Boring logs for each AS and SVE well connected to the remedial system are included as Attachment A.

System Trenching

Between October 26 and November 10, 2015 Arcadis and Clearcreek Contractors (Clearcreek) completed the system trenching and underground conveyance piping installation from the well field to the system compound. A layout of the system trenching and well locations are provided on Figure 2.

The underground AS conveyance piping is composed of one inch diameter high-density polyethylene (HDPE) pipe, and the SVE conveyance piping is composed of two inch schedule 40 polyvinyl chloride (PVC) pipe. AS/SVE conveyance piping was bedded in compacted sand and pea gravel. Controlled density fill (CDF) slurry was used above the pea gravel, followed by utility locating tape and copper wire. An aggregate road base was placed above the CDF and concrete was poured to match the existing grade. AS and SVE well heads were placed within flush mounted well boxes. The details of the AS and SVE well connections to the conveyance piping are shown on Figure 3 and trench construction details are shown on Figure 4.

System Compound Installation and Design

Between January 20 and 26, 2016, Arcadis placed the AS/SVE system equipment, constructed the manifold and completed to connections between the conveyance piping and the manifold. The AS/SVE system is housed within a skid mounted temporary building. The system enclosure and external elements are protected from vehicles by surrounding bollards. Bollard construction details are presented on Figure 4. The external manifolds and piping are surrounded by a locking chain-link security fence with privacy slats.

The location of this system compound is presented on Figure 2 and the treatment compound elevations are shown on Figure 5. The treatment system enclosure layout is shown on Figure 6.

The AS system components consists of a 15 horsepower (HP) air compressor capable of delivering 90 standard cubic feet per minute (scfm) at 28 pounds per square inch (psi), nine AS wells (AS-1 through AS-6 and CW-2, CW-3 and CW-4), remedial piping, a 5-well manifold, and controls for pulsing operation of the AS wells. To accommodate the nine AS wells, the internal 5 well manifold was expanded into an external 8-well manifold by splitting four of the lines exiting the system enclosure. The AS-3 conveyance line is connected directly to the internal AS manifold. Each AS well is equipped with a gate valve and a psi gauge to control and monitor the flow to each individual AS well. The AS process and

instrumentation diagram (P&ID) is included on Figure 7 and manifold details shown on Figure 8. AS compressor details are as follows:

AS Compressor

Quantity:	1
Manufacturer:	Rietschle Zephyr
Model:	DLR-150
Maximum Flow:	90 scfm
Maximum Pressure:	28 psi
Motor:	15 hp

The SVE system consists of a 5 hp SVE blower capable of 120 scfm at 80 inches of water (in wc) vacuum, eight SVE wells (VE-1, VE-2, VE-3, VE-4 and VE-5, CW-2, CW-3 and CW-4), an internal 5-well manifold, remedial piping, a knock-out tank, a vapor control valve (VCV) to control and regulate flow from the well field to the FALCO electric catalytic oxidizer (CATOX), and a Type B round pipe effluent stack. To accommodate the eight SVE wells, the internal five well manifold was expanded into an external six well manifold by splitting three of the lines entering the system enclosure. The remaining SVE wells are connected directly to the internal system compound manifold. Each well connection at the manifold includes a vacuum gauge and sample port to allow for the collection of flow, temperature and volatile organic hydrocarbon (VOC) concentration readings. There are two locations (influent-1 and influent-2) on the SVE system piping where flow, temperature and VOC concentrations can be collected for the entire system. Influent-1 is pre-dilution and is located on the vacuum side of the blower. Influent-2 is post–dilution and is located on the pressure side of the blower. The extracted soil vapor is then processed by the CATOX and discharged through the effluent stack. An effluent sample port is located on the stack where VOC samples can be collected. The SVE P&ID is included on Figure 9 with the manifold details shown on Figure 8. The CATOX equipment specifications are included as Attachment B. SVE blower and CATOX details are as follows:

SVE Blower

Quantity:	1
Manufacturer:	Rotron
Model:	EN707F72MXL Explosion Proof Regenerative Blower
Maximum Flow:	120 scfm

Maximum Vacuum:	80 in wc
Motor:	5 hp

CATOX

Quantity:	1
Manufacturer:	Fallmouth
Model:	Falco 100
Capacity:	40-120 scfm
Maximum Input Loading:	2,200 parts per million volume (ppmv) for petroleum hydrocarbons
Temperature range:	330º-620 ºC
Catalyst:	Monolithic. Precious metal
Heater:	30.5 amp @ 240V single phase

The system is equipped with a programmable logic controller with customizable settings for fully automated operation. System settings are controlled through a touch screen interface and variable frequency drive controls for the SVE blower. The system operations can be monitored remotely with 4G telemetry managed by Fliteway Technologies. The status of the system can be checked remotely 24 hour a day 7 days a week. An activated system shutdown alarm generates an email that informs the project team of the shutdown.

Critical safety devices are incorporated throughout the system to keep the operating parameters within their designed limits of safe operation. System shut-down alarms are in place if the operating parameters are outside of the applicable set points. The automated alarms include high and low vacuum alarms on the SVE system, high and low pressure alarms on the AS system, high and low temp alarms on the CATOX, multiple motor fault alarms, alarms associated with the heater relay on the AS/SVE and several alarms tied to the operation of the CATOX. The air compressor and process piping is equipped with a pressure relief valve and the blower and process piping is equipped with a vacuum relief valve. To ensure proper destruction efficiency, the system is equipped with the VCV, which controls auto dilution and flow from the well field. The VCV will not open until the CATOX reaches the minimum temperature set point and will open auto dilution if the CATOX temperature is approaching the maximum temperature set point or is rising too quickly. The VCV is equipped with individual alarms that control this process. If the systems pulls water in through the SVE lines at any point during operation, the system is capable of storing water in a 117 gallon knockout tank. The knockout tank is equipped with a Warrick 3-level conductive

float switch and will shut down if the water level of the knockout tank reaches the high-high mark on the switch.

The system is powered by a 200 amp 120/208 volt three phase service, installed by licensed electricians from SHJ Electric Inc. (SHJ). This service panel is located on the east side of the service station and is protected by a bollards. The electrical layout of the system was inspected and approved by Seattle City Light on March 9, 2016. A copy of this Electrical Permit Inspection Report is presented as Attachment C. Electrical details and a single line diagram for the system is included on Figure 10.

Vapor Discharge Permitting

Prior to system startup, the Notice of Construction No. 10813 and Registration No. 29664 was issued by the Puget Sound Clean Air Agency (PSCAA). A copy of the PSCAA permit is provided in Attachment D. Operational restrictions are summarized in the permit. While the system is in operation the results from monitoring and sampling activities will be evaluated for compliance with PSCAA permit requirements.

System Startup

Between April 18 and 22, 2016, Arcadis turned on the treatment system. Under Arcadis' supervision, a licensed electrician from SHJ tested the voltage between each phase of the electrical service including between phases and from each phase to ground. After confirming that the service had been installed correctly, the system was powered on and the electrical connections in the main panel were tested and confirmed live. Once complete, the electrical connections linking the main panel to the CATOX were also confirmed.

Following the completion of the electrical testing, the system was energized. Arcadis conducted a series of tests to confirm the SVE and AS critical safety devices and interlocks between the AS and SVE systems and SVE and CATOX were functional.

Prior to applying vacuum to the well field. Arcadis gauged site wells with an oil/water interface probe to test for the presence of non-aqueous phase liquid (NAPL). NAPL was detected within wells VE-1, AS-6, EW-1, EW-3 and MW-4. NAPL was removed from each well using a disposable bailer and transferred to a 20-gallon labeled steel drum that is stored onsite.

Following gauging, the system was started and the AS and SVE well locations were confirmed with the conveyance piping/manifold locations at the treatment compound. Vacuum was then applied to the SVE wells, baseline data were collected, and effluent flowrate, total vacuum, blower temperature, and

influent/effluent VOC concentrations were recorded. Flow rates were analyzed using an anemometer and VOC concentrations were analyzed using a photo ionization detector (PID). After confirming total system operational settings were within the PSCAA permit limits, flowrate, vacuum, temperature, VOC concentration and lower explosive level (LEL) levels were recorded for each individual well. The process was repeated with only individual SVE wells open to the system vacuum. Field data sheets are included in Attachment E.

Influent and effluent samples were then collected using a vacuum pump and tedlar bags from the respective sample ports. The tedlar bags were shipped to Eurofins Lancaster Laboratories to be analyzed for benzene, toluene, ethylbenzene and xylenes (BTEX) and gasoline range hydrocarbons (GRO). A summary of this analytical data is presented in Table 1 and the laboratory report is included as Attachment F.

Due to the high influent VOC concentrations observed during startup activities and the presence of NAPL at the southwest corner of the site, the AS portion of the system was not started. The startup of the AS portion of the system will be based on an evaluation of soil vapor and groundwater concentrations and/or the absence or presence of NAPL. Until that time, the system will operate as SVE only.

System parameters were measured on a weekly basis for two weeks following startup. A summary of the first three weeks of system operation is summarized in Table 2. Regular system operations and maintenance (O&M) events started in May of 2016. O&M will be conducted on a monthly basis, including system, performance monitoring, and analytical sample collection. Results will be submitted to the Department of Ecology on an annual basis.

If you have any questions please contact Brian Marcum at 503-220-8201 x1137 or Brian.Marcum@arcadis.com.

Sincerely,

Arcadis U.S., Inc.

Brian Marcum
Project Manager

Rebecca Andresen, L.G.
Vice President

Copies:

Richard Wright, Property Owner

Enclosures:

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Table 2	AS/SVE Operational Data

Attachments

Attachment A	System Well Boring Logs
Attachment B	CATOX FALCO 100 Specifications
Attachment C	Electrical Permit Inspection Report
Attachment D	PSCAA Permit
Attachment E	System Startup Field Notes and Form
Attachment F	SVE Analytical Data

References

Arcadis, 2015. Annual Site Status Report 2014 Former ARCO Facility No. 11060. July 31, 2015.

Alisto, 1996. Remediation System Well Installations BP Oil Company Service Station No. 11060. September 19, 1996.

TABLES

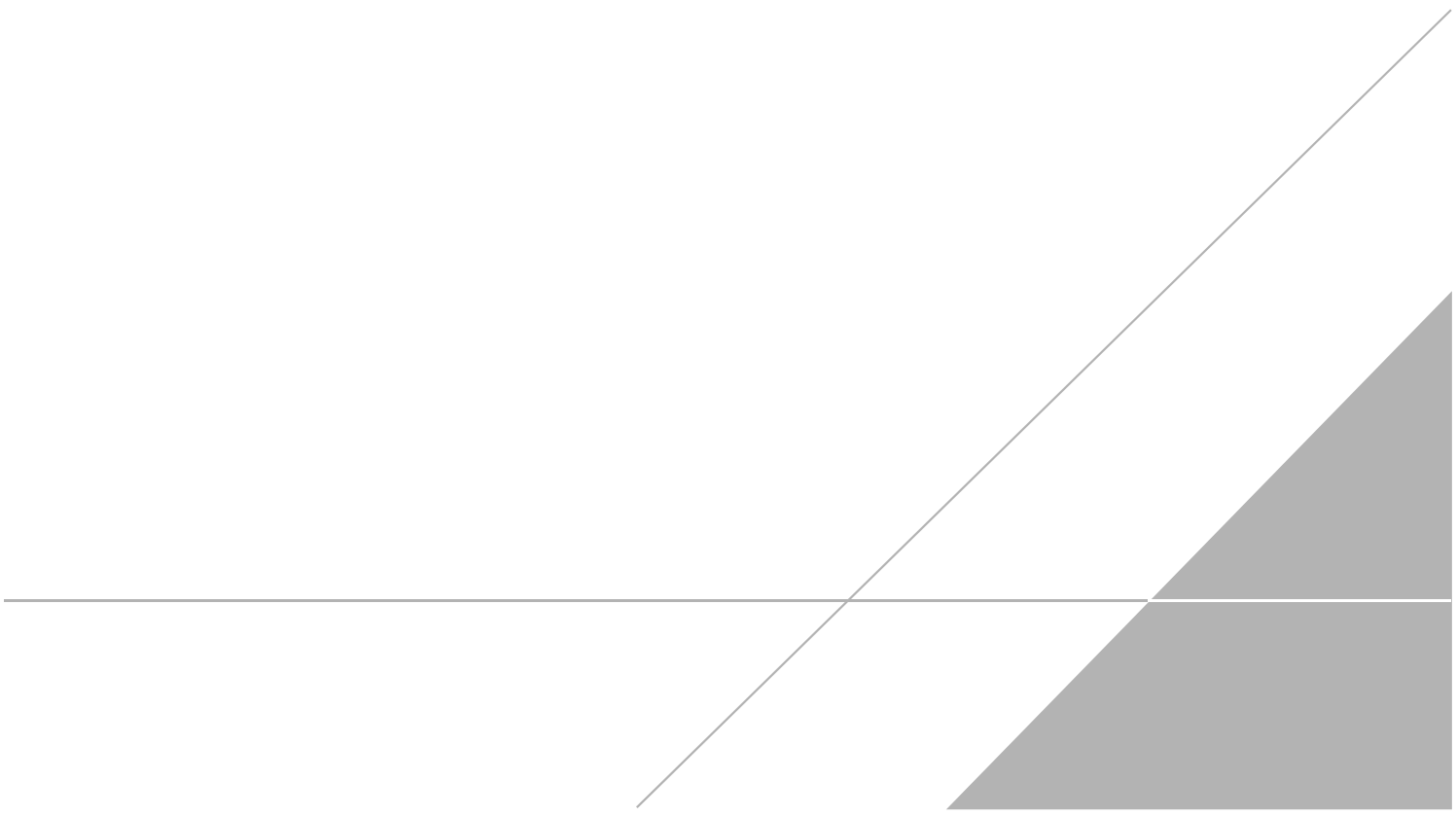


Table 1
AS/SVE - Soil Vapor Extraction Analytical Data
WA-11060

4580 Fauntleroy Way SW, Seattle, WA 98126

Date	Influent Flowrate (scfm) [1]	Laboratory Analytical Influent Concentrations					Laboratory Analytical Effluent Concentrations					GRO Mass Removal		
		GRO (ppmv)	Benzene (ppmv)	Toluene (ppmv)	Ethylbenzene (ppmv)	Total Xylenes (ppmv)	GRO (ppmv)	Benzene (ppmv)	Toluene (ppmv)	Ethylbenzene (ppmv)	Xylenes (ppmv)	Mass Removal Rate (lbs/day)	Mass Removal Rate (lbs/period)	Cumulative Mass Removal (lbs)
Permit Requirements	**<350**	**--**	**--**	**--**	**--**	**--**	**<200**	**<200**	**<200**	**<200**	**<200**	**--**	**--**	**--**
04/20/16	22.7	760.0	0.8 J	0.9 J	0.7 J	1.8 J	< 5.0	< 0.5	< 0.8	< 0.4	< 0.7	--	--	--

scfm = Standard cubic feet per minute. scfm = acfm * (Pactual / Pstandard) * (Tstandard / Tactual)
P = pressure
T = temperature
Standard pressure is equal to 1 atmosphere and standard temperature 68 °F, as used by the National Institute of Standards and Technology (NIST).
GRO = Total petroleum hydrocarbons - gasoline range organics
GRO (C-4-C10 hydrocarbons hexane) by EPA method 25 modified
EPA = Environmetal Protection Agency
ppmv = Parts per million volume
Benzene, Toluene, Ethylbenzene and Xylenes by EPA method 18 modified
Mass Removal Rate = Flow * time * Concentration * Molecular Weight * Molar Density of Air
TPHg molecular weight = 86 lb / [lb mol]
Molar density of air = P/RT = 1 atm / (0.7302 [ft3 * atm] / [lb mol * ºR]) / (68 + 459.67)ºR = 0.00260 lb mol / ft3
Molar density of air based on standard pressure of 1 atm and standard temperature of 68ºF, as used by the National Institute of Standards and Technology (NIST).
P = pressure
R = gas constant
ºR = degrees Rankine
T = temperature
atm = atmosphere
lb mol = Pound per Mole
ft^3 = cubic feet
lbs = Pounds
lbs/day = pounds per day
Period = Length of time since the previous date that operational data was collected
lbs/period = Pounds per period
Cumulative mass removed = Previous mass removed + Removal rate * Elapsed time per period
< = Operation data must be less than the permit requirement
> = Operation data must be greater than the permit requirement
-- = Not collected/ not available
< = Analytical sample results below laboratory method detection limits
1 = Influent sample port is located post-dilution thus flow rate through cat ox is equal to exhaust flowrate and compliant with Puget Sound Clean Air Agency (PSCAA) permit #29602 subpart 4b

Table 2
AS/SVE OPERATIONAL DATA
WA-11060

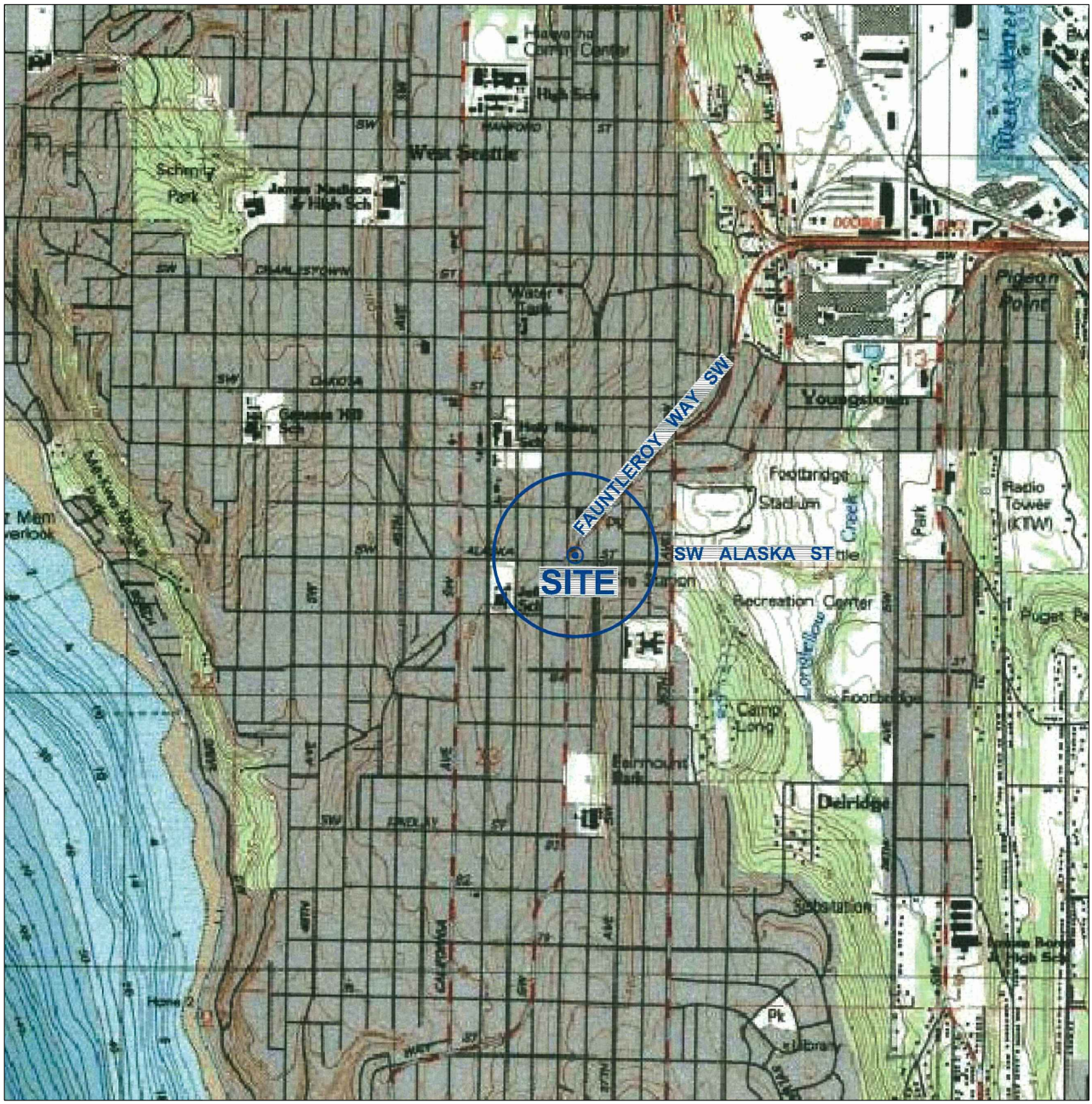
4580 Fauntleroy Way SW, Seattle, WA 98126

