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Workplan to Conduct

Multi-Phase Extraction Pilot Test
at

2200 Telegraph Avenue
Oakland, California

August 15, 2017

Project 6460

Prepared for:

Mr. Mo Mashhoon
Mash Petroleum
428 13th Street, 10th Floor
Oakland, California 94612

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ACKNOWLEDGEMENT STATEMENT

Site Location: 2200 Telegraph Avenue, Oakland, California

I have read and acknowledge the content, recommendations and/or conclusions contained in the attached document or report submitted on my behalf to ACDEH's FTP server and the SWRCB's Geotracker website.

Mr. Mo Mashhoon
Mash Petroleum
428 13th Street, 10th Floor
Oakland, California 94612

CERTIFICATION

SOMA Environmental Engineering, Inc. has prepared this report on behalf of Mr. Mo Mashhoon of Mash Petroleum for the site located at 2200 Telegraph Avenue, Oakland, California. The report was prepared in accordance with our discussion held at the Alameda County Department of Environmental Health offices during our meeting on July 31st, 2017.

Mansour Sepehr, PhD., PE
Principal Hydrogeologist

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1. INTRODUCTION

SOMA Environmental Engineering, Inc. has prepared this workplan on behalf of Mr. Mo Mashhoon of Mash Petroleum, Inc. for the site located at 2200 Telegraph Avenue, Oakland, California. This workplan was prepared in accordance with our discussion held at the Alameda County Department of Environmental Health offices during our meeting dated July 31st, 2017.

The subject property is located at 2200 Telegraph Avenue, Oakland, California. Figure 1 shows the location of the site and vicinity. The site is located at the corner of the intersection of Grand Avenue and Telegraph Avenue in a commercial/residential area (Figure 2).

Based on the results of a subsurface investigation conducted by Conestoga-Rover & Associates (CRA), subsurface soils at the site generally consists of poorly graded sand and clayey sands to approximately 7 feet below ground surface (bgs), underlain by silt and clay to a depth of approximately 20 feet bgs. Groundwater was encountered at approximately 11 feet bgs. Groundwater flow at the site and vicinity has been observed to be to the southeast (CRA, 2012).

In addition, an underground Bay Area Rapid Transit (BART) railway is present beneath the subject property. The BART railway is comprised of three separate and parallel tunnels that run beneath the northwestern to southeastern portions of the site. See Figure 2. The tunnels are about 12 feet deep.

The property has been operated as a vehicle fuel service station since mid 1940s. The site previously operated as a Chevron Station #9-3600 and is currently an active independent gasoline service station under “A&A Gas and Mart”. Currently, there are three 10,000-gallon underground storage tanks (USTs) at the site.

Environmental evaluation of the site began in 1986 when new USTs replaced the older USTs and petroleum contamination was discovered. In 1994 the product lines also were replaced by a new piping system. Between 1986 and 2012, numerous soil and groundwater investigations were conducted at the subject site. Elevated concentrations of total petroleum hydrocarbon as gasoline (TPH-g), benzene, toluene, ethylbenzene and xylenes (BTEX) and methyl tertiary butyl ether (MtBE) were identified in a dissolved groundwater plume migrating to the southeast.

The subsurface analytical data collected at the site was evaluated with respect to

the State Water Resources Control Board (SWRCB) Low-Threat Closure Policy (LTCP). Based on the results of the sampling and monitoring activities and conditions set forth by the LTCP criteria, in a letter dated January 27, 2015 the site received no further action (NFA) status by the RWQCB and Alameda County Department of Environmental Health (ACDEH).

ACDEH conditioned the closure of the site by stating that if a change in land use occurs during site redevelopment, ACDEH must be notified that the case will be re-evaluated upon receipt of approved development plans. In addition the case closure documentation states that excavation or reconstruction activities in areas of residual contamination require planning and implementation of appropriate health and safety procedures. Lastly, the closure documentation states that the former Chevron facility was to be included in the City of Oakland Permit Tracking System due to the residual contamination that remained at the property.

1.1 Summary of Recent Field Investigation Activities

The results of previous site investigation activities revealed the presence of TPH-g and MtBE in off-site areas located hydraulically down-gradient direction of the site at 2201 Valley Street. Due to the recent economic growth in downtown Oakland, and a significant demand for housing and commercial redevelopment, Mr. Mo Mashhoon, the current site owner has received an acceptable offer to sell his property to a prospective buyer. Due to the past activities at the site and fact that residual levels of petroleum hydrocarbons still remains in the subsurface, in late 2016 the prospective buyer retained PES Environmental, Inc. (PES) to conduct additional site investigation for further delineation of remaining petroleum hydrocarbons in soil and groundwater beneath the site and at 2201 Valley Street properties.