Date	SVE Operation (on or off) Arrival / Departure	SVE Hour Meter (Hours)	SVE Period Operation (Hours)	SVE Percent Uptime (%)	AS Operation (on or off) Arrival / Departure	AS Hour Meter (Hours)	AS Period Operation (Hours)	AS Percent Uptime (%)	Cat Ox Inlet Temperature (^{o}F)	Post-Dilution[1]						Effluent PID (ppmv)	Destruction Efficiency (%)	VOC Mass Removal Rate (lbs/day)	VOC Mass Removal Rate (lbs/period)	Cumulative VOC Removal (lbs)
										Presure (in. Wc)	Influent Temperature (^{o}F)	Influent Flowrate (fpm)	Influent Flowrate (acfm)	Influent Flowrate (scfm)	Influent PID (ppmv)				
Permit Requirements		--	--	--		--	--	--	**> 625**	--	--		--	**<120**	--	**<200**	**>97% [2]**			
04/20/16	off / on	6021.5	--	--	off / off	37.8	--	--	633.0	3.0	83.0	1080.0	23.54	23	316.0	0.9	99.7%	2.31	--	--
04/22/16	on / on	6064.0	42.5	88.5%	off / off	37.8	0.0	0.0%	649.0	2.0	89.0	1110.0	24.20	23	283.7	2.1	99.3%	2.10	3.73	3.73
04/27/16	on / on	6189.6	125.6	100.0%	off / off	37.8	0.0	0.0%	626.0	3.0	88.0	840.0	18.31	18	376.5	6.0	98.4%	2.12	11.11	14.84
05/04/16	on / on	6354.2	164.6	100.0%	off / off	37.8	0.0	0.0%	626.0	3.0	91.0	920.0	20.06	19	245.5	1.4	99.4%	1.51	10.34	25.17

Annual Operational Hours	**333**
Average Uptime Percentage	**96.18%**
Average SVE flow rate (scfm):	**16**

SVE = Soil Vapor Extraction
AS - Air Sparge
Period = Length of time since the previous date that operational data was collected
% = Percentage
Uptime = Calculated percentage of operation during the period. (Hours of operation per period / total hours per period)
Cat Ox = Catalytic Oxidizer, the system component that catalyzes combustion of extracted Volatile Organic Compounds (VOCs)
^{o}F = Fahrenheit
in Wc = Inches of water column
in Hg = Inches of mercury
fpm= feet per minute
acfm = Actual cubic feet per minute measured by anemometer
scfm = Standard cubic feet per minute. scfm = acfm * (Pactual / Pstandard) * (Tstandard / Tactual)
P = pressure
T = temperature
Standard pressure is equal to 1 atmosphere and standard temperature 68 °F, as used by the National Institute of Standards and Technology (NIST).
PID = Photoionization Detector
ppmv = Parts per million volume
Destruction Efficiency = (influent VOCs - effluent VOCs) / (influent VOCs). VOCs measured by PID
Mass Removal Rate= Flowrate * time * Concentration * Molecular Weight * Molar Density of Air
VOC molecular weight = 86 lb / [lb mol]
Molar density of air = P/RT = 1 atm / (0.7302 [ft^3 * atm] / [lb mol * ^{o}R]) / (68 + 459.67)^{o}R = 0.00260 lb mol / ft^3
Molar density of air based on standard pressure of 1 atm and standard temperature of 68^{o}F, as used by the National Institute of Standards and Technology (NIST).
P = pressure
R = gas constant
^{o}R = degrees Rankine
T = temperature
atm = atmosphere
lb mol = Pound per Mole
ft^3 = cubic feet
lbs = Pounds
lbs/day = Pounds per day
lbs/period = Pounds per period
Cumulative mass removed = Previous mass removed + Removal rate * Elapsed time
< = Operation data must be less than the permit requirement
> = Operation data must be greater than the permit requirement
-- = Not collected/ not available
1 = Influent sample port is located post-dilution thus flow rate through cat ox is equal to exhaust flowrate and compliant with Puget Sound Clean Air Agency (PSCAA) permit #29602 subpart 4b
2= Destruction Efficiency must be >97% when TPH influent is greater than 200 ppmv per PSCAA permit # 29602 subpart 4

FIGURES



REFERENCE: BASE MAP USGS 7.5X15. MIN. TOPO. QUAD.,SEATTLE SOUTH, WA, 1983.

0 2000' 4000'

Approximate Scale: 1 in. = 2000 ft.

BP WEST COAST PRODUCTS LLC
FORMER BP STATION NO. 11060
4580 FAUNTLEROY WAY, SEATTLE, WASHINGTON

AIR SPARGE AND SOIL VAPOR EXTRACTION SYSTEM INSTALLATION AND STARTUP REPORT

SITE LOCATION MAP

ARCADIS Design & Consultancy for natural and built assets

FIGURE 1

CITY: PETALUMA, CA DIV/GROUP: ENV DB: J. HARRIS LD:--- PIC:--- PM: S. DAVIS TM: T. POTTER LYR:(Opt)ON=*;OFF=*REF*
C:\ENVCAD\Emeryville\ACTIGP09BPNAWA48M0000\AS-SVE\DWG\GP09BPNAWA48 N01.dwg LAYOUT: 1 SAVED: 5/16/2016 3:35 PM ACADVER: 19.1S (LMS TECH) PAGESETUP: --- PLOTSTYLETABLE: ARCADIS.CTB PLOTTED: 5/16/2016 4:27 PM BY: REYES, ALEC
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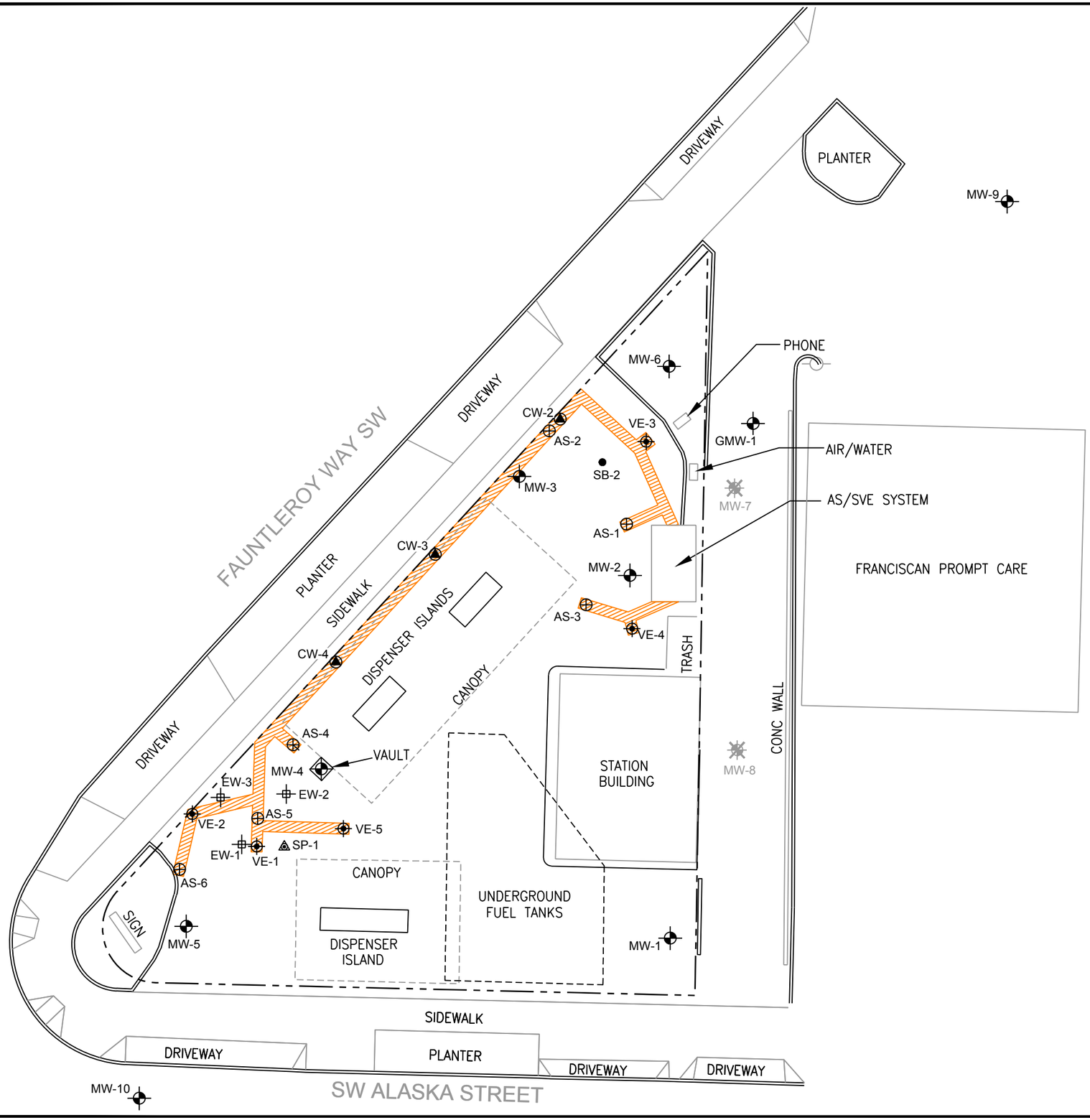

LEGEND

- APPROXIMATE PROPERTY LINE
- CW-2 — AS AND SVE COMBINATION WELL LOCATION
- MW-2 — MONITORING WELL LOCATION
- MW-7 — ABANDONED MONITORING WELL LOCATION
- SP-1 — INACTIVE AIR SPARGING WELL LOCATION
- VE — VAPOR EXTRACTION WELL LOCATION (APPROXIMATE)
- AS — AIR SPARGING WELL LOCATION
- EW-1 — EXTRACTION WELL
- APPROXIMATE TRENCH LOCATION
- AS — AIR SPARGE
- SVE — SOIL VAPOR EXTRACTION

NOTES:
1. VE and SVE well locations have not been surveyed and are approximate (except for VE-1 and VE-2).

0 20' 40'
GRAPHIC SCALE

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SITE PLAN

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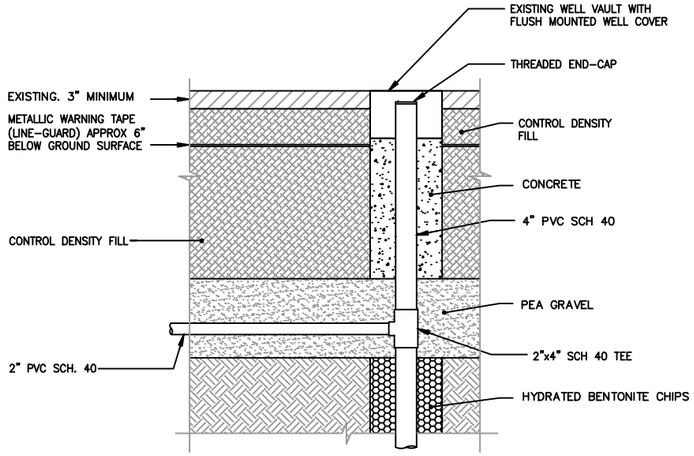
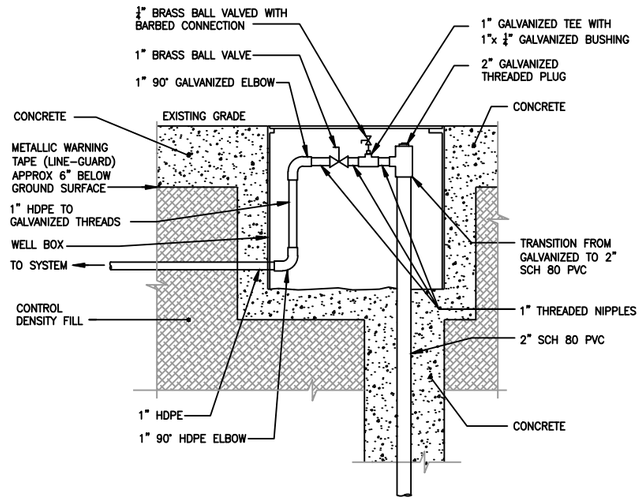
FIGURE 2



SOIL VAPOR EXTRACTION WELLHEAD DETAIL

NOT TO SCALE



AIR SPARGE WELLHEAD DETAIL

NOT TO SCALE

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AIR SPARGE AND SOIL VAPOR EXTRACTION SYSTEM INSTALLATION AND STARTUP REPORT

VAULT AND WELLHEAD DETAILS

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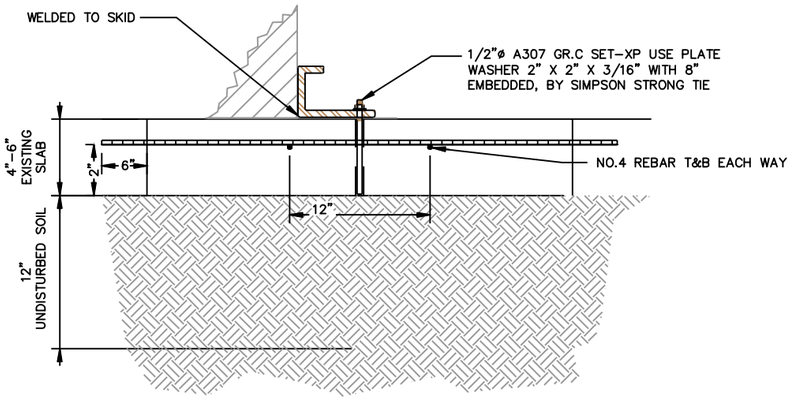
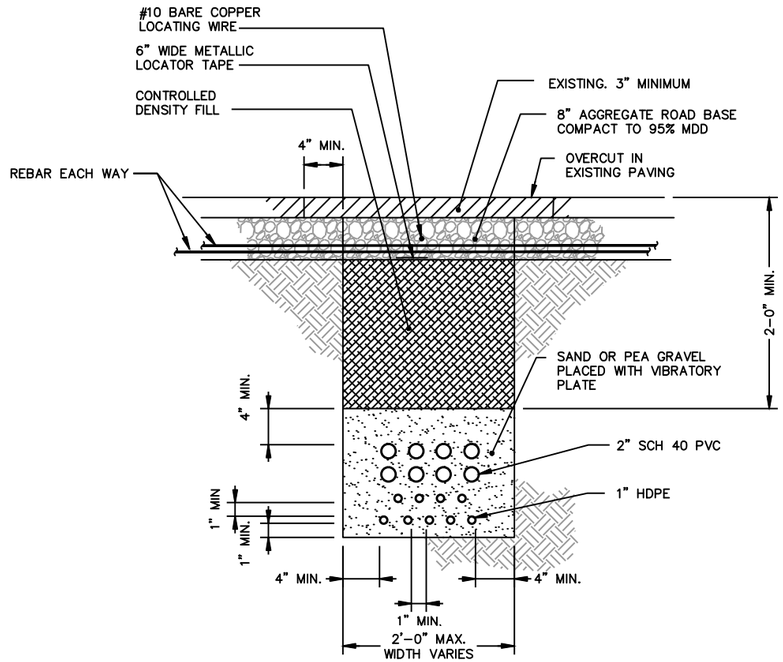
FIGURE
3



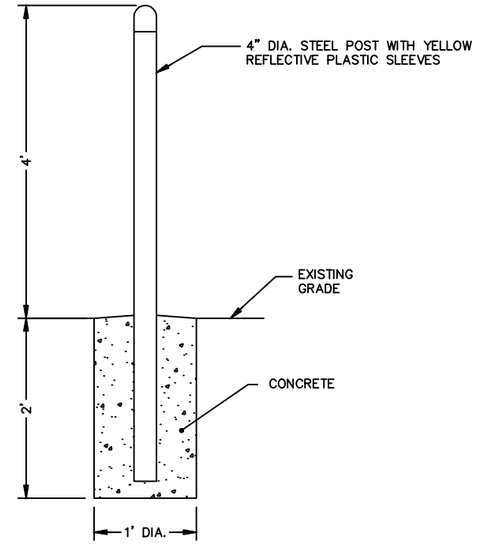
EQUIPMENT ANCHORAGE DETAILS

NOT TO SCALE



MULTIPLE AS/SVE PIPING TRENCH DETAILS

NOT TO SCALE



BOLLARD DETAIL

NOT TO SCALE

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4580 FAUNTLEROY WAY, SEATTLE, WASHINGTON
AIR SPARGE AND SOIL VAPOR EXTRACTION SYSTEM INSTALLATION AND STARTUP REPORT

TRENCHING, ANCHOR, AND BOLLARD DETAILS

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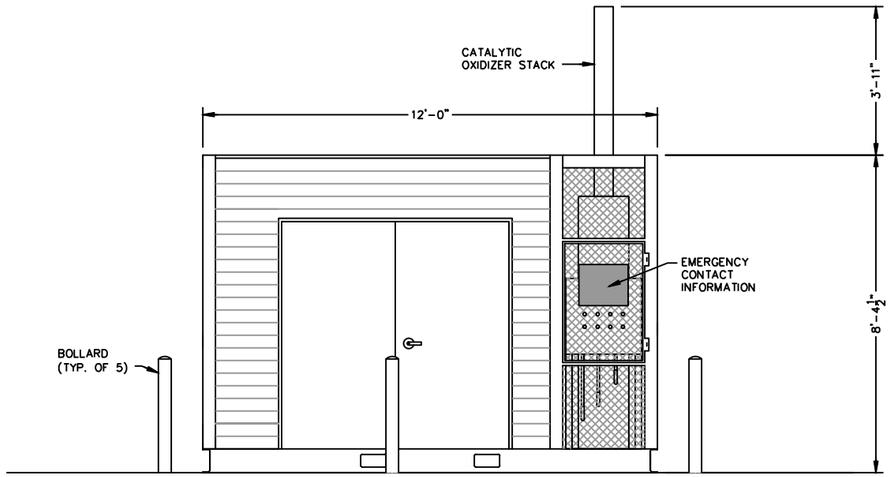
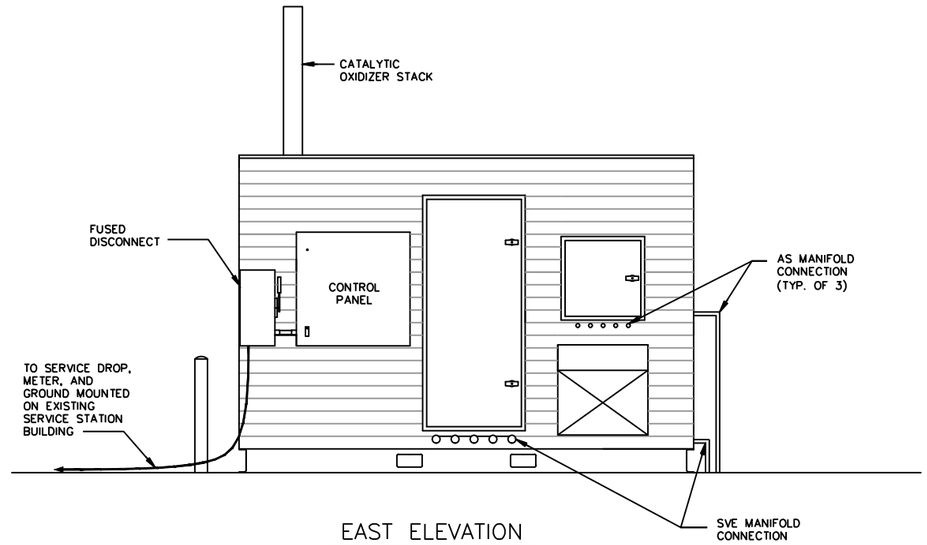
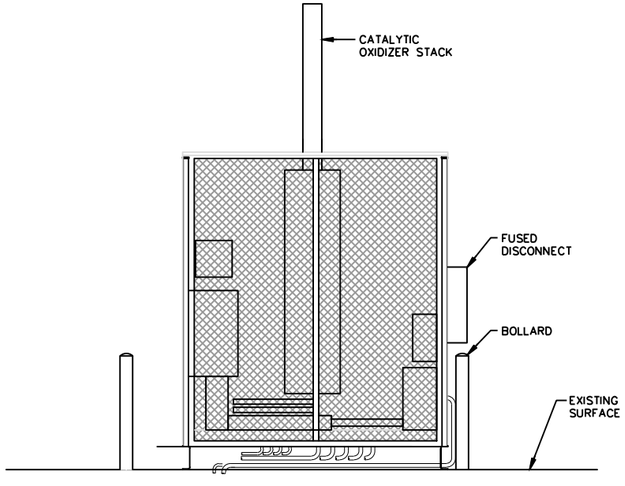
FIGURE
4



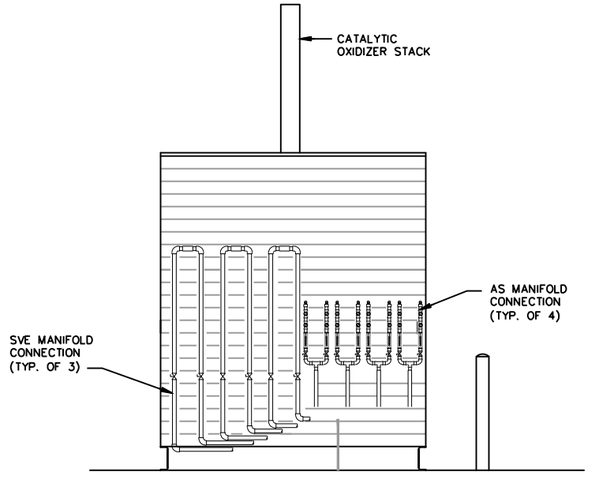
WEST ELEVATION
SCALE 1" = 4'-0"



EAST ELEVATION
SCALE: 1/2" = 1'-0"



SOUTH ELEVATION
SCALE: 1/2" = 1'-0"



NORTH ELEVATION
SCALE: 1/2" = 1'-0"

NOTE:

1. ALL EXTERIOR COLORS/MATERIALS WILL BE PAINTED AND/OR TEXTURED TO MATCH THE EXISTING ARCO BUILDING.

0 4' 8'

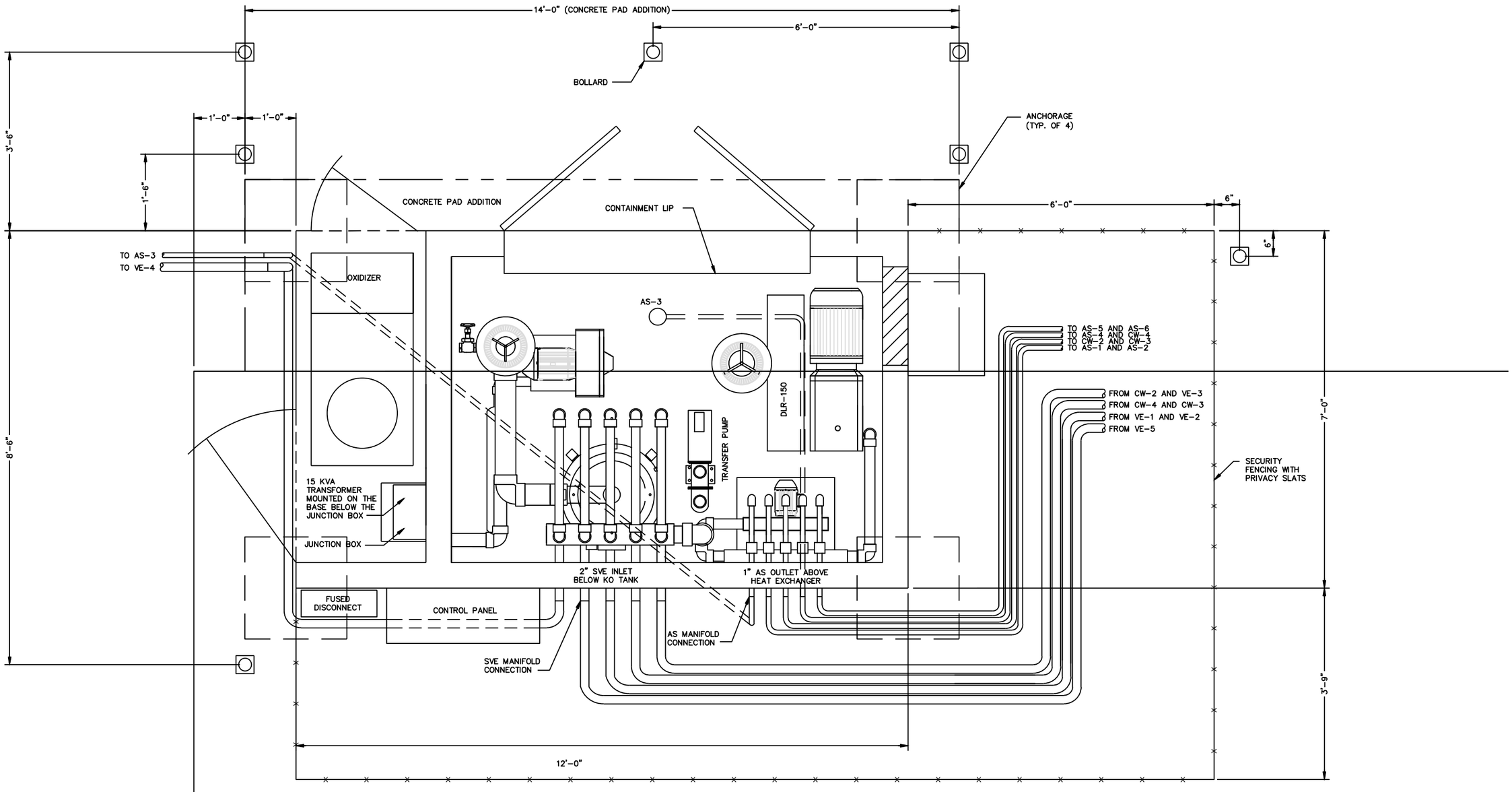
Approximate Scale: 1 in. = 4 ft.

BP WEST COAST PRODUCTS LLC
FORMER BP STATION NO. 11060
4580 FAUNTLEROY WAY, SEATTLE, WASHINGTON
AIR SPARGE AND SOIL VAPOR EXTRACTION SYSTEM INSTALLATION AND STARTUP REPORT

TREATMENT COMPOUND ELEVATIONS

ARCADIS Design & Consultancy for natural and built assets

FIGURE
5



NORTH

0 2' 4'

Approximate Scale: 1 in. = 2 ft.

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AIR SPARGE AND SOIL VAPOR EXTRACTION SYSTEM INSTALLATION AND STARTUP REPORT

TREATMENT ENCLOSURE

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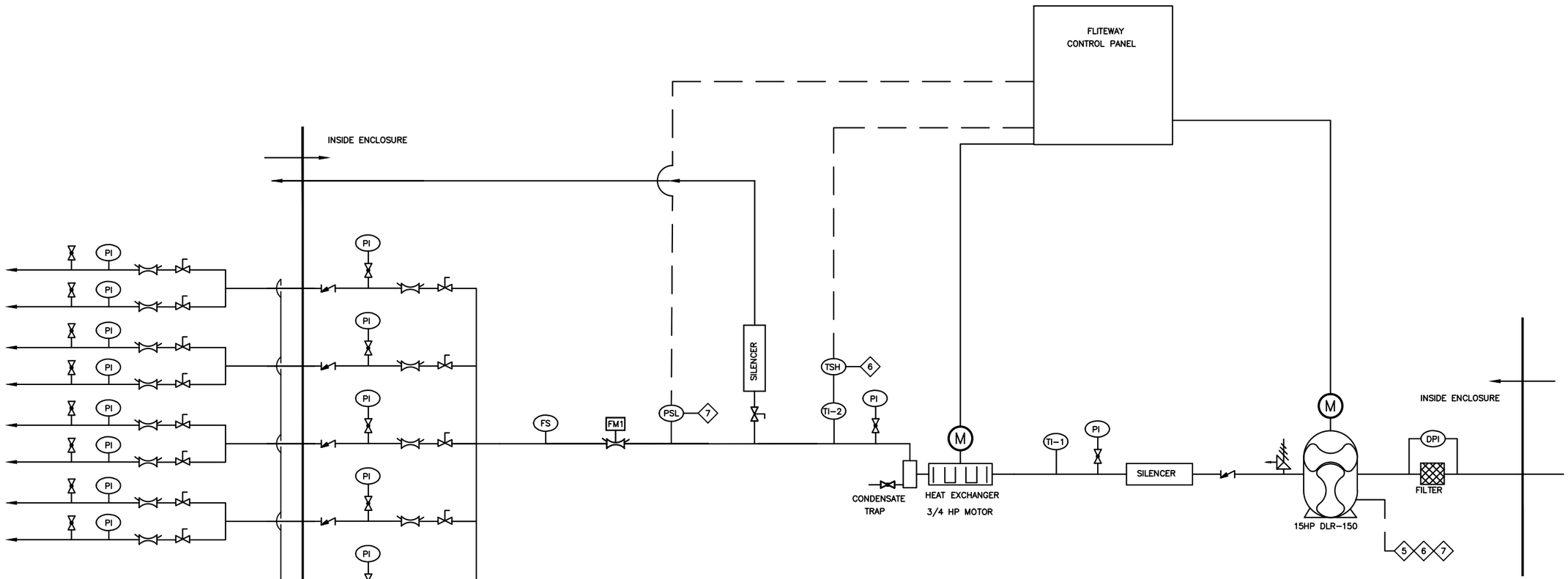
FIGURE
6



LEGEND

- PI — PRESSURE INDICATOR 0–30 PSI
- PSL — PRESSURE SWITCH LOW 0–30 PSI
- TI–1 — TEMPERATURE INDICATOR 50–400
- DPI — DIFFERENTIAL PRESSURE INDICATOR
- TSH — TEMPERATURE SWITCH HIGH 0–250
- FS — PITOT TUBE FLOW SENSOR
- TI–2 — TEMPERATURE INDICATOR 0–250
- RELIEF VALVE
- BALL VALVE
- GATE VALVE
- CHECK VALVE
- DWYER VFC–121 FLOWMETERS
- FM1 — CHEMLINE FLOW METER

INTERLOCK SCHEDULE

- 5 — OXIDIZER FAILURE – SHUT DOWN DLR–150
- 6 — TEMPERATURE ALARM HIGH – TEMPERATURE GREATER THAN 127° F, SHUT DOWN DLR–150, SIGNAL ALARM.
- 7 — PRESSURE ALARM LOW – PRESSURE LESS THAN 10 PSI, SHUT DOWN DLR–150, SIGNAL ALARM.

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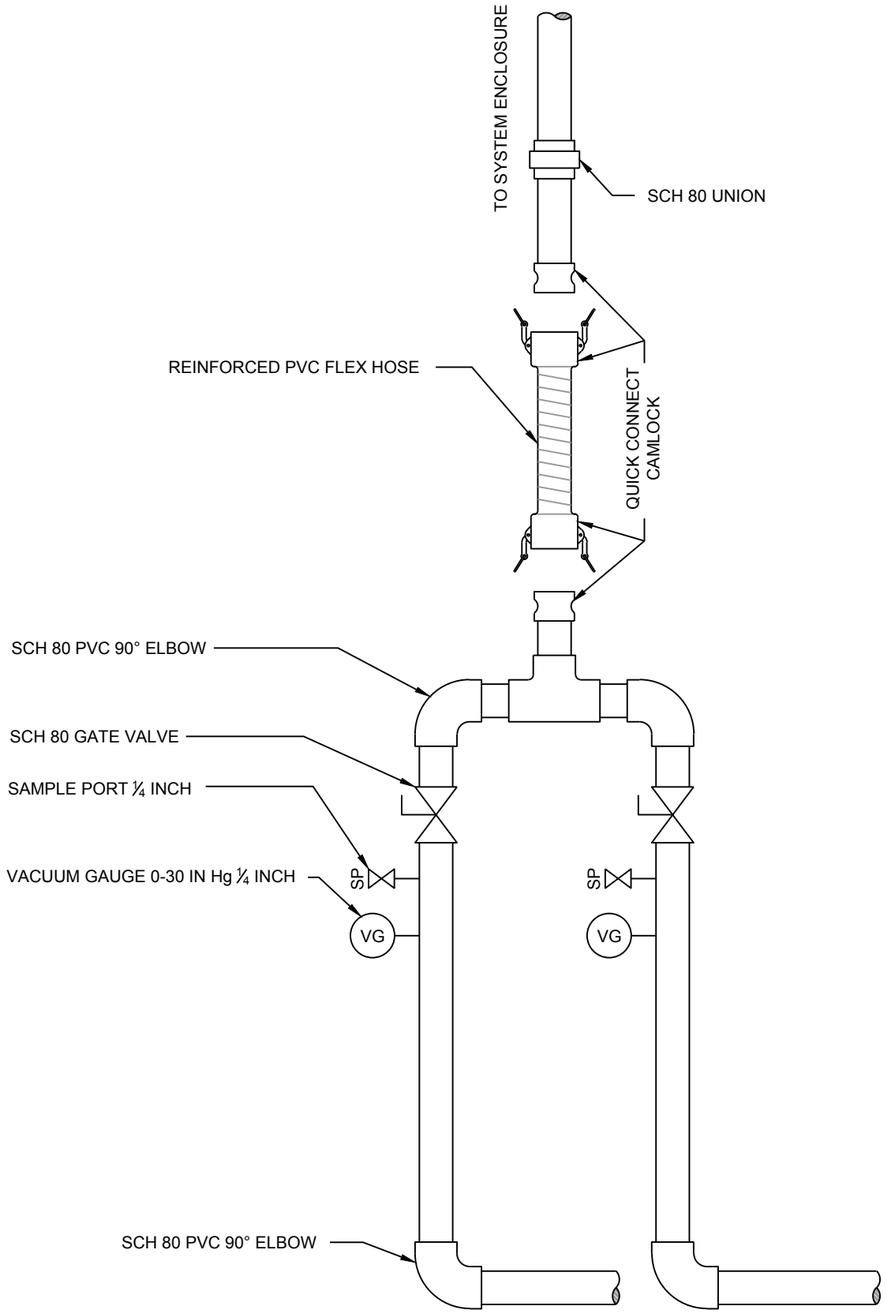
AIR SPARGE AND SOIL VAPOR EXTRACTION SYSTEM INSTALLATION AND STARTUP REPORT

AIR SPARGE PROCESS AND INSTRUMENTATION DIAGRAM

ARCADIS Design & Consultancy for natural and built assets

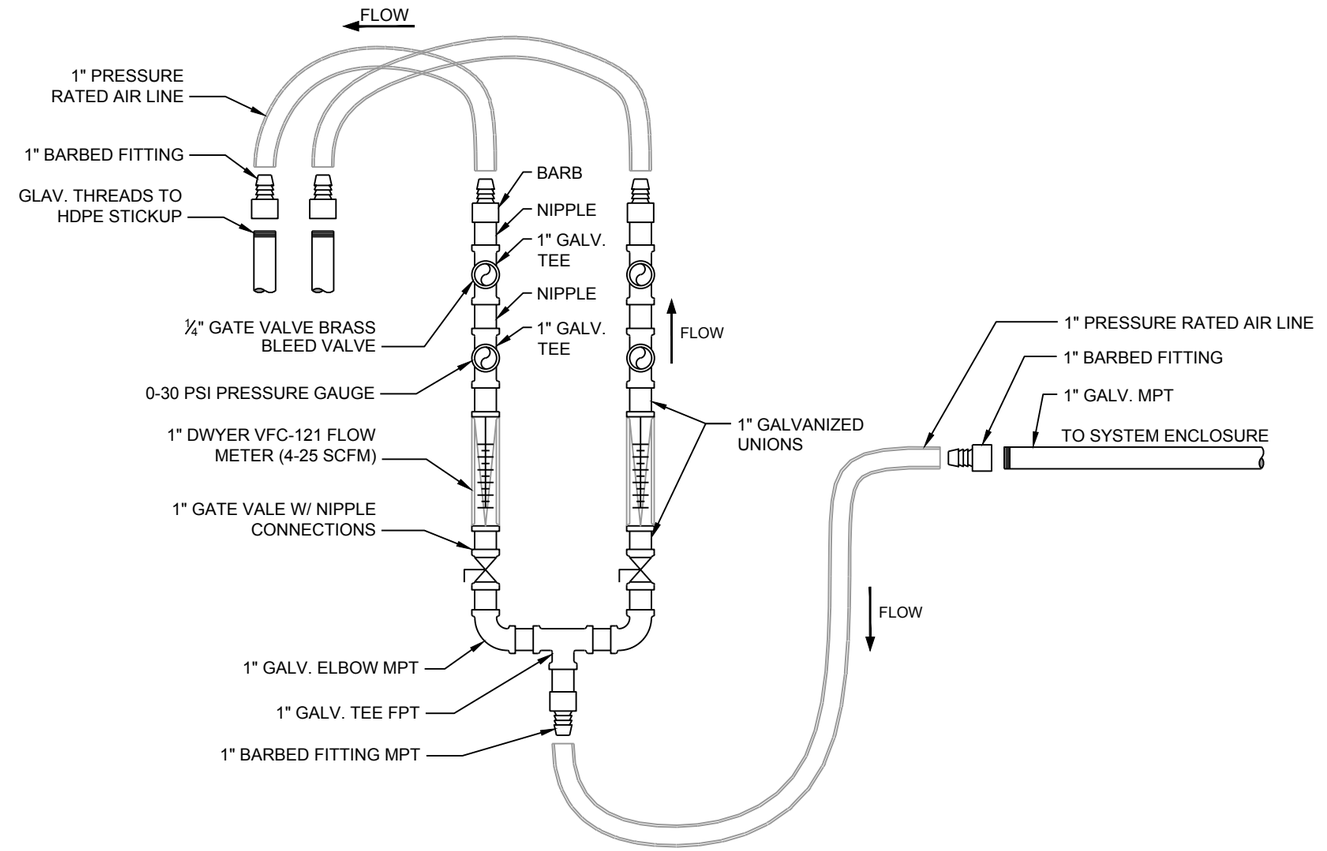
FIGURE
7



SVE MANIFOLD CONNECTION DETAIL

NOT TO SCALE

SVE MANIFOLD NOTES:
MANIFOLD MOUNTED VERTICALLY ONTO A UNI-STRUT (OR SIMILAR) FARAME



AS MANIFOLD CONNECTION DETAIL

NOT TO SCALE

AS MANIFOLD NOTES:
VERTICAL MANIFOLD ATTACHED TO UNI-STRUT OR SIMILAR

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AIR SPARGE AND SOIL VAPOR EXTRACTION SYSTEM INSTALLATION AND STARTUP REPORT

SVE MANIFOLD DETAILS

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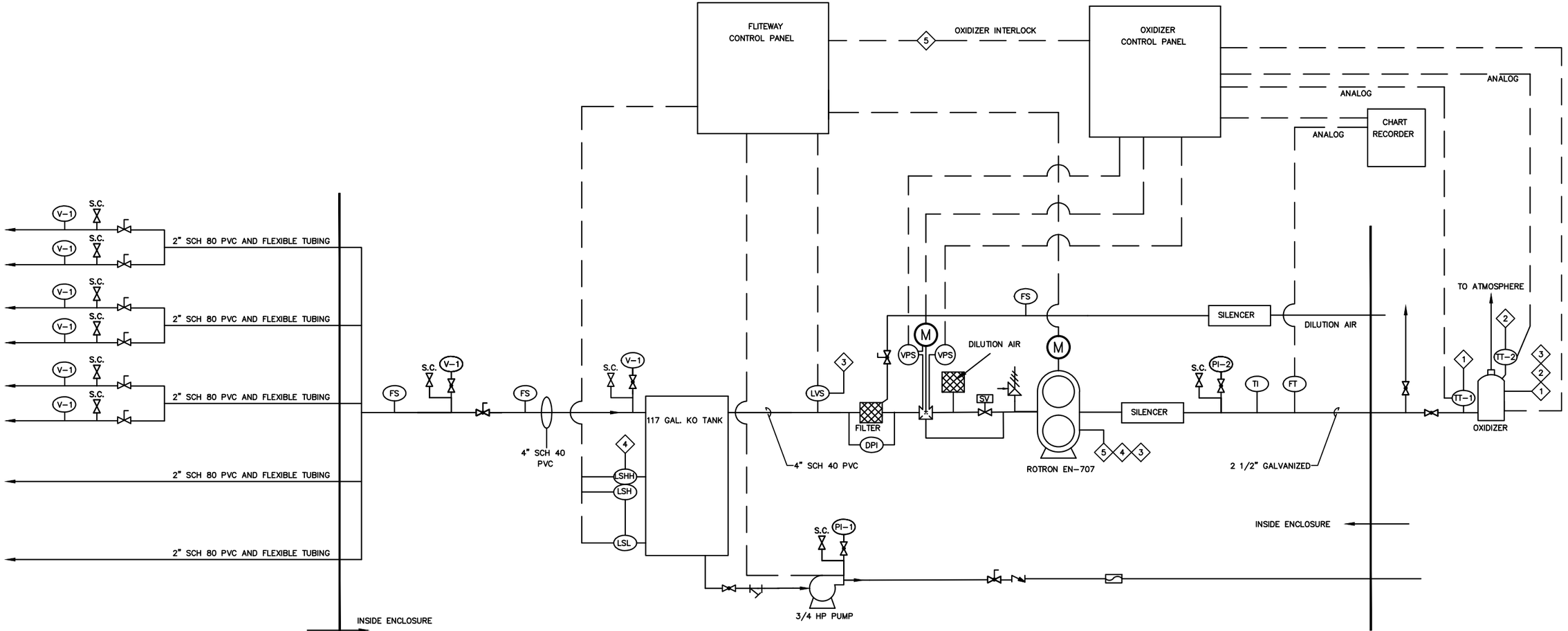
FIGURE
8



LEGEND

- RELIEF VALVE
- GATE VALVE
- S.C. SAMPLE CONNECTION/PORT
- CHECK VALVE
- BALL VALVE
- WYE STRAINER
- TOTALIZING FLOW METER
- (FS) PITOT TUBE FLOW SENSOR
- (LVS) LOW VAC SWITCH
- (VPS) VAPOR CONTROL SWITCH
- (SV) SOLENOID VALVE
- (PI-1) PRESSURE INDICATOR 0-30 PSI
- (DPI) DIFFERENTIAL PRESSURE INDICATOR
- (LSHH) LEVEL SWITCH HIGH-HIGH LEVEL
- (LSH) LEVEL SWITCH HIGH LEVEL
- (LSL) LEVEL SWITCH LOW LEVEL
- (TI) TEMPERATURE INDICATOR 0-250
- (PI-2) PRESSURE INDICATOR 0-30" WC
- (V-1) VACUUM INDICATOR 0-30" HG
- (TT) TEMPERATURE TRANSMITTER
- (FT) FLOW TRANSMITTER
- THREE WAY VALVE

INTERLOCK SCHEDULE

1. TEMPERATURE ALARM LOW – TEMPERATURE LESS THAN 270°C, SHUT DOWN OXIDIZER, SIGNAL ALARM.
2. TEMPERATURE ALARM HIGH – TEMPERATURE GREATER THAN 620°C, SHUT DOWN OXIDIZER, SIGNAL ALARM.
3. LOW VACUUM ALARM – VACUUM LESS THAN 1 IN. H2O, SHUT DOWN ROTRON EN-707 AND OXIDIZER, SIGNAL ALARM.
4. LEVEL ALARM – SHUT DOWN ROTRON EN-707 AND OXIDIZER, SIGNAL ALARM.
5. OXIDIZER FAILURE – SHUT DOWN EN-707, SIGNAL ALARM.