The objectives of the PES Phase II investigation were to:

(1) Collect soil and groundwater data to confirm that current environmental conditions are not materially different from those during the sampling performed in 2012 in support of LTCP case closure;
(2) Investigate potential petroleum hydrocarbons residual in soils and groundwater next to the USTs where limited over-excavation was performed in 1986;
(3) Investigate along product lines to assess for a potential release since piping was replaced in 1994;

(4) Confirm the extent of the dissolved phase TPH-g groundwater plume down-gradient of the subject property;
(5) Provide special coverage across the site to eliminate potential data gaps, and;
(6) Collect soil vapor data to evaluate for presence of benzene and/or other fuel related VOCs in vadose zone in the vicinity of the identified groundwater plume in anticipation of ACDEH requirements related to change in property use through redevelopment.

In early April 2017, under supervision of PES, 11 soil borings, 12 hand-auger holes, and 16 soil vapor probes were drilled. The locations of soil borings, hand-auger holes and soil vapor probes are shown in Figure 2. Borings were advanced to depths ranging from 2 to 23 feet below ground surface (bgs). The sample locations and depths were intended to provide soil, groundwater, and/or soil vapor characterization data across varying depths within the planned site redevelopment footprint.

During this investigation 50 soil samples, 17 groundwater samples and 19 soil vapor samples collected and analyzed for petroleum hydrocarbons and its constituents. In addition oxygen content of the soil vapors were analyzed to evaluate if the bio-attenuation in the vadose zone is occurring.

The results of laboratory analysis on soil, groundwater and soil vapors revealed the presence of elevated levels of contaminants in the subsurface as follows:

Soil Analytical

The results of laboratory analysis on soil samples revealed the presence of elevated levels of lead in three samples (SB9-6, HA3-2, and HA7-4) which ranged between 360 to 860 mg/Kg, exceeding Environmental Screening Levels (ESLs) of 80 mg/Kg.

TPH-g concentration ranged between non-detect and 610 mg/Kg. However, the majority of soil samples show insignificant levels of TPH-g (less than ESLs levels for commercial and residential land use type). Only one sample exhibited significant concentration of 610 mg/kg which is greater than ESLs (100 mg/Kg) for commercial and residential land use type.

Low concentrations of VOCs were detected in soil samples, however, the reported concentrations of VOCs were lower than their ESLs for commercial and residential

land use type.

Groundwater Analytical

Elevated levels of TPH-g were detected in groundwater samples collected from close by borings to USTs. For instance, TPH-g at maximum concentrations of 50,000 µg/L was detected in groundwater sample collected from SB-5 at 11.5 feet bgs. This boring is located in the southeast corner of USTs. TPH-g was also detected at high concentrations in other groundwater samples collected from close by borings of USTs such as SB-3 at 27,000 µg/L. In general, the presence of TPH-g concentration above 20,000 µg/L could be an indirect indication of presence of free phase petroleum hydrocarbons in groundwater.

Benzene was detected in groundwater samples collected from SB-5 and SB-3 at concentrations ranging between 5.4 and 120 µg/L, exceeding residential vapor intrusion ESL of 1.1 µg/L.

Ethylbenzene was detected in groundwater samples collected from SB-3, SB-5 and SB-8 at concentrations ranging between 19 µg/L and 4,200 µg/L, exceeding residential vapor intrusion ESL of 13 µg/L.

Xylenes were detected in groundwater samples at different depths collected from SB-5, at concentrations of 6,100 µg/L and 9,300 µg/L, exceeding residential vapor intrusion ESL of 1,300 µg/L.

Naphthalene was detected in groundwater samples collected from SB-3, SB-5 at concentrations ranging between 1,000 µg/L and 1,400 µg/L, exceeding residential vapor intrusion concentration of 20 µg/L.

Soil Vapor Results:

The results of soil vapor concentrations showed elevated levels of chloroform, benzene and ethylbenzene.

Chloroform was detected at maximum concentration of 160 µg/m^3 exceeding its residential soil vapor ESL of 61 µg/m^3. Benzene was detected at maximum concentration of 120 µg/m^3, exceeding its residential soil vapor ESL of 48 µg/m^3. Ethylbenzene was detected at maximum concentration of 1,800 µg/m^3 exceeding its residential soil vapor ESL of 560 µg/m^3.