BP WEST COAST PRODUCTS LLC
FORMER BP STATION NO. 11060
4580 FAUNTLEROY WAY, SEATTLE, WASHINGTON

AIR SPARGE AND SOIL VAPOR EXTRACTION SYSTEM INSTALLATION AND STARTUP REPORT

SOIL VAPOR EXTRACTION PROCESS AND INSTRUMENTATION DIAGRAM

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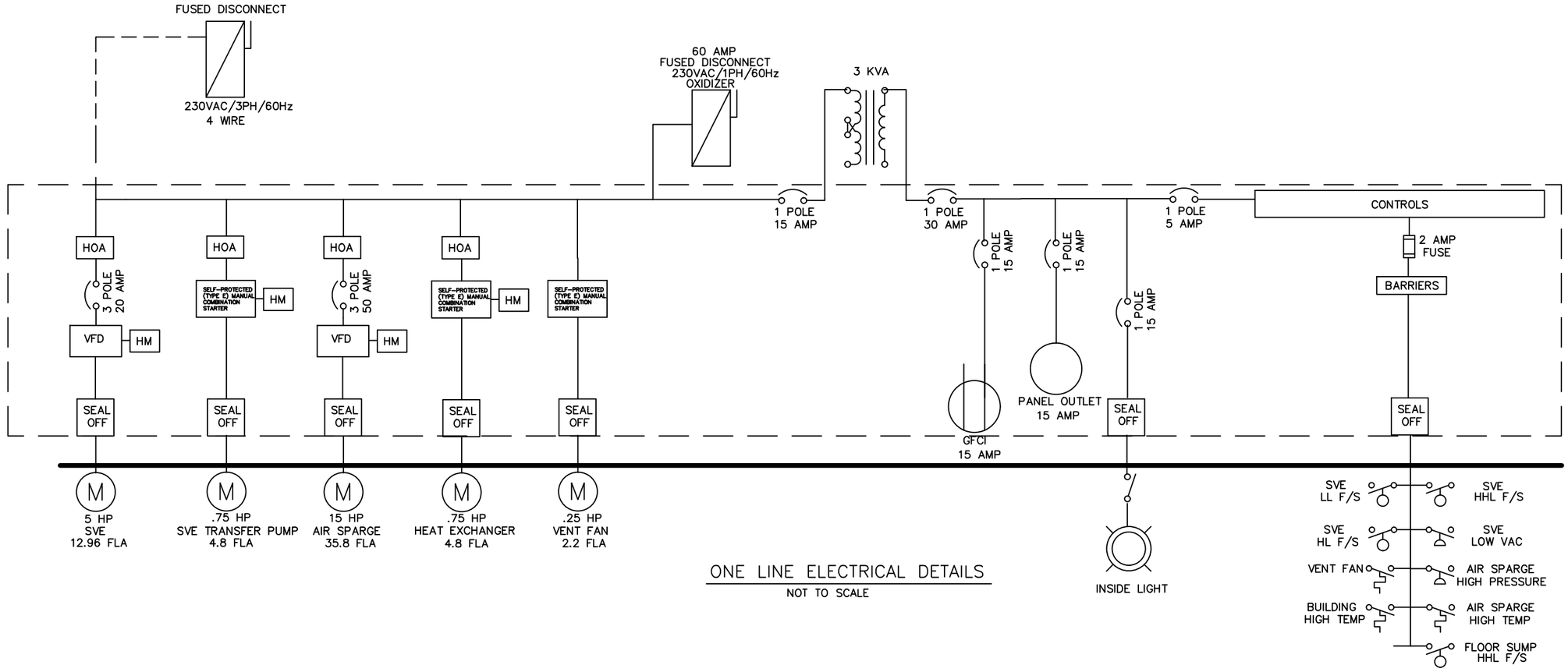
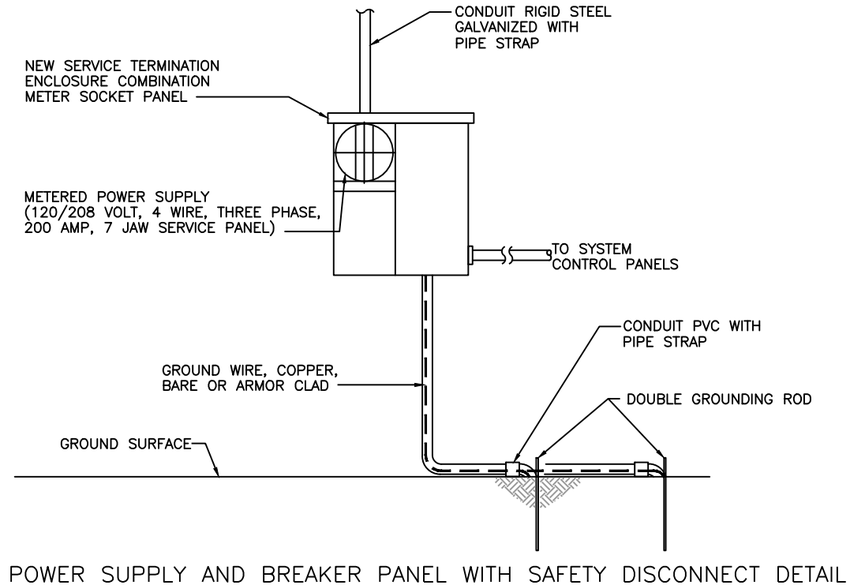
FIGURE 9



ONE LINE ELECTRICAL DETAILS

NOT TO SCALE



POWER SUPPLY AND BREAKER PANEL WITH SAFETY DISCONNECT DETAIL

NOT TO SCALE

BP WEST COAST PRODUCTS LLC
FORMER BP STATION NO. 11060
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AIR SPARGE AND SOIL VAPOR EXTRACTION SYSTEM INSTALLATION AND STARTUP REPORT

ELECTRICAL DETAILS AND SINGLE LINE DIAGRAM

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FIGURE
10

APPENDIX A

System Well Boring Logs

ALISTO ENGINEERING GROUP
TUKWILA, WASHINGTON

LOG OF BORING CW-2

SEE SITE PLAN

ALISTO PROJECT NO: 20-007-03 DATE DRILLED: 07/24/98

CLIENT: BP Oil Company

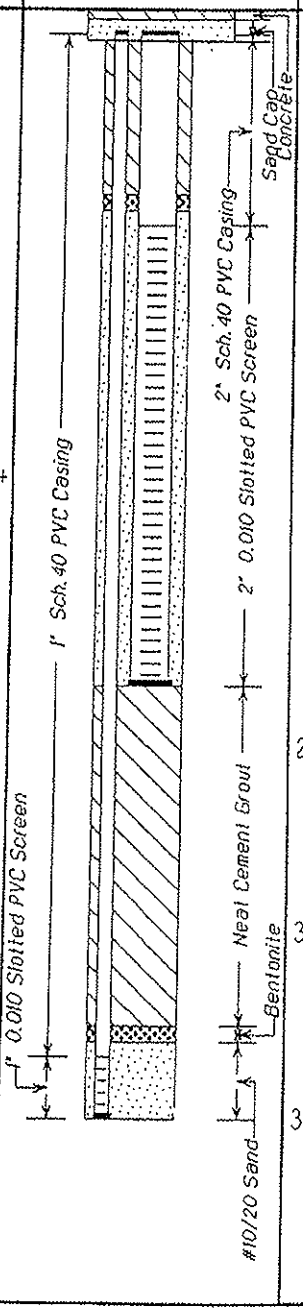
LOCATION: 4580 Fauntleroy Way S.W., Seattle, Washington

DRILLING METHOD: Hollow-Stem Auger (10"); logged from cuttings

DRILLING COMPANY: Geotech Exploration CASING ELEVATION:

LOGGED BY: G.B.L. APPROVED BY: Al Sevilla

BLOWS/6 IN.	PID VALUES	WELL DIAGRAM	DEPTH feet	SAMPLES	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
							8" concrete underlain with wood debris and compacted crushed rock (fill)
						OH	silty organic soils: brown.
			6			SM	silty SAND: gray brown, damp, dense; fine- to medium-grained sand; minor gravel to 1/2-inch-diameter.
	300+		12				
			18				Same: at 15 feet, damp, more dense; fine-grained sand; increased silt.
			24				
			30				
			36				Boring terminated at 36 feet.



ALISTO ENGINEERING GROUP
TUKWILA, WASHINGTON

LOG OF BORING CW-3

SEE SITE PLAN

ALISTO PROJECT NO: 20-007-03 DATE DRILLED: 07/25/96

CLIENT: BP Oil Company

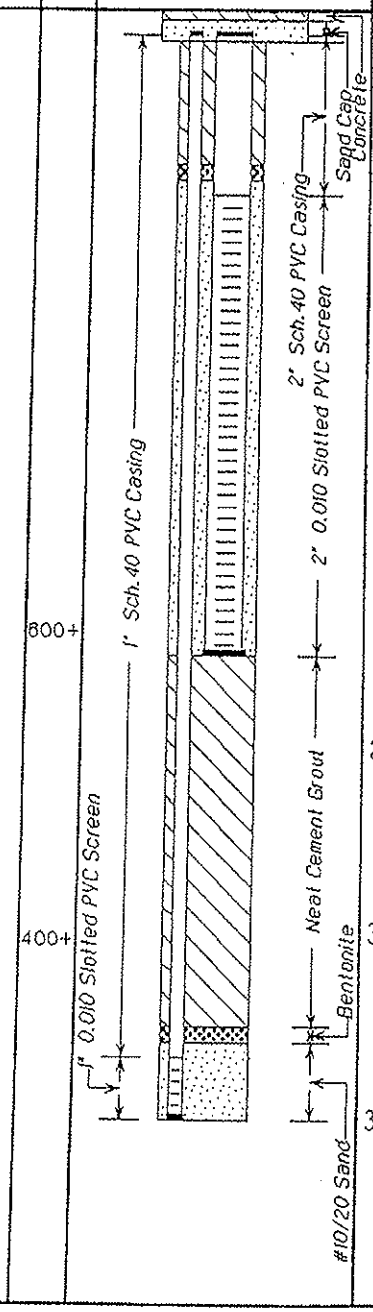
LOCATION: 4580 Fauntleroy Way S.W., Seattle, Washington

DRILLING METHOD: Hollow-Stem Auger (10"); logged by cuttings

DRILLING COMPANY: Geotech Exploration CASING ELEVATION:

LOGGED BY: G.B.L. APPROVED BY: Al Sevilla

BLOWS/6 IN.	PID VALUES	WELL DIAGRAM	DEPTH feet	SAMPLES	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
							8" concrete underlain by 2 feet of crushed rock (fill)
			6			SM	silty SAND: gray, moist, compact; fine- to medium-grained sand; minor gravel up to 1/2-inch-diameter.
	600+		12				
			18				
			24			SW	SAND: gray, damp, very dense; less silt.
	400+		30				
			36				Boring terminated at 38 feet.



ALISTO ENGINEERING GROUP
TUKWILA, WASHINGTON

LOG OF BORING CW-4

SEE SITE PLAN

ALISTO PROJECT NO: 20-007-03 DATE DRILLED: 07/25/90

CLIENT: BP Oil Company

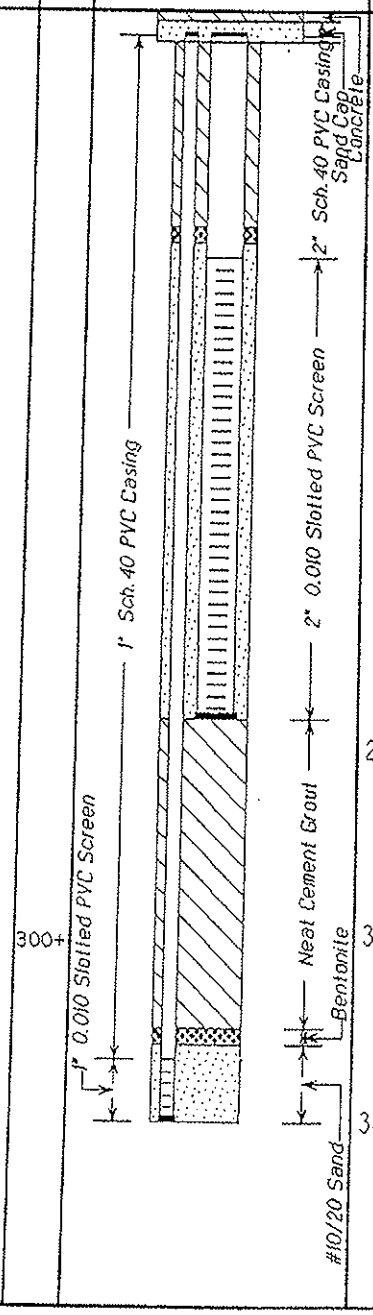
LOCATION: 4580 Fauntleroy Way S.W., Seattle, Washington

DRILLING METHOD: Hollow-Stem Auger (10"); logged by cuttings

DRILLING COMPANY: Geotech Exploration CASING ELEVATION:

LOGGED BY: G.B.L. APPROVED BY: Al Sevilla

BLOWS/6 IN.	PID VALUES	WELL DIAGRAM	DEPTH feet	SAMPLES	GRAPHIC LOG	SOIL CLASS	GEOLOGIC DESCRIPTION
							8" concrete underlain by 12" of crushed rock (fill)
						GP	Sand and building debris; large cobbles up to 6- to 8-inches-diameter.
			6			ML	silty SAND: gray, moist, dense; fine- to medium-grained sand; minor gravel up to 1/2-inch-diameter.
			12				
			18			ML	silty SAND: gray brown, moist, dense; plastic.
			24				Same: at 23 feet, very dense.
	300+		30				
			36				Boring terminated at 38 feet.



Date Start/Finish: 6/9/2014 - 6/13/2014
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow Stem Auger
Auger Size: 8" Outer Diameter
Rig Type:
Sampling Method: HA/SS

Northing: NE
Easting: NE
Casing Elevation: NE

Borehole Depth: 29 feet bgs
Surface Elevation: NE

Descriptions By: Ryan Brauchla

Well/Boring ID: **AS-2**

Client: BP West Coast Products, LLC.

Location: Former ARCO 11060, Shell Station,
4580 Fauntleroy Way SW
Seattle, WA 98116

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N - Value	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	0									Concrete	Concrete
										Boring cleared to a depth of 6.5 feet bgs with air-knife and vacuum truck	2" Well Cap
											2/12 Silica Sand
5	-5	1	HA	0.5			0.6	CL		CLAY with gravel (CL): low plasticity clay with coarse subangular gravel, brown, very dense, dry to damp, some oxidation present	
10	-10	2	SS	0.5	20 50/6"	>50	44.6	CL		CLAY with gravel (CL): medium plasticity clay with coarse rounded gravel, blue-grey, very dense, damp, slight HCLO	Neat Cement
											2" Schedule 80 PVC Riser
15	-15	3	SS	1.5	12 15 16	31	610.4	ML		Clayey SILT (ML): nonplastic silt with trace clay, blue-grey, medium density, damp to moist, HCLO	
											First Encountered Groundwater

ARCADIS
Infrastructure, environment, buildings

Remarks:
bgs = below ground surface
HA = Hand Auger
NE = Not Established
PID = Photoionization Detector
ppm = parts per million
HCLO = Hydrocarbon-like Odor
SS = Split Spoon sample, 2" x 1.5'
PVC = Polyvinyl Chloride

Traffic rate well vault to be installed at later date

Project: GP09BPNAWA48 Template:
Data File:
Date: 8/21/2014 RB

Date Start/Finish: 6/9/2014 - 6/13/2014
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow Stem Auger
Auger Size: 8" Outer Diameter
Rig Type:
Sampling Method: HA/SS

Northing: NE
Easting: NE
Casing Elevation: NE

Borehole Depth: 29 feet bgs
Surface Elevation: NE

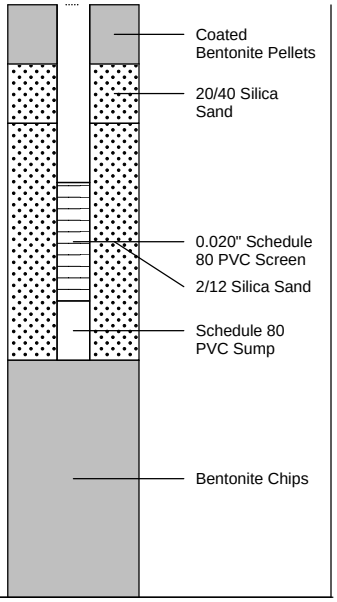
Descriptions By: Ryan Brauchla

Well/Boring ID: **AS-2**

Client: BP West Coast Products, LLC.

Location: Former ARCO 11060, Shell Station,
4580 Fauntleroy Way SW
Seattle, WA 98116

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N - Value	PID Headspace (ppm)	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
20	-20	4	SS	1.0	20 18 20	38	851.7	SW-SM		Silty SAND (SW-SM): well sorted fine to medium sand with little low plasticity silt, grey, dense, wet, HCLO	
		5	SS	1.0	20 35 30	65	258.3	SW-SM		Silty SAND (SW-SM): moderately well sorted fine to medium sand with little low to medium plasticity silt, grey-brown, dense, wet, HCLO	
25	-25	6	SS	1.0	45 50/6"	>50	12.3	SM		Silty SAND (SM): moderately well sorted fine to medium sand with low to medium plasticity silt, brown, very dense, wet	
		7	SS	1.0	30 50/5"	>50	18.3	SM		Silty SAND (SM): moderately well sorted medium sand with medium plasticity silt, brown, very dense, wet	



ARCADIS
Infrastructure, environment, buildings

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PID = Photoionization Detector
ppm = parts per million
HCLO = Hydrocarbon-like Odor
SS = Split Spoon sample, 2" x 1.5'
PVC = Polyvinyl Chloride

Traffic rate well vault to be installed at later date

Date Start/Finish: 6/9/2014 - 6/13/2014
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow Stem Auger
Auger Size: 8" Outer Diameter
Rig Type:
Sampling Method: HA/SS

Northing: NE
Easting: NE
Casing Elevation: NE

Borehole Depth: 26.5 feet bgs
Surface Elevation: NE

Descriptions By: Ryan Brauchla

Well/Boring ID: **AS-3**

Client: BP West Coast Products, LLC.

Location: Former ARCO 11060, Shell Station,
4580 Fauntleroy Way SW
Seattle, WA 98116

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N - Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	0										Concrete	Concrete
											Boring cleared to a depth of 6.5 feet bgs with air-knife and vacuum truck	2" Well Cap
												2/12 Silica Sand
5	-5	1	HA	0.5			0.1		CL		CLAY (CL): low to medium plasticity clay with silt and trace fine sand, brown, dense, damp	
10	-10	2	SS	1.0	7 10 10	20	0.8		CL		CLAY (CL): low plasticity clay, trace medium sand, dark grey, medium density, moist, woody debris present	Neat Cement 2" Schedule 80 PVC Riser
15	-15	3	SS	0.4	50/6"	>50	42.6		CL		CLAY (CL): low plasticity clay, brown, very dense, moist, slight HCLO	Coated Bentonite Pellets 20/40 Silica Sand

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Remarks:
bgs = below ground surface
HA = Hand Auger
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PID = Photoionization Detector
ppm = parts per million
HCLO = Hydrocarbon-like Odor
SS = Split Spoon sample, 2" x 1.5'
PVC = Polyvinyl Chloride

Traffic rate well vault to be installed at later date

Project Number:GP09BPNAWA48
Data File:
Template:
Date: 8/21/2014
Created/Edited by:RB

Date Start/Finish: 6/9/2014 - 6/13/2014
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow Stem Auger
Auger Size: 8" Outer Diameter
Rig Type:
Sampling Method: HA/SS

Northing: NE
Easting: NE
Casing Elevation: NE

Borehole Depth: 26.5 feet bgs
Surface Elevation: NE

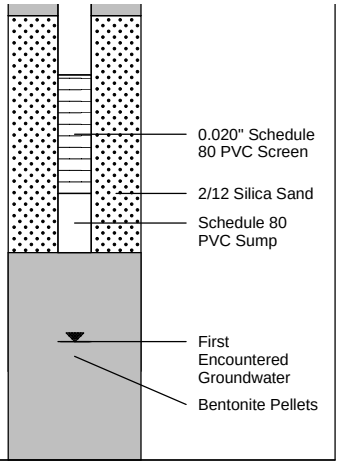
Descriptions By: Ryan Brauchla

Well/Boring ID: **AS-3**

Client: BP West Coast Products, LLC.

Location: Former ARCO 11060, Shell Station,
4580 Fauntleroy Way SW
Seattle, WA 98116

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N - Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
20	-20	4	SS	1.2	27 31 40	71	867.7		SW		SAND (SW): well sorted medium sand with trace silt, brown-grey, dense, moist, strong HCLO	
		5	SS	1.5	21 30 34	64	1,838		ML		Sandy SILT (ML): low plasticity silt with medium sand, grey, dense, damp, HCLO	
25	-25	6	SS	1.0	1 1 1	2	349.7		ML		Sandy SILT (ML): low plasticity silt with medium sand, grey, soft, wet, HCLO with visible product encountered at 26 ft bgs	



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PID = Photoionization Detector
ppm = parts per million
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SS = Split Spoon sample, 2" x 1.5'
PVC = Polyvinyl Chloride

Traffic rate well vault to be installed at later date

Project Number:GP09BPNAWA48
Data File:
Template:
Date: 8/21/2014
Created/Edited by:RB

Date Start/Finish: 6/9/2014 - 6/10/2014 - 6/11/2014
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow Stem Auger
Auger Size: 8" Outer Diameter
Rig Type:
Sampling Method: HA/SS

Northing: NE
Easting: NE
Casing Elevation: NE

Borehole Depth: 29 feet bgs
Surface Elevation: NE

Descriptions By: Ryan Brauchla

Well/Boring ID: **AS-4**

Client: BP West Coast Products, LLC.

Location: Former ARCO 11060, Shell Station,
4580 Fauntleroy Way SW
Seattle, WA 98116

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N - Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	0										Concrete	Concrete
											Boring cleared to a depth of 6.5 feet bgs with air-knife and vacuum truck	2" Well Cap
												2/12 Silica Sand
5	-5	1	HA	0.5			10.3		SP-SM		Silty SAND with gravel (SP-SM): poorly sorted fine to medium sand with nonplastic silt and medium rounded gravel, greyISH-brown, very dense, dry to damp	
10	-10	2	SS	1.0	8 9 9	18	59.7		ML		Sandy clayey SILT (ML): nonplastic silt with poorly sorted medium sand and clay, blue-grey, medium density, dry to damp, slight HCLO	Neat Cement
												2" Schedule 80 PVC Riser
15	-15	3	SS	1.5	14 11 14	25	54.4		CL		CLAY (CL): low to medium plasticity clay with silt, orange-brown, medium density, damp, slight HCLO	

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HA = Hand Auger
NE = Not Established
PID = Photoionization Detector
ppm = parts per million
HCLO = Hydrocarbon-like Odor
SS = Split Spoon sample, 2" x 1.5'
PVC = Polyvinyl Chloride

Traffic rate well vault to be installed at later date

Project Number:GP09BPNAWA48
Data File:
Template:
Date: 8/21/2014
Created/Edited by:RB

Date Start/Finish: 6/9/2014 - 6/10/2014 - 6/11/2014
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow Stem Auger
Auger Size: 8" Outer Diameter
Rig Type:
Sampling Method: HA/SS

Northing: NE
Easting: NE
Casing Elevation: NE

Borehole Depth: 29 feet bgs
Surface Elevation: NE

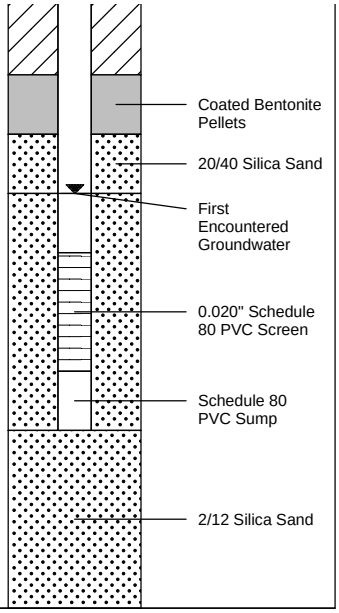
Descriptions By: Ryan Brauchla

Well/Boring ID: **AS-4**

Client: BP West Coast Products, LLC.

Location: Former ARCO 11060, Shell Station,
4580 Fauntleroy Way SW
Seattle, WA 98116

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N - Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description
20	-20	4	SS	1.0	50/6"	>50	1,468		SW		SAND (SW): well sorted medium sand with trace nonplastic silt, blue-grey, very dense, damp, HCLO
		5	SS	1.0	30 50/5"	>50	835.9		SW		SAND (SW): well sorted medium sand with trace nonplastic silt, blue-grey, very dense, wet, HCLO
25	-25	6	SS	0.4	75/4"	>75	1,270		SP		SAND with gravel (SP): poorly sorted sand with rounded coarse gravel and trace medium plasticity silt, blue-grey, very dense, wet, HCLO
		7	SS	1.0	19 50/6"	>50	258.6		ML		SILT (ML): low plasticity silt, blue-grey, very dense, wet



Well/Boring Construction

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SS = Split Spoon sample, 2" x 1.5'
PVC = Polyvinyl Chloride

Traffic rate well vault to be installed at later date

Project Number:GP09BPNAWA48
Data File:
Template:
Date: 8/21/2014
Created/Edited by:RB

Date Start/Finish: 6/9/2014 - 6/10/2014 - 6/11/2014
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow Stem Auger
Auger Size: 8" Outer Diameter
Rig Type:
Sampling Method: HA/SS

Northing: NE
Easting: NE
Casing Elevation: NE

Borehole Depth: 26.5 feet bgs
Surface Elevation: NE

Descriptions By: Ryan Brauchla

Well/Boring ID: **AS-5**

Client: BP West Coast Products, LLC.

Location: Former ARCO 11060, Shell Station,
4580 Fauntleroy Way SW
Seattle, WA 98116

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N - Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	0										Concrete	Concrete
											Boring cleared to a depth of 6.5 ft bgs with air-knife and vacuum truck	2" Well Cap
												2/12 Silica Sand
5	-5	1	HA	0.5			9.4		CL		CLAY (CL): medium plasticity clay, blue-grey, dense, damp, slight HCLO	
10	-10	2	SS	0.5	14 13 11	24	24.5		CL		CLAY (CL): low plasticity clay, grey and brown, medium density, dry and crumbly, slight HCLO	Neat Cement
												2" Schedule 80 PVC Riser
15	-15	3	SS	1.5	14 20 20	40	1,553		CL		CLAY (CL): medium plasticity clay with some silt, blue-grey, dense, damp, strong HCLO	
												Coated Bentonite Pellets

ARCADIS
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Remarks:
bgs = below ground surface
HA = Hand Auger
NE = Not Established
PID = Photoionization Detector
ppm = parts per million
HCLO = Hydrocarbon-like Odor
SS = Split Spoon sample, 2" x 1.5'
PVC = Polyvinyl Chloride

Traffic rate well vault to be installed at later date

Project Number:GP09BPNAWA48
Data File:
Template:
Date: 8/21/2014
Created/Edited by:RB

Date Start/Finish: 6/9/2014 - 6/10/2014 - 6/11/2014
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow Stem Auger
Auger Size: 8" Outer Diameter
Rig Type:
Sampling Method: HA/SS

Northing: NE
Easting: NE
Casing Elevation: NE

Borehole Depth: 26.5 feet bgs
Surface Elevation: NE

Descriptions By: Ryan Brauchla

Well/Boring ID: **AS-5**

Client: BP West Coast Products, LLC.

Location: Former ARCO 11060, Shell Station,
4580 Fauntleroy Way SW
Seattle, WA 98116

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N - Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
20	-20	4	SS	0.5	50/6"	>50	1,106		SW		SAND (SW): well sorted fine to medium sand with trace silt, brown, very dense, damp, strong HCLO	20/40 Silica Sand
		5	SS	0.5	50/6"	>50	1,353		SP		Gravelly SAND (SP): poorly sorted fine to coarse sand with large rounded gravel and trace nonplastic silt, brown, very dense, damp, strong HCLO	0.020" Schedule 80 PVC Screen
25	-25	6	SS	0.5	26 50/5"	>50	637.1		ML		Clayey SILT (ML): low plasticity silt with clay and trace very fine sand, brown-grey, very dense, damp, HCLO	Schedule 80 PVC Sump 2/12 Silica Sand

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PID = Photoionization Detector
ppm = parts per million
HCLO = Hydrocarbon-like Odor
SS = Split Spoon sample, 2" x 1.5'
PVC = Polyvinyl Chloride

Traffic rate well vault to be installed at later date

Date Start/Finish: 6/9/2014 - 6/10/2014 - 6/11/2014
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow Stem Auger
Auger Size: 8" Outer Diameter
Rig Type:
Sampling Method: HA/SS

Northing: NE
Easting: NE
Casing Elevation: NE

Borehole Depth: 29 feet bgs
Surface Elevation: NE

Descriptions By: Ryan Brauchla

Well/Boring ID: **AS-6**

Client: BP West Coast Products, LLC.

Location: Former ARCO 11060, Shell Station,
4580 Fauntleroy Way SW
Seattle, WA 98116

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N - Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	0										Concrete	Concrete
											Boring cleared to a depth of 6.5 ft bgs with air-knife and vacuum truck	2" Well Cap
												2/12 Silica Sand
5	-5	1	HA	0.5			0.1		CL		CLAY (CL): low to medium plasticity clay with trace poorly-sorted medium sand, greyish-brown, very dense, damp	
10	-10	2	SS	1.5	7 8 9	17	13.3		CL		CLAY (CL): low plasticity clay and silt with trace fine sand, blue-grey, medium density, moist, woody debris present	Neat Cement
												2" Schedule 80 PVC Riser
15	-15	3	SS	1.5	10 12 12	24	1,607		SM		Silty SAND (SM): well-sorted fine to medium sand with nonplastic silt and trace coarse rounded gravel, grey, medium density, wet, HCLO	First Encountered Groundwater

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Remarks:
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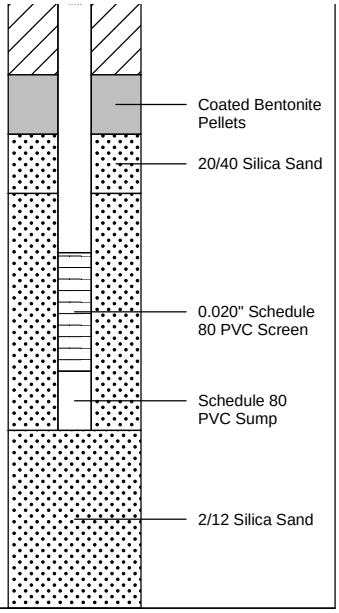
HA = Hand Auger
NE = Not Established
PID = Photoionization Detector
ppm = parts per million
HCLO = Hydrocarbon-like Odor
SS = Split Spoon sample, 2" x 1.5'
PVC = Polyvinyl Chloride

Traffic rate well vault to be installed at later date

Project Number:GP09BPNAWA48
Data File:
Template:
Date: 8/21/2014
Created/Edited by:RB

Date Start/Finish: 6/9/2014 - 6/10/2014 - 6/11/2014 **Drilling Company:** Cascade Drilling **Driller's Name:** Curtis Askew **Drilling Method:** Hollow Stem Auger **Auger Size:** 8" Outer Diameter **Rig Type:** **Sampling Method:** HA/SS	**Northing:** NE **Easting:** NE **Casing Elevation:** NE **Borehole Depth:** 29 feet bgs **Surface Elevation:** NE **Descriptions By:** Ryan Brauchla	**Well/Boring ID: AS-6** **Client:** BP West Coast Products, LLC. **Location:** Former ARCO 11060, Shell Station, 4580 Fauntleroy Way SW Seattle, WA 98116

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N - Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
20	-20	4	SS	1.0	15 24 20	44	895.7		SM		Silty SAND (SM): well-sorted fine to medium sand with little nonplastic silt, brown, dense, wet, HCLO	
		5	SS	1.5	23 24 27	51	1,383		SM		Silty SAND (SM): well-sorted fine to medium sand with nonplastic silt, brown, dense, wet, HCLO	
									CL		CLAY lens @ 23.5 ft bgs	
									SW		SAND with gravel (SW): well-sorted medium sand with little coarse rounded gravel, brown-grey, dense, dry, HCLO	
25	-25	6	SS	1.5	19 24 17	41	1,495		ML		Sandy SILT (ML): nonplastic silt with fine sand, brownish-grey, dense, wet, HCLO	
		7	SS	1.5	27 30 31	61	69.6		ML		Sandy SILT (ML): nonplastic silt with fine sand, brownish-grey, dense, wet, HCLO	



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Remarks:

bgs = below ground surface
HA = Hand Auger
NE = Not Established
PID = Photoionization Detector
ppm = parts per million
HCLO = Hydrocarbon-like Odor
SS = Split Spoon sample, 2" x 1.5'
PVC = Polyvinyl Chloride

Traffic rate well vault to be installed at later date

Date Start/Finish: 6/9/14 - 6/10/14 - 6/11/14 - 6/13/14
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow Stem Auger
Auger Size: 10" Outer Diameter
Rig Type:
Sampling Method: HA/SS

Northing: NE
Easting: NE
Casing Elevation: NE

Borehole Depth: 16.5 feet bgs
Surface Elevation: NE

Descriptions By: Ryan Brauchla

Well/Boring ID: VE-3

Client: BP West Coast Products, LLC.

Location: Former ARCO 11060, Shell Station,
4580 Fauntleroy Way SW
Seattle, WA 98116

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N - Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	0										Concrete	Jet Set Concrete Seal
												2/12 Silica Sand
												4" Well Cap
											Boring cleared to a depth of 6.5 feet bgs with air-knife and vacuum truck	Bentonite Chips
												4" Schedule 40 PVC Riser
5	-5	1	HA	0.5			0.0		CL		CLAY with gravel (CL): low plasticity clay with dry clods and rounded medium gravel, brown, very dense, dry to damp	
												2/12 Silica Sand
10	-10	2	SS	1.0	10 8 8	16	3.5		SC		Clayey SAND (SC): low plasticity clay and coarse rounded sand in roughly equal proportions, brown, loose, damp	0.020" Schedule 40 PVC Screen
15	-15	3	SS	1.0	15 20 50/6"	>70	6.4		CL		CLAY (CL): medium plasticity clay, blue-grey, very dense, damp	

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PID = Photoionization Detector
ppm = parts per million
HCLO = Hydrocarbon-like Odor
SS = Split Spoon sample, 2" x 1.5'
PVC = Polyvinyl Chloride

Traffic rate well vault to be installed at later date

Project Number:GP09BPNAWA48
Data File:
Template:
Date: 8/21/2014
Created/Edited by:RB

Date Start/Finish: 6/9/2014 - 6/13/2014
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow Stem Auger
Auger Size: 10" Outer Diameter
Rig Type:
Sampling Method: HA/SS

Northing: NE
Easting: NE
Casing Elevation: NE

Borehole Depth: 16.5 feet bgs
Surface Elevation: NE

Descriptions By: Ryan Brauchla

Well/Boring ID: VE-4

Client: BP West Coast Products, LLC.

Location: Former ARCO 11060, Shell Station,
4580 Fauntleroy Way SW
Seattle, WA 98116

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N - Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	0										Concrete	Jet Set Concrete Seal
											Construction backfill with fragments of concrete and tile was observed to a depth of 3 feet bgs	2/12 Silica Sand
												4" Well Cap
											Boring cleared to a depth of 6.5 feet bgs with air-knife and vacuum truck	Bentonite Chips
												4" Schedule 40 PVC Riser
5	-5	1	HA	0.5			0.0		CL		CLAY (CL): low to medium plasticity clay with some poorly-sorted fine to medium sand, brown, dense, damp	
												2/12 Silica Sand
10	-10	2	SS	1.0	7 10 10	20	119.9		CL		CLAY with gravel (CL): low to medium plasticity clay with coarse rounded gravel, brown, medium density, damp	0.020" Schedule 40 PVC Screen
15	-15	3	SS	0	50/6"	>50					No recovery	
		4	SS	0	50/6"	>50					No recovery	

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ppm = parts per million
HCLO = Hydrocarbon-like Odor
SS = Split Spoon sample, 2" x 1.5'
PVC = Polyvinyl Chloride

Traffic rate well vault to be installed at later date

Project Number:GP09BPNAWA48
Data File:
Template:
Date: 8/21/2014
Created/Edited by:RB

Date Start/Finish: 6/9/2014 - 6/10/2014 - 6/11/2014
Drilling Company: Cascade Drilling
Driller's Name: Curtis Askew
Drilling Method: Hollow Stem Auger
Auger Size: 10" Outer Diameter
Rig Type:
Sampling Method: HA/SS

Northing: NE
Easting: NE
Casing Elevation: NE

Borehole Depth: 16.5 feet bgs
Surface Elevation: NE

Descriptions By: Ryan Brauchla

Well/Boring ID: VE-5

Client: BP West Coast Products, LLC.

Location: Former ARCO 11060, Shell Station,
4580 Fauntleroy Way SW
Seattle, WA 98116

DEPTH	ELEVATION	Sample Run Number	Sample/Int/Type	Recovery (feet)	Blow Counts	N - Value	PID Headspace (ppm)	Analytical Sample	USCS Code	Geologic Column	Stratigraphic Description	Well/Boring Construction
0	0										Concrete	Jet Set Concrete Seal
												2/12 Silica Sand
												4" Well Cap
											Boring cleared to a depth of 6.5 ft bgs with air-knife and vacuum truck	Bentonite Chips
												4" Schedule 40 PVC Riser
											Rubble blocking part of boring at 4.8 ft bgs	
5	-5	1	HA	0.5			148.9		SP-SM		SAND with silt and gravel (SP-SM): poorly sorted fine to coarse sand with nonplastic silt and coarse gravel, grey, medium density, dry, strong HCLO	
												2/12 Silica Sand
10	-10	2	SS	1.0	5 10 13	23	975.5		CL		CLAY (CL): medium plasticity clay with trace sand and gravel, blue-grey, medium density, damp, HCLO	0.020" Schedule 40 PVC Screen
												First Encountered Groundwater
15	-15	3	SS	1.5	10 12 11	23	885.2		SW		SAND (SW): well sorted medium sand with little nonplastic silt, grey-brown, medium density, wet, HCLO	

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HCLO = Hydrocarbon-like Odor
SS = Split Spoon sample, 2" x 1.5'
PVC = Polyvinyl Chloride

Traffic rate well vault to be installed at later date

Project Number:GP09BPNAWA48
Data File:
Template:
Date: 8/21/2014
Created/Edited by:RB

APPENDIX B

CATOX FALCO 100 Specifications

FALCO 100 SPECIFICATIONS

The FALCO 100 electric catalytic oxidizer treats air streams contaminated with volatile organic compounds. The catalyst provides VOC destruction efficiencies up to 99%. Startup is fully automatic. Controllers accurately regulate input loading and temperatures.

The controls adjust a FALCO Vapor Control Valve (VCV) to maintain safe maximum input concentration. Automatic shutdown results if temperatures exceed limits.

A shell and tube heat exchanger provides efficient heat recovery and a bypass valve allows adjustment of heat recovery. High heat recovery minimizes energy use during operation at low input vapor concentration. Low heat recovery enables operation at high vapor concentration.

This compact unit fits into small spaces, making it especially well suited for soil vapor extraction. The economical and durable FALCO 100 integrates with a wide variety of vapor extraction systems and is easily moved from site to site and permitted.

The FALCO 100 has been installed at over one thousand remediation sites Globally since 1990.