2. PROPOSED SCOPE OF WORK

SOMA proposes to perform the following tasks:

Task 1: Construction of site conceptual model;

Task 2: Conduct an MPE pilot test;

Task 3: Prepare corrective action plan

2.1 Construction of site conceptual model

SOMA will conduct a thorough file review and compile the data from previous consultant reports including well and boring logs, chemical data, the latest groundwater monitoring and remediation reports. The previous data, along with the data collected during the Phase II site investigation gathered by PES, will be used to construct longitudinal and transverse geologic cross-sections in relation to groundwater flow direction at the site. The concentrations of petroleum hydrocarbons and its constituents at different layers detected in the past will be presented to evaluate the vertical extent of residual contaminants at the site.

Upon preparation of the geologic cross-section the future site development plan will be placed over the site to evaluate the potential exposure pathway and whether or not the residual contaminants at the site will impact the future residents and commercial workers at the site. The construction plan will show the extent of excavation, if any needed during the site development and if the excavated soils will need proper disposal.

As part of the site conceptual model, the total mass of chemicals in the subsurface will be evaluated. The mass calculation will involve using the existing chemical data in soil and groundwater. The results of latest site investigation revealed the potential presence of free phase product in groundwater. As part of remedial investigation the extent of free product along with the mass of free product will be calculated during chemical mass calculation processes.

2.2 Conducting MPE pilot test

SOMA proposes conducting the following pilot testing to determine the feasibility of utilizing high vacuum MPE, as an interim remedial action to minimize impact of

on-site contamination on current and future on-site workers, occupants and residents. The results of the proposed pilot testing will be utilized in evaluating possible remedial alternatives for the site and preparing a CAP.

For conducting the pilot test, three MPE pilot test wells (EX-1 thru EX-3) along with five observation wells (OB-1 thru OB-5) will be drilled. The locations of the three MPE pilot test wells along with observation wells are presented in Figure 3. The extraction wells will be 25 feet deep and 4-inch in diameter. The observation wells will be up to 25 feet deep. The wells will be perforated from 2-3 feet from below ground surface (bgs) to the desired depths. The wells will be drilled using hollow stem auger rig. During installation of the extraction and observation wells, they will be continuously logged by a geologist. Photo-ionization detector (PID) will be utilized to detect and record readings. The readings will be noted on the well logs.

The locations of the MPE extraction wells were chosen based on the results of the latest subsurface investigation conducted by PES. These locations are at or near the soil borings drilled by PES where the highest groundwater contamination was detected which may be an indication of free phase hydrocarbons in groundwater. These locations are also very near or next to the existing USTs. The observation wells will be used during the pilot test to record the observed vacuum readings as well as water level readings in order to evaluate the zone of influence of each MPE well as well as combined effect of MPE operation on groundwater drawdown.

2.3 Pilot Test Objectives

The following summarizes objectives of MPE pilot testing.

Pilot test results will be utilized to accomplish the following:

- Mass Removal: determine whether tested technologies can accomplish removal of contaminant mass at satisfactory rates. Mass removal rates will be also evaluated to determine, if applied over a longer time the technology has the potential to achieve significant mass reduction. It should be noted, however, that it can be difficult to accurately determine long-term mass removal trends based on short-term pilot testing. Prior to recommending the appropriate technology, as explained above contaminant mass will be re-evaluated using the newly available data to allow for a more thorough evaluation of effectiveness of proposed remedial technologies.

- Zone of Influence (ZOI) Evaluation: provide indications of the vadose and saturated zone response to the application of vacuum. ZOI will be determined for each extraction well as well as the overall ZOI when all three wells are operating by utilizing the monitoring point pressure gauges, wellhead and monitoring point vacuum from well head pressure gauge.
- Subsurface Soil Properties/Parameters Evaluation: provide information about the nature and variability of site-specific subsurface parameters, such as air permeability and air flow rate will be used in calculating mass removal rates and contaminant distribution.
- Discharge Concentrations/Design Parameters: establish initial levels of contaminants in extracted gas and liquid. These data will be used for treatment system design and discharge permitting.
- Cost Evaluation: evaluate cost of full-scale system implementation and operation as well as assessment of the duration of the soil and groundwater remediation.

Extended MPE pilot testing will allow for a more realistic assessment of actual removal rates and observation of rebound effect or asymptotic behavior of removal rates, and determine whether a permanent or temporary remedial system will be more feasible.

2.4 Test Preparation and Notifications

In accordance with conditions of the various-locations Bay Area Air Quality Management District (BAAQMD) air discharge permit for the mobile treatment system unit (MTS) to be used for pilot testing, SOMA will notify BAAQMD of the location, date and duration of the test and the vapor treatment to be utilized, and notify Alameda County Department of Environmental Health (ACDEH) a minimum of 72 hours in advance of pilot testing. Provisions will be made for on-site pretreatment of extracted groundwater utilizing granulated activated carbon (GAC) vessels and discharge it, under the appropriate discharge permit, to the onsite waste water inlet. A temporary wastewater discharge permit will be obtained prior to initiating pilot testing.