FM C US APPROVED

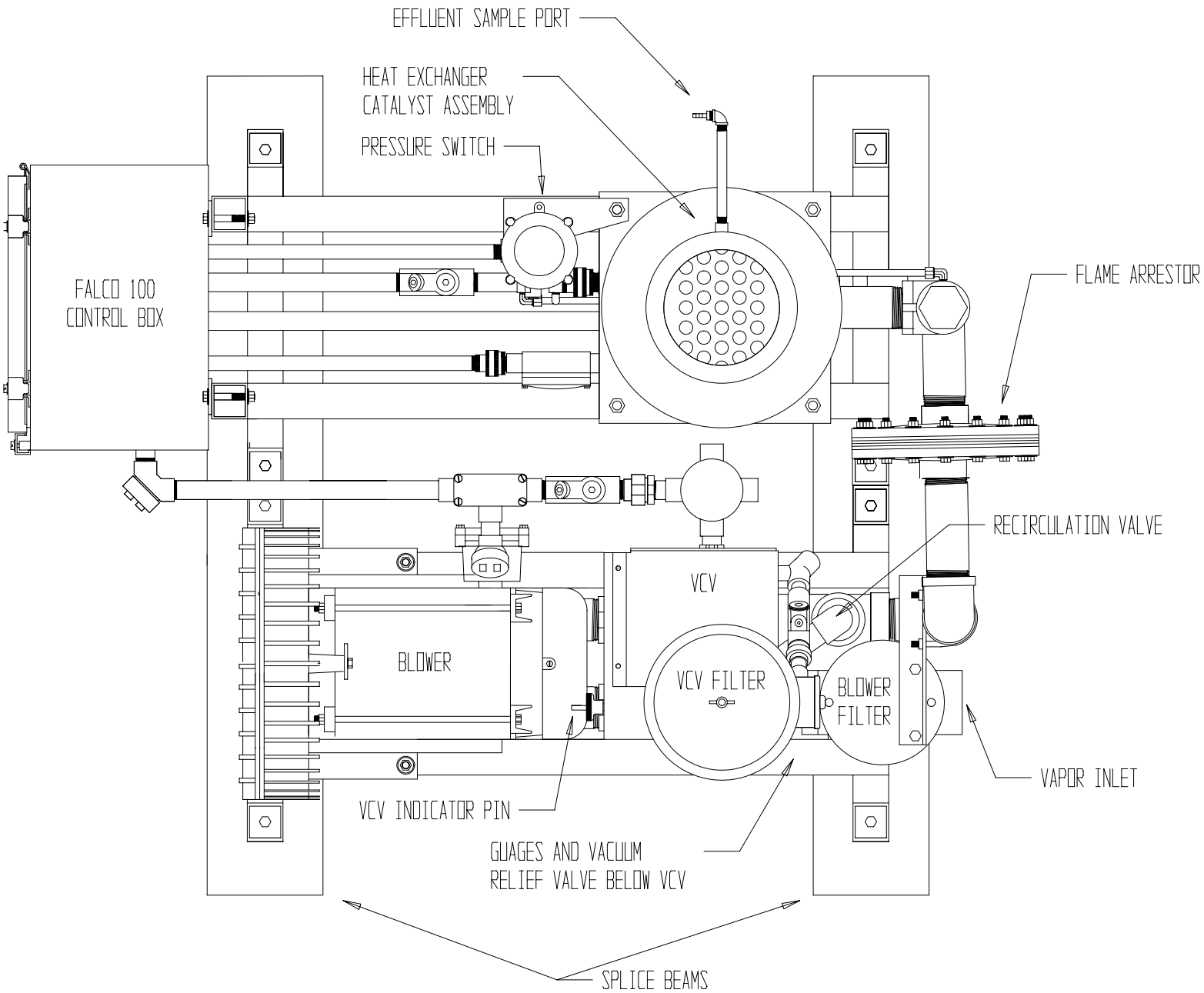
- **CAPACITY** 40-120 CFM
- **MAXIMUM INPUT LOADING** 2,200 ppmv for petroleum hydrocarbons.
- **DESTRUCTION EFFICIENCY** Up to 99%
- **CATALYST TEMPERATURE RANGE** 330-620ºC (626-1148ºF)
- **CATALYST** Monolithic. Precious metal
- **HEAT EXCHANGER** Stainless steel shell and tube. 67% efficient (adjustable)
- **HEATER (Electric)** 30.5 amp @ 240 single phase (7.3 kW). Solid State control.
- **WEIGHT** 325 lb. Easily transported
- **CONSTRUCTION** 304 stainless steel and aluminum
- **DIMENSIONS** 6’8” high X 50” long X 24” wide
- **POWER REQUIREMENTS** 7.3 kW, 240VAC 1 phase: Heater 30.5 amp, Controls 3 amp
- **APPROVALS** System is Factory Mutual approved for use in hazardous locations.

  South Coast Air Quality Management District (SCAQMD) Certified Equipment Permit.

FALMOUTH PRODUCTS P.O. BOX 541 FALMOUTH, MA 02541 PHONE 508 548 6686 FAX 508 548 8144
www.falmouthproducts.com

Rev 11-24-2010

FIGURE 4 FALCO 100 WITH 3 H.P. BLOWER PACKAGE TOP VIEW



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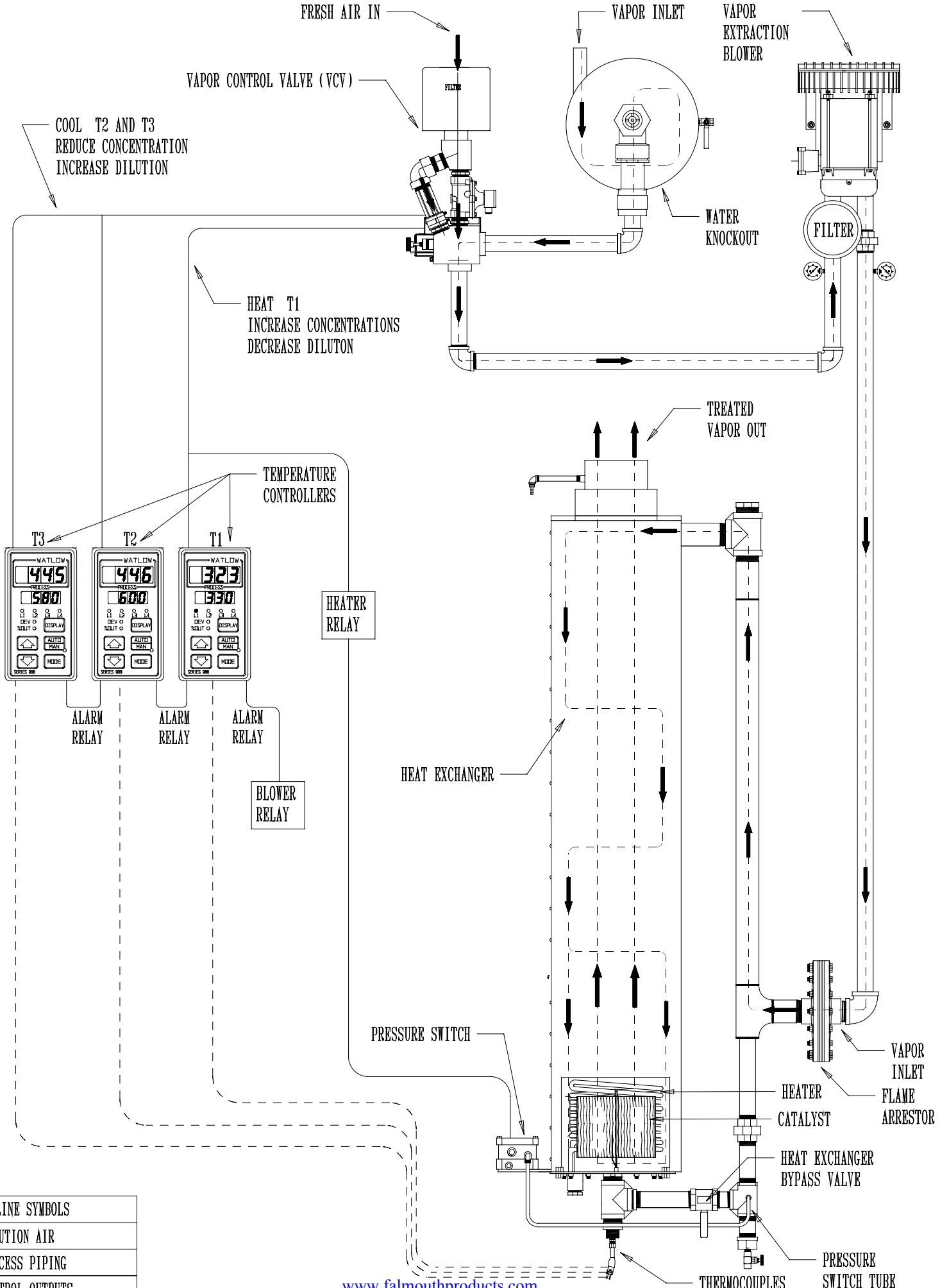
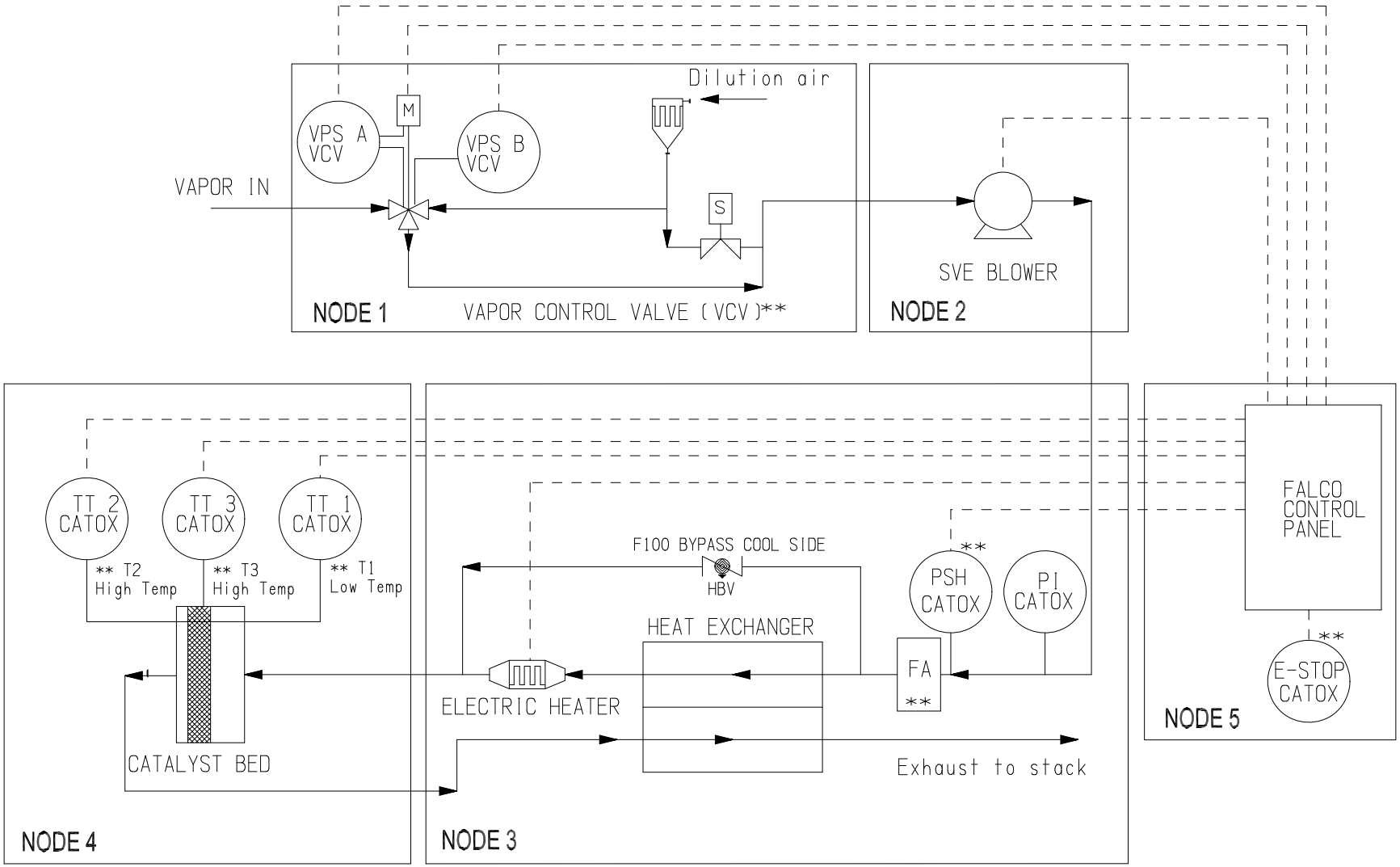


100 REV 6-10-03

FIGURE 1 FALCO 100 FLOW AND CONTROL



VPS = valve position switch
VCV = vapor control valve
FA = flame arrestor
CATOX = catalytic oxidizer
HBV = Heat exchanger bypass valve
E-STOP = SVE Blower Emergency Stop switch

** Critical Safety Device

FALMOUTH PRODUCTS
FALCO 100
CATALYTIC
OXIDIZER

www.falmouthproducts.com

FALMOUTH PRODUCTS, INC.
P.O. BOX 541
FALMOUTH, MA 02541 U.S.A.
PHONE: (508) 548-6686
FAX: (508) 548-8144

SHEET: 1 OF 1		
SIZE: A		
SCALE: -		
DWG: 1501	DRAWN BY: MW	CHECKED BY: CC
ASSY:	DATE: 8-5-08	REV: A

DESCRIPTION: P & ID: FALCO 100

FALMOUTH PRODUCTS PO BOX 541 FALMOUTH, MA 02541 PHONE 508 548 6686 FAX 508 548 8144

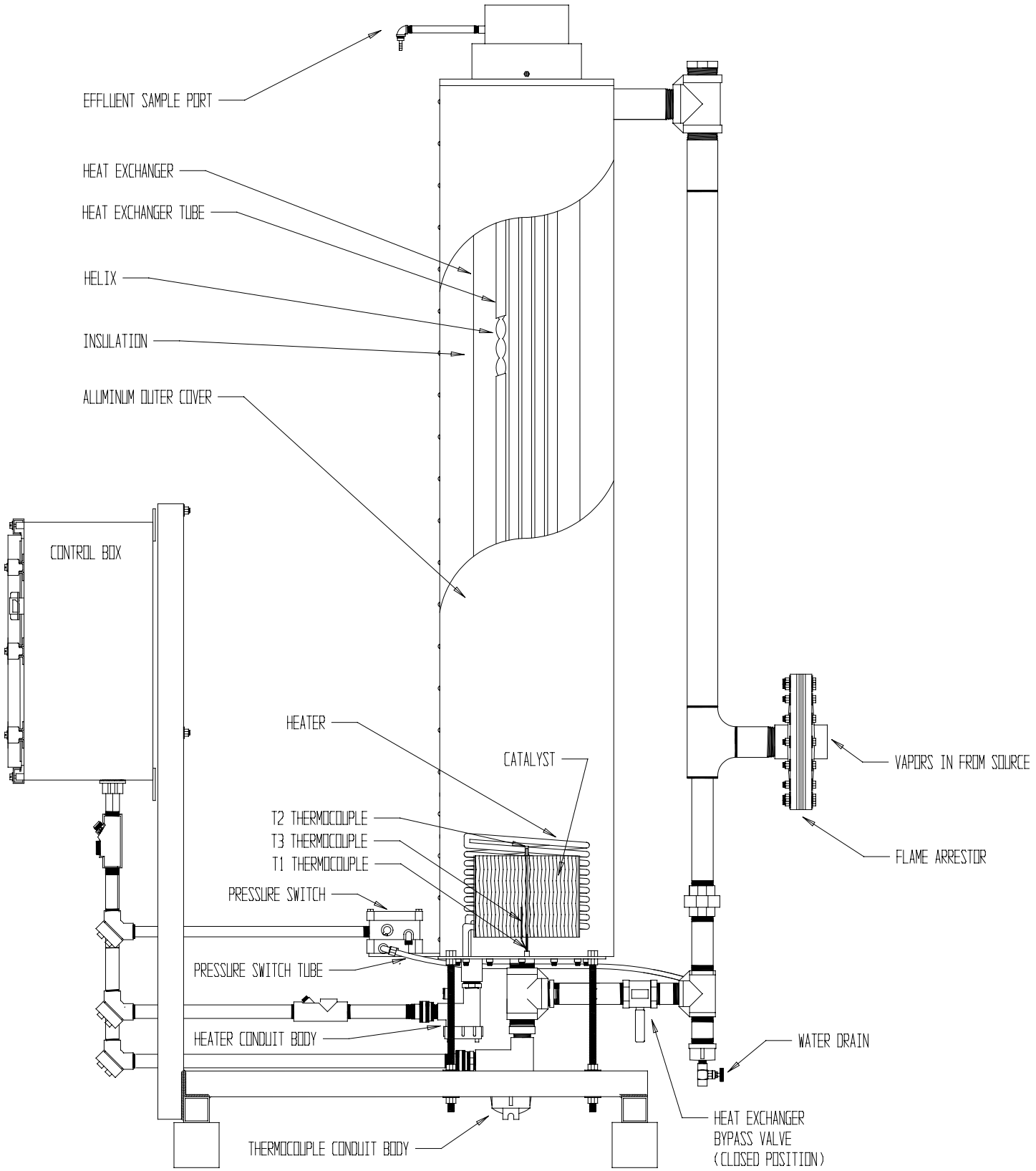


FIGURE 2
FALCO 100 MAJOR COMPONENTS

www.falmouthproducts.com

Rev 6-10-03

APPENDIX C

Electrical Permit Inspection Report

CITY OF SEATTLE
DEPARTMENT OF CONSTRUCTION AND INSPECTIONS

ELECTRICAL PERMIT INSPECTION REPORT

A/P # 6508346

Online ELECTRICAL ONLY

INSPECTION DATE: 3/9/2016 INSTALLER: S H J ELECTRIC COMPANY INC

WORK SITE ADDRESS: 4580 FAUNTLEROY WAY SW

ADDRESS CORRECTION REQUIRED: ☐

WORK ACTIVITY LOCATION: _____

INSPECTION NUMBER	INSPECTION TYPE	PARTIAL PASSED	PASSED	FAILED	CANCELLED	WAIVED
2001190	FINAL					
_____	COVER	☐	☐	☐	☐	☐
	☐ UNDERGROUND	☐	☐	☐		
	☐ SLAB	☐	☐	☐		
	☐ FLOOR	☐	☐	☐		
	☐ WALLS	☐	☐	☐		
	☐ CEILINGS	☐	☐	☐		
_____	FEEDER	☐	☐	☐	☐	☐
_____	SERVICE	☐	☐	☐	☐	☐
_____	FINAL	☐	☐	☐	☐	☐

Check inspection results online
http://web1.seattle.gov/DPD/permitstatus/
Submit permit changes to
OTCPermits@seattle.gov
Inspections are scheduled online
http://web6.seattle.gov/DPD/InspectionRequest/default.aspx
Or by calling 684-8900
Inspector desk phone hours 7-8am

REINSPECTION FEE REQUIRED: ☐ ADD ON FEES REQUIRED: ☐

Service on side of building for Remediation Skid|| 03/08/2016 WEBUSR Contact : Stephen Bowser 206-849-7372

NOTES:

THE CITY OF SEATTLE HAS ADOPTED THE 2014NEC –VISIT OUR WEBSITE FOR SEATTLE AMENDMENTS WWW.SEATTLE.GOV/DPD/CODES/DEFAULT.ASP

Marshall Lee
INSPECTOR

684-8425
PHONE

MARSHALL.LEE@SEATTLE.GOV
EMAIL

WARNING: CORRECTIONS MUST BE COMPLETED WITHIN 14 WORKING DAYS

APPENDIX D

PSCAA Permit

pscleanair.org
Puget Sound Clean Air Agency

Puget Sound Clean Air Agency

Notice of Construction No. **10813**

HEREBY ISSUES AN ORDER OF APPROVAL TO CONSTRUCT, INSTALL, OR ESTABLISH

Registration No. **29664**

Date

Soil remediation project at the former Atlantic Richfield Company (ARCO) Facility No. 11060. The project includes an air sparge and soil vapor extraction (AS/SVE) treatment unit equipped with a catalytic oxidizer.

APPLICANT

Arti Patel
ARCADIS U.S., Inc
2929 Briarpark Drive, Suite 300
Houston, TX 77042

OWNER

Arti Patel
ARCADIS U.S., Inc
2929 Briarpark Drive, Suite 300
Houston, TX 77042

INSTALLATION ADDRESS

Former Arco #11060 Remediation, 4580 Fauntleroy Way SW, Seattle, WA 98126-2740

THIS ORDER IS ISSUED SUBJECT TO THE FOLLOWING RESTRICTIONS AND CONDITIONS

1. Approval is hereby granted as provided in Article 6 of Regulation I of the Puget Sound Clean Air Agency to the applicant to install or establish the equipment, device or process described hereon at the INSTALLATION ADDRESS in accordance with the plans and specifications on file in the Engineering Division of the Puget Sound Clean Air Agency.

2. This approval does not relieve the applicant or owner of any requirement of any other governmental agency.

3. All vapors from the remediation extraction system shall be vented to a catalytic oxidizer until the criteria in Condition No. 8 of this Order of Approval have been met.

4. The maximum influent flow rate to the catalytic oxidizer shall not exceed 120 standard cubic feet per minute.

5. The control efficiency of the catalytic oxidizer shall be maintained at a minimum of 98% by weight when the TPH influent concentration to the catalytic oxidizer is greater than or equal to 200 ppmv.

6. The catalyst inlet temperature shall be at least 625 degrees Fahrenheit.

7. To determine compliance with Conditions 4, 5 and 6 of this Order of Approval, the owner or operator shall conduct monthly monitoring on the catalytic oxidizer as specified below:

    a. Measure the catalyst inlet temperature;

    b. Analyze inlet gas stream to determine the flow rate and the concentration of total petroleum hydrocarbon (TPH);

    c. Analyze exhaust gas to determine the flow rate and the concentration of TPH; and

    d. Calculate the control efficiency based on the inlet and exhaust gas analysis.

Initial monitoring shall be performed no later than 15 days after start-up of the catalytic oxidizer. Gas concentration shall be determined using a photoionization detector (PID) or other equivalent method approved by the Agency.

8. The owner or operator may operate the air sparge and soil vapor extraction treatment unit without the catalytic oxidizer when sampling data for two or more consecutive months demonstrates the following criteria are met:

   a. The pre-control total petroleum hydrocarbon (TPH) emissions are less than 2.5 pounds per day; and

   b. The pre-control benzene emissions are less than 0.018 pounds per day.

   Written approval from the Puget Sound Clean Air Agency must be obtained prior to removal of the catalytic oxidizer. Approval is based on review of monitoring data submitted in writing to the Agency, including measured flow rate and concentrations of TPH and benzene and an estimate of daily emissions for TPH and benzene.

9. The owner or operator shall maintain the following records on-site for at least two years and shall make them available to Agency personnel upon request:

   a. All monitoring results showing the concentration of TPH at the inlet and outlet to the catalytic oxidizer, including the date monitoring was conducted;

   b. Calculations showing the control efficiency of the catalytic oxidizer based on monitoring results;

   c. All monitoring results showing the pre-control concentration of TPH and benzene are below the criteria in Condition 8 of this Order of Approval, including the date the monitoring was conducted;

   d. All measurements of the influent flow rate to the catalytic oxidizer; and

   e. All measurements of the catalyst inlet temperature.

10. The owner or operator shall report any non-compliance with Condition No. 5 of this Order of Approval to the Agency no later than 30 days after it is first discovered. The owner or operator shall detail the corrective action taken and include the data showing the exceedance as well as the time of occurrence in the submittal.

APPEAL RIGHTS

Pursuant to Puget Sound Clean Air Agency's Regulation I, Section 3.17 and RCW 43.21B.310, this Order may be appealed to the Pollution Control Hearings Board (PCHB). To appeal to the PCHB, a written notice of appeal must be filed with the PCHB and a copy served upon Puget Sound Clean Air Agency within 30 days of the date the applicant receives this Order.

Margaret L. Corbin
Reviewing Engineer

Carole Cenci
Compliance Manager

APPENDIX E

System Startup Field Notes and Form

4/18/16 — 11060 System Startup — 4580 Fountaingrove Way, SW — Jason Little & Scott Winship — Pg 1 of

Weather: Sunny 59°

0650 – Arcadis onsite. Begin H+S paperwork. High risk permit to work (LO/TO). Energized work permit. Start out site. Don PPE.

0705 – Adam Doherty (SHT) onsite. Arcadis & SHT hold joint H+S tailgate. Emphasis on correct PPE, LO/TO for non energized work. Jason Little texted Brian Merlin to inform him of work. Will call if no response prior to start of LO/TO

0730 – Jason Little called Peter Campbell to inform him system startup will commence soon. Left message.

0740 – Arcadis establishes limited approach boundary around power distribution panel. Adam Doss Arc. rated 4 cal/cm² coveralls + face shield.

0800 – begin phase testing on panel, voltage confirmed correct on drop.

0815 – Voltage tested and confirmed correct on system panel

0820 – Voltage tested and confirmed correct on panel to system
– System on. Sump pump alarm. Inspect of sump.

0830 – Jason Little called filtering to begin telemetry activities.

0840 – System restarted. No alarms after sump pump drained.

0850 – Begin testing alarms. float switch is a mercury type. SHT will attempt to trigger alarm by tripping

0930 – During testing of air sparge interlocks it was found we are only getting air out to one set of 4S wells.
– also note: Low pressure alarm = high pressure alarm on 4M sparge

1000 – float switch column filled with water. No alarm trigger. Transfer pump NOT triggered

4/18/16

11060 ~~Fauntleroy~~ System Startup
4580 Fauntleroy Way, SW Seattle

Juan Little
Scott Wendy

Weather 72° Sunny

1005 - called peter campbell with the update. Informed him on the issue with the solenoids not activating and 4/5 sparge wells. + Issue with float switch.

1010 - electrician testing to see if the solenoids for 4/5 sparge are getting voltage

1S607 - In line B is low ... - close and have 24 V
- In line A is high low - close and have 24 V

1S506 - Inline A high ...

1230 - float switch ... rewired & confirmed to function alarm manually trigger with ... wire

A2H1 - ...

1240 - ... office

1245 - break for lunch

1315 - Begin testing and confirming the functionality of each sparge and VE well.

1500 - VE-1 and VE-2 are not getting any vacuum at well head. System VFD was set so inflow was ≈ 80 in Hg absolutely no vac on wells. Scott attempted to purge wells water in lines pulled into knockout tank.

1555 - System shutdown due to high temp ~~alarm~~ on CatOx "A2H1". No alarm on panel. System reset.

1615 - begin to ... wells / ports

1715 - ~~...~~ ... sample ...

1800 - completed configuration of pressure side port.
- Arcadis OUT

Rite in the Rain
ALL-WEATHER WRITING PAPER

4/20/16 — 11060 System Startup DAY 2 — 4580 Fauntleroy Way SW, Seattle WA

John Little
Scott Wenning

Weather: 60° Sunny

0730 – Arcadis onsite. HFS tailgate, permit to work, review scope of work. Employees on buddy system for gauging. exclusion zone for high traffic area.
– Don PPE

0750 – Calibrated + bump test Mini-Rae 3000 110

0755 – Began gauging wells start at MW-1 (onsite wells only)

0845 – MW-6 was discovered in planter under bush. Photos taken of location.

1047 – Gauging round complete. finish at MW-4.
– Product discovered in
MW-4 2.14
EW-1 1.34 ft
EW-3 1.06 ft
VE-1 0.08 ft

1050 – Began bailing wells start at MW-4. ≈ 2 gallons of product removed from MW-4, photos of initial bail included in Notes.

1135 – called Sam Miles to inform him of progress and that 4 wells had product. Sam called Peter campbell to confirm if system should be turned on if product exist within well.

1150 – Scott Wenning spoke with peter Campbell who confirmed that the system should not be turned on at VE-1. Scott also emphasized that VE-1 and VE-2 where not getting any vacuum to the wells.

1200 – Continue bail at EW-3 + EW-1 + VE-1

1325 – Complete bail of 3 wells until product < 0.1 ft 7-8 gallons total, Product transferred into poly drum onsite 3/4 full, will need New drum next bail event.

1345 – Exclusion zone removed, Set up around system

1350 – Gauge of MW-9 (offsite well)

4/20/16 11060 System startup day 2

Jason Little
Scott Wray

Sunny – 78°
Wind 12 mph SW

1410 – Calibrate 8 gas meter

1425 – System started, High AS volume alarm. ~~Alarm Screen~~ there is a standing alarm screen on the main panel which specifies alarm, AS shutdown (AT ... warm v)

1430 – Cleared out VE-1 and VE-2 using positive pressure Full of water, after closing volume on VE-1 and VE-2 wells

1515 – System operational, Began collecting O+M reading with all wells open.
- continued labeling of system complex

1655 – Began collecting individual well readings.

☆ Note: VE-3 acts ~~as a b~~ like a dilution valve. Very close proximity to system. Strong VOC.

1735 – Samples and O+M readings collected on all wells and O+M reading collected (total system open).
Still need to install sample ports on VE-4 and VE-5 and collect samples

1740 – Called Sam Miles with update on progress. Will return on 4/21 to complete readings

1755 – Arcadis out.

Drum Inventory

1 – 30 gal poly drum (product)
3/4 full

SITE MAINTENANCE SCOPE OF WORK

Site	4580 Fauntleroy Way, Seattle, WA 98116
Client	Former ARCO
BP Site #	11060
System	Air Sparge / Soil Vapor Extraction
PM	Brian Marcum
TM	Ross LaGrandeur
Project#	GP09BPNA.WA48
Date	

TECHNICIAN: Scott Wenning 4/20

WORK TASKS TO BE COMPLETED

- ☐ Review and sign HASP - fill out conduct tailgate safety meeting
- ☐ Walk site and report any unusual situations (i.e. drums)
- ☐ Is system and control equipment in proper operating condition?
- ☐ Check well heads and system piping for secure connections.
- ☐ Are INF and EFF sample ports in proper working order.
- ☐ Record operational data (including well data) to optimize system per worksheet.
- ☐ Collect PID readings to ensure 98% efficiency

Destruct Efficiency = ((inf conc. - eff conc)/inlet conc.) x 100

Compliance Checklist

- ☐ The remediation unit in proper working condition.
- ☐ If remediation equipment is operating, the control equipment is also operating.
- ☐ The remediation system is not discharging more than 3 minutes per hour:
  - ☐ Air as dark or darker than No. 1 on the Ringelmann Chart
  - ☐ Air that is greater than 20% opacity.
- ☐ The Falco Oxidizer > 600 °F or 315 °C in catalytic mode.
- ☐ **If operating below 98%, call office immediately**
- ☐ The effluent flow rate is not greater than 120 scfm.
- ☐ **Efficiency confirmed by PID or FID at the INF and EFF within the last month.**
- ☐ Collect departure data per data form
- ☐ Sign out HASP

☐ Call Casey Sanders (916-865-3125 / 916-223-8641) for operational issues, Ross LaGrandeur (206-726-4754 / 831-229-4548) before leaving site.

SYSTEM DATA FORM

GENERAL INFO

	ARRIVAL	DEPARTURE	
Date	4/20/16	4/20/16	(mm/dd/yy)
Time	0700	1600	(hh:mm)
Op Status	offline	online	(on/off)
Alarm	↓	none	(ie PS1)
Elect Svc Meter	↓	056	(kwh)

	ARRIVAL	DEPARTURE	
Oxidizer Hour Meter		6009.9	Hours
SVE Hour Meter	↓	6021.5	Hours
Sparge Hour Meter	↓	037.4	Hours
Chart Recorder Operating	NA	NA	(Y/N)
Chart Data Downloaded	NA	NA	(Y/N)
SVE VFD Setting		40 %	~~Hz~~ %
AS VFD Setting	↓	offline	Hz
Man. Dilution Valve	↓	0	% open
Pre Dilution** Vac	See Below		in. H_2O
Pre Dilution** Flow	NA	NA	scfm
Pre Dilution** Temp	NA	NA	°F
Post Dilution Pressure	NA	NA	H_2O
Post Dilution Flow	NA	NA	scfm
Post Dilution Temp	NA	NA	°F
Destruction Efficiency	↓		%
PreCat Temp (T-1)		334	°C
Cat Temp (T-3)	↓	419	°C
PostCat Temp (T-2)	↓	425	°C

** = Only collect Pre-dilution readings if dilution air is being added

Calibration Records

	Date Calibrated	Calibration Expiration
PID	4/20/16	4/21/16

MONTHLY SAMPLING

Monthly Samples Collected	Yes	No
If Yes, sample ID	Date	Time
~~INFLUENT 2_AE(~~ 11060_influent_042116	4/21	1340
~~EFFLUENT_AE(~~ 11060_effluent_042116	4/21	1330

SITE MAINTENANCE SCOPE OF WORK

Site	4580 Fauntleroy Way, Seattle, WA 98116
Client	Former ARCO
BP Site #	11060
System	Air Sparge / Soil Vapor Extraction
PM	Brian Marcum
TM	Ross LaGrandeur
Project#	GP09BPNA.WA48
Revised Date	

TECHNICIAN:

AS SYSTEM

Arrival Status: offline Time: 0700

Departure Status: offline Time: 1600

Compressor Hour Meter Reading: 0379 Compressor Oil Acceptable?: Yes No, change

Comments:

ARRIVAL

Location ID	Percent Open	Pressure (psi)	Flow (acfm)
Compressor			
Manifold			
Individual AS Piping			
AS-3			
Split/Paired AS Piping			
AS-1			
AS-2			
CW-2			
CW-3			
CW-4			
AS-4			
AS-5			
AS-6			

DEPARTURE

Location ID	Percent Open	Pressure (psi)	Flow (acfm)
Compressor			
Manifold			
Individual AS Piping			
AS-3			
Split/Paired AS Piping			
AS-1			
AS-2			
CW-2			
CW-3			
CW-4			
AS-4			
AS-5			
AS-6			

Health and Safety item check

Fire Extinguisher	checked, initialed and dated	
First Aid Kit	checked, initialed and dated	
Eye wash	checked, initialed and dated	
Spill kit	present	✓

Lockout/Tag out during system maintenance

time and date LOTO NA

time and date LOTO removal NA

Comments:

On-site:

HASP containing MSDS _____

Permits (PSCAA) _____

Mass removal with destruction efficiency for PSCAA _____

4/20

SITE MAINTENANCE SCOPE OF WORK

Site	4580 Fauntleroy Way, Seattle, WA 98116
Client	Former ARCO
BP Site #	11060
System	Air Sparge / Soil Vapor Extraction
PM	Brian Marcum
TM	Ross LaGrandeur
Project#	GP09BPNA.WA48
Revised Date	

TECHNICIAN: Scott Wenning

fpm

SVE Well Data

Well ID	%Open	Vacuum	Air Flow	Temperature	PID Readings	Comments
INF (Pre-dilution)	---	18 in Hg	90	83	390	4 inch line PVC
INF (Post Dilution)	pressure 3 in WC		1680	90	316	2" galvanized line
Effluent	---	---	---	---	~~---~~	0.9 ppm
Split/Paired SVE Manifold Piping						
VE-1	100	2.5 in Hg	180	76	668	2" PVC
VE-2	100	2.0 in Hg	225	77	283	2" PVC
VE-3	100	2.5 in Hg	1760	78 135	~~480~~	~~not~~ closed initially
CW-2	100	2.5	94	80	740	2" PVC
CW-3	100	2.5 in Hg	97	80	240	2" PVC
CW-4	100	2.5 in Hg	115	80	143	2" PVC
Individual SVE Manifold Piping						
VE-4	100	20 in H_2O	145	70	398	need sample ports
VE-5	100	20 in H_2O	164	71	317	need sample ports
unit	%	in. H_2O	scfm	°F	ppmv	

2" = 0.0218 ft² 2 1/2" = 0.0341 ft² 3" = 0.0491 ft² = 0.0873 ft²

Comments:

VE-3 - high flow well - w/ low VOCs
- set to 20% open @ ~ 200 fpm in 2" PVC

Groundwater Gauging Form

Page 1 of 2

Project No.: GP09BPNAWA.48

Site Location: 11060 - 4580 Fauntleroy Way SW, Seattle WA

Prepared By: Scott Wenning / Jason Little Date: 4/20/16

Gauging Equipment: Water Probe / Oil-Water Interface Probe Other

Well ID	Time	Sheen or ~~Odor~~	LNAPL Depth	LNAPL Thickness	DTW	TD	PID	Notes
AS-1	0900	yes	NA	NA	23.30	—	663	
AS-2	0910	yes	NA	NA	22.27	—	712	
AS-3	0855	~~yes~~	NA	NA	21.81	~~21.84~~ SW	835	
AS-4	1042	yes	NA	NA	21.68	—	532	
AS-5	1020	yes	—	—	—	—	1009	dry
AS-6	0945	yes	25.34	0.04	25.38	—	836	mud to Bail
EW-1	1017	yes	24.59	1.34	25.93	—	508	well seal needs replaced 4" Bail - ~~1.5~~ gal removed
~~EW-2~~ well not on map	1028	no	24.24	NA	NA	—	3.0	
EW-3	1002		24.80	~~2.5~~ 1.06	25.86	—	587	Bail / mud new well cap not sealed to storm water 4"
GMW-1	0830	~~NA~~ no	NA	NA	22.64	—	233.0	Bailed ~1.5 gal
MW-1	0815	~~NA~~ no	NA	NA	24.35	—	27.8	
MW-2	0847	~~NA~~ NO	NA	NA	23.79	—	4160	
MW-3	0922	no	NA	NA	22.94	—	1371	
MW-4	1047	yes	23.21	2.11	25.32	—	501	Bail / Removed ~2 gallons NAPL
MW-5	1052	yes	NA	NA	25.28	—	380	

ARCADIS Design & Consultancy for natural and built assets

Groundater Gauging Form

Project No.: GP09BPNAWA.48

Page 2 of 2

Site Location: 11060 - 4580 Fauntleroy Way SW, Seattle WA

Prepared By: SJ JL

Date: 4/20/16

Gauging Equipment: Water Probe / Oil-Water Interface Probe

Other _____

Well ID	Time	~~Sheen~~ odor	LNAPL Depth	LNAPL Thickness	DTW	TD	PID	Notes
MW-6	0840	no	NA	NA	22.42	—	0.5	in Bushes / planter hidden photo taken
MW-9	1400	NO	NA	NA	21.19	—	1.2	
VE-1	1010	yes	24.69	0.68	25.37	—	735	Bailed w 1gal
VE-2	1000	NO	NA	NA	14.19	—	105	
VE-3	0905	yes	NA	NA	14.09	—	204	
VE-4	0852	yes	NA	NA	14.50	—	403	
VE-5	1035	yes	NA	NA	14.50	—	178	
CW-2 VE	0915	yes	NA	NA	19.71	~~19.71~~	655	
CW-3 -VE	0930	yes	NA	NA	22.83	—	247	
CW-4 -VE	0945	yes	NA	NA	21.02	—	237	
CW2-AS	0915	yes	NA	NA	23.08	—	233	
CW3-AS	0930	yes	NA	NA	23.93		333	
CW4-AS	0940	yes	NA	NA	24.54	—	845	
EW-2	1030	yes	NA	NA	24.60	—	866	

4/21/16 — Jason Lisle

SITE MAINTENANCE SCOPE OF WORK

Site	4580 Fauntleroy Way, Seattle, WA 98116
Client	Former ARCO
BP Site #	11060
System	Air Sparge / Soil Vapor Extraction
PM	Brian Marcum
TM	Ross LaGrandeur
Project#	GP09BPNA.WA48
Revised Date	

☆ Individual Well Sampling (~~all~~ reading taken when individual wells are open while all other readings taken while entire Field ops wells are closed)

TECHNICIAN:

SVE Well Data

Well ID	%Open	Vacuum	Air Flow	~~Temperature~~ LEL %	PID Readings	Comments
INF (Pre-dilution)	---					
INF (Post Dilution)	---					
Effluent	---	---	---	---	---	
Split/Paired SVE Manifold Piping						
VE-1	☆100	~~2.0~~ 1.0 in Hg		20	324	
VE-2	☆100	1.5 in Hg		24	137	
VE-3	~~☆~~	2.0 in Hg		16	285	
CW-2	~~☆~~	1.0		▲ 99	345	▲ over alarm on LEL
CW-3	~~☆~~	1.0 in Hg		▲ 19	400	▲ over alarm on LEL
CW-4	~~☆~~	~~2.0~~ 1.0 in Hg		▲ 99	~~3~~80	▲ over Alarm on Multi Rae
Individual SVE Manifold Piping						
VE-4	☆100	25. in H_2O		51	174	
VE-5	☆100	23 in H_2O		20	232	
unit	%	in. H_2O	scfm	%	ppmv	

2" = 0.0218 ft² 2 1/2" = 0.0341 ft² 3" = 0.0491 ft² = 0.0873 ft²

Comments: ☆ LEL Sampling — System shutdown

SITE MAINTENANCE SCOPE OF WORK

Site	4580 Fauntleroy Way, Seattle, WA 98116
Client	Former ARCO
BP Site #	11060
System	Air Sparge / Soil Vapor Extraction
PM	Brian Marcum
TM	Ross LaGrandeur
Project#	GP09BPNA.WA48
Date	

TECHNICIAN: Jason Little

WORK TASKS TO BE COMPLETED

- ✓ Review and sign HASP - fill out conduct tailgate safety meeting
- ✓ Walk site and report any unusual situations (i.e. drums)
- ✓ Is system and control equipment in proper operating condition?
- X Check well heads and system piping for secure connections. – Need to replace EW-1 and EW-2 well seals
- ✓ Are INF and EFF sample ports in proper working order.
- ✓ Record operational data (including well data) to optimize system per worksheet.
- ✓ Collect PID readings to ensure 98% efficiency

Destruct Efficiency = ((inf conc. - eff conc)/inlet conc.) x 100

Compliance Checklist

- ✓ The remediation unit in proper working condition.
- ✓ If remediation equipment is operating, the control equipment is also operating.
- ✓ The remediation system is not discharging more than 3 minutes per hour:
  - ☐ Air as dark or darker than No. 1 on the Ringelmann Chart
  - ☐ Air that is greater than 20% opacity.
- ✓ The Falco Oxidizer > 600 °F or 315 °C in catalytic mode.
- ✓ **If operating below 98%, call office immediately**
- ✓ The effluent flow rate is not greater than 120 scfm.
- ✓ **Efficiency confirmed by PID or FID at the INF and EFF within the last month.**
- ✓ Collect departure data per data form
- ✓ Sign out HASP

☐ Call Casey Sanders (916-865-3125 / 916-223-8641) for operational issues, Ross LaGrandeur (206-726-4754 / 831-229-4548) before leaving site.