SOMA will prepare a site-specific Health and Safety Plan (HASP). The HASP will be prepared according to the Occupational Safety and Health Administration (OSHA), “Hazardous Waste Operation and Emergency Response” guidelines (29 CFR

1910.120) and the California Occupational Safety and Health Administration (Cal/OSHA) “Hazardous Waste Operation and Emergency Response” guidelines (CCR Title 8, section 5192). The HASP is designed to address safety provisions during field activities and protect the field crew from physical and chemical hazards resulting from drilling and sampling. The HASP establishes personnel responsibilities, general safe work practices, field procedures, personal protective equipment standards, decontamination procedures, and emergency action plans. The HASP will be reviewed and signed by field staff and contractors prior to beginning field operations.

2.5 Pilot Test Length

In order to evaluate long-term mass removal trends, SOMA proposes conducting an extended 4-week pilot test, described above, to achieve a realistic assessment of actual removal rates, observe the steady state vacuum readings and groundwater elevation readings as well. We believe that the longer pilot test period will provide more useful data and can be implemented with greater and dependable results.

2.6 Sampling Before, During and After Pilot Testing

The MPE pilot test extraction wells and the observation/monitoring wells described above, will be monitored and sampled prior to initiating proposed pilot testing, to establish baseline conditions and evaluate groundwater quality as well as the groundwater flow direction and gradient before conducting MPE pilot testing. In addition to standard analytical methods, additional constituents such as dissolved oxygen (DO) and dissolved iron will be evaluated utilizing the appropriate sample collection techniques and laboratory methods. The initial groundwater monitoring and sampling will be conducted once all appropriate development and survey has been implemented.

2.7 MPE Pilot Test Summary

Achievement of remedial goals and establishment of long-term trends in mass removal cannot be expected from the typical short-term MPE pilot test. The purpose of the MPE pilot test is to evaluate feasibility of dewatering the smear zone and removing liquid-phase and potential presence of free phase hydrocarbons adsorbed to the smear zone using vacuum-enhanced volatilization. Due to the presence of a shallow water bearing zone at the site, smear zone dewatering will be critical to MPE

success. Pilot testing is required to determine air/water yields necessary to completely expose the smear zone for successful mass removal of VOCs from the subsurface. In addition, vacuum ZOI will be determined using vacuum measurements collected at vacuum monitoring wells. The pilot test will demonstrate whether MPE can accomplish removal of contaminant mass at sufficient rates that, if carried out over a sufficient period of time, can potentially achieve significant remediation.

2.7.1 MPE Pilot Test Equipment

SOMA proposes to conduct MPE pilot testing within the Shallow WBZ where the highest contaminant concentrations have been observed, utilizing newly installed monitoring-remediation wells as extraction wells and proposed wells as observation wells (Figure 3). As discussed in the following paragraphs, proposed extraction wells will be completed with 4-inch-diameter well screens and casing to a maximum depth of approximately 25 feet bgs, with a well screen completely exposing the impacted zone.

Below are the details of mobile treatment system (MTS) that will be utilized at the site:

1. The MTS is equipped with electrical generator, air compressors, liquid ring vacuum pump rated at 25-horsepower and 428 standard cubic feet per minute, electrical/pneumatic submersible pumps, air/water separator vessel, discharge hoses and traffic-rated hose ramps, drop tubes (stingers), and a thermal/catalytic oxidizer for vapor treatment.
2. The MTS has adequate flow/vacuum range for site-specific soil type and is system is equipped with vacuum pressure relief dilution valves and temperature gauges.
3. MTS will utilize the existing three-phase power source for running liquid ring pump and possibly electrical oxidizer.
4. A flow measurement device will allow for measurement of total flow and individual well flows; there are sample ports to sample at each well location; a cumulative sampling port to sample before and after the treatment unit will also be available. Samples will be collected throughout the pilot test to provide sufficient data to evaluate system efficiency.
5. All piping materials utilized during pilot testing will be appropriate for site contamination; aboveground lines connecting the individual extraction wells

and the treatment system unit will be protected by rubberized traffic-rated ramps.

6. The oxidizer for treatment of extracted vapor operates under a valid various-locations BAAQMD permit. An MPE pilot test general schematic diagram is illustrated in Figure 4.

Two possible MPE system configuration can be utilized; dual-phase extraction (DPE) and two-phase extraction (TPE). DPE utilizes separate mechanical systems for pumping groundwater and extracting soil vapor. TPE utilizes a single vacuum pump to extract both groundwater and soil vapor through small-diameter drop tube (stinger) piping inserted in the well. The most cost-effective MPE configuration is determined by aquifer permeability and the corresponding yield of both air and water. The water production rate needed to dewater the target zone, and the induced vacuum generated for soil vapor extraction, will determine whether DPE or TPE will be utilized. If the water production rate is high (>2 gpm/well), then DPE would be utilized. If the water production rate is low (<2 gpm/well), then TPE would be utilized. Based on subsurface geology, and anticipated pumping rates, most likely a TPE configuration will be utilized. During the pilot test, influent flow rates will be regulated to achieve maximum system efficiency.

The downhole stinger utilized during pilot testing will consist of flush-threaded Schedule 40 PVC well casing. The stinger will be connected by flexible hose to the MTS, and slowly extended deeper into the extraction well as groundwater is removed from the well casing/screen by vacuum until the bottom of the stinger is 1 foot from the bottom of the well. Total depth of the well will be measured prior to inserting the stinger.

As required, SOMA will notify the BAAQMD of the location, date, and duration of the pilot test, and the vapor treatment to be utilized three days prior to start of the event.

Provisions will be made for on-site pretreatment of extracted groundwater utilizing granulated activated carbon (GAC) vessels and discharge. Wastewater will be discharged to the sanitary sewer under the wastewater discharge permit issued by East Bay Municipal Utility District (EBMUD). EBMUD will be notified three days prior to start of the MPE event.

MPE Set Up

The MPE system will be set up according to diagram illustrated on Figure 4 and procedures described in sections above. The proposed wells EX-1 thru EX-3 and a combination of these wells will be used during this event.

During initial startup, SOMA will check for blockages, piping leaks, equipment functioning, and safety of the overall setup and operation.

The MTS system will be operating continuously throughout event; however no overnight data collection is proposed at this time. Following initial startup, MTS operational data will include:

1. Oxidizer temperature and pump/air temperature as displayed on the MTS control panel.

2. Pump/air temperature as displayed on the MTS control panel.

3. Total flow will be calculated using the pump vacuum observation.

4. Dilution flow will be used to control influent concentrations for safety reasons.

5. Total liquids removed will be read by the flow meter after the transfer pump attached to the bottom of the knockout pot.

6. In addition to frequent PID readings throughout the day, influent weekly soil vapor samples will be collected on the discharge side of the liquid ring pump. Vapor samples will be collected in Tedlar bags and submitted to a California state-certified environmental laboratory for analyses using EPA TO-15 and TO-3 analytical method. In addition, effluent vapor samples will also be obtained from the oxidizer stack within 24 hours of the start of the pilot test to demonstrate compliance with BAAQMD various-locations modified permit conditions.

7. Extracted soil vapor concentrations will be measured hourly throughout the day (excluding the night time) with an appropriately calibrated FID or PID calibrated to hexane.

8. During the pilot test each extraction well will be tested individually and in combination with the other wells in order to assess the contribution of each well to the overall mass removal rate in order to assess the best combination of the wells that produce the highest removal rate.

Appropriate groundwater samples will be collected from the effluent line to demonstrate compliance with the temporary waste discharge permit, which will be utilized for groundwater disposal.

Appendix C includes MTS Operational Data Sheets. MTS operational data will include oxidizer temperature, pump/air temperature, total flow, dilution flow, well flow, and total liquids removed by vacuum.

2.8 Effluent Treatment Provisions

SOMA proposes on-site treatment of extracted groundwater utilizing a GAC, and treated groundwater will be discharged to the public sewer system under appropriate wastewater discharge permit issued by EBMUD. Groundwater samples will be collected and analyzed as required by the discharge permit.

Extracted vapor will be treated using an on-board thermal/catalytic oxidizer and discharged to the atmosphere under modified air discharge permit issued by BAAQMD. Based on the permit requirements, prior to discharge treated vapor will be sampled within first 24 hours of system operation and analyzed by a certified analytical laboratory.

2.9 Laboratory Sample Analysis

Collected groundwater samples will be analyzed for the following:

- TPH-g (EPA Method 8260), TPH-d (EPA Method 8015)
- VOCs (benzene, toluene, ethylbenzene, total xylenes- collectively termed as BTEX, MtBE, and fuel gasoline oxygenates) (EPA Method 8260)

Collected vapor samples will be used to evaluate contaminant mass removal rates and comply with the permit requirements. Vapor samples collected during the pilot test will be analyzed for the following:

- TPH-g and BTEX using USEPA Test Methods TO-3 and TO-15 (full list).

3. PREPARATION OF CORRECTIVE ACTION PLAN

Upon completion of the MPE pilot test the effectiveness of this alternative will be evaluated. The information received upon this pilot test will be used in preparation

of the Corrective Action Plan (CAP). The CAP will compare different remedial alternatives in terms of effectiveness, feasibility, costs and time to achieve the cleanup goal of future unrestricted use of the site, as agreed to by Mash Petroleum and the prospective buyer. The CAP will introduce the most effective, feasible, and less costly alternative in removing chemicals from the soil and groundwater at the site.

4. PROJECTED SCHEDULE AND REPORT PREPARATION

The workplan will be implemented upon receipt of authorization from Alameda County Department of Environmental Health. We anticipate that the proposed work, can be completed in approximately 8 weeks following receipt of authorization.

Upon completion of all field activities, SOMA will prepare and submit a report documenting description of well installations and MPE pilot test results, conclusions and recommendations.

FIGURES

Image Provided By EDR Aerials

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SITE MAP

2200 Telegraph Avenue
Oakland CA 94612

PREPARED FOR:
PROJ. MGR:
DRAWN BY: Ruchi Mathur

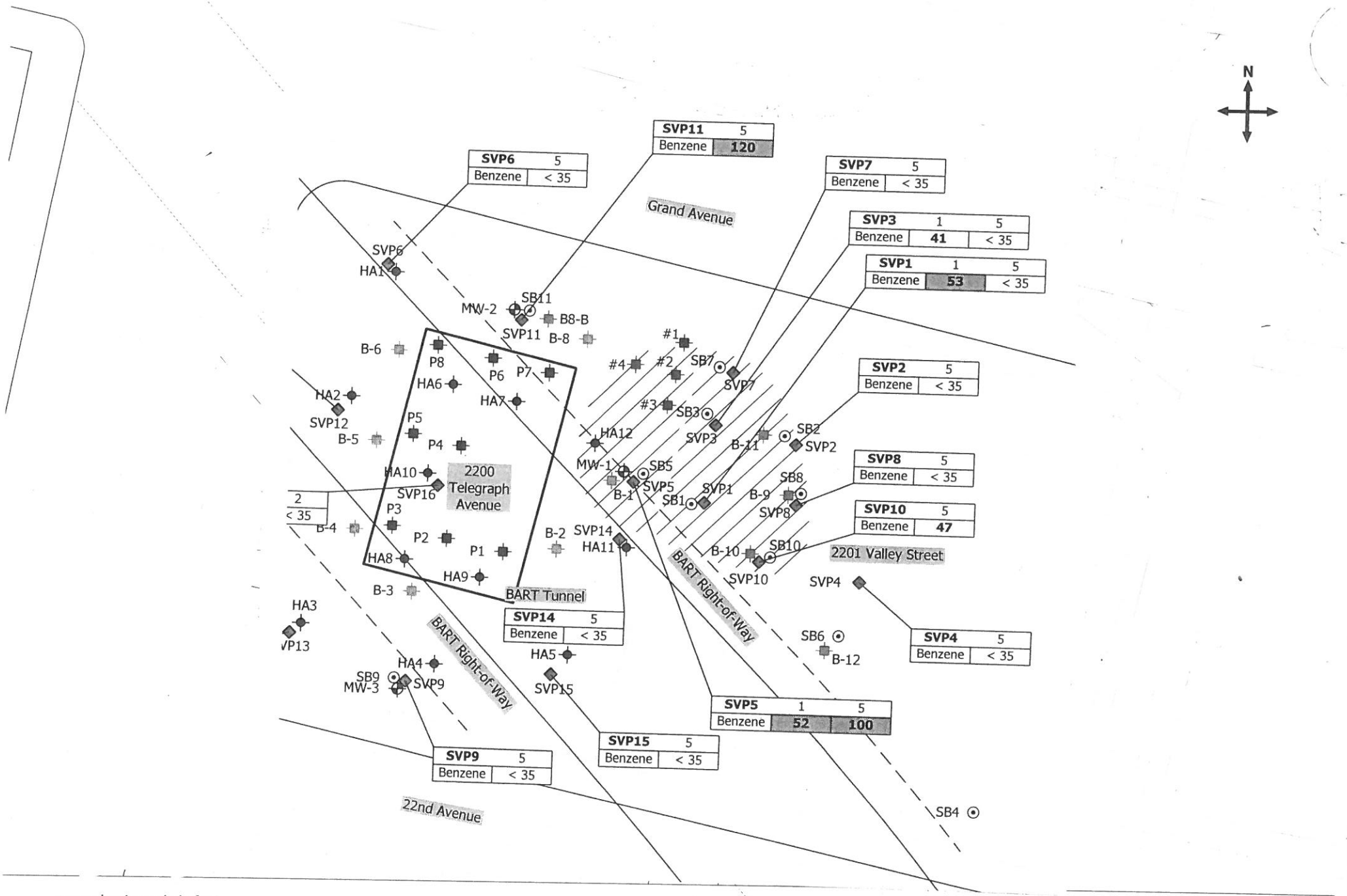

Figure 2: Site Map Showing the locations of soil borings and vapor probes installed by PES

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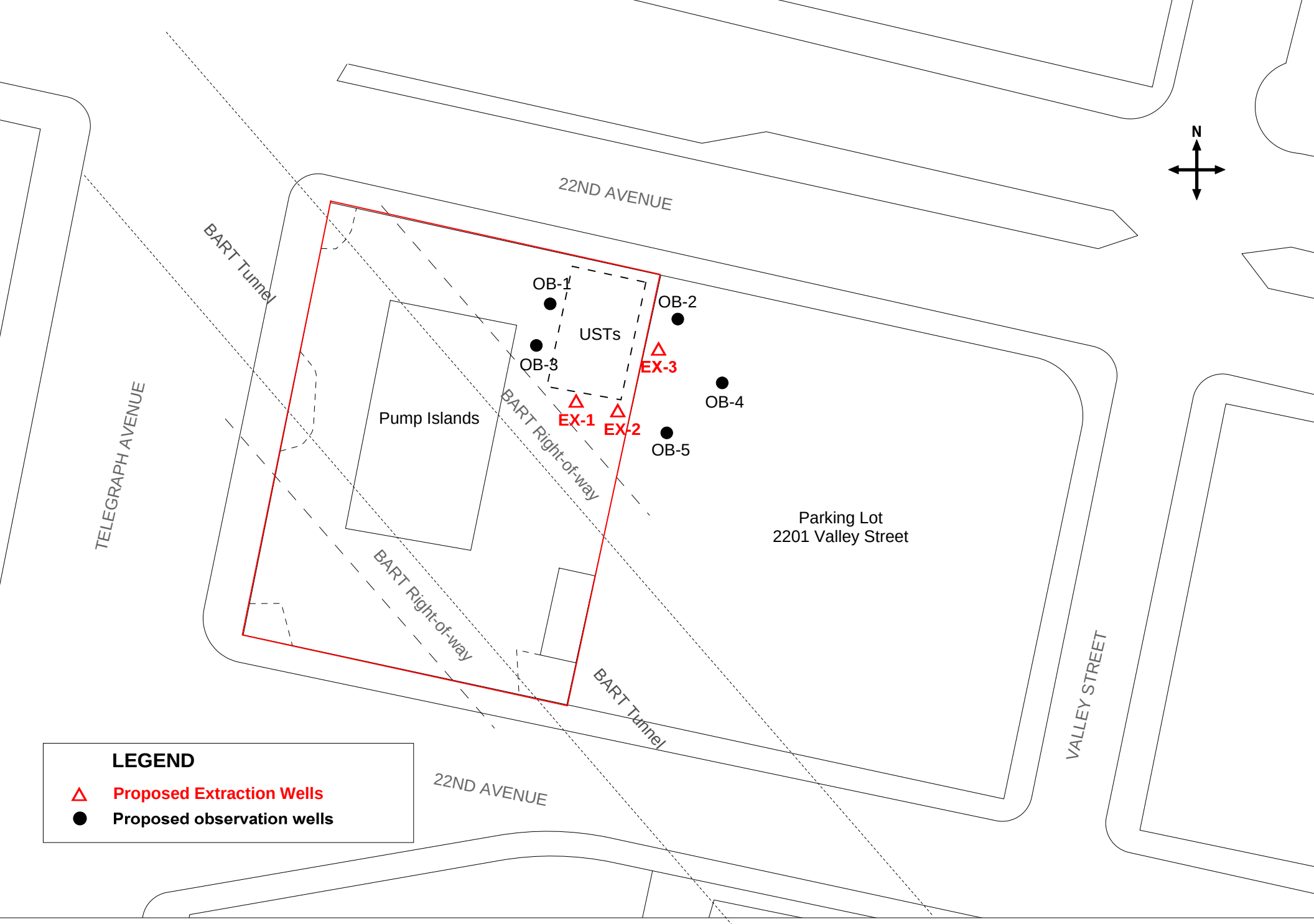

Figure 3: Site Map with Proposed Extraction and Observation Well Locations
2200 Telegraph Avenue, Oakland

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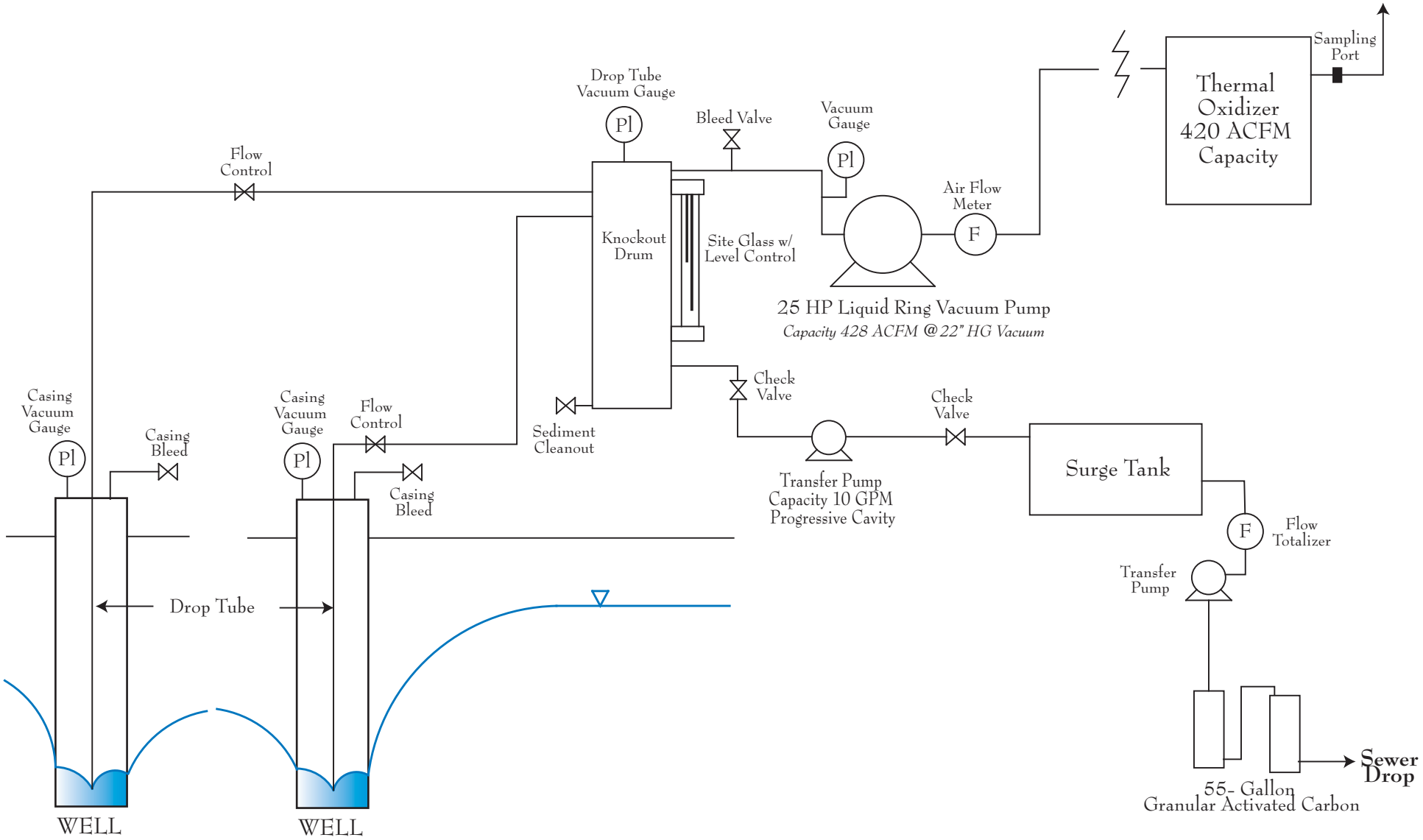

Not to Scale

Figure 4: MTS Process Schematic

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APPENDIX A

MTS OPERATIONAL DATA SHEET

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SITE: _____
ADDRESS: _____
PROJECT #: _____

MTS OPERATIONAL DATA

DATE	TIME	OXIDIZER TEMPERATURE (F)	PUMP/AIR TEMPERATURE (F)	STINGER VACUUM (IN-Hg)	PUMP VACUUM (IN-Hg)	TOTAL FLOW (SCFM)	DILUTION FLOW (SCFM)	HOURS OF OPERATION (HOURS)	INFLUENT CONCENTRATION (PPMV)	WATER TOTALIZER