SYSTEM DATA FORM

GENERAL INFO

	ARRIVAL	DEPARTURE	
Date	4/22/16	4/22/16	(mm/dd/yy)
Time	0950	1115	(hh:mm)
Op Status	On	On	(on/off)
Alarm	None	None	(ie PS1)
Elect Svc Meter	–	114	(kwh)

	ARRIVAL	DEPARTURE	
Oxidizer Hour Meter	–	6052.3	Hours
SVE Hour Meter	–	6064.0	Hours
Sparge Hour Meter	–	37.8	Hours
Chart Recorder Operating	NA	NA	(Y/N)
Chart Data Downloaded	NA	NA	(Y/N)
SVE VFD Setting	–	50%	Hz
AS VFD Setting	–	offline	Hz
Man. Dilution Valve	–	0	% open
Pre Dilution** Vac	See Below		in. H_2O
Pre Dilution** Flow	NA	NA	scfm
Pre Dilution** Temp	NA	NA	°F
Post Dilution Pressure	NA	NA	H_2O
Post Dilution Flow	NA	NA	scfm
Post Dilution Temp	NA	NA	°F
Destruction Efficiency	–	99%	%
PreCat Temp (T-1)	–	343	°C
Cat Temp (T-3)	–	439	°C
PostCat Temp (T-2)	–	420	°C

** = Only collect Pre-dilution readings if dilution air is being added

Calibration Records

	Date Calibrated	Calibration Expiration
PID		
MiniRae 3000	4/22/16	4/23/16

MONTHLY SAMPLING

Monthly Samples Collected	Yes	(No)
If Yes, sample ID	Date	Time
INFLUENT 2_AE( )		
EFFLUENT_AE( )		

SITE MAINTENANCE SCOPE OF WORK

Site	4580 Fauntleroy Way, Seattle, WA 98116
Client	Former ARCO
BP Site #	11060
System	Air Sparge / Soil Vapor Extraction
PM	Brian Marcum
TM	Ross LaGrandeur
Project#	GP09BPNA.WA48
Revised Date	

TECHNICIAN: _____

AS SYSTEM

Arrival Status: offline — Time:

Departure Status: offline — Time:

Compressor Hour Meter Reading: — Compressor Oil Acceptable?: Yes No, change

Comments:

ARRIVAL

Location ID	Percent Open	Pressure (psi)	Flow (acfm)
Compressor			
Manifold			
Individual AS Piping			
AS-3			
Split/Paired AS Piping			
AS-1			
AS-2			
CW-2			
CW-3			
CW-4			
AS-4			
AS-5			
AS-6			

DEPARTURE

Location ID	Percent Open	Pressure (psi)	Flow (acfm)
Compressor			
Manifold			
Individual AS Piping			
AS-3			
Split/Paired AS Piping			
AS-1			
AS-2			
CW-2			
CW-3			
CW-4			
AS-4			
AS-5			
AS-6			

Health and Safety item check

Fire Extinguisher	checked, initialed and dated	→ Need to service extinguisher
First Aid Kit	checked, initialed and dated	
Eye wash	checked, initialed and dated	
Spill kit	present	

On-site:

HASP containing MSDS _____

Permits (PSCAA) _____

Mass removal with destruction efficiency for PSCAA _____

Lockout/Tag out during system maintenance

time and date LOTO _____

time and date LOTO removal _____

Comments:

SITE MAINTENANCE SCOPE OF WORK

Site	4580 Fauntleroy Way, Seattle, WA 98116
Client	Former ARCO
BP Site #	11060
System	Air Sparge / Soil Vapor Extraction
PM	Brian Marcum
TM	Ross LaGrandeur
Project#	GP09BPNA.WA48
Revised Date	fpm

TECHNICIAN: Jason Hintz

SVE Well Data

Well ID	%Open	Vacuum	Air Flow	Temperature	PID Readings	Comments
INF (Pre-dilution)	---	19 in Hg	140	68	285	
INF (Post Dilution)	---	+2 in wc	110	89	283.7	
Effluent	---	---	---	---	2.1	
Split/Paired SVE Manifold Piping						
VE-1	100	2.0 in hg	220	70	543	
VE-2	100	1.0 in hg	295	66	318	
VE-3	20	0.5 in hg	315	67	331	
CW-2	100	1.5 in hg	310	68	185	
CW-3	100	1.0 in hg	270	68	213	
CW-4	100	1.5 in hg	275	68	381	
Individual SVE Manifold Piping						
VE-4	100	20 in H_2O	250	69	294	
VE-5	100	20 in H_2O	185	69	121	
unit	**%**	**in. H_2O**	**scfm**	**°F**	**ppmv**	

2" = 0.0218 ft^2 2 1/2" = 0.0341 ft^2 3" = 0.0491 ft^2 = 0.0873 ft^2

Comments:

SITE MAINTENANCE SCOPE OF WORK

Site	4580 Fauntleroy Way, Seattle, WA 98116
Client	Former ARCO
BP Site #	11060
System	Air Sparge / Soil Vapor Extraction
PM	Brian Marcum
TM	Ross LaGrandeur
Project#	GP09BPNA.WA48
Date	

TECHNICIAN: Jason Little

WORK TASKS TO BE COMPLETED

- ☑ Review and sign HASP - fill out conduct tailgate safety meeting
- ☑ Walk site and report any unusual situations (i.e. drums)
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- ☑ The remediation unit in proper working condition.
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- ☐ The remediation system is not discharging more than 3 minutes per hour:
  - ☐ Air as dark or darker than No. 1 on the Ringelmann Chart
  - ☐ Air that is greater than 20% opacity.
- ☑ The Falco Oxidizer > 600 °F or 315 °C in catalytic mode.
- ☐ **If operating below 98%, call office immediately**
- ☑ The effluent flow rate is not greater than 120 scfm.
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- ☑ Collect departure data per data form
- ☐ Sign out HASP

☐ Call Casey Sanders (916-865-3125 / 916-223-8641) for operational issues, Ross LaGrandeur (206-726-4754 / 831-229-4548) before leaving site.

SYSTEM DATA FORM

GENERAL INFO

	ARRIVAL	DEPARTURE	
Date	4/27/16	4/27/16	(mm/dd/yy)
Time	1500	1720	(hh:mm)
Op Status	On	On	(on/off)
Alarm	None	None	(ie PS1)
Elect Svc Meter	—		(kwh)

	ARRIVAL	DEPARTURE	
Oxidizer Hour Meter	—	6177.5	Hours
SVE Hour Meter	—	6189.6	Hours
Sparge Hour Meter	—	37.8	Hours
Chart Recorder Operating	NA	NA	(Y/N)
Chart Data Downloaded	NA	NA	(Y/N)
SVE VFD Setting	—	50%	~~Hz~~
AS VFD Setting	—	offline	Hz
Man. Dilution Valve	—	0	% open
Pre Dilution** Vac	See Below		in. H_2O
Pre Dilution** Flow	NA	NA	scfm
Pre Dilution** Temp	NA	NA	°F
Post Dilution Pressure	NA	NA	H_2O
Post Dilution Flow	NA	NA	scfm
Post Dilution Temp	NA	NA	°F
Destruction Efficiency	—	98.4	%
PreCat Temp (T-1)	—	330	°C
Cat Temp (T-3)	—	413	°C
PostCat Temp (T-2)	—	411	°C

** = Only collect Pre-dilution readings if dilution air is being added

Calibration Records

	Date Calibrated	Calibration Expiration
PID		
MiniRae 3000	4/27/16	4/28/16

MONTHLY SAMPLING

Monthly Samples Collected	Yes	No
If Yes, sample ID	Date	Time
INFLUENT 2_AE( )		NO
EFFLUENT_AE( )		NO

SITE MAINTENANCE SCOPE OF WORK	
Site	4580 Fauntleroy Way, Seattle, WA 98116
Client	Former ARCO
BP Site #	11060
System	Air Sparge / Soil Vapor Extraction
PM	Brian Marcum
TM	Ross LaGrandeur
Project#	GP09BPNA.WA48
Revised Date	

TECHNICIAN: Jason Little

Fpm

SVE Well Data

Well ID	%Open	Vacuum	Air Flow	Temperature	PID Readings	Comments
INF (Pre-dilution)	---	20	198	69	607.2	4" pipe
INF (Post Dilution)	---	+3	840	88	367.5	
Effluent	---	---	---	---	6.0	
Split/Paired SVE Manifold Piping						
VE-1	100	3 in hg	205	63	920.3	
VE-2	100	1 in hg	161	61	844.1	
VE-3	20	2 in hg	275	62	110.7	
CW-2	100	3 in hg	183	61	380.4	
CW-3	100	2 in hg	215	62	485.0	
CW-4	100	3 in hg	315	61	776.4	
Individual SVE Manifold Piping						
VE-4	100	18 in H_2O	255	66	467.8	
VE-5	100	18 in H_2O	260	66	392.9	
unit	**%**	**in. H_2O**	~~**scfm**~~	**°F**	**ppmv**	

2" = 0.0218 ft^2 2 1/2" = 0.0341 ft^2 3" = 0.0491 ft^2 4" = 0.0873 ft^2

Comments:

APPENDIX F

SVE Analytical Data

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Analysis Report

2425 New Holland Pike, Lancaster, PA 17601 • 717-656-2300 • Fax: 717-656-2681 • www.LancasterLabs.com

ANALYTICAL RESULTS

Prepared by:

Eurofins Lancaster Laboratories Environmental
2425 New Holland Pike
Lancaster, PA 17601

Prepared for:

Atlantic Richfield c/o ARCADIS
Suite 600
630 Plaza Drive
Highlands Ranch CO 80129

Report Date: April 29, 2016

Project: WA-11060

Submittal Date: 04/22/2016
Group Number: 1653238
PO Number: GP09BPNA.WA48
State of Sample Origin: WA

Client Sample Description	Lancaster Labs (LL) #
11060-Effluent-042116 Air	8345582
11060-Influent-042116 Air	8345583

The specific methodologies used in obtaining the enclosed analytical results are indicated on the Laboratory Sample Analysis Record.

Regulatory agencies do not accredit laboratories for all methods, analytes, and matrices. Our scopes of accreditation can be viewed at http://www.eurofinsus.com/environment-testing/laboratories/eurofins-lancaster-laboratories-environmental/resources/certifications/ .

Electronic Copy To	Atlantic Richfield c/o ARCADIS	Attn: Casey Sanders
Electronic Copy To	Atlantic Richfield c/o ARCADIS	Attn: Jason Little
Electronic Copy To	ARCADIS U.S., Inc.	Attn: Brian Marcum
Electronic Copy To	ARCADIS U.S., Inc.	Attn: Richard Rodriguez
Electronic Copy To	ARCADIS U.S., Inc.	Attn: Ross LaGrandeur

Respectfully Submitted,

Stacy L. Butt
Specialist

(717) 556-7236

Project Name: WA-11060
LL Group #: 1653238

General Comments:

Through our technical processes and second person review of data, we have established that our data/deliverables are in compliance with the methods and project requirements unless otherwise noted or previously resolved with the client. The compliance signature is located on the cover page of the Analysis Reports.

See the Laboratory Sample Analysis Record section of the Analysis Report for the method references.

All QC met criteria unless otherwise noted in an Analysis Specific Comment below. Refer to the QC Summary for specific values and acceptance criteria.

Project specific QC samples are not included in this data set

Matrix QC may not be reported if site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

Surrogate recoveries (if applicable) which are outside of the QC window are confirmed unless attributed to a dilution or otherwise noted in an Analysis Specific Comment below.

The samples were received at the appropriate temperature and in accordance with the chain of custody unless otherwise noted.

Analysis Specific Comments:

No additional comments are necessary.

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Analysis Report

Sample Description: 11060-Effluent-042116 Air
WA-11060
4580 Fauntleroy Way SW - Seattle, WA

LL Sample # AQ 8345582
LL Group # 1653238
Account # 13255

Project Name: WA-11060

Collected: 04/21/2016 13:20 by JL

Submitted: 04/22/2016 09:45
Reported: 04/29/2016 12:42

Atlantic Richfield c/o ARCADIS
Suite 600
630 Plaza Drive
Highlands Ranch CO 80129

CAT No.	Analysis Name	CAS Number	Final Result	MDL	Final Result	MDL	DF
Volatiles in Air	**EPA 18 mod/EPA 25 mod**		ppm(v)	ppm(v)	mg/m3	mg/m3	
07090	Benzene	71-43-2	N.D.	0.50	N.D.	1.6	1
07090	>C4-C10 Hydrocarbons hexane	n.a.	N.D.	5.0	N.D.	18	1
07090	Ethylbenzene	100-41-4	N.D.	0.40	N.D.	1.7	1
07090	Toluene	108-88-3	N.D.	0.80	N.D.	3.0	1
07090	Xylene (total)	1330-20-7	N.D.	0.70	N.D.	3.0	1

MDL = Method Detection Limit

Sample Comments

State of Washington Lab Certification No. C457

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07090	>C4-C10 + BTEX	EPA 18 mod/EPA 25 mod	1	M1611330AA	04/22/2016 19:54	Jeffrey B Smith	1

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Analysis Report

Sample Description: 11060-Influent-042116 Air
WA-11060
4580 Fauntleroy Way SW - Seattle, WA

LL Sample # AQ 8345583
LL Group # 1653238
Account # 13255

Project Name: WA-11060

Collected: 04/21/2016 13:30 by JL

Submitted: 04/22/2016 09:45
Reported: 04/29/2016 12:42

Atlantic Richfield c/o ARCADIS
Suite 600
630 Plaza Drive
Highlands Ranch CO 80129

CAT No.	Analysis Name	CAS Number	Final Result		MDL	Final Result		MDL	DF
Volatiles in Air	**EPA 18 mod/EPA 25 mod**		ppm(v)		ppm(v)	mg/m3		mg/m3	
07090	Benzene	71-43-2	0.82	J	0.50	2.6	J	1.6	1
07090	>C4-C10 Hydrocarbons hexane	n.a.	760		5.0	2,700		18	1
07090	Ethylbenzene	100-41-4	0.68	J	0.40	3.0	J	1.7	1
07090	Toluene	108-88-3	0.93	J	0.80	3.5	J	3.0	1
07090	Xylene (total)	1330-20-7	1.8	J	0.70	7.8	J	3.0	1

MDL = Method Detection Limit

Sample Comments

State of Washington Lab Certification No. C457

All QC is compliant unless otherwise noted. Please refer to the Quality Control Summary for overall QC performance data and associated samples.

Laboratory Sample Analysis Record

CAT No.	Analysis Name	Method	Trial#	Batch#	Analysis Date and Time	Analyst	Dilution Factor
07090	>C4-C10 + BTEX	EPA 18 mod/EPA 25 mod	1	M1611330AA	04/22/2016 20:23	Jeffrey B Smith	1

Quality Control Summary

Client Name: Atlantic Richfield c/o ARCADIS
Group Number: 1653238
Reported: 04/29/2016 12:42

Matrix QC may not be reported if insufficient sample or site-specific QC samples were not submitted. In these situations, to demonstrate precision and accuracy at a batch level, a LCS/LCSD was performed, unless otherwise specified in the method.

All Inorganic Initial Calibration and Continuing Calibration Blanks met acceptable method criteria unless otherwise noted on the Analysis Report.

Method Blank

Analysis Name	Result	MDL
	ppm(v)	ppm(v)
Batch number: M1611330AA	Sample number(s): 8345582-8345583	
Benzene	N.D.	0.50
>C4-C10 Hydrocarbons hexane	N.D.	5.0
Ethylbenzene	N.D.	0.40
Toluene	N.D.	0.80
Xylene (total)	N.D.	0.70

LCS/LCSD

Analysis Name	LCS Spike Added ppm(v)	LCS Conc ppm(v)	LCSD Spike Added ppm(v)	LCSD Conc ppm(v)	LCS %REC	LCSD %REC	LCS/LCSD Limits	RPD	RPD Max
Batch number: M1611330AA	Sample number(s): 8345582-8345583								
Benzene	10.1	8.91	10.1	8.97	88	89	71-116	1	30
Ethylbenzene	10	7.02	10	7.38	70	74	59-144	5	30
Toluene	10	9.47	10	9.89	95	99	77-143	4	30
Xylene (total)	29.8	19.75	29.8	21.36	66	72	58-148	8	30

*- Outside of specification
(1) The result for one or both determinations was less than five times the LOQ.
(2) The unspiked result was more than four times the spike added.
P###### is indicative of a Background or Unspiked sample that is batch matrix QC and was not performed using a sample from this submission group.

Summa Canister Field Test Data/Chain of Custody

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Acct. # 13255 Group # 1653238 Sample # 8345582-83 — For Eurofins Lancaster Laboratories Environmental use only. Instructions on reverse side correspond with circled numbers. Bottle Order (SCR) # ______

(1) Client Information

Client: Arcadis   Account #:
Project Name/#: 11060
Project Manager: Brian Arrowsy   P.O. #: G109 BPNAWALL
Sampler: Jon Litta   Quote #:
Name of state where samples were collected: Washington

(3) Turnaround Time Requested (TAT) (circle one): (Standard) Rush (specify) ______

(4) Data Package Required? Yes No   **(5) EDD Required?** Yes No

	Temperature (F) Start	Temperature (F) Stop	Pressure ("Hg) Start	Pressure ("Hg) Stop
Ambient	70	60	—	—
Maximum	—	—	—	—
Minimum	—	—	—	—

(6) Analyses Requested: EPA TO-15; EPA 18 (☑ BTEX ☐ MTBE); EPA 25 (select range below); Helium as tracer; O2/CO2; Library Search

(2)

Sample Identification	Start Date/Time (24-hour clock)	Stop Date/Time (24-hour clock)	Canister Pressure in Field ("Hg) (Start)	Canister Pressure in Field ("Hg) (Stop)	Interior Temp. (F) (Start)	Interior Temp. (F) (Stop)	Flow Reg. ID	Can ID	Can Size (L)	Controller Flowrate (mL/min)	EPA TO-15	EPA 18	EPA 25	Helium as tracer	O2/CO2	Library Search
11060-effluent-042116	4-21/1320	4-21/1320	TEDLAR	—	70	70	—		1	—	✓	✓				
11060-influent-042116	4-21/1330	4-21/1330	TEDLAR	—	70	70	—		1	—						
							—		1	—						
							—		1	—						
							—		1	—						
							—		1	—						
							—		1	—						
							—		1	—						
							—		1	—						
							—		1	—						
							—		1	—						

(7) Instructions/QC Requirements & Comments

EPA 25 (check one): ☐ C1 - C4 ☐ C2 - C10 ☐ C1 - C10 ☑ C4 - C10 (GRO) ☐ C2 - C4

(8)

Canisters Shipped by: FedEx	Date/Time: 4-21/1620	Canisters Received by:	Date/Time:	Relinquished by:	Date/Time:	Received by:	Date/Time:
Relinquished by: [signature]	Date/Time:	Received by:	Date/Time:	Relinquished by:	Date/Time:	Received by:	Date/Time:
Relinquished by:	Date/Time:	Received by:	Date/Time:	Relinquished by:	Date/Time:	Received by: [signature]	Date/Time: 4/22/16 09:45

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Sample Administration Receipt Documentation Log

Doc Log ID: 143917

Group Number(s):

Client: Arcadis

11060 165238

Delivery and Receipt Information

Delivery Method:	Fed Ex	Arrival Timestamp:	04/22/2016 9:45
Number of Packages:	1	Number of Projects:	1
State/Province of Origin:	WA		

Arrival Condition Summary

Shipping Container Sealed:	Yes	Sample IDs on COC match Containers:	Yes
Custody Seal Present:	No	Sample Date/Times match COC:	Yes
Samples Chilled:	N/A	VOA Vial Headspace ≥ 6mm:	N/A
Paperwork Enclosed:	Yes	Total Trip Blank Qty:	0
Samples Intact:	Yes	Air Quality Samples Present:	Yes
Missing Samples:	No	Air Quality Flow Controllers Present:	No
Extra Samples:	No	Air Quality Returns:	No
Discrepancy in Container Qty on COC:	No		

Unpacked by Katie Hartlove (2114) at 10:29 on 04/22/2016

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Lancaster, PA 17605-2425

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Explanation of Symbols and Abbreviations

The following defines common symbols and abbreviations used in reporting technical data:

RL	Reporting Limit	**BMQL**	Below Minimum Quantitation Level
N.D.	none detected	**MPN**	Most Probable Number
TNTC	Too Numerous To Count	**CP Units**	cobalt-chloroplatinate units
IU	International Units	**NTU**	nephelometric turbidity units
umhos/cm	micromhos/cm	**ng**	nanogram(s)
C	degrees Celsius	**F**	degrees Fahrenheit
meq	milliequivalents	**lb.**	pound(s)
g	gram(s)	**kg**	kilogram(s)
µg	microgram(s)	**mg**	milligram(s)
mL	milliliter(s)	**L**	liter(s)
m3	cubic meter(s)	**µL**	microliter(s)
		pg/L	picogram/liter

<	less than
>	greater than
ppm	parts per million - One ppm is equivalent to one milligram per kilogram (mg/kg) or one gram per million grams. For aqueous liquids, ppm is usually taken to be equivalent to milligrams per liter (mg/l), because one liter of water has a weight very close to a kilogram. For gases or vapors, one ppm is equivalent to one microliter per liter of gas.
ppb	parts per billion
Dry weight basis	Results printed under this heading have been adjusted for moisture content. This increases the analyte weight concentration to approximate the value present in a similar sample without moisture. All other results are reported on an as-received basis.

Laboratory Data Qualifiers:

B - Analyte detected in the blank
C - Result confirmed by reanalysis
E - Concentration exceeds the calibration range
J (or G, I, X) - estimated value ≥ the Method Detection Limit (MDL or DL) and < the Limit of Quantitation (LOQ or RL)
P - Concentration difference between the primary and confirmation column >40%. The lower result is reported.
U - Analyte was not detected at the value indicated
V - Concentration difference between the primary and confirmation column >100%. The reporting limit is raised due to this disparity and evident interference…

Additional Organic and Inorganic CLP qualifiers may be used with Form 1 reports as defined by the CLP methods. Qualifiers specific to Dioxin/Furans and PCB Congeners are detailed on the individual Analysis Report.

Analytical test results meet all requirements of the associated regulatory program (i.e., NELAC (TNI), DoD, and ISO 17025) unless otherwise noted under the individual analysis.

Measurement uncertainty values, as applicable, are available upon request.

Tests results relate only to the sample tested. Clients should be aware that a critical step in a chemical or microbiological analysis is the collection of the sample. Unless the sample analyzed is truly representative of the bulk of material involved, the test results will be meaningless. If you have questions regarding the proper techniques of collecting samples, please contact us. We cannot be held responsible for sample integrity, however, unless sampling has been performed by a member of our staff.

This report shall not be reproduced except in full, without the written approval of the laboratory.

Times are local to the area of activity. Parameters listed in the 40 CFR Part 136 Table II as “analyze immediately” are not performed within 15 minutes.

